

A 32-year-old physiotherapist presents with a two week history of increasing shortness of breath and leg swelling. Previously well, she gave birth eight weeks ago by planned Caesarean section and is breast-feeding. Over the last four weeks, she has become progressively breathless, and developed a dry cough and swollen ankles. She smoked in her teenage years.

On examination, she is afebrile with a pulse of 108 beats per minute and irregular. Her blood pressure is 85/53 mmHg. Her respiratory rate is 16 breaths per minute, which increases to 24 breaths per minute on light exercise.

Her jugular venous pressure (JVP) is elevated at 5 cm and she has pitting oedema of both lower limbs to the mid-shin. A pan-systolic murmur, loudest at the apex, and a third heart sound can be heard. Percussion note is dull at the right base and is associated with decreased air entry. Coarse crackles are present at the left base. Her liver is mildly tender and enlarged 3 cm below the right costal margin.

A chest X-ray (CXR) shows a pleural effusion at the right base, a blunted left costophrenic angle, alveolar shadowing at both bases and large pulmonary vessels. Atrial fibrillation with an occasional ectopic beat is evident on electrocardiogram (ECG).

Investigations reveal the following:

Investigation	Result	Normal Values
Haemoglobin (Hb)	112 g/l	115-155 g/l
White Cell Count (WCC)	$12.5 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$246 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	132 mmol/l	135-145 mmol/l
Potassium (K^+)	3.8 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	84 μ mol/l	50-120 μ mol/l
Urea	4.5 mmol/l	2.5-6.5 mmol/l
Bilirubin	20 μ mol/l	1-22 μ mol/l
Albumin	36 g/l	35-55 g/l
Alanine aminotransferase (ALT)	106 U/l	7-55 U/l
Alkaline phosphatase (ALP)	121 U/l	30-150 U/l
C-reactive Protein (CRP)	34 mg/l	< 10 mg/l

Thyroid Stimulating Hormone (TSH)	1.23 $\mu\text{U/l}$	0.17–3.2 $\mu\text{U/l}$
Free T ₄	18.2 pmol/l	11–22 pmol/l
Mean Corpuscular Volume (MCV)	84.3 fl	80–100 fl

What is the most likely diagnosis?

Your answer was incorrect

- A Atypical pneumonia
- B Pulmonary embolus
- C Peripartum cardiomyopathy
- D Subacute bacterial endocarditis
- E Primary pulmonary hypertension

Explanation



- C Peripartum cardiomyopathy

Peripartum cardiomyopathy is an idiopathic condition occurring in the last month of pregnancy or in the first five months postpartum. It presents with heart failure secondary to left ventricular systolic dysfunction. The clinical vignette describes a patient with significant heart failure, and this is the most likely underlying diagnosis. Heart failure should be managed with β -blockade and diuretics, and ACE inhibitors can be considered postpartum. In many cases cardiac function recovers, but if it remains poor then heart transplant should be considered.

- D Subacute bacterial endocarditis

This diagnosis should be considered in all patients with a new pan-systolic murmur. However, there are no additional features to suggest this diagnosis. The pan-systolic murmur present here is likely caused by mitral regurgitation secondary to left ventricular dilatation rather than endocarditis. However, in both cases an echocardiogram would be the next investigative option.

- A Atypical pneumonia

The chest findings reported here could be confused with an atypical pneumonia, but the bilateral nature and the systemic features in keeping with heart failure make this less likely.

B Pulmonary embolus

The risk of pulmonary embolism increases in pregnancy and should be considered in peripartum individuals with dyspnoea. A large pulmonary embolism would lead to features of right-sided heart failure, including a raised JVP and peripheral oedema. However, typically with a pulmonary embolism there would be limited chest findings.

E Primary pulmonary hypertension

This condition normally presents over a longer time-frame than indicated in this case. Furthermore, the primary features are of dyspnoea with right-sided heart failure signs and symptoms developing. Examination of the chest is usually normal, as left ventricular function is often preserved.

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A 60-year-old man on long-term haemodialysis presents with chest pain and a troponin level of 27 ng/l (normal range 0-14 ng/l). He is next due to dialyse the following morning. There is T-wave inversion in the lateral leads which was not present on a 12-lead Electrocardiogram (ECG) from two months earlier. He does not have pulmonary oedema. The pain is only partially relieved by a small dose of intravenous (IV) diamorphine.

Which would be the most appropriate acute cardiovascular management for this man?

Your answer was incorrect

- A Aspirin and IV nitrates
- B Aspirin, IV nitrates and abciximab
- C Ticagrelor, aspirin, IV nitrates, IV furosemide and treatment dose low-weight molecular heparin (LMWH)
- D Ticagrelor, aspirin, IV nitrates and unfractionated heparin
- E Reassure the patient that the raised troponin level is due to his kidney disease

Explanation



- D Ticagrelor, aspirin, IV nitrates and unfractionated heparin

This man is on long-term haemodialysis, and his new ECG changes raise the possibility of an NSTEMI. Current European Society Cardiology (ESC) guidelines recommend aspirin, ticagrelor and fondaparinux in patients presenting with NSTEMI. Fondaparinux is not recommended in patients with eGFR <20; in such patients, options include LMWH (with dose reduction to 1 mg/kg OD; not recommended if eGFR <15) or unfractionated heparin, which does not require a dose reduction. Ticagrelor was evaluated in the PLATO trial, which demonstrated reduced rates of cardiovascular mortality, myocardial infarction (MI), stroke, and all-cause mortality when compared with clopidogrel, without an associated increase in major bleeding side effects.

A Aspirin and IV nitrates

Nitrates are useful for pain in this case but do not impact on overall prognosis. Nitrates and aspirin alone would not represent an adequate combination of therapies for this patient.

B Aspirin, IV nitrates and abciximab

Per the ESC guidelines, there are no specific recommendations for the use of abciximab, or for dose adjustment in the case of kidney disease. Careful evaluation of haemorrhagic risk is needed. In any case, current guidance states that it is not recommended to administer GPIIb/IIIa inhibitors in patients in whom coronary anatomy is not known.

C Ticagrelor, aspirin, IV nitrates, IV furosemide and treatment dose low-weight molecular heparin (LMWH)

The longer patients are on dialysis the less likely they will be passing urine. Furosemide would not off-load the patient unless he was passing urine. In any respect, he is not in failure. Given his kidney disease, treatment dose (LMWH) would not be an appropriate option either, with ESC guidelines recommending a dose reduction for those with stage IV chronic kidney disease (CKD), and stating that LMWH is not recommended for those with stage V CKD.

E Reassure the patient that the raised troponin level is due to his kidney disease

This patient has ongoing chest pain, ECG changes and a raised troponin. It would be inappropriate to reassure without further investigation and treatment.

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A 55-year-old man with a history of hypertension and duodenal ulceration presents with tearing interscapular back pain and a new early diastolic murmur. Aortic dissection involving the aortic root and disrupting the aortic valve is confirmed on computed tomography scan. The patient undergoes urgent operative intervention with the replacement of the aortic root with a Dacron graft and replacement of the valve with a metallic prosthesis.

After excellent postoperative recovery, he returns for a follow-up appointment complaining of increasing lethargy, exertional dyspnoea, and palpitations. His medication includes warfarin, methyldopa, nifedipine and ranitidine.

Physical examination reveals a small haematoma related to his sternal scar, sinus tachycardia, an ejection systolic murmur and pale mucous membranes.

Investigations reveal the following:

Investigation	Result	Normal Value
Haemoglobin (Hb)	57 g/l	135–175 g/l
White cell count (WCC)	$12.0 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$486 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Mean corpuscular volume (MCV)	100 fl	80–100 fl
Erythrocyte sedimentation rate (ESR)	27 mm/hour	1–20 mm/hour
International normalised ratio (INR)	3.31	< 1.3
Direct Coombs test	Negative	
Faecal occult blood	Negative	
Serum transferrin-receptor assay	Increased	
Fibrin degradation products	Increased	

What is the most likely diagnosis?

Your answer was incorrect

- A Peptic ulceration
- B Autoimmune haemolysis

- C Over-anticoagulation
- D Prosthetic valve dysfunction
- E Valve haemolysis

Explanation



- E Valve haemolysis

Fragmentation of erythrocytes on a prosthetic valve is an unusual complication of valve replacement, but doesn't necessarily imply haemodynamic dysfunction of the valve. It tends to manifest as low-grade iron deficiency anaemia but occasionally causes a clinically important anaemia. The increased fibrin degradation products also fit with the possibility of valve haemolysis.

- C Over-anticoagulation

The negative faecal occult blood test, and INR of 3.3 (target 2–3), make this a less likely diagnosis.

- A Peptic ulceration

The negative faecal occult blood test makes this a less likely diagnosis.

- B Autoimmune haemolysis

A negative Coombs test excludes autoimmune haemolysis (which in this case could have been related to methyldopa treatment).

- D Prosthetic valve dysfunction

This patient's significant anaemia and increased fibrin degradation products make valve haemolysis a more likely diagnosis than valve dysfunction.

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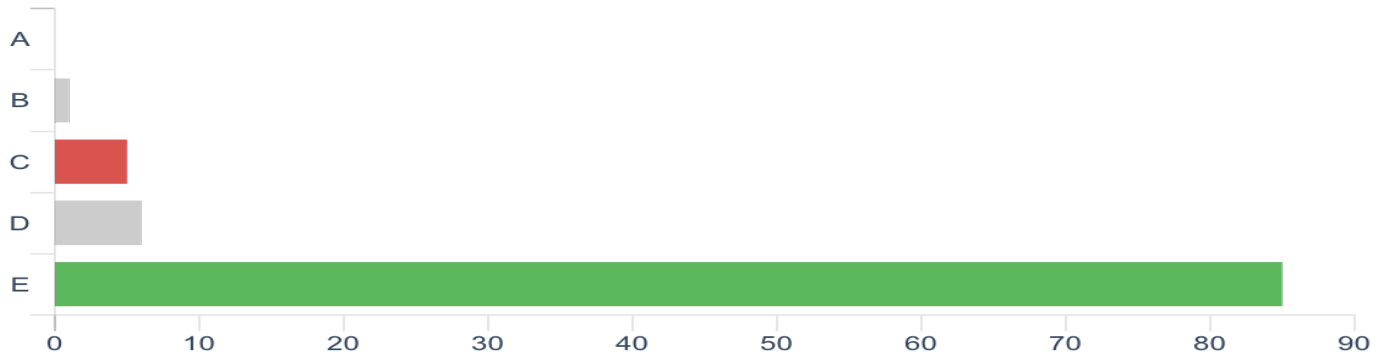
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You are the Senior House Officer (SHO) in the Cardiology Clinic and wish to start a male patient, who has recently been diagnosed with hypertension, on an agent in addition to his angiotensin-converting enzyme (ACE) inhibitor. He is a type II diabetic who is currently diet-controlled. His blood pressure is 155/90 mmHg.

Which of the following is the most appropriate next agent?

Your answer was incorrect

- A Diltiazem
- B Valsartan
- C Atenolol
- D Amlodipine
- E Bendroflumethiazide

Explanation



- D Amlodipine

Recommendations from the National Institute for Health and Care Excellence (NICE) hypertension guidelines recommend the addition of a CCB as step 2 agent, if hypertension is inadequately controlled on ACEi monotherapy. Beta-blockers and thiazides are not recommended as first- or second-line agents due to data around their adverse event profile with respect to the impact they have on blood glucose control. As such, amlodipine is the next logical choice as diltiazem is cardioselective and may precipitate bradycardia.

- E Bendroflumethiazide

Thiazide diuretics are not recommended as first- or second-line agents in diabetics due to their adverse impact on blood glucose control.

- A Diltiazem

This is a cardioselective, negatively inotropic, calcium channel blocker and is not recommended as it may precipitate bradycardia.

B Valsartan

Valsartan is an angiotensin receptor blocker. It can be used in combination with ACE inhibition in the treatment of heart failure. In combination with ACE inhibition, valsartan can cause hyperkalaemia and it is therefore not the optimal second-line agent here.

C Atenolol

Beta-blockers are not recommended as first- or second-line agents in diabetics due to data around their adverse impact on blood glucose control.

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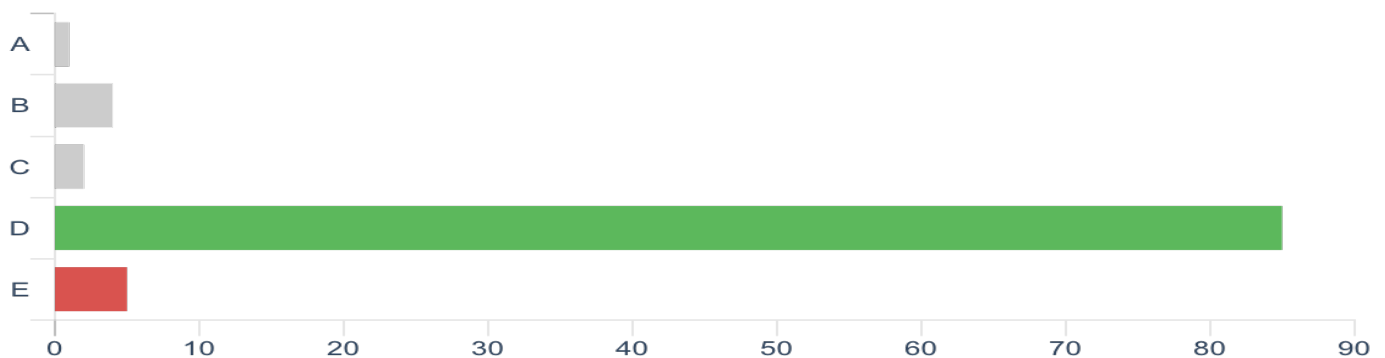
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4

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External Links

Hypertension in adults: diagnosis and management

[nice.org.uk/guidance/cg127](http://www.nice.org.uk/guidance/cg127)

(<http://www.nice.org.uk/guidance/cg127>)

Expanded Explanation

Overview

Clinical Presentation

Diagnosis / Investigation

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Prognosis



A 45-year-old man presents to the Emergency Department with a fever, widespread rash, and confusion. His only past history of note was Sydenham's chorea and a number of recent dental extractions.

While in hospital, his rash, which initially looked like petechial haemorrhages, worsens and develops into a purpuric rash heavily concentrated on his trunk and lower limbs. He is started on cefuroxime and aciclovir. Over the weekend, he develops an episode of ataxic hemiparesis that resolves. When he is seen on the Monday morning ward round, he complains of incoordination of his right arm.

A computed tomography head shows evidence of small infarcts in a number of areas. A lumbar puncture is performed. The only abnormality is a raised protein of 0.7 g/l (normal < 0.5 g/l). Herpes simplex virus polymerase chain reaction is negative. The patient continues to experience spiking temperatures of up to 39 °C and the rash is not subsiding despite antibacterial and antiviral treatment.

What is the most useful examination to confirm the cause of his neurological symptoms?

Your answer was incorrect

- A Magnetic resonance imaging (MRI) brain
- B Trans-oesophageal echocardiography (TOE)
- C Cryoglobulins
- D Serum antiphospholipid antibodies
- E Blood cultures

Explanation



- B Trans-oesophageal echocardiography (TOE)

A patient with persistent fever, rash and embolic events must have an urgent TOE to exclude infective endocarditis. The recent dental extractions raise the possibility of *S. viridans* endocarditis.

D Serum antiphospholipid antibodies

Although cerebral lupus may present with multiple small infarcts, given the pyrexia and recent dental extractions, infective endocarditis should be ruled out first.

A Magnetic resonance imaging (MRI) brain

MRI brain may confirm multiple small infarcts, although it won't confirm whether they are septic in nature.

C Cryoglobulins

Cryoglobulins are a non-specific marker of vasculitis and are found in a significant percentage of patients with infective endocarditis, but they are relatively non-specific.

E Blood cultures

Blood cultures may be positive but won't confirm endocarditis as the underlying cause of his neurological symptoms, because of septic emboli.

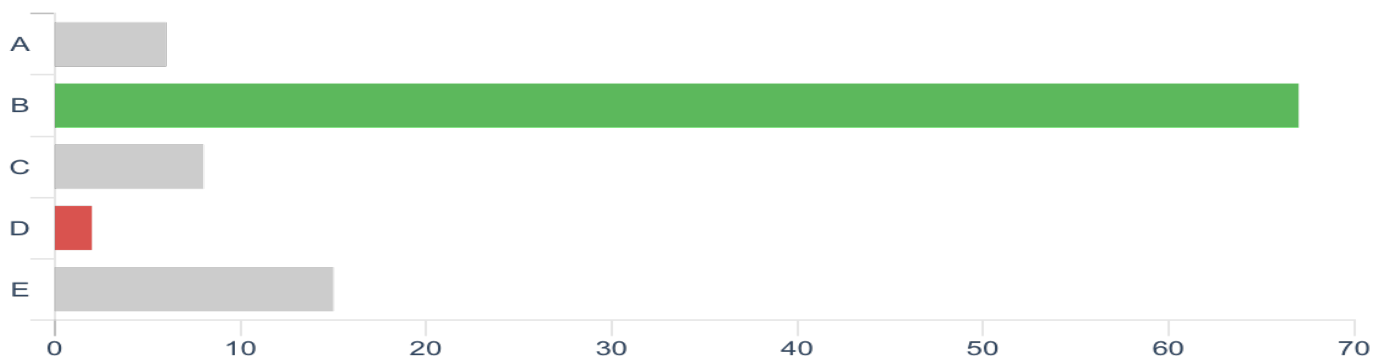
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Expanded Explanation

Overview

Clinical Presentation

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A 30-year-old woman who is known to have recurrent attacks of migraine presents to the Emergency Department complaining of central dull chest pain. She normally takes amitriptyline, and started sumatriptan for the acute attack. She has just returned from a holiday in Spain.

On examination she appears normal with all observations within normal range. Initial blood tests reveal normal haematology and biochemistry. Both D-dimer and troponin T assays are within the normal range and a chest X-ray is normal. A 12-lead electrocardiogram is unremarkable.

What is the most appropriate course of action?

Your answer was incorrect

- A Start heparin and arrange a ventilation/perfusion scan
- B Obtain a psychiatric opinion
- C Stop sumatriptan
- D Arrange a gastroscopy
- E Reassure and discharge

Explanation



- C Stop sumatriptan

Sumatriptan has been associated with chest pain, and various studies have suggested up to 17% of people taking it report chest pain, possibly due to vasospasm. Furthermore, sumatriptan has been associated with myocardial infarctions and is contraindicated in people with known ischaemic heart disease. Although troponin is normal today, this patient does appear to have symptomatic coronary artery vasospasm and would probably benefit from stopping the sumatriptan.

- B Obtain a psychiatric opinion

Given the strong link between sumatriptan and vasospasm, symptomatic cardiac chest pain should be excluded first before a functional disorder and psychiatric referral are considered.

A Start heparin and arrange a ventilation/perfusion scan

Given the chest pain is dull and retrosternal in nature, it is much more consistent with cardiac chest pain. As such a VQ is not indicated.

D Arrange a gastroscopy

Although reflux oesophagitis may cause similar pain, the link between sumatriptan and cardiac vasospasm should be explored first before considering gastroscopy.

E Reassure and discharge

This runs the risk of the patient returning with an Non-ST-elevated myocardial infarction (NSTEMI) due to vasospasm over the next few months.

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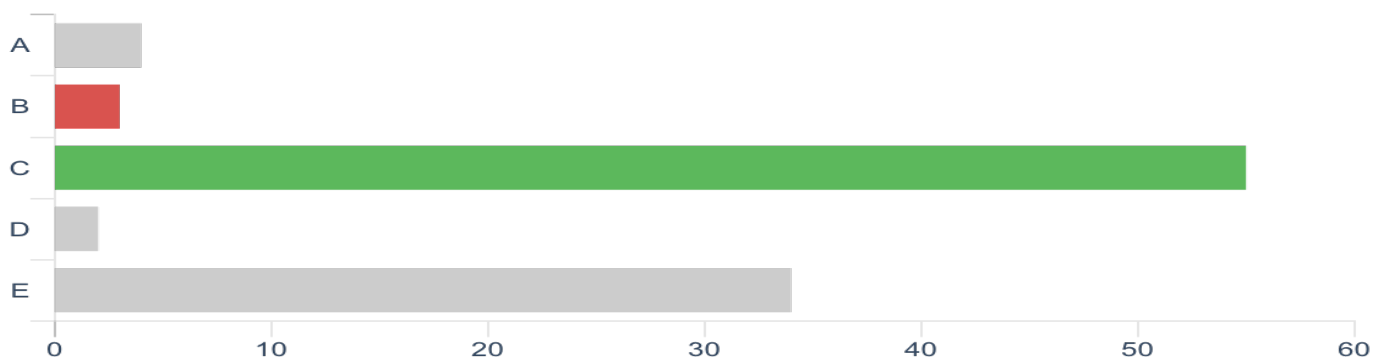
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 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q7

A 24-year-old woman presents to the Emergency Department (ED) following an episode of collapse preceded by palpitations. She has recently completed a course of amoxicillin for a chest infection prescribed by her General Practitioner, but has no other medical history of note.

On examination, she is found to have a heart rate of 100 beats per minute and clear lungs.

Investigations reveal the following:

Investigation	Result	Normal Values
Haemoglobin (Hb)	122 g/l	115-155 g/l
White cell count (WCC)	$13.0 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$250 \times 10^9/l$	$150-400 \times 10^9/l$
Potassium (K^+)	5.6 mmol/l	3.5-5.0 mmol/l
Sodium (Na^+)	138 mmol/l	135-145 mmol/l
Magnesium (Mg^{2+})	1.2 mmol/l	0.75-1.00 mmol/l
Corrected Calcium (Ca^{2+})	2.3 mmol/l	2.2-2.6 mmol/l
Estimated glomerular filtration rate (eGFR)	> 60	

While in the ED, an electrocardiogram (ECG) is captured which demonstrates a self-terminating episode of Torsades de pointes (TdP).

Which one of the following is this patient's most significant risk factor for torsades de pointes?

Your answer was incorrect

- A Hyperkalaemia
- B Tachycardia
- C Hyponatraemia
- D Recent beta-lactam antibiotic use

E Female sex

Explanation



E Female sex

TdP is a form of polymorphic VT associated with QT prolongation, in which the QRS complexes 'twist' around the isoelectric line. Other risk factors include: hypocalcaemia, congestive heart failure, digitalis therapy, subclinical long-QT syndrome, baseline QT prolongation, severe alkalosis, recent conversion from atrial fibrillation, and a range of drugs such as sotalol and macrolides that cause QT prolongation. Female sex is a powerful predictor of the risk of TdP in patients with congenital and acquired long-QT syndrome. How or whether variability in the expression of genes that determine normal cardiac electrophysiology explains the sex-dependent risk of TdP is not yet clear.

D Recent beta-lactam antibiotic use

It is macrolides (particularly erythromycin and clarithromycin) that are associated with QT prolongation, and thus increase the risk of torsades de pointes.

A Hyperkalaemia

It is hypokalaemia that causes QT prolongation, and thus increases the risk of torsades de pointes.

B Tachycardia

It is bradycardia, not tachycardia, that represents increased risk of torsades de pointes. With decreased heart rate, the QT lengthens and vice versa.

C Hyponatraemia

It is hypomagnesaemia that causes QT prolongation, and thus increases the risk of torsades de pointes.

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Q8

A 55-year-old man had an infero-lateral myocardial infarction (MI) a year ago. Since then, he has been fine and was discharged from your care until a month ago, when he started suffering from chest pains again.

The chest pains continued to worsen despite an increase in anti-angina medication, and he underwent coronary angioplasty with stenting of his right coronary artery. He has come to see you in the Cardiology Clinic for review of his symptoms and therapy.

Which one of the following medications should he be taking to provide a proven mortality benefit?

Your answer was incorrect

- A Amlodipine
- B Flecainide
- C Nitrates
- D Clopidogrel
- E Nicorandil

Explanation



- D Clopidogrel

The Second International Study of Infarct Survival (ISIS-2) showed that aspirin and streptokinase, or both, improved survival outcomes in patients with myocardial infarction. The First International Study of Infarct Survival (ISIS-1) revealed an improved survival in a randomised trial of intravenous atenolol among 16,027 cases of suspected acute myocardial infarction. The CAPRIE trial was a randomised, blinded trial of clopidogrel versus aspirin in patients at risk of ischaemic events; it demonstrated an 8.7% relative risk reduction with respect to ischaemic events versus aspirin. The Scandinavian Simvastatin Survival Study (4S) was a randomised trial of cholesterol lowering in 4444 patients with coronary artery disease. Among other drugs that do not improve prognosis include magnesium and anti-arrhythmics such as propafenone and flecainide.

A Amlodipine

While verapamil has been shown to provide mortality benefit in the chronic phase following ST-elevated MI (STEMI) (and is recommended for those with contraindication to beta-blocker therapy), routine use of dihydropyridines has failed to show benefit and they should therefore only be prescribed for clear additional indications, such as hypertension or residual angina.

B Flecainide

Flecainide has not been proven to provide a mortality benefit in the context of ischaemic heart disease.

C Nitrates

The ISIS-4 trial demonstrated no mortality benefit from nitrates in the setting of STEMI.

E Nicorandil

Current National Institute for Health and Care Excellence (NICE) guidance on myocardial infarction: cardiac rehabilitation and prevention of further cardiovascular disease states 'Do not offer nicorandil to reduce cardiovascular risk in patients after an MI'.

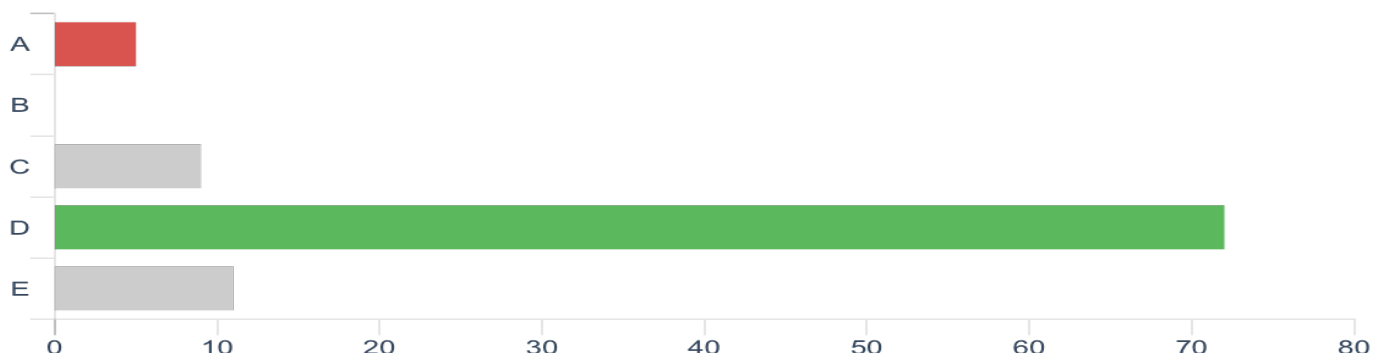
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External Links

NICE. Cardiac infarction

[nice.org.uk/guidance/CG172](https://www.nice.org.uk/guidance/CG172)

(<https://www.nice.org.uk/guidance/CG172>)

Expanded Explanation

Overview

Clinical Presentation

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Links to NICE guidelines/CKS



Q9

A 72-year-old man is admitted to the Emergency Department with worsening congestive heart failure over the past four weeks. He is known to have dilated cardiomyopathy, which has been stabilised on drugs. His medication includes digoxin 0.125 mg once daily, carvedilol 6.25 mg once daily, frusemide 40 mg once daily and losartan 50 mg once daily.

On examination, his blood pressure is 105/60 mmHg and his pulse 102 bpm and regular. His jugular venous pressure is raised and he has peripheral oedema. His respiratory rate is 25 breaths per minute and he has bilateral crepitations.

What is the most appropriate management option for this patient?

Your answer was incorrect

- A β -blockers should be permanently stopped
- B Increase the dose of digoxin
- C Add spironolactone (25 mg od) to his medication
- D Stop digoxin
- E Reduce the dose of losartan to 25 mg OD

Explanation



- C Add spironolactone (25 mg od) to his medication

The RALES trial showed that spironolactone (25 mg once a day) reduced mortality by 30% when added to conventional therapy. Recent evidence has supported the use of spironolactone in resistant hypertension, (PATHWAY-2), showing it as the most effective BP-lowering medication in doses up to 50 mg. COPENICUS (Carvedilol Prospective Randomised Cumulative Survival Trial) showed that carvedilol did improve survival and was well tolerated in patients with severe heart failure. The SOLVD trial (Studies Of Left Ventricular Dysfunction) showed that enalapril improved survival in patients with heart failure.

- A β -blockers should be permanently stopped

There has been some debate about whether the beta-blocker should be discontinued in acute fluid overload, but evidence (from the B-CONVINCED trial) suggests that they can be continued without significantly worsening shortness of breath.

B Increase the dose of digoxin

The recommended dose of digoxin in the treatment of heart failure (for patients in sinus rhythm) is 62.5–125 µgrams one a day. Increasing digoxin dose does not represent the best next step in this case.

D Stop digoxin

Results of the DIG (Digitalis Investigation Group) trial showed no difference in survival between the treatment arm and placebo, but did reveal an increased hospitalisation and mortality rate following the withdrawal of digoxin.

E Reduce the dose of losartan to 25 mg OD

Given this patient's evidence of worsening heart failure, current evidence recommends the addition of spironolactone as the next best step. Losartan is known to have beneficial haemodynamic effects, with greater benefit at 50 than 25 mg, and reduction in losartan dose therefore does not represent the most appropriate management option for this patient.

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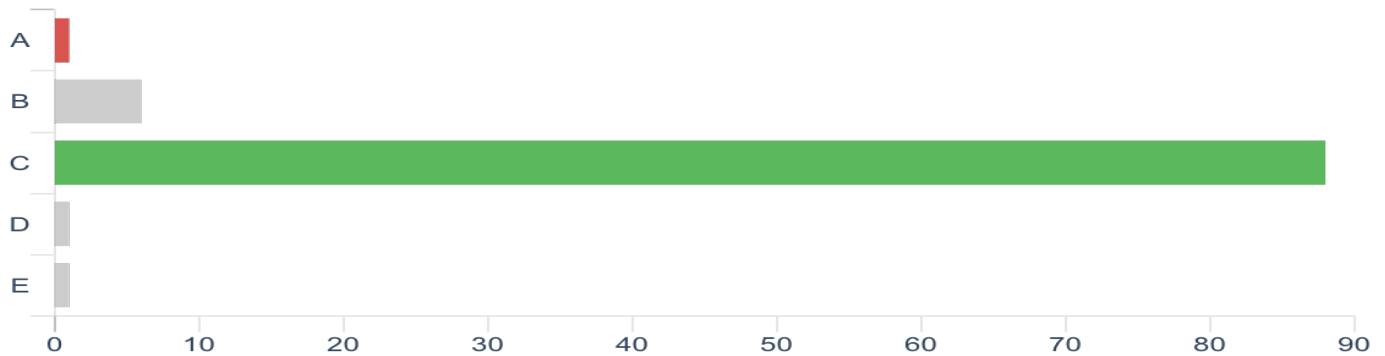
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External Links

B-CONVINCED: Beta-blocker CONTinuation vs. INTerruption in patients with Congestive heart fa...

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([https://watermark.silverchair.com/ehp323.pdf?](https://watermark.silverchair.com/ehp323.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAkYwggJCBgkqhki)

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[bMWWkXVhwsrAOe8UwXJlww1m6rtWM9ZSxxeFdr9rpGmWjVq-](https://watermark.silverchair.com/ehp323.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAkYwggJCBgkqhki)

[ijdFQUQBR3Ffse6g2jhrEy05F4k1TfztgahYKiW5Amy3QS6NL3b7vEJ8V78jjXiPLTKNth9O2lQxV;](https://watermark.silverchair.com/ehp323.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAkYwggJCBgkqhki)
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

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Q10

A 53-year-old man has been referred to the Medical Clinic by his General Practitioner (GP.) In his letter, the GP says he is unsure whether the patient is really hypertensive because his blood pressure at his surgery is usually just borderline (ranges between 145 and 155/80 and 95 mmHg). He has a past medical history of benign prostatic hypertrophy but no history of any cardiovascular disorders.

On examination, his blood pressure (BP) is 130/85 mmHg. His pulse 70 beats per minute and regular. His body mass index is 34 kg/m².

What would be the most appropriate step in the management of this patient?

Your answer was incorrect

- A Start him on an α -adrenergic blocker
- B Start him on a β -blocker
- C Reassure and discharge from follow-up
- D 24 h ambulatory BP monitoring
- E Arrange for ongoing office BP monitoring through the GP, with advice to start medication should it remain elevated

Explanation



- D 24 h ambulatory BP monitoring

In such patients where the diagnosis is unclear, an ambulatory 24 hour BP monitor may be helpful. This is advocated by European Society of Cardiology (ESC) guidelines on hypertension, which state that grade 1 hypertension (140–159/90–99) in the healthcare practitioner's office, where there is suspicion of white coat hypertension, can be considered for ambulatory or home BP monitoring. These 'out-of-office' monitoring methodologies are complementary to measurements taken in the healthcare practitioner's office.

- A Start him on an α -adrenergic blocker

Further investigation would be appropriate prior to starting medication in this case. However, were the patient to require anti-hypertensive medication, current National Institute for Health and Care Excellence (NICE) guidelines recommend an angiotensin-converting enzyme (ACE) inhibitor or angiotensin II receptor blocker (ARB) as first-line therapy in patients under 55 years old.

B Start him on a β -blocker

Further investigation would be appropriate prior to starting medication in this case. However, were the patient to require anti-hypertensive medication, current NICE guidelines recommend an ACE inhibitor or ARB as first-line therapy in patients under 55 years old.

C Reassure and discharge from follow-up

Given that this patient has had a number of clinic blood pressures suggestive of low-grade hypertension, it would seem prudent (and indeed is recommended by current ESC guidance) to perform out-of-office monitoring for confirmation.

E Arrange for ongoing office BP monitoring through the GP, with advice to start medication should it remain elevated

Given that this patient has had a number of clinic blood pressures suggestive of low-grade hypertension, it would seem prudent (and indeed is recommended by current ESC guidance) to perform out-of-office monitoring for confirmation.

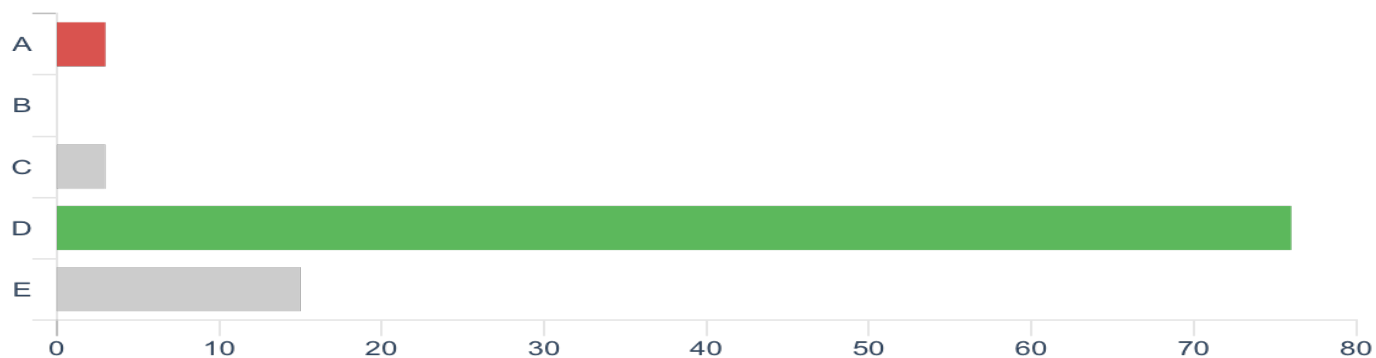
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External Links

Hypertension in adults: diagnosis and management

[nice.org.uk/guidance/cg127](http://www.nice.org.uk/guidance/cg127)

(<http://www.nice.org.uk/guidance/cg127>)

ESC guidelines on the management of Arterial Hypertension

[escardio.org/Guidelines/Clinical-Practice-Guidelines/Arterial-Hypertension-Management-of](https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Arterial-Hypertension-Management-of)

(<https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Arterial-Hypertension-Management-of>)

Expanded Explanation

Overview

Clinical Presentation

Diagnosis / Investigation

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Prognosis



Q11

You are asked to evaluate a 39-year-old woman who is in her 39th week of gestation. She is planned to undergo Caesarean section because of fetal distress due to placental abruption.

On examination, she appears to be an averagely built lady with body mass index of 27 kg/m² and a heart rate of 95 beats per minute. Her blood pressure is 132/78 mmHg and her respiratory rate is 18 breaths per minute. She has no jugular venous distension; her apex beat is in the fifth intercostals space, her midclavicular line has a mid-systolic click and a late systolic murmur at apex radiating towards axilla. The rest of her physical examination is unremarkable except for gravid uterus.

She has no past medical history of note except for a history of skin wheals and pruritis following ingestion of amoxicillin. The symptoms resolved after treatment with chlorpheniramine maleate

Which of the following is the best regimen for endocarditis prophylaxis in this patient?

Your answer was incorrect

- A Ampicillin 2 g Intravenous (IV) 30 minutes before operation
- B Vancomycin 1 g IV 60 minutes before operation
- C Clindamycin 600 mg IV 30 minutes before operation
- D Erythromycin 500 mg IV 30 minutes before procedure
- E No prophylaxis required

Explanation



- E No prophylaxis required

The evidence in favour of antibiotic prophylaxis is limited, with no randomised trial. National Institute for Health and Care Excellence (NICE) guidelines (CG64: Prophylaxis against infective endocarditis) no longer recommend antibiotic prophylaxis for dental or respiratory procedures. They are only indicated for gastrointestinal and genitourinary procedures where

there is a suspicion of pre-existing infection. In this case while a cardiac murmur is detected, there are no signs or symptoms from the clinical history suggestive of infective endocarditis. The murmur is typical of that heard in mitral valve prolapse.

A Ampicillin 2 g Intravenous (IV) 30 minutes before operation

NICE guidelines generally no longer recommend routine prophylaxis for valve lesions due to lack of evidence of benefit. In a patient with a potential penicillin allergy, ampicillin is not an appropriate choice of antibiotic.

B Vancomycin 1 g IV 60 minutes before operation

The role for prophylactic antibiotics no longer features in NICE guideline recommendations. They are only recommended for gastrointestinal and genitourinary procedures where there is a suspicion of pre-existing infection. High-risk patients for infective endocarditis are identified by NICE guidelines (CG64: Prophylaxis against infective endocarditis), they include previous infective endocarditis, prosthetic valves, acquired valvular heart disease with stenosis or regurgitation, and structural congenital heart disease including surgically corrected or palliated structural conditions.

C Clindamycin 600 mg IV 30 minutes before operation

Antibiotic prophylaxis is no longer recommended for valve lesions in accordance with NICE guidelines (2016). European Society of Cardiology (ESC) guidelines (2017) only recommend antibiotics for those with the highest risk of infective endocarditis undergoing the highest-risk procedures. Antibiotic prophylaxis is no longer recommended for native valve disease, and is not indicated for respiratory, gastrointestinal or genitourinary procedures.

D Erythromycin 500 mg IV 30 minutes before procedure

Erythromycin would not be an appropriate choice for infective endocarditis, and antibiotic prophylaxis is no longer recommended due to limited evidence. In this patient there are no signs of symptoms of infective endocarditis. If there is suspicion of infective endocarditis, a minimum of three blood culture sets are required before starting antibiotic therapy. In addition to an echocardiogram, early cardiology involvement and an infectious disease specialist are recommended.

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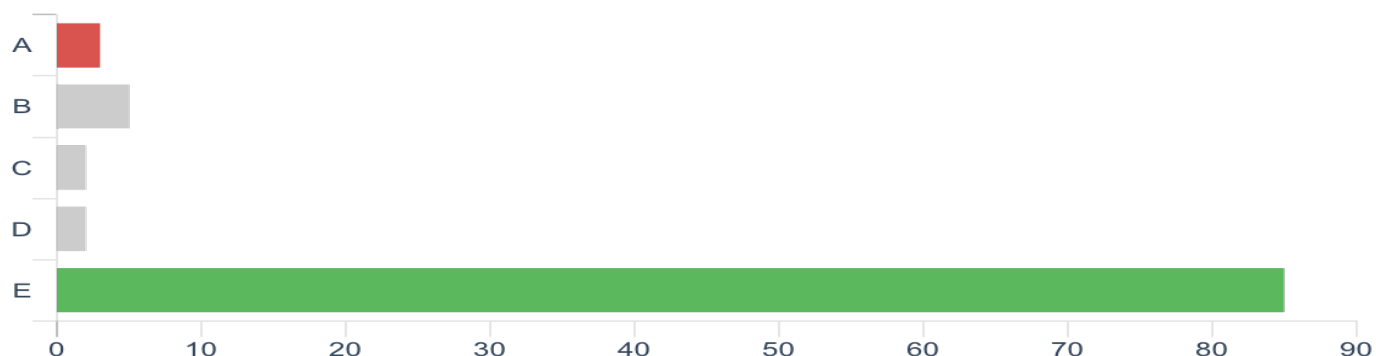
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ESC. Valvular heart diseaseacademic.oup.com/eurheartj/article/38/36/2739/4095039#supplementary-data[\(https://academic.oup.com/eurheartj/article/38/36/2739/4095039#supplementary-data\)](https://academic.oup.com/eurheartj/article/38/36/2739/4095039#supplementary-data)**NICE. Prophylaxis against infective endocarditis**[nice.org.uk/guidance/cg64](https://www.nice.org.uk/guidance/cg64)[\(https://www.nice.org.uk/guidance/cg64\)](https://www.nice.org.uk/guidance/cg64)

Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis**

Diagnosis / Investigation

Management

Prognosis



Q12

A 25-year-old man presents to the Emergency Department with a history of ingestion of an unknown quantity of digoxin. On examination, his pulse is 95 beats per minute (bpm) and his blood pressure (BP) 105/65 mmHg.

Investigations reveal the following:

Investigation	Result	Normal Value
Potassium (K ⁺)	5.2 mmol/l	3.5–5.0 mmol/l
Sodium (Na ⁺)	139 mmol/l	135–145 mmol/l
Chloride (Cl ⁻)	99 mmol/l	98–106 mmol/l
Bicarbonate (HCO ₃ ²⁻)	22 mmol/l	22–29 mmol/l
Creatinine (Cr)	99 µmol/l	50–120 µmol/l
Digoxin	8.5 nmol/l	1.2–2.0 nmol/l

An electrocardiogram (ECG) reveals a sinus rhythm rate of 95 bpm and multiple premature ventricular beats.

The patient is administered charcoal and digoxin-specific Fab fragment. After 10 minutes the ECG monitor shows ventricular tachycardia (VT). The patient is dizzy and sweaty, and his BP is 105/80 mmHg.

What is the most appropriate further treatment for this patient?

Your answer was incorrect

- A Synchronised direct current (DC) cardioversion
- B Asynchronised DC cardioversion
- C Intravenous (IV) procainamide
- D IV amiodarone
- E IV lignocaine

Explanation



E IV lignocaine

The patient has VT secondary to digoxin toxicity. The patient has been given digibind, therefore any cardiovascular instability is likely to improve significantly over several minutes. With the patient's blood pressure above 100, IV lidocaine (lignocaine) is the most appropriate management option. Phenytoin may also be used as an alternative to lidocaine (both are class IB agents) if immune therapy is unsuccessful or unavailable in the treatment of tachyarrhythmias secondary to digoxin toxicity.

B Asynchronised DC cardioversion

Synchronisation prevents the shock occurring on the T-wave (during repolarisation) therefore precipitating ventricular fibrillation. Unsynchronised DC cardioversion may occur if the patient is pulseless or unstable and the defibrillator will not synchronise.

A Synchronised direct current (DC) cardioversion

DC cardioversion is less successful in the setting of digoxin toxicity, although it may be considered in the event of significant cardiovascular instability.

C Intravenous (IV) procainamide

While IV procainamide can be used for management of ventricular tachycardia its limited availability makes it a less suitable choice in this scenario.

D IV amiodarone

Amiodarone should be used cautiously due to its cutaneous effects and serious consequences if extravasation occurs; therefore administration should be via a central venous if possible, but it can be delivered peripherally in the emergency situation. It does have a drug-drug interaction with digoxin, leading to increased plasma levels, meaning that ideally, lignocaine is the preferred acute intervention for VT associated with digoxin.

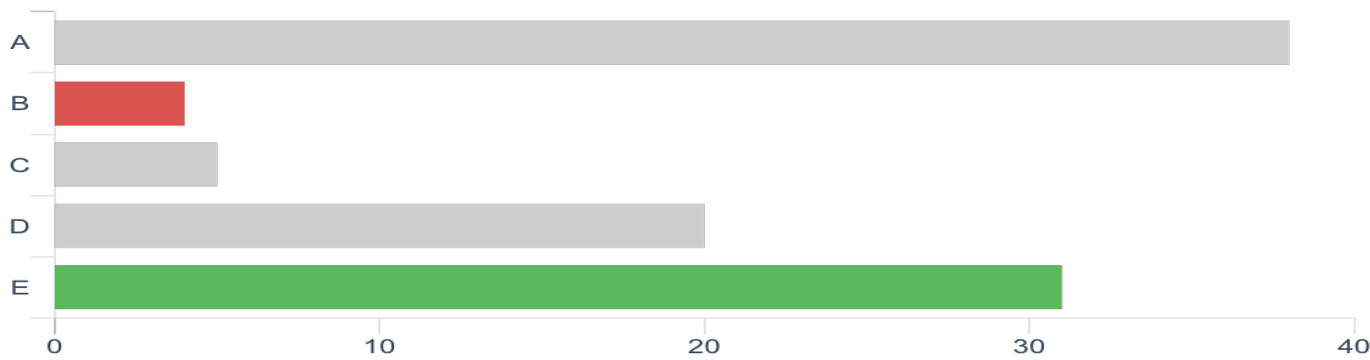
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Q13

A 48-year-old woman with a mitral valve prosthesis for the last five years presents to the Emergency Department with severe shortness of breath. The shortness of breath started a few days ago but has rapidly worsened over the past two hours. The patient had not taken her warfarin for the past five days.

On examination, the patient is sitting up in the bed with a pulse of 110 beats per minute. Her blood pressure 78/55 mmHg. Jugular venous pulsations are seen up to the angle of the jaw. Heart sounds are muffled and inspiratory crackles can be heard all over the chest.

Urgent transthoracic echocardiography is ordered; though the visualisation is poor, it suggests a thrombus attached to the mitral prosthesis. The regional cardiac surgery unit is 90 minutes transfer away.

What is the next management step for this patient?

Your answer was incorrect

- A Intravenous (IV) alteplase
- B IV heparin infusion
- C Immediate valve replacement
- D Transoesophageal echocardiography (TEE)
- E Check her international normalised ratio

Explanation



- A Intravenous (IV) alteplase

The patient has a prosthetic valve thrombosis (PVT) resulting in shock. This complication occurs in 0.03–5.5% annually with equal frequency in bioprosthesis and mechanical valves. It is more common in mitral prosthesis and with subtherapeutic anticoagulation. If the patient is haemodynamically unwell (ie pulmonary oedema or hypotension) and no immediate surgery is available, thrombolytic therapy should be given. Serial echocardiography should be performed, and if the response is inadequate repeat thrombolytic therapy can be given.

- B IV heparin infusion

If patients are haemodynamically stable and have a subtherapeutic anticoagulation in the context of a PVT, Heparin plus or minus aspirin can be administered with regular follow-up if successful. In this case however, the patient is haemodynamically unstable due to a PVT secondary to likely subtherapeutic anticoagulation; therefore urgent thrombolysis should be considered.

C Immediate valve replacement

In stable patients, surgery is a better option for left-sided PVT, while right-sided PVT should be treated with thrombolytic agents. Surgery may be considered if patients are critically ill and immediate surgery is available; however an evaluation of risks and benefits must be sought, and in this acute scenario thrombolytic therapy should be administered whilst this decision is being made.

D Transoesophageal echocardiography (TEE)

While TEE is the best diagnostic modality, transthoracic echocardiography is the initial choice in sick patients, and then if the diagnosis is not confirmed, a TEE can be done.

E Check her international normalised ratio

Given the acute presentation in the context of a mitral valve prosthesis and the patient having not taken her warfarin for past 5 days, investigation should be focussed on exclusion of a PVT. Transthoracic/transoesophageal echo should be primary investigations with early therapeutic intervention.

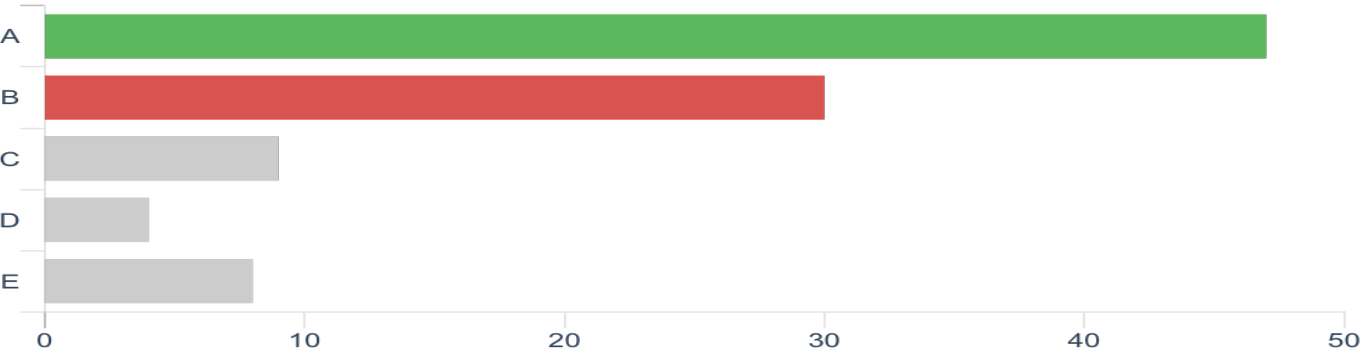
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Q14

A 56-year-old man presents to the Emergency Department with a history of shortness of breath on exertion of three months' duration. For the last month, he has been unable to walk one block without getting short of breath. He has also noticed swelling of his feet.

On physical examination, he has jugular venous distension, a low-volume pulse of 95 beats per minute and a blood pressure of 95/60 mmHg. There is also a harsh ejection systolic murmur at the aortic area, left-sided third heart sound (S3) gallop and inspiratory crackles at both lung bases.

He has been diabetic and hyperlipidaemic for the past six years, and his medications include aspirin 75 mg per day, fosinopril 20 mg per day and metformin 850 mg three times per day. An echocardiogram (ECHO) is ordered, which reveals severe left ventricular dysfunction (LVD) with an ejection fraction of 28%, a calcified aortic valve with a calculated aortic valve area of 0.6 cm², and a trans-aortic gradient of 30 mmHg.

What is the next best step in this patient's management?

Your answer was incorrect

- A Aortic valve replacement
- B Aortic balloon valvotomy
- C Discontinue fosinopril
- D Repeat ECHO with dobutamine infusion
- E Add bisoprolol and furosemide to his current therapy and repeat ECHO in six months

Explanation



- D Repeat ECHO with dobutamine infusion

This patient has severe LVD and calculated valve area in such patients can be falsely low because low cardiac output reduces the valve opening forces. It is important to distinguish patients with true severe aortic stenosis (AS) with secondary LVD from those who have a falsely low calculated aortic valve area because of low cardiac output. An important method of distinguishing between the two conditions is to assess the haemodynamics after increasing

the cardiac output by dobutamine infusion during an ECHO or cardiac catheterisation. Patients with truly severe AS manifest an increase in trans-aortic pressure gradient while the valve surface area remains the same during dobutamine infusion; while those with falsely low calculated valve area manifest an increase in calculated valve surface area. Dobutamine echocardiography is also important to assess LV contractile reserve. Patients who have 20% or more increase in stroke volume after dobutamine infusion have a much better prognosis after surgery compared to those who do not have LV contractile reserve.

- E Add bisoprolol and furosemide to his current therapy and repeat ECHO in six months

While these would be important therapies in the treatment of heart failure, confirmation of this patient's aortic valve status is required. This is best performed by stress echo to confirm whether this is true AS or pseudo-severe AS due to poor LV function.

- A Aortic valve replacement

Due to this patient's low ejection fraction, it is uncertain whether this is true aortic stenosis or pseudo-severe AS due to reduced LV function. It is appropriate to perform dobutamine echo to confirm before referral for intervention.

- B Aortic balloon valvotomy

Due to this patient's low ejection fraction, it is uncertain whether this is true aortic stenosis or pseudo-severe AS due to reduced LV function. It is appropriate to perform dobutamine echo to confirm before referral for intervention.

- C Discontinue fosinopril

Fosinopril is indicated in the treatment of hypertension and as an adjunctive therapy in heart failure. There is no indication to stop it here. This patient should undergo dobutamine echo to confirm whether this is true AS or pseudo-severe AS due to poor LV function.

6063

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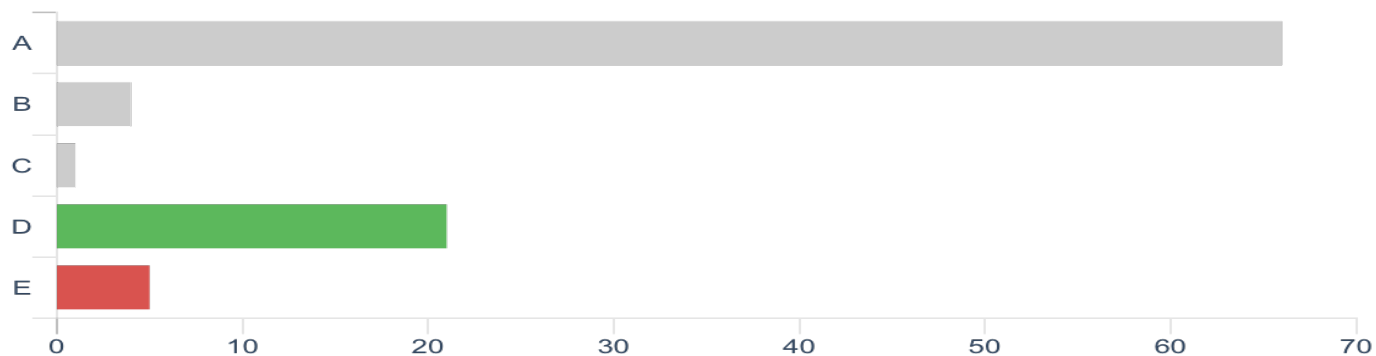
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Q15

A 33-year-old woman present to the Emergency Department with a history of progressive dyspnoea of two weeks' duration, sometimes associated with palpitations. A 24 hour tape carried out by her General Practitioner has recorded episodes of paroxysmal atrial fibrillation (AF). She has also noticed increased swelling of her feet and abdomen and decreased effort tolerance. She denies any chest pain, fever, rhinorrhoea, sore throat, or rash. She is pregnant in her 36th week of gestation and has no past medical history of note. She does not take alcohol or any other drugs.

Examination of the cardiovascular system during prenatal visits has been normal. Electrocardiogram (ECG) and chest X-ray performed a year ago during a pre-employment check-up were normal.

On examination, she has a pulse of 98 beats per minute. Her respiratory rate is 22 breaths per minute, while her blood pressure is 110/60 mmHg. She has jugular venous distension, a summation gallop, and bilateral inspiratory crackles up to one-third of the chest posteriorly.

An ECG shows sinus tachycardia. Echocardiography reveals diffuse left ventricular hypokinesia with an ejection fraction of 25%. The patient is started on digoxin 0.125 mg per day, furosemide 60 mg twice daily and hydralazine 25 mg twice daily.

Which of the following medications is most important to add to the above regimen?

Your answer was incorrect

- A Heparin
- B Carvedilol
- C Enalapril
- D Nitroglycerine
- E Methylprednisolone

Explanation



- A Heparin

This patient has presented with heart failure in 36th week of pregnancy. She had no prior evidence of heart disease or any identifiable cause of heart failure. This satisfies the clinical criteria for diagnosis of peripartum cardiomyopathy (PPCM). Therapy of PPCM involves sodium restriction, diuretics to optimise the volume status, digoxin and afterload-reducing agents.

Patients with PPCM are at risk of thromboembolism due to both hypercoagulable state of pregnancy and stasis of blood in the left ventricle. In this case, particularly the episodes of paroxysmal AF drive us towards anticoagulation, with heparin preferred to minimise risk of embolic stroke.

E Methylprednisolone

Empirical use of immunosuppressive therapy has not been found to be beneficial for management of PPCM. Risks to the fetus during PPCM include low birth weight and prematurity, with subsequent pregnancies monitored closely due to risk of recurrence.

B Carvedilol

For patients presenting with PPCM, defined as left ventricular systolic dysfunction 1 month prior to delivery or 5 months postpartum, volume status should first be managed with diuretics after liaison with obstetricians. Beta-blockers should be added once the patient's volume status is optimised.

C Enalapril

Management of PPCM includes sodium restriction, diuretics to optimise the volume status, digoxin and afterload-reducing agents. Angiotensin-converting enzyme inhibitors are contraindicated during pregnancy, particularly first trimester, therefore hydralazine is preferred.

D Nitroglycerine

Nitrates are generally not recommended during pregnancy. A combination of diuretics and supportive measures, together with thromboprophylaxis due to the high risk of embolic stroke, is administered.

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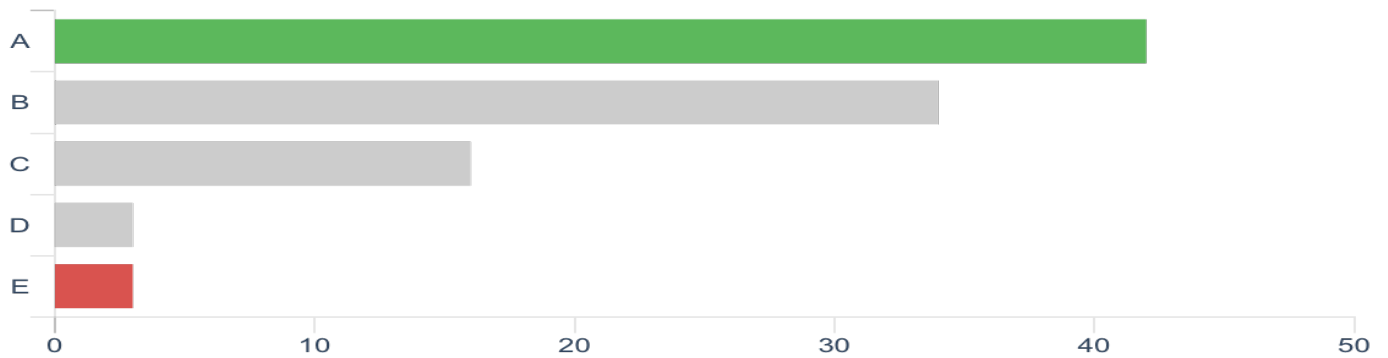
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Q16

A 62-year-old man present to his General Practitioner with a history of pain in both calves. The pain starts after walking three blocks and is described as cramping and is relieved by rest. He has been a known hypertensive for the last 10 years, which is well controlled on ramipril. He has a 40-pack year history of smoking. A treadmill exercise test conducted two years ago was normal. He does not have any other past medical history of note.

On examination, he has a body mass index of 26 kg/m². His blood pressure (BP) is 125/75 mmHg, while his heart rate is 75 bpm. Bilateral femoral bruits and absent dorsalis pedis pulses are also observed. Examination of the heart and respiratory system is normal.

Lipid profile results reveal the following:

Investigation	Result	Normal Values
Total cholesterol	5.6 mmol/l	< 5.2 mmol/l
Low-density lipoprotein (LDL) cholesterol	3.5 mmol/l	< 3.5 mmol/l
High-density lipoprotein (HDL) cholesterol	1.2 mmol/l	> 1.0 mmol/l
Triglycerides	2.8 mmol/l	0-1.5 mmol/l

He is advised to continue taking bisoprolol 10 mg per day and is also started on aspirin 100 mg per day, cilostazol 100 mg twice per day, a low-fat diet, and a supervised exercise training programme. On a follow-up visit three months later his symptoms have improved, and he is now able to walk five blocks without symptoms.

A repeat lipid profile reveals the following:

Investigation	Result	Normal Values
Total cholesterol	6.0 mmol/l	< 5.2 mmol/l
LDL cholesterol	3.7 mmol/l	< 3.5 mmol/l
HDL cholesterol	1.3 mmol/l	> 1.0 mmol/l
Triglycerides	2.4 mmol/l	0-1.5 mmol/l

Which of the following is the next best step in this patient's management?

Your answer was incorrect

A Start a statin with an LDL target of < 1.8 mmol/l

- B Stop bisoprolol
- C Start amlodipine with a BP target of 120/80 mmHg
- D Start isosorbide mononitrate
- E Start a statin with an LDL target of < 3.0 mmol/l

Explanation



- A Start a statin with an LDL target of < 1.8 mmol/l

Patients with peripheral arterial disease have an increased risk of adverse cardiovascular event and frequently have coexistent coronary and cerebrovascular atherosclerosis; therefore it is considered a coronary artery disease equivalent. Current European Society of Cardiology (ESC) guidelines on cardiovascular disease prevention recommend in patients at very high CV risk, an LDL cholesterol goal of < 1.8 mmol/l (< 70 mg/dl) or a reduction of at least 50% if the baseline is between 1.8 and 3.5 mmol/l (70 and 135 mg/dl). For this reason an appropriate statin should be commenced.

- E Start a statin with an LDL target of < 3.0 mmol/l

This would be an appropriate target for patients who are not at very high or high CV risk (for whom separate targets exist).

- B Stop bisoprolol

Beta-blockers do not significantly impair the walking capacity in most patients, and considering their favourable effect on coronary artery disease, need not be stopped. Cardioselective beta blockers such as bisoprolol have a better side effect profile in this respect.

- C Start amlodipine with a BP target of 120/80 mmHg

Current ESC guidelines on cardiovascular disease prevention recommend that based on current data, it may still be prudent to recommend lowering SBP/DBP to values within the range 130-139/80-85 mmHg, and possibly close to the lower values in this range, in all hypertensive patients (specific targets for elderly and diabetic patients are available in the weblink).

- D Start isosorbide mononitrate

ISMN is not indicated in the treatment of peripheral arterial disease, and in any case this patient remains symptom free on his current therapy.

6068

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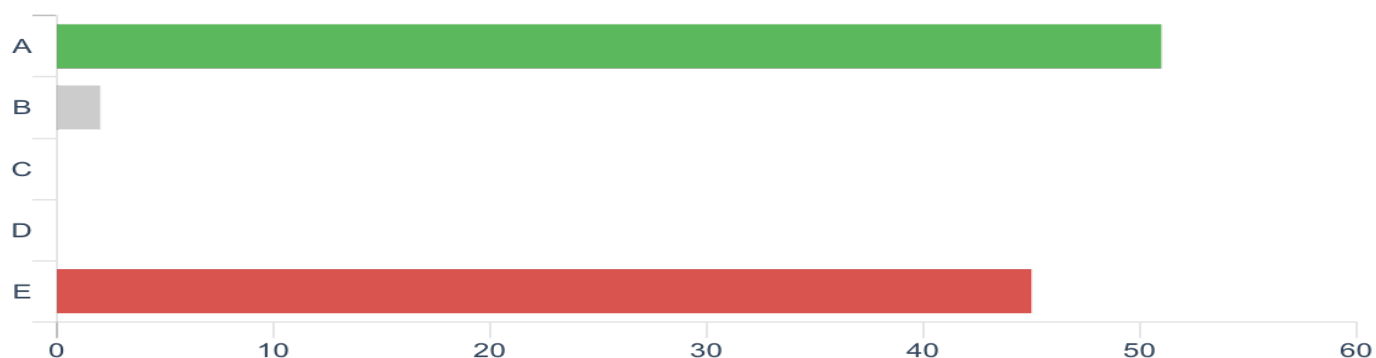
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External Links

ESC guidelines on cardiovascular disease prevention

academic.oup.com/eurheartj/article/37/29/2315/1748952/2016-European-Guidelines-on-cardiovascular-disease
(<https://academic.oup.com/eurheartj/article/37/29/2315/1748952/2016-European-Guidelines-on-cardiovascular-disease>)

Expanded Explanation

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Links to NICE guidelines/CKS



Q17

A 55-year-old woman presents to the Emergency Department with a history of tiredness and decreased effort tolerance of three months' duration. She has a five-year history of hypertension controlled with slow-release indapamide 1.5 mg a day. She is a lifelong non-smoker and has no family history of premature coronary artery disease. Her lipid profile checked six months earlier was normal. She has no other past medical history of note.

On examination, she has an irregular pulse at a rate of 95 beats per minute. Her blood pressure is 135/80 mmHg, with no jugular venous distension, an apex beat in the fifth intercostal space, and normal heart sounds, without any murmur.

Investigations reveal the following:

Investigation	Result	Normal Values
Haemoglobin (Hb)	140 g/l	115-155 g/l
Potassium (K ⁺)	4.4 mmol/l	3.5-5.0 mmol/l
Sodium (Na ⁺)	138 mmol/l	135-145 mmol/l
Creatinine (Cr)	85 µmol/l	50-120 µmol/l
Thyroid-stimulating hormone (TSH)	1.3 µU/l	0.17-3.2 µU/l
Free thyroxine (T4)	13 pmol/l	11-22 pmol/l
Electrocardiogram (ECG)	Atrial fibrillation (AF) with ventricular rate of 108/min	
Echocardiography (ECHO)	Left ventricular (LV) ejection fraction 58%, left atrial diameter 4.6 cm, concentric LV hypertrophy and trivial mitral regurgitation	

Which of the following treatments would you institute next?

Your answer was incorrect

- A Aspirin
- B Aspirin and dipyridamole
- C Dipyridamole modified-release (MR)
- D Clopidogrel
- E Non-vitamin K oral anticoagulant (NOAC)

Explanation



- E Non-vitamin K oral anticoagulant (NOAC)

The National Institute for Health and Care Excellence (NICE) guidelines (CG180: Management of atrial fibrillation) advocate rhythm control should be initiated in this patient. The duration of AF is uncertain; therefore, the first step should be adequate anticoagulation with a NOAC, eg rivaroxaban, apixaban, or dabigatran. NICE has now advocated that patients can be started immediately on a NOAC for non-valvular AF, as opposed to using warfarin. NOACs have advantages over warfarin, in terms of simpler monitoring and management, as well as fewer interactions. Anticoagulation should be continued for at least 3 weeks before direct current cardioversion. Anticoagulation may be continued thereafter, given her increased left atrial size and mitral regurgitation.

- D Clopidogrel

Warfarin and NOACs, eg rivaroxaban, apixaban, dabigatran, provide a greater benefit with regard to stroke prevention, compared with clopidogrel alone. The CHA₂DS₂-VAS_c score provides guidance, as well as informed decision-making, for patients regarding anticoagulation. Patients with a CHA₂DS₂-VAS_c score of ≥ 1 (provided the risk factor is not gender) should be considered for anticoagulation.

- A Aspirin

Aspirin has no role in anticoagulation of patients in AF. In this clinical case, her CHA₂DS₂-VAS_c score for AF is 2, hence conveying an annual risk of stroke of 2.2%. Therefore, anticoagulation with warfarin or a non-vitamin K oral anticoagulant (NOAC), eg rivaroxaban, apixaban or dabigatran, is recommended.

- B Aspirin and dipyridamole

A patient's bleeding risk must be considered before commencing anticoagulation of AF; the HASBLED score can be used to assess this. Studies showed aspirin with the addition of another antiplatelet was worse than warfarin alone in stroke prevention, with an increased risk of bleeding, compared with warfarin.

C Dipyridamole modified-release (MR)

Dipyridamole MR has no role in the reduction of stroke in patients with AF alone. If anticoagulation is required, warfarin or a NOAC, eg rivaroxaban, apixaban or dabigatran, should be initiated after consultation with the patient. If patients have a mechanical valve or moderate-to-severe mitral stenosis, then warfarin should be the first choice, as NOACs are contraindicated in these conditions.

6069

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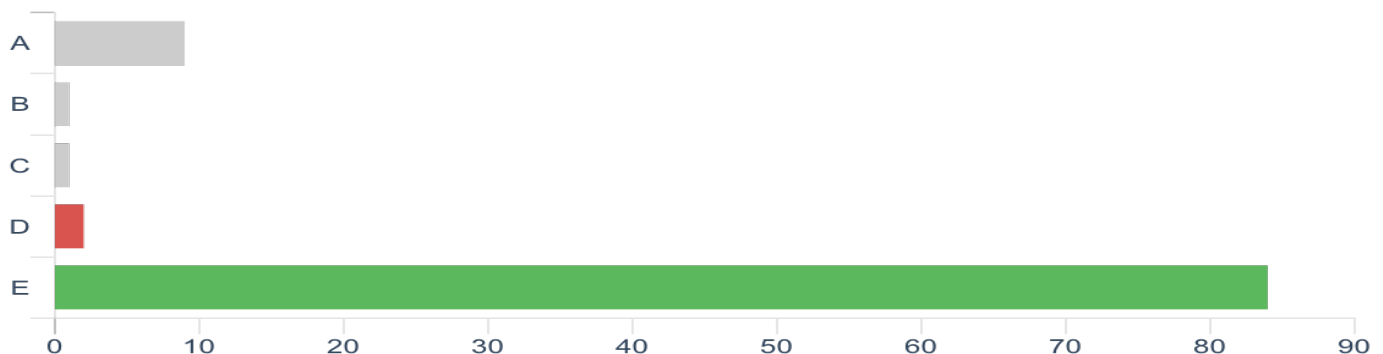
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External Links

NICE. Atrial fibrillation: management

[nice.org.uk/guidance/cg180/resources/guidance-atrial-fibrillation-the-management-of-atrial-fibrillation-pdf](https://www.nice.org.uk/guidance/cg180/resources/guidance-atrial-fibrillation-the-management-of-atrial-fibrillation-pdf)

(<https://www.nice.org.uk/guidance/cg180/resources/guidance-atrial-fibrillation-the-management-of-atrial-fibrillation-pdf>)



Q18

A 24-year-old woman has been referred to the Cardiology Clinic with a one year history of exertional breathlessness. She undergoes echocardiography, which reveals a congenitally bicuspid aortic valve with a peak gradient of 55 mmHg. She wishes to start a family. Whilst discussing pros and cons she volunteers that she wouldn't like to take treatment during pregnancy where she has to inject herself.

What would be the most appropriate treatment for her valve problem?

Your answer was incorrect

- A Advise avoidance of pregnancy
- B Refer for valvuloplasty
- C Refer for metal valve replacement
- D Refer for bio-prosthetic valve replacement
- E Pregnancy under cardiologist supervision and subsequent valve replacement

Explanation



- D Refer for bio-prosthetic valve replacement

Pregnancy will greatly increase the required cardiac output and lead to a rapid worsening of symptoms. Congenital aortic stenosis is the major cause in patients under the age of 30 years and presenting with symptomatic aortic stenosis (AS). Valvotomy is reserved for patients unsuitable for surgery; This leaves a porcine valve replacement before pregnancy as the best option. Untreated AS has an average 5-year survival rate of only 40%.

- A Advise avoidance of pregnancy

This patient has severe symptomatic AS, and wishes to start a family. She should be offered intervention on her valve prior to pregnancy.

- B Refer for valvuloplasty

National Institute for Health and Care Excellence (NICE) guidance states that 'in adults, the procedure should only be used to treat patients who are unsuitable for surgery, as the efficacy is usually shortlived.'

C Refer for metal valve replacement

Metal valve replacements require warfarinisation and, as such, would be unsuitable in this patient because warfarin is teratogenic in early pregnancy and not advised in late pregnancy due to the risk of haemorrhage. This means that whilst trying to get pregnant she would ideally be managed with low molecular weight heparin, which wouldn't fit with her preference not to inject herself.

E Pregnancy under cardiologist supervision and subsequent valve replacement

This patient has severe symptomatic AS. Pregnancy in this context is associated with 10% maternal morbidity. She should undergo intervention on her valve prior to pregnancy.

6515

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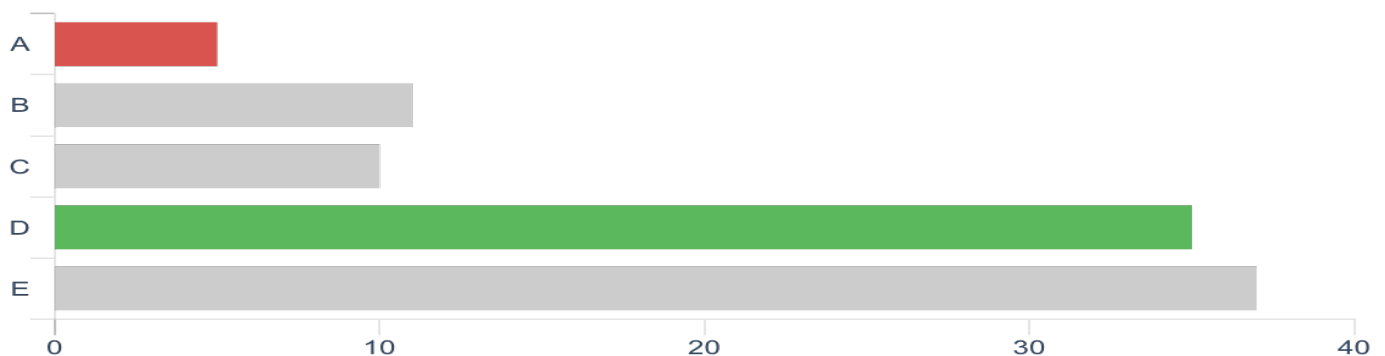
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Responses Correct:	1
Responses Incorrect:	19
Responses Total:	20

Responses - % Correct:

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External Links

NICE. Sutureless aortic valve replacement for aortic stenosis

[nice.org.uk/Guidance/IPG624](https://www.nice.org.uk/Guidance/IPG624)

(<https://www.nice.org.uk/Guidance/IPG624>)



Q19

A 54-year-old man presents to the Emergency Department (ED) with an episode of retrosternal chest pain lasting 15 minutes while playing squash. He went home after the event but his wife persuaded him to attend the ED. There have been two similar episodes, one six months ago when he was walking the dog on a cold morning, and another three months ago when he experienced a short period of indigestion type pain while running on the treadmill. He stopped smoking three years ago but has no other specific past medical history.

A review 12 hours after presentation reveals the following:

Investigation	Result	Normal values
Electrocardiogram (ECG)	T wave inversion v4 - v6	
Creatinine kinase (CK)	420 U/l	22-198 U/l
3 hour troponin	<0.03 ng/l	< 0.4 ng/l

Which of the following diagnoses fit best with this clinical picture?

Your answer was incorrect

- A Non-cardiac chest pain
- B Non ST-elevated myocardial infarction (NSTEMI)
- C ST-elevated myocardial infarction (STEMI)
- D Stable angina
- E Unstable angina

Explanation



- D Stable angina

Angina pectoris is described as a constricting discomfort experienced retrosternally, or in the jaw, shoulders, arms or neck. It is precipitated by exertion and relieved by rest or glyceryl nitrate (GTN). CK, while raised, is not specific for cardiac muscle damage, and can be associated with vigorous exercise. Troponin, on the other hand, is specific for cardiac muscle.

Levels depend upon local biochemistry departments, with high levels indicating varying degrees of myocardial necrosis and should drive further investigations/more aggressive management in accordance with National Institute for Health and Care Excellence (NICE) guidelines CG126: Stable angina management. In the context of a troponin here which is less than 0.03 (ie negative), it is likely that the electrocardiogram changes are reflective of stable angina; it is the troponin which stratifies him in the lower risk group.

C ST-elevated myocardial infarction (STEMI)

STEMI is defined by the ESC as typical acute chest pain and persistent (> 20 minutes) ST elevation on the ECG. Urgent intervention is required with reperfusion therapy.

A Non-cardiac chest pain

The differential diagnosis for chest pain is extensive with respiratory, gastrointestinal, neuromusculoskeletal and psychogenic causes to be considered. In this scenario, retrosternal chest pain precipitated by exertion in a patient with a significant smoking history and resting ECG changes consistent with ischaemia, cardiac investigation and management should be initiated. Non-cardiac chest pain is a diagnosis of exclusion.

B Non ST-elevated myocardial infarction (NSTEMI)

The European Society of Cardiology (ESC) defines NSTEMI as acute chest pain but without persistent ST-elevation. ECG changes may resemble ST depression, T-wave inversion, T-wave flattening or no ECG changes. If the troponin is elevated or shows a significant rise, then non-ST elevation myocardial infarction is diagnosed. In this clinical case, while ECG changes are present, normal troponins exclude the diagnosis of NSTEMI.

E Unstable angina

Unstable angina is similar to the NSTEMI definition of acute chest pain but without persistent ST-elevation; however patients have negative cardiac biomarkers. This patient is experiencing chest pain typically on exertion, whereas unstable angina may present at rest, with increasing frequency/severity and may last longer than stable angina.

6516

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External Links

NICE. Stable angina[nice.org.uk/guidance/cg126/chapter/1-Guidance#preventing-and-treating-episodes-of-angina](https://www.nice.org.uk/guidance/cg126/chapter/1-Guidance#preventing-and-treating-episodes-of-angina)[\(https://www.nice.org.uk/guidance/cg126/chapter/1-Guidance#preventing-and-treating-episodes-of-angina\)](https://www.nice.org.uk/guidance/cg126/chapter/1-Guidance#preventing-and-treating-episodes-of-angina)

Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Links to NICE guidelines/CKS



Q20

A 48-year-old man is admitted to the Emergency Department with chest pain which came on after carrying a pile of bricks. 48 hours later he is pain free. His electrocardiogram (ECG) shows T-wave inversion in leads V2 to V6. His troponin T level is 0.07 ng/ml (normal < 0.05 ng/ml).

Which of the following represents the best management for this patient?

Your answer was correct

- A Arrange coronary angiogram
- B Arrange inpatient exercise stress test
- C Start to mobilise and if he is pain free he can be discharged
- D Discharge now and see him in clinic in 4-6 weeks' time
- E Arrange outpatient treadmill test (stress test) in 4-6 weeks' time and discharge him now

Explanation



- A Arrange coronary angiogram

This patient has an abnormal troponin T, which at above 0.05 ng/ml now puts him into the range considered to be a myocardial infarction (MI), with the T-wave inversion indicating a non-ST elevation event. Percutaneous coronary intervention (PCI) is recommended for Non-ST elevated MI (NSTEMI) and unstable angina (National Institute for Health and Care Excellence (NICE), CG94: Unstable angina and NSTEMI: early management). Ideally, he should be subject to definitive coronary artery evaluation and the best way to do this is via coronary angiography following a careful risk benefit analysis after risk stratification (GRACE score).

- B Arrange inpatient exercise stress test

In view of the abnormal troponin T, inpatient exercise testing should be avoided; this has been endorsed by recent NICE guidance.

C Start to mobilise and if he is pain free he can be discharged

Management of patients presenting with NSTEMI or unstable angina is recommended as invasive assessment with coronary angiography and subsequent reperfusion providing no contraindications.

D Discharge now and see him in clinic in 4-6 weeks' time

Immediately following a MI this would be inappropriate given the clinical presentation. Risk stratification is recommended, using an appropriate scoring system, ie GRACE score, together with consideration for angiography and revascularisation following acute coronary syndrome.

E Arrange outpatient treadmill test (stress test) in 4-6 weeks' time and discharge him now

In troponin-negative patients, non-invasive investigation for patients stratified as low or intermediate risk with uncertain diagnosis may be appropriate. In this case given the clinical history, raised troponin and ECG changes, coronary artery evaluation should be considered via coronary angiography.

6517

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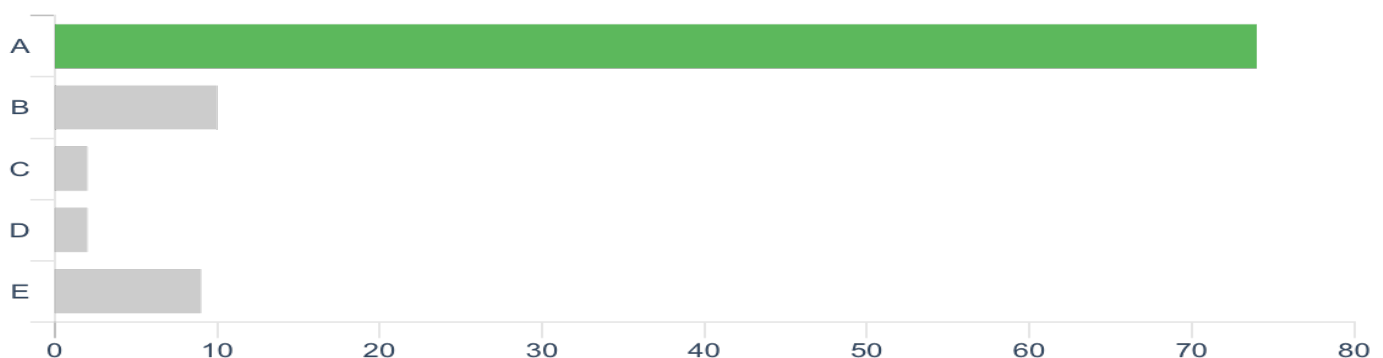
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External Links

NICE. Unstable angina and NSTEMI

[nice.org.uk/guidance/CG94](https://www.nice.org.uk/guidance/CG94)

(<https://www.nice.org.uk/guidance/CG94>)

GRACE risk score

[ed.ac.uk/research/impact/medicine-vet-medicine/grace](https://www.ed.ac.uk/research/impact/medicine-vet-medicine/grace)

(<https://www.ed.ac.uk/research/impact/medicine-vet-medicine/grace>)

Expanded Explanation

Overview

Clinical Presentation

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Links to NICE guidelines/CKS



Q21

A 35-year-old man is being treated for end-stage cardiomyopathy following viral infection. His current medication includes aspirin, bisoprolol, ramipril and furosemide. There is still evidence of cardiac failure. Echocardiography (ECHO) three months earlier revealed an ejection fraction of only 31%.

Which of the following medications has the best evidence with respect to a survival benefit?

Your answer was incorrect

- A Spironolactone
- B Digoxin
- C Bendrofluazide
- D Warfarin
- E Bumetanide

Explanation



- A Spironolactone

For patients with chronic heart failure with New York Heart Association (NYHA) II-IV already taking a β -blocker, angiotension-converting enzyme (ACE) inhibitor and loop diuretics, an aldosterone antagonist such as spironolactone is recommended. The RALES study demonstrated benefit of adding spironolactone in these patients with severe heart failure and ejection fraction below 35%. The study showed a relative risk of 0.7 for all-cause mortality in the group taking spironolactone. The study used low-dose spironolactone at a dose of 25 mg per day.

The PARADIGM-HF study demonstrated benefit of dual inhibition of the renin-angiotensin-aldosterone system and neprolysin inhibition compared with ACE inhibitors alone. The dual inhibitors better known as Entresto (valsartan/sacubitril) represent a major development in heart failure treatment; the new combination can be used instead of an ACE inhibitor or angiotensin receptor blocker for treatment of patients with heart failure with reduced ejection fraction.

C Bendrofluazide

Diuretics are used for symptomatic relief and clinical signs of pulmonary and systemic venous congestion. Loop diuretics are usually required in moderate to severe heart failure. Thiazide diuretics may be used in addition to a loop diuretic for resistant oedema; typically metolazone is cautiously used in this instance.

B Digoxin

Digoxin is indicated in patients with an ejection fraction $<40\%$, NYHA II-IV and on optimal dose of β -blocker, ACE inhibitor or angiotensin II receptor blocker (ARB), and aldosterone antagonist. Therefore, addition of spironolactone is recommended before digoxin. Digoxin is also indicated in patients with atrial fibrillation (AF), particularly if the ventricular rate at rest is > 80 beats per minute (bpm) or at exercise is > 110 – 120 bpm.

D Warfarin

Warfarin has no role in the management of heart failure alone, it may be considered in patients with a diagnosis of AF as stroke prophylaxis.

E Bumetanide

Bumetanide is a loop diuretic and can be used instead of furosemide given its increased bioavailability; however it is used for relief of symptoms and signs of congestion rather than to improve the ejection fraction. In patients with NYHA II-IV and left ventricular ejection fraction $< 35\%$ together with a QRS duration > 120 ms, cardiac resynchronisation therapy may be considered following specialist review (see National Institute for Health and Care Excellence (NICE) guidelines for full criteria).

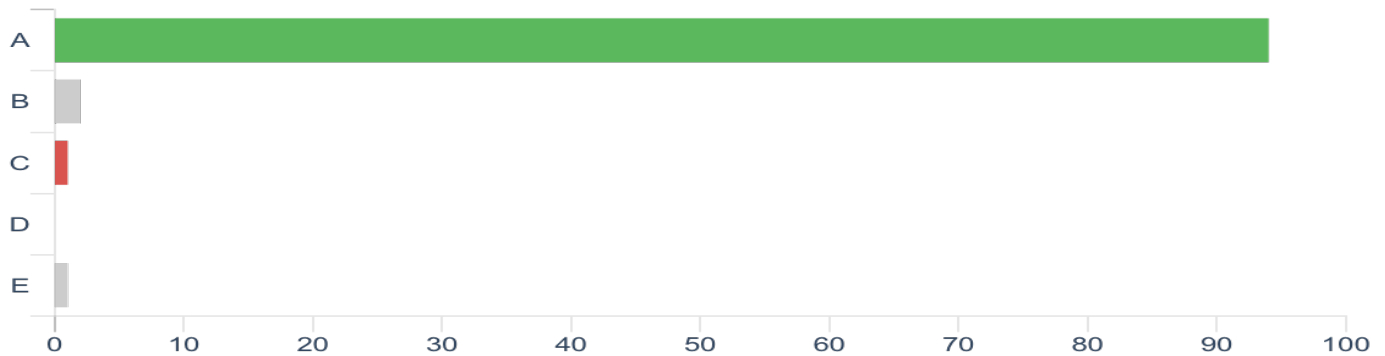
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Responses Total:	21
Responses - % Correct:	5%

External Links

PARADIGM-HF Study. The New England Journal of Medicine

[nejm.org/doi/full/10.1056/nejmoa1409077](https://doi.org/10.1056/nejmoa1409077)

(<https://www.nejm.org/doi/full/10.1056/nejmoa1409077>)

Acute heart failure: diagnosis and management

[nice.org.uk/guidance/cg187/chapter/1-recommendations#initial-pharmacological-treatment](https://www.nice.org.uk/guidance/cg187/chapter/1-recommendations#initial-pharmacological-treatment)

(<https://www.nice.org.uk/guidance/cg187/chapter/1-recommendations#initial-pharmacological-treatment>)

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

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Q22

A 42-year-old man presents to the Emergency Department (ED) with loss of vision in his right eye. Past history of note includes recurrent episodes of acute pancreatitis.

Fundoscopy reveals cotton wool spots and a number of flame haemorrhages. On wider examination, there is evidence of eruptive xanthoma on extensor surfaces of upper and lower limbs. Emergency blood testing reveals normal full blood count and urea and electrolytes, but the lab notes that the sample appears markedly lipaemic. Previous blood lipid results are not available.

Which of the following represents the best long-term management for this patient?

Your answer was incorrect

- A Warfarin
- B Clopidogrel
- C Aspirin
- D Fenofibrate
- E Simvastatin

Explanation



- D Fenofibrate

This patient has presented with retinal vein thrombosis and has a past history of recurrent pancreatitis. Together with the clinical findings of eruptive xanthomata and the lipaemic sample on testing in the ED, this picture is highly suggestive of familial hypertriglyceridaemia. The mainstay of management is commencement of fibrate therapy.

- A Warfarin

The venous thrombosis is related to hypertriglyceridaemia and is not a result of a coagulation disorder for which antithrombotics are indicated.

B Clopidogrel

Clopidogrel is an antiplatelet agent, the primary role of which is in stroke secondary prevention, post coronary artery stenting, and in patients who are intolerant to aspirin.

C Aspirin

Aspirin is indicated for secondary prevention of coronary artery disease and in primary stroke prevention.

E Simvastatin

Statins including simvastatin have only modest effects on triglycerides and as such are not indicated here.

6550

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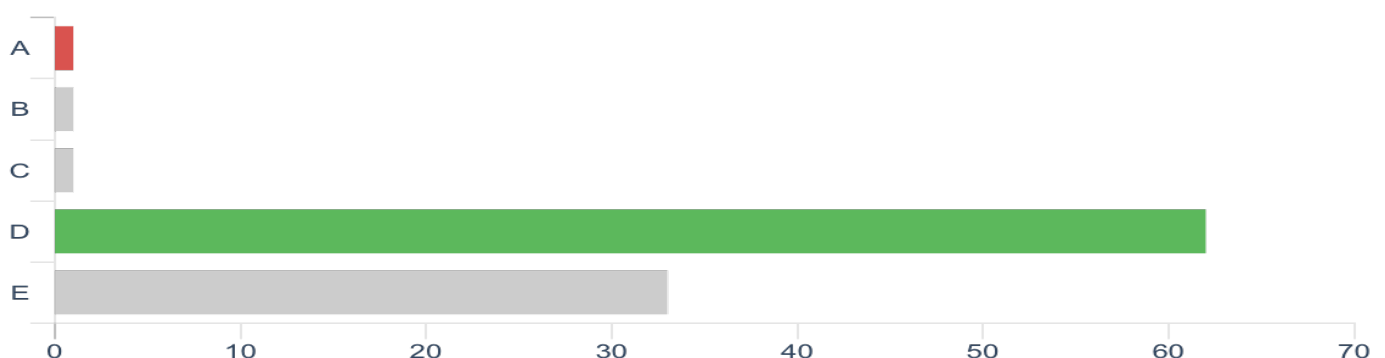
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Responses Correct:

1

Responses Incorrect:	21
Responses Total:	22
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Expanded Explanation

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Links to NICE guidelines/CKS



Q23

You review a 78-year-old woman who was admitted to the Emergency Department (ED) following a collapse at a morning service in church. This has been her third episode of collapse in recent months. On admission to the ED she is hypotensive: her blood pressure is 90/70 mmHg, while her pulse is 38 beats per minute (bpm).

An electrocardiogram reveals atrial fibrillation (AF) with a ventricular rate of 40 bpm. There is a past medical history of hypertension and chronic obstructive pulmonary disease (COPD). Her medication includes a seretide inhaler and ramipril for blood pressure. Review of previous casualty cards reveals one other documented bradycardic collapse and an admission with fast AF at a ventricular rate of 135 bpm.

Which of the following represents the most appropriate long-term therapy for this woman?

Your answer was correct

- A Verapamil
- B Sotalol
- C Amiodarone
- D Permanent pacemaker
- E Digoxin

Explanation



- D Permanent pacemaker

The patient has sinus node dysfunction or 'sick sinus syndrome' as the cause for her atrial arrhythmia and episodes of bradycardia and tachycardia. In this condition, symptomatic bradycardia and syncope are both ESC Class I indications for a permanent implantable pacemaker. Dual-chamber pacemakers (DDD) are usually implanted, however patients with atrial fibrillation usually receive a single chamber device (VVI).

- A Verapamil

Verapamil is a rate-limiting calcium channel blocker, therefore it would worsen the bradycardia and so is not a suitable option for treatment.

B Sotalol

Sotalol is a non-competitive β -blocker which exhibits Class III anti-arrhythmic actions. Adverse effects include bradycardia, therefore it would not be appropriate in this case of symptomatic bradycardia.

C Amiodarone

Amiodarone is a class III anti-arrhythmic used for treatment of ventricular tachycardias, ventricular fibrillation, atrial fibrillation with a fast ventricular rate and supraventricular tachycardias. While its main use is to cardiovert patients, it exhibits β -blocker and calcium channel blocker effects, therefore making it unsuitable for bradycardic patients. Due to its numerous side effects it is not a suitable long-term option.

E Digoxin

Digoxin is a cardiac glycoside and while it can be used to slow atrial fibrillation with a fast ventricular rate, its use in bradycardia would exacerbate the patient's condition.

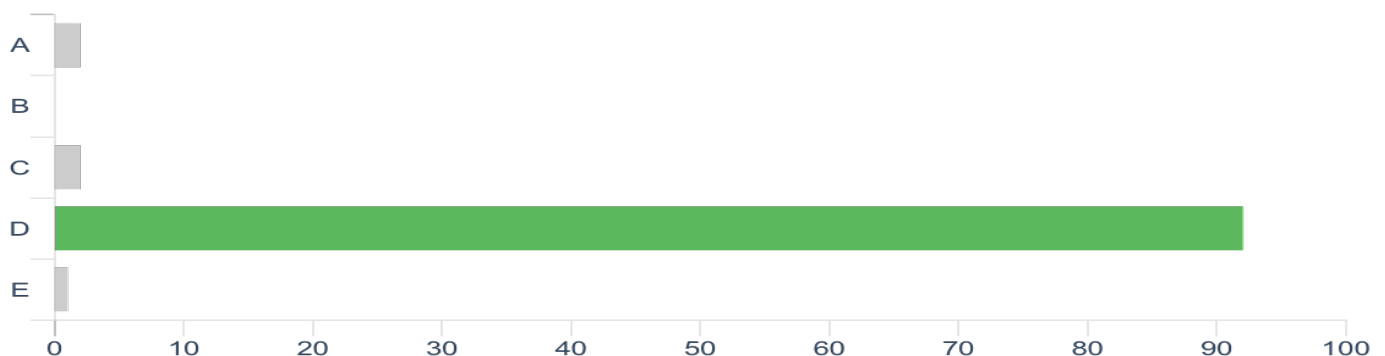
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Responses Incorrect:	21
Responses Total:	23
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Q24

A 68-year-old woman has had more than three blood pressure readings equal to or greater than 175/65 mmHg during the past month. She is obese, with a body mass index of 34 kg/m².

On further questioning, she admits to shortness of breath on minimal exercise, and occasionally she wakes in the night very short of breath and has to open the windows. She does not report suffering from any excessive sleepiness in the daytime, and is able to maintain her job as a busy personal assistant.

Which of the following would be the most appropriate initial therapy in this patient?

Your answer was correct

- A Ramipril
- B Atenolol
- C Bendrofluazide
- D Doxazosin
- E Bisoprolol

Explanation



- A Ramipril

While National Institute for Health and Care Excellence (NICE) guidelines recommend calcium channel blockers in the over 55 age group, her obesity and heart failure would drive you towards ramipril. Her shortness of breath may be indicative of left ventricular dysfunction, therefore ramipril would be the best choice. Meta-analyses have suggested that angiotensin II receptor blockers (ARBs) or angiotensin-converting enzyme inhibitors (ACEIs) are associated with the lowest incidence of diabetes.

NICE guidelines recommend clinic blood pressure and subsequent ambulatory blood pressure monitoring for diagnosis of hypertension. Screening for complications, ie target organ damage, is required, including electrocardiogram (ECG) to exclude left ventricular hypertrophy or previous cardiovascular events, urine dip for protein, renal function and hypertensive retinal changes.

In addition to lifestyle modification, medication can be initiated in this case of grade II hypertension.

B Atenolol

Beta-blockers are not recommended for initial treatment of uncomplicated hypertension owing to conflicting evidence on their benefit. The majority of evidence for beta-blockers in hypertensive management is based upon atenolol.

C Bendrofluazide

Given this patient has signs suggestive left ventricular impairment, an ACE inhibitor would be preferred over a thiazide diuretic such as bendroflumethiazide. Thiazide-like diuretics are now a more favourable alternative to the traditional thiazides, with them being particularly effective for antihypertensive treatment when used in combination therapy. Side effects include hyperuricaemia, hyperglycaemia, hyponatraemia, and hypokalaemia.

D Doxazosin

Alpha-blockers are not recommended because in the ALLHAT trial, treatment with doxazocin resulted in worse outcomes leading to early termination in the treatment arm.

E Bisoprolol

Atenolol is the beta-blocker upon which the majority of evidence for antihypertensive treatment is based. The ASCOT study reported that the use of beta-blockers and thiazides increased the risk of new-onset type II diabetes, therefore they would not be the preferred option this scenario.

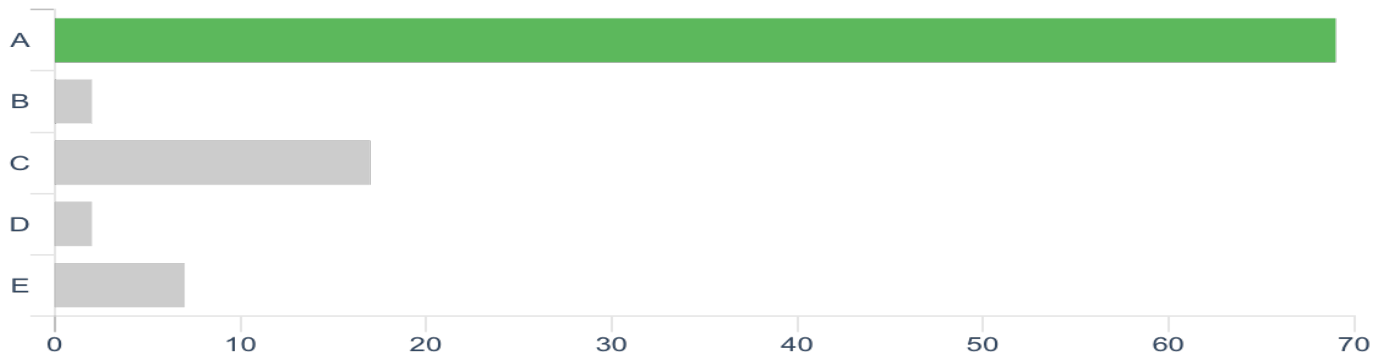
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Responses Incorrect:	21
Responses Total:	24
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External Links

Hypertension in adults: diagnosis and management

[nice.org.uk/guidance/cg127](http://www.nice.org.uk/guidance/cg127)

(<http://www.nice.org.uk/guidance/cg127>)

Expanded Explanation

Overview

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Q25

A 42-year-old man presents to the Emergency Department (ED) with an episode of chest pain following a vigorous game of tennis. On admission to the ED he admits to a previous episode after jogging a few weeks earlier. He smokes five cigarettes per day and drinks 25 units of alcohol per week. His father died suddenly at the age of 42, and his brother died at the age of 21.

On examination, there is a systolic murmur, loudest at the left sternal border, and a fourth heart sound. An electrocardiogram (ECG) reveals left ventricular hypertrophy. Echocardiography (ECHO) reveals a thickness ratio (septum : left ventricular wall) of 1.5 : 1.

What diagnosis fits best with this clinical picture?

Your answer was incorrect

- A Alcoholic cardiomyopathy
- B Aortic stenosis
- C Hypertrophic obstructive cardiomyopathy
- D Coronary artery disease
- E Restrictive cardiomyopathy

Explanation



- C Hypertrophic obstructive cardiomyopathy

Familial HOCM occurs as an autosomal dominant condition with variable penetrance. Symptoms may include dyspnoea, syncope, angina or palpitations. Unfortunately the condition is also associated with increased risk of lethal arrhythmias and sudden death. Chest X-ray examination may reveal normal or increased heart size. Electrocardiogram (ECG) shows left ventricular hypertrophy and there are often Q waves in anterolateral and inferior leads. Echocardiography reveals increased septal versus left ventricular wall diameter (diameter ratio of >1.3:1). Surgical resection of myocardial tissue is an option where the outflow gradient is increased. Amiodarone is useful for arrhythmia prophylaxis; an implantable cardioverter/defibrillator may be an option in patients with recurrent ventricular tachycardia.

A Alcoholic cardiomyopathy

Alcohol leads to a dilated cardiomyopathy, but the thickness suggested by the echo and family history of early death makes hypertrophic cardiomyopathy the most likely diagnosis here.

B Aortic stenosis

While exertional angina and an ejection systolic murmur are associated with aortic stenosis, the thickness suggested by the echo and family history of early death makes hypertrophic cardiomyopathy the most likely diagnosis here.

D Coronary artery disease

The thickness suggested by the echo and family history of early death makes hypertrophic cardiomyopathy the most likely diagnosis here.

E Restrictive cardiomyopathy

This is characterised by normal wall thickness and diastolic dysfunction due to ventricular rigidity.

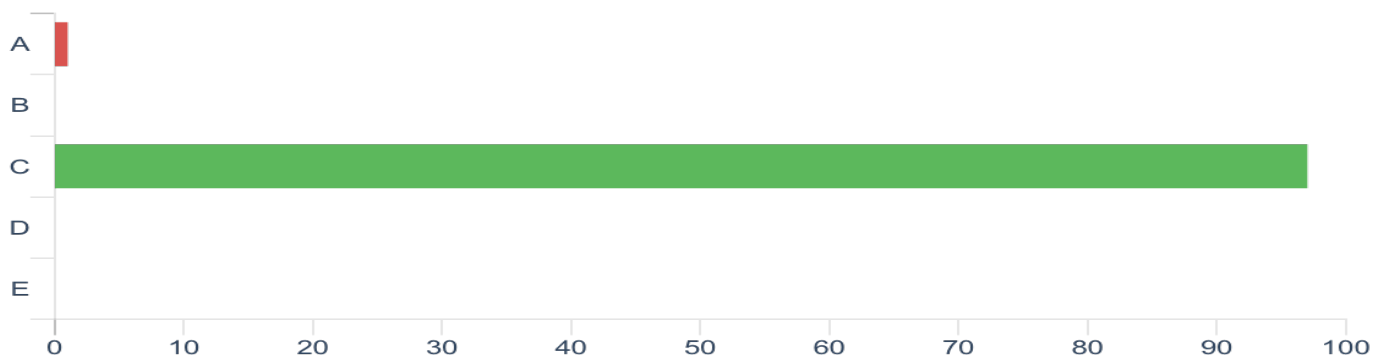
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Q26

A 44-year-old man who was previously fit and well developed short-lived pleuritic-sounding chest pain while playing basketball one evening. The following morning he attends the Emergency Department (ED) at the insistence of his wife.

On examination, he presents normally on an electrocardiogram (ECG), while his creatine kinase (CK) and troponin T levels are within the normal range. A chest X-ray (CXR) is unremarkable.

What diagnosis fits best with this clinical picture?

Your answer was incorrect

- A Non-cardiac chest pain
- B Unstable angina
- C Stable angina
- D STEMI
- E N-STEMI

Explanation



- A Non-cardiac chest pain

Normal ECG, CK and troponin T makes the diagnosis of cardiac chest pain very unlikely. If high-sensitivity troponin is negative at 12 hours it indicates a very low cardiovascular risk. Troponin elevation is correlated to myocardial necrosis and most commonly associated with acute coronary syndrome, however it can also be elevated in heart failure, tachyarrhythmias and other conditions such as sepsis, therefore its interpretation must be taken in context. The presence of pleuritic pain also suggests a respiratory or musculoskeletal cause.

- B Unstable angina

In patients with ischaemic pain but without a rise in cardiac biomarkers, the diagnosis of unstable angina may be made. Usually a history of previous stable angina and in the presence of cardiovascular risk factors intimates at this diagnosis. The clinical history suggests a non-

cardiac origin for the pain.

C Stable angina

Typical angina exhibits a constricting discomfort in the front of the chest, precipitated by exertion, relieved by rest or glyceryl trinitrate (GTN) and often involves a crescendo of pain. A pleuritic pain which reaches maximal intensity fast is more likely to be a respiratory or neuromuscular cause.

D STEMI

Diagnosis is made with typical acute chest pain and persistent ST-elevation on the ECG, representing an epicardial coronary occlusion.

E N-STEMI

Acute chest pain but without ST-elevation on ECG. ECG changes may include ST-depression, T-wave inversion or T-wave abnormalities. A rise in cardiac biomarkers with the above presentation indicates a N-STEMI diagnosis.

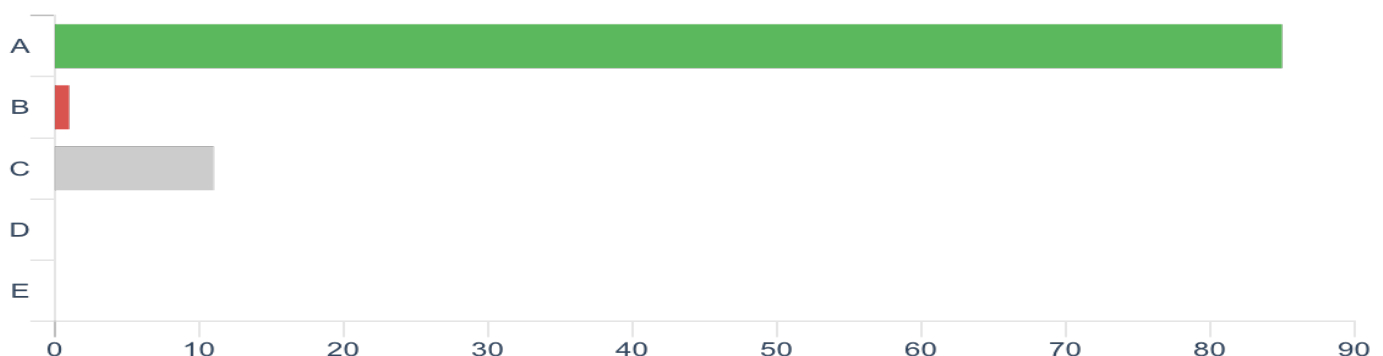
6556

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Responses Correct:	3
Responses Incorrect:	23
Responses Total:	26
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 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q27

A 54-year-old man, who has received tissue plasminogen activator (TPA) for an anterior myocardial infarction (MI), develops sudden dyspnoea and left ventricular failure five days later.

On examination, systolic murmur is heard loudest at the left sternal edge. Echocardiography (ECHO) with colour flow Doppler reveals a left to right shunt.

What is the most likely diagnosis?

Your answer was correct

- A Ventricular septal defect (VSD)
- B Mitral regurgitation
- C Atrial septal defect
- D Aortic regurgitation
- E Aortic dissection

Explanation



- A Ventricular septal defect (VSD)

VSD is classically seen 5–10 days after MI. Patients present with rapid deterioration, pulmonary oedema and hypotension. There is a harsh pansystolic murmur loudest at the left sternal edge. Diagnosis is usually made with the aid of colour flow Doppler. Inotropes are used to manage severe hypotension; cautious vasodilator therapy may be employed if the systolic blood pressure is above 100 mmHg. If patients remain unstable, intra-aortic balloon pump may be considered. Surgical or specialist cardiological opinion should be requested with reference to formal surgical closure or catheter placement of an umbrella device.

- B Mitral regurgitation

Mitral regurgitation can occur due to papillary muscle damage as a complication of an MI. The murmur is typically pansystolic and best heard at the cardiac apex, with radiation to the axillae.

C Atrial septal defect

Atrial septal defects can present as a chronic left to right shunt which results in right ventricular volume overload. It is not commonly associated with acute myocardial infarction, therefore the patient's presentation and heart sounds are consistent with an acute ventricular septal defect (VSD) secondary to ischaemia.

D Aortic regurgitation

Aortic regurgitation is not a typical complication of an acute MI. An aortic regurgitation murmur may be described as an early diastolic murmur, loudest at the left sternal edge, third intercostal space and accentuated by leaning the patient forward in held expiration.

E Aortic dissection

Aortic dissections present classically as acute central chest pain radiating to the back, described as a sharp, tearing or ripping pain. Patients exhibit acute cardiac decompensation and shock. An aortic regurgitation murmur may be detected depending upon the type of dissection.

6557

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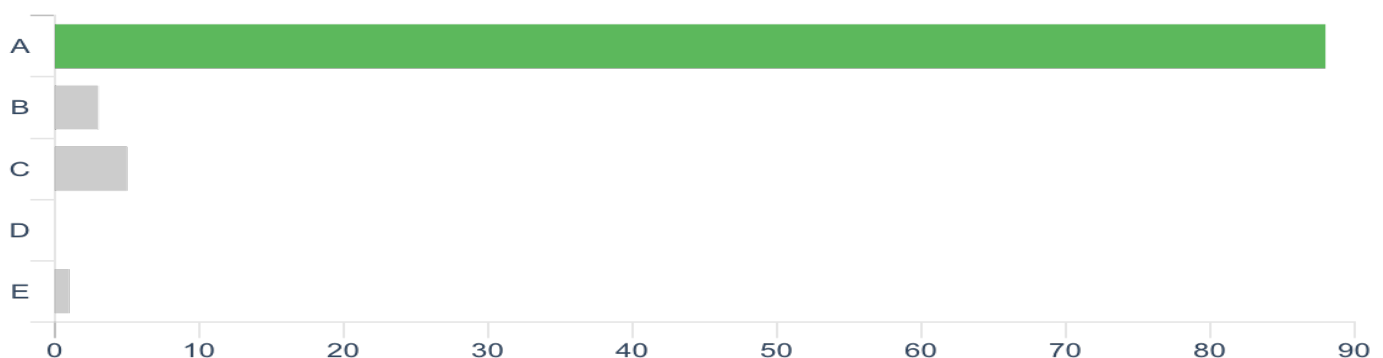
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Session Progress

Responses Correct:	4
Responses Incorrect:	23
Responses Total:	27
Responses - % Correct:	15%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis

Links to NICE guidelines/CKS



Q28

A 53-year-old man who was previously fit and well developed prolonged and convincing chest pain while playing sport. He is seen in the Emergency Department (ED) about six hours later.

On examination, there is T-wave inversion in the inferior leads of an Electrocardiogram (ECG). His creatine kinase (CK) level is approximately 500 U/l, while his troponin T level is 0.16 ng/ml (elevated).

Which of the following represents the most likely diagnosis?

Your answer was incorrect

- A Non-cardiac chest pain
- B Unstable angina
- C Stable angina
- D STEMI
- E NSTEMI

Explanation



- E NSTEMI

Given the inferior ECG changes and the raised troponin at 6 hours, the likely diagnosis is NSTEMI. Management include dual-antiplatelet therapy, appropriate secondary prevention, bed rest, analgesia and continuous ECG monitoring. He would be a candidate for inpatient angiography as his is at a high risk of future cardiovascular events (the GRACE score may be calculated to support this decision).

- A Non-cardiac chest pain

Given the significant ECG changes and troponin rise, the diagnosis is NSTEMI. Were the investigations to be negative and the pain atypical for cardiac pain, then non-cardiac chest pain may be suspected.

B Unstable angina

The diagnosis of unstable angina relies upon a clinical history of ischaemic pain but without a rise in cardiac biomarkers. Here the troponin is significantly elevated indicating a NSTEMI cause in conjunction with the ECG changes.

C Stable angina

Typical angina chest pain is short-lived, relieved by rest or GTN usually within 5 minutes. The pain usually involves a build-up or crescendo, with troponin levels negative. This patient may have experienced exertional chest pain typical of angina prior to his presentation of NSTEMI in the scenario.

D STEMI

Diagnosis is made with typical acute chest pain and persistent ST-elevation on the ECG, representing an epicardial coronary occlusion. T-wave inversion indicated NSTEMI as the more likely diagnosis especially in the context of a troponin rise.

6558

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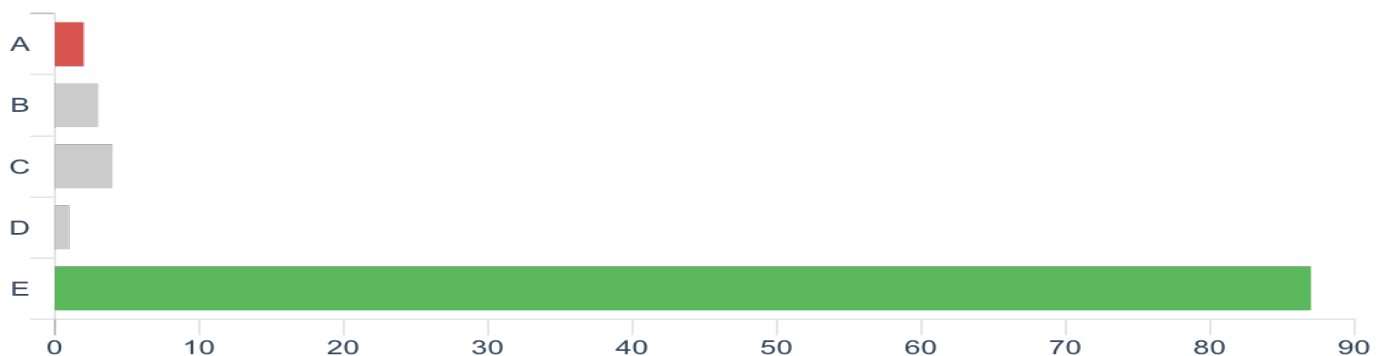
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Responses Correct:	4
Responses Incorrect:	24
Responses Total:	28
Responses - % Correct:	14%

 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q29

You are working as an expedition doctor on a climbing trip to the Andes. A 38-year-old man is brought down rapidly from the mountain to base camp.

On arrival at the medical tent, he is on 40% oxygen and his saturations are still only 90%.

On examination, there is evidence of bilateral crepitations, consistent with pulmonary oedema.

Which of the following agents represents the next most appropriate intervention for this man?

Your answer was incorrect

- A Intravenous (IV) furosemide
- B IV Hydrocortisone
- C Nifedipine
- D Acetazolamide
- E High-concentration oxygen

Explanation



- E High-concentration oxygen

This man has high-altitude pulmonary oedema, a type of high-altitude illness. This is caused by accumulation of white and red blood cells in the lungs due to a breakdown of the pulmonary blood-gas barrier due to hypobaric hypoxia. This results in accumulation of extravascular fluid in the alveolar spaces – pulmonary oedema.

Nifedipine reduces pulmonary hypertension and is the treatment of choice for pulmonary oedema in cases where high-concentration oxygen is not available. In this case, however, it is, so oxygen would be initiated first, particularly in view of persistent hypoxia on 40% oxygen.

- A Intravenous (IV) furosemide

Given the pathophysiology of high-altitude pulmonary oedema caused by exposure to a low partial pressure of oxygen at high altitude, IV furosemide is not the correct choice.

B IV Hydrocortisone

In acute mountain sickness, patients may also present with high-altitude cerebral oedema, the treatment for which is dexamethasone.

C Nifedipine

If high-flow oxygen is not available, then nifedipine can be used as second line. It reduces pulmonary hypertension and therefore is an appropriate choice for pulmonary oedema in the context of acute mountain sickness.

D Acetazolamide

Acetazolamide may be of some value in prophylaxis in preventing acute mountain sickness, but the best prevention is slow acclimatisation.

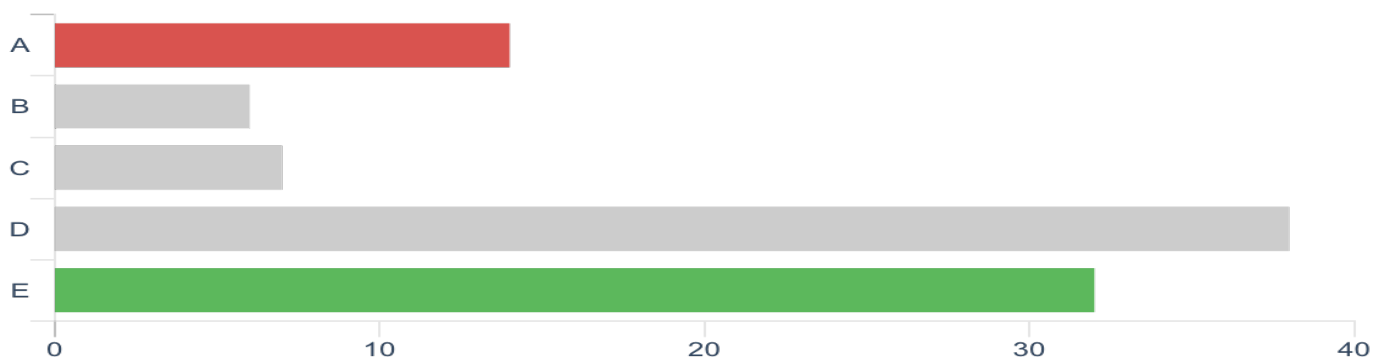
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Responses Total:	29
Responses - % Correct:	14%

 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Q30

A 23-year-old man is admitted as to the Emergency Department (ED) from a nightclub. He presents with new-onset atrial fibrillation (AF) with a ventricular rate of 130 beats per minute (bpm). His systolic blood pressure is only 95 mmHg, and he is electrically cardioverted. His sinus rhythm electrocardiogram (ECG) shows a PR interval of 100 milliseconds and a slurred onset of the QRS complex (delta wave).

What is the long-term treatment of choice in this patient?

Your answer was incorrect

- A Digoxin
- B Amiodarone
- C Sotalol
- D Radiofrequency ablation of the accessory pathway
- E Cardioversion for symptomatic arrhythmias in the future

Explanation



- D Radiofrequency ablation of the accessory pathway

This patient has Wolff-Parkinson-White syndrome associated with an accessory conduction pathway leading to earlier than normal ventricular depolarisation, predisposing the patient to tachyarrhythmias. The majority of patients present with reciprocating tachycardias at 150–250 bpm, 15% present with AF and around 5% with atrial flutter. In a patient of this age, referral to a cardiovascular electrophysiologist for consideration of radiofrequency ablation would be the treatment of choice.

- A Digoxin

AV nodal blocking agents should be avoided with pre-excited AF; digoxin can enhance antegrade conduction through the accessory pathway resulting in a rapid ventricular rate and subsequent ventricular fibrillation.

B Amiodarone

Stable patients with atrioventricular re-entrant tachycardia (AVRT) may respond to amiodarone to control the rate of the re-entrant tachycardia; however long-term treatment of choice is radiofrequency ablation of the accessory pathway.

C Sotalol

Beta-blockers do not usually affect the accessory pathway conduction but can often reduce the rate of re-entrant tachycardia.

E Cardioversion for symptomatic arrhythmias in the future

Radiofrequency ablation should be first choice in symptomatic Wolff-Parkinson-White syndrome or atrioventricular re-entrant tachycardia.

6561

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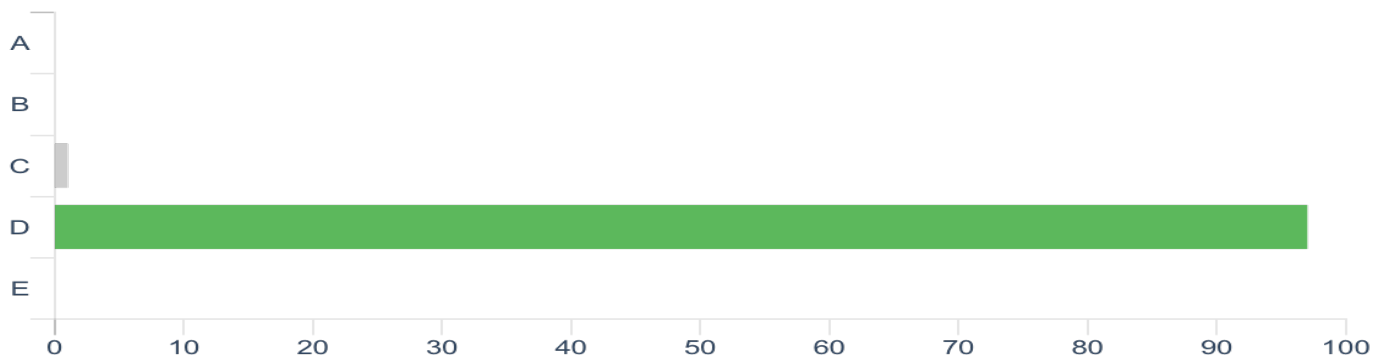
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Responses Total:	30
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Q31

A 28-year-old man presents to the Cardiology Clinic for follow up after two episodes of collapse. The Cardiology Clinic previously arranged a 24-hour tape which reveals one episode of nocturnal paroxysmal atrial fibrillation (AF) with a maximal ventricular rate of 145 beats per minute (bpm). His PR interval is 140 ms, and the QT interval is normal. Echocardiography (ECHO) is unremarkable. Thyroid function testing is unremarkable.

Which of the following treatments is most appropriate in this case?

Your answer was incorrect

- A Electrophysiological studies and ablation
- B Disopyramide
- C Amiodarone
- D Digoxin
- E Diltiazem

Explanation



- A Electrophysiological studies and ablation

Bisoprolol is recommended as initial prophylaxis against further episodes of paroxysmal atrial fibrillation by both the National Institute for Health and Care Excellence (NICE) and the European Society of Cardiology (ESC). However many patients do not, however, want to commit to long-term medical therapy, and for this reason electrophysiological studies coupled with possible ablation is an increasingly popular option. This can be used in combination with Class Ic agents, eg propafenone or flecainide, to control ventricular rates if atrial fibrillation evolves into atrial flutter.

- B Disopyramide

Disopyramide is an anti-arrhythmic medication used for treatment of ventricular tachycardia due to its Class Ia properties.

C Amiodarone

This is useful in acute management; however, due to its side-effects from long-term use, amiodarone is not the most appropriate choice.

D Digoxin

Digoxin is pro-fibrillatory and therefore should not be used in paroxysmal atrial fibrillation or if direct-current (DC) cardioversion is planned.

E Diltiazem

Beta-blockers are generally considered first line; however diltiazem can be used if there is no evidence of structural heart disease on echocardiogram or if patients have severe asthma.

6562

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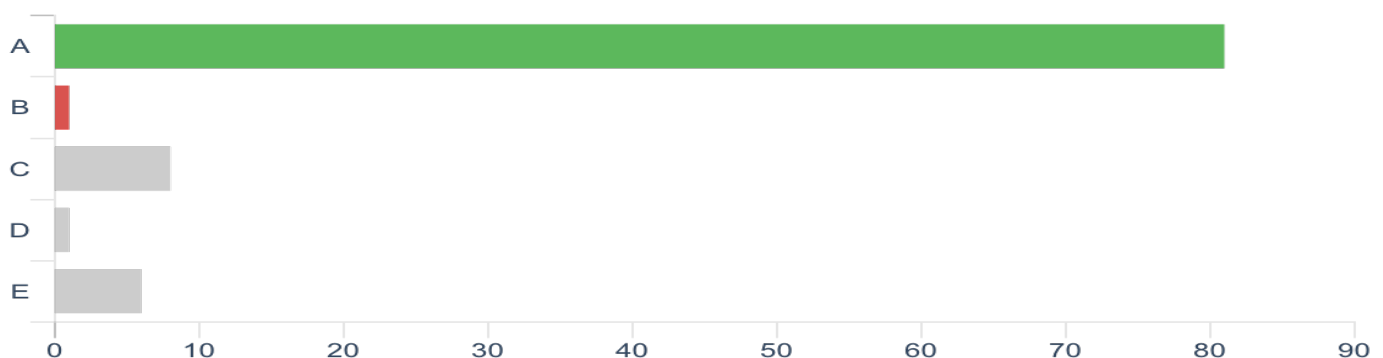
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Responses Correct:

4

Responses Incorrect:	27
Responses Total:	31
Responses - % Correct:	13%

External Links

NICE. Atrial fibrillation: management

[nice.org.uk/guidance/cg180/resources/guidance-atrial-fibrillation-the-management-of-atrial-fibrillation-pdf](https://www.nice.org.uk/guidance/cg180/resources/guidance-atrial-fibrillation-the-management-of-atrial-fibrillation-pdf)

(<https://www.nice.org.uk/guidance/cg180/resources/guidance-atrial-fibrillation-the-management-of-atrial-fibrillation-pdf>)



Q32

A 69-year-old woman is assessed in the Emergency Department (ED) after an episode of retrosternal chest pain which developed while she was cleaning her kitchen floor. The pain lasted for 30 minutes.

She has a past history of rheumatic fever and hypertension, but nothing else of note. The pain started five hours ago, and she is now pain-free.

On examination, she is obese, with a body mass index (BMI) of 34 kg/m². Her blood pressure is 147/82 mmHg, and is controlled with ramipril and bendroflumethiazide.

An electrocardiogram (ECG) reveals broad P waves, but nothing else of note. A chest X-ray (CXR) reveals evidence of old tuberculosis.

What is the management of choice in this patient?

Your answer was correct

- A Admit for 12-hour highly sensitive troponin T test
- B Observe in the Emergency Department and await 3-hour highly sensitive troponin T test
- C Discharge
- D Commence intravenous (IV) heparin
- E Commence IV IIB/IIIA antagonist therapy

Explanation



- B Observe in the Emergency Department and await 3-hour highly sensitive troponin T test

This patient has at least two risk factors for cardiac chest pain: obesity and hypertension. As such, she should be screened for cardiac chest pain. A high-sensitivity troponin at this point in her presentation is sufficient to determine the presence of an ischaemic event with myocardial damage. As this patient's pain started > 3 hours ago, a single troponin test is sufficient to exclude acute myocardial infarction.

A Admit for 12-hour highly sensitive troponin T test

Modern practice with high-sensitivity troponin now dictates that troponin assays at 3 and 6 hours from the onset of chest pain are adequate to determine whether myocardial damage has occurred.

If a single test at > 6 hours away is not elevated, then this is strong evidence for the absence of cardiac ischaemia.

C Discharge

The patient has presented with 30 minutes of cardiac-sounding chest pain and therefore warrants further investigation. With serial ECGs being unremarkable, troponin assays are required to exclude myocardial ischaemia, and therefore, discharge would not be appropriate.

D Commence intravenous (IV) heparin

IV heparin use has largely been superseded by low-molecular-weight heparin and factor Xa inhibitors such as fondaparinux, due to practicalities of administration and the narrow therapeutic window (activated partial thromboplastin time (APTT)) required with IV heparin.

E Commence IV IIB/IIIA antagonist therapy

IIB/IIIA receptor antagonist therapy would not be indicated, unless significant ECG changes occurred or there was the presence of elevated troponins. Its use is predominantly in 'upstream' management of acute coronary syndromes or as an adjunct during percutaneous coronary intervention. IIB/IIIA receptor antagonists are usually combined with a suitable anticoagulant.

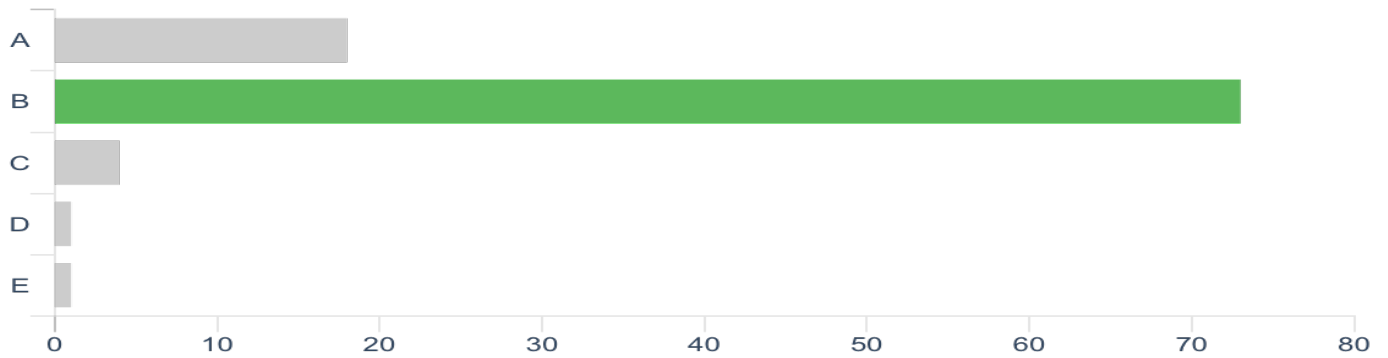
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Responses Incorrect:	27
Responses Total:	32
Responses - % Correct:	16%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

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Links to NICE guidelines/CKS



Q33

A 56-year-old man developed acute severe shortness of breath four days after a ST-elevation myocardial infarction (MI).

On examination in the Emergency Department (ED), his blood pressure is 99/50 mmHg and similar on both arms. His pulse is 110 beats per minute (bpm) and his respiratory rate is 28 breaths per minute. He has elevated jugular venous pressure (JVD), a pan systolic murmur heard loudest at the apex, and bi-basal crackles, which extend up to mid-zones.

What diagnosis fits best with this clinical picture?

Your answer was incorrect

- A Ventricular septal defect
- B Mitral regurgitation
- C Aortic dissection
- D Aortic regurgitation
- E Atrial septal defect

Explanation



- B Mitral regurgitation

This occurs due to papillary muscle rupture usually presents from 1 to 14 days after a myocardial infarction. The pan-systolic murmur is usually loudest at the apex, although its absence does not exclude this diagnosis. The abrupt onset of acute pulmonary oedema and rapid progression to cardiogenic shock should prompt investigations to look for an acute mitral regurgitation or a ventricular septal defect. Inferior and posterior T-wave changes may be seen.

- A Ventricular septal defect

This is an important differential diagnosis in this context, but the pan-systolic murmur is usually loudest at the lower left sternal edge and is accompanied by a parasternal thrill. In contrast, the pan-systolic murmur that is associated with acute mitral regurgitation is usually

loudest at the apex without a thrill. It is important to note that the murmur is not always easy to detect, especially in patients presenting with cardiogenic shock.

C Aortic dissection

Type A aortic dissection can cause myocardial infarction by impairing the perfusion of the right coronary artery, but it would not fit this presentation.

D Aortic regurgitation

Aortic regurgitation presents with a diastolic murmur. It can complicate a type A aortic dissection but not a myocardial infarction.

E Atrial septal defect

Atrial septal defect does not complicate a myocardial infarction. It leads to fixed splitting of the second heart sound but not a murmur.

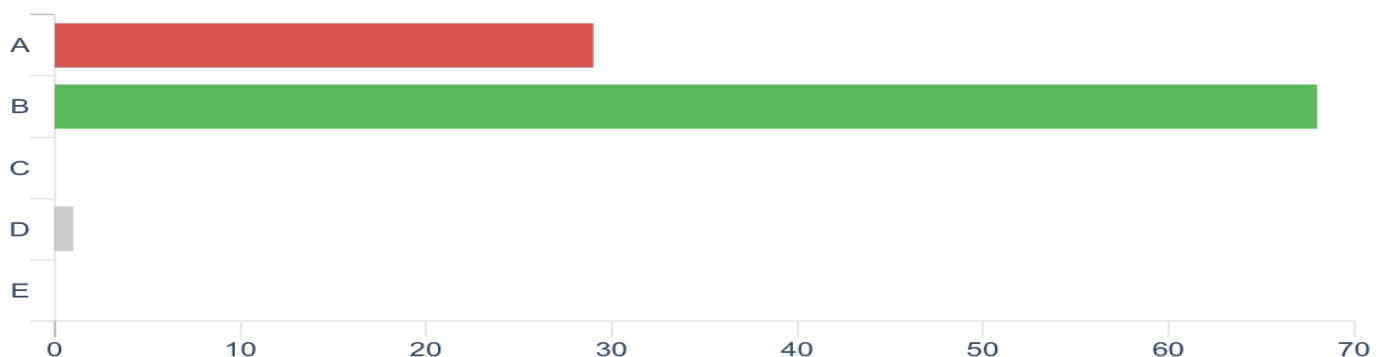
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Responses Incorrect:	28
Responses Total:	33
Responses - % Correct:	15%



Q34

A 48-year-old Afro-Caribbean man recently underwent ambulatory blood pressure monitoring. His daytime average blood pressure was recorded as 155/96 mmHg. He is asymptomatic, his chest is clear, his abdomen is soft and non-tender, and his body mass index (BMI) is 24 kg/m². Ophthalmoscopy is entirely normal, and routine bloods including urea and creatinine are unremarkable.

Which of the following pharmacological treatments would be the most appropriate to initiate for him?

Your answer was incorrect

- A Amlodipine
- B None indicated
- C Losartan
- D Atenolol
- E Doxazosin

Explanation



- A Amlodipine

The current NICE clinical guideline for hypertension (CG127, see below) recommends calcium channel blockers as first-line antihypertensive treatment for patients at any age of African-Caribbean family origin.

- B None indicated

The current NICE clinical guideline for hypertension (CG127) recommends initiating antihypertensive drug treatment for patients of any age with stage 2 hypertension. The stages of hypertension are:

Stage 1: Clinic BP is $\geq 140/90$ mmHg and confirmed by subsequent ABPM daytime average $\geq 135/85$ mmHg.

Stage 2: Clinic BP is $\geq 160/100$ mmHg and confirmed by subsequent ABPM daytime average $\geq 150/95$ mmHg.

Severe: Clinic systolic BP is ≥ 180 mmHg or clinic diastolic BP ≥ 110 mmHg.

C Losartan

The current NICE clinical guideline for hypertension (CG127) recommends that first-line antihypertensive treatment for patients at any age, and of African-Caribbean family origin, is calcium channel blockers. Angiotensin receptor blockers are first-line antihypertensive treatment for patients age < 55 years from a non-African-Caribbean family background.

D Atenolol

The current NICE clinical guideline for hypertension (CG127) recommends that first-line antihypertensive treatment for patients at any age, and of African-Caribbean family origin is calcium channel blockers. Beta-blockers are not preferred first-line antihypertensive treatments, because meta-analysis suggests they are associated with increased risk of impaired glucose tolerance.

E Doxazosin

The current NICE clinical guideline for hypertension (CG127) recommends that first-line antihypertensive treatment for patients at any age, and of African-Caribbean family origin is calcium channel blockers. Alpha-blockers such as doxazosin are reserved for patients with resistant hypertension. They may increase the risk of cardiac failure in some patients.

6579

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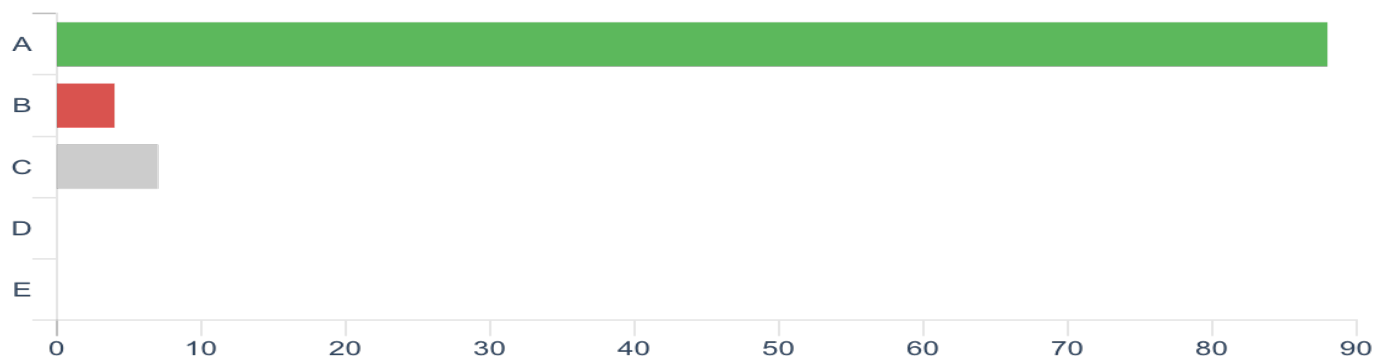
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Responses Correct:	5
Responses Incorrect:	29
Responses Total:	34
Responses - % Correct:	15%

External Links

NICE. CG127 Hypertension in adults: diagnosis and management. 2011.

[nice.org.uk/guidance/cg127](https://www.nice.org.uk/guidance/cg127)

(<https://www.nice.org.uk/guidance/cg127>)

Expanded Explanation

Overview

Clinical Presentation

Diagnosis / Investigation

Management

Prognosis



Q35

A 28-year-old man presents to the Emergency Department (ED) after collapsing at a swimming pool. He cannot recall any detail of the collapse. Collateral history confirmed that he collapsed after swimming and there was no seizure activity after the collapse. A rapid heart rate was detected by the first attender at the scene. He has no past medical history, drug history or history of alcohol or drug abuse. He confirms a family history of unexplained sudden death. An 12-lead electrocardiogram (ECG) shows a sinus rhythm with corrected QT interval of 0.5 s.

What is the most likely cause of his collapse?

Your answer was incorrect

- A JLN1 mutation
- B JLN2 mutation
- C LQT1 mutation
- D LQT3 mutation
- E LQT7 mutation

Explanation



- C LQT1 mutation

Romano-Ward syndrome (LQT 1-6 mutations) can present with recurrent syncopal episodes precipitated by emotions or physical activities such as swimming. LQT1 and 2 make up the majority of cases of long QT (around 90% of the total).

- B JLN2 mutation

Jervell-Lange-Nielsen syndrome (JLN 1 and 2 mutations) is rare and is usually associated with deafness. JLN2 is seen even less frequently than JLN1 mutation (making up around 10% of cases of the syndrome).

- A JLN1 mutation

Jervell-Lange-Nielsen syndrome (JLN 1 and 2 mutations) is rare and is usually associated with deafness. It has a markedly higher incidence in Scandinavia (particularly Norway and Sweden).

D LQT3 mutation

LQT3 mutations usually have tachy-arrhythmic events during sleep, as this is usually triggered by bradycardia. Cardiac pacing is potentially helpful. LQT3 mutations are a less frequent (7%) cause of long QT, but are more frequently lethal.

E LQT7 mutation

Anderson syndrome is extremely rare. It is associated with skeletal abnormalities and periodic episodes of muscle weakness, as well as long-QT syndrome.

6581

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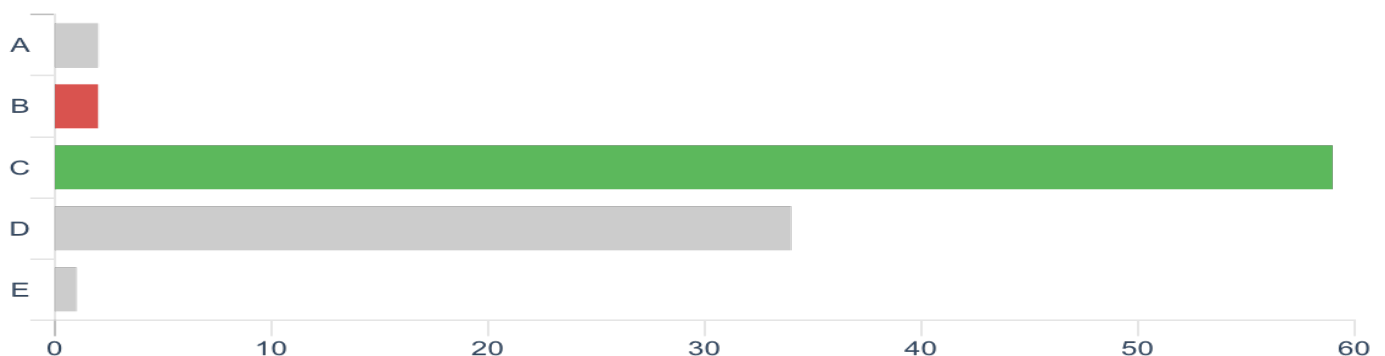
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Responses Correct:

5

Responses Incorrect:	30
Responses Total:	35
Responses - % Correct:	14%



Q36

A 29-year-old man presents to the Emergency Department (ED) with a one-day history of fever and severe central pleuritic chest pain. He is normally fit and well, with no history of drug or alcohol abuse. He was born in the United Kingdom and has no travel history. He reports a similar episode of pleuritic chest pain some six months earlier, which his General Practitioner (GP) diagnosed as pericarditis.

On examination, his temperature is 38.5°C. His heart rate is 100 beats per minute (bpm) and his blood pressure (BP) is 108/70 mmHg. A chest radiograph is within normal limits. A 12-lead electrocardiogram (ECG) shows sinus tachycardia and widespread ST elevation in limb and precordial leads.

What is the most appropriate first-line treatment?

Your answer was correct

- A Aspirin
- B Aspirin and colchicine
- C Prednisolone
- D Alteplase
- E Dalteparin

Explanation



- B Aspirin and colchicine

Non-steroidal anti-inflammatory drugs and colchicine are recommended first-line therapy for acute pericarditis. The ICAP study has suggested that colchicine reduces the risk of recurrent pericarditis from 37.5 to 16.7%, making it the first-choice option here.

- A Aspirin

Colchicine is recommended as an adjunct to non-steroidal anti-inflammatory drugs for the treatment of acute pericarditis, particularly where it is recurrent. High-dose aspirin would have been an option if this was a first episode of pericarditis.

C Prednisolone

Corticosteroids are not recommended as first-line therapy for acute pericarditis. Corticosteroids are usually considered an option for patients who aren't able to tolerate colchicine and don't respond to NSAIDs or aspirin alone.

D Alteplase

This treatment is not indicated for acute pericarditis. It is not associated with improved outcomes and may increase the risk of pericardial haemorrhage.

E Dalteparin

There is no clear indication for anticoagulant use, except for venous thromboembolism prophylaxis. Assuming this young patient is able to move around the bed, they would be considered at low risk of venous thromboembolism.

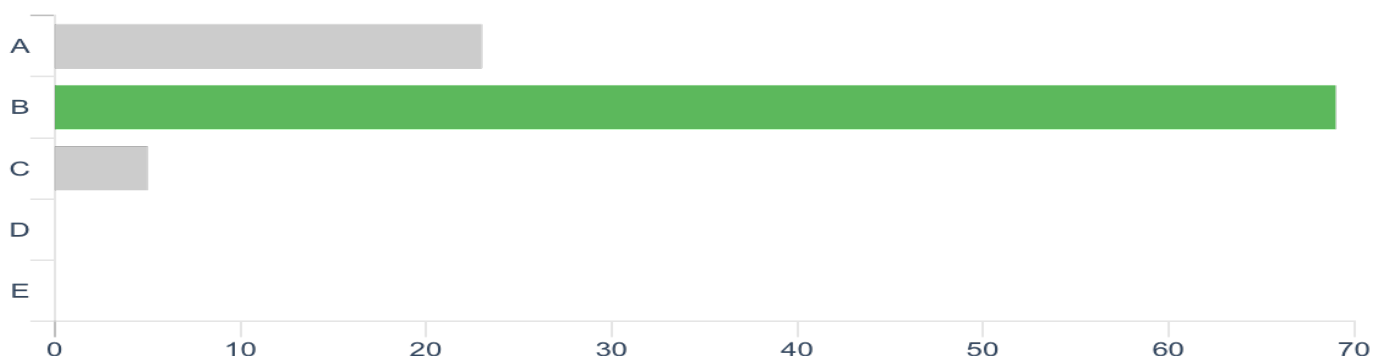
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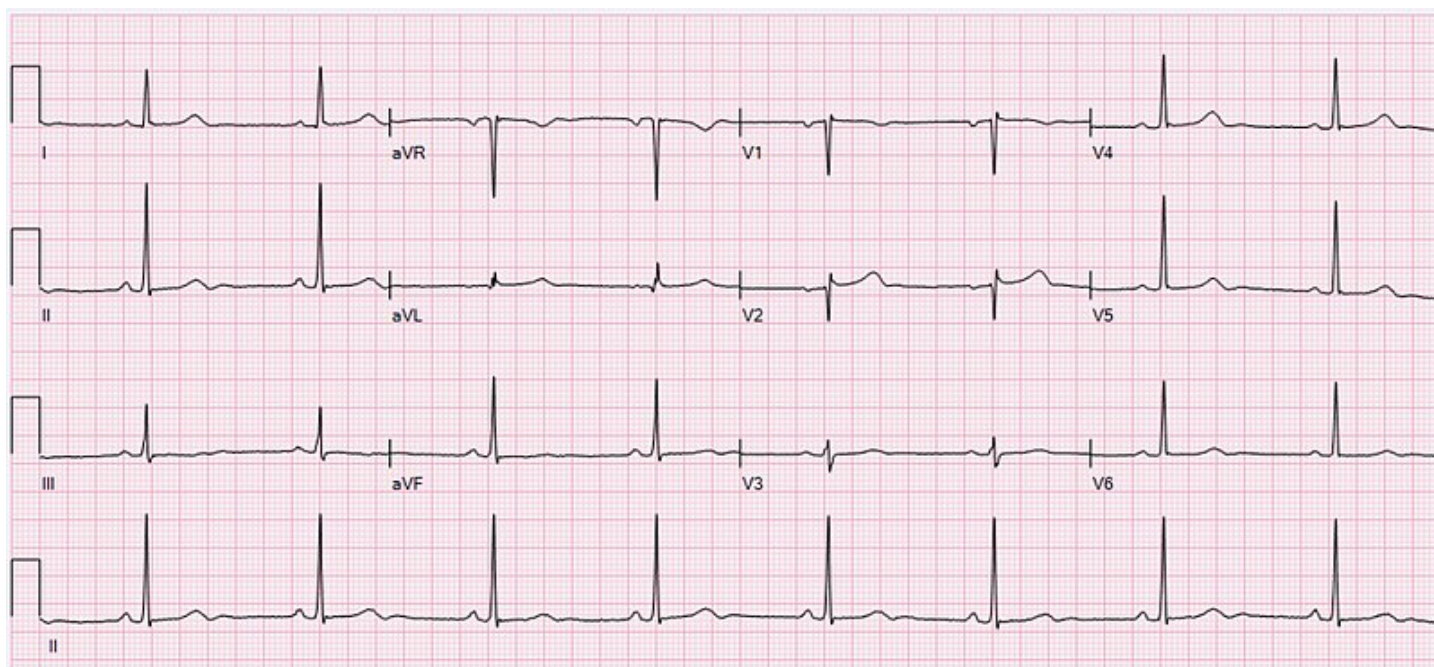
Responses Correct:	6
Responses Incorrect:	30
Responses Total:	36
Responses - % Correct:	17%

 External Links**A Randomized Trial of Colchicine for Acute Pericarditis**[nejm.org/doi/full/10.1056/NEJMoa1208536#t=article](http://www.nejm.org/doi/full/10.1056/NEJMoa1208536#t=article)[\(http://www.nejm.org/doi/full/10.1056/NEJMoa1208536#t=article\)](http://www.nejm.org/doi/full/10.1056/NEJMoa1208536#t=article)

Q37

A 71-year-old woman presented to the Emergency Department (ED) with an anterior myocardial infarction (MI) which required primary coronary intervention. Two days after the procedure, she complains of a presyncope episode after returning from the bathroom. This lasted a few minutes and has since subsided.

On examination, her heart sound are normal. Her blood pressure (BP) is 101/58 mmHg. An electrocardiogram (ECG) is shown below:



What would be the best management strategy in this patient?

Your answer was correct

- A Adrenaline (epinephrine)
- B Atropine
- C Immediate transcutaneous pacing
- D Close observation with continuous ECG monitoring
- E Amiodarone

Explanation



D Close observation with continuous ECG monitoring

This ECG shows sinus bradycardia. Whilst the patient is currently asymptomatic, and there is a lack of poor prognostic indicators (recent asystole, Mobitz II AV block, complete heart block, ventricular pause > 3 s), they can be observed closely. Should they develop adverse features or poor prognostic indicators then treatment with atropine or transcutaneous pacing would be indicated.

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A Adrenaline (epinephrine)

Adrenaline is a second-line drug for bradycardia with adverse features not responding to atropine. It is an interim measure aiming to stabilise the patient whilst pacing is arranged. This patient is relatively stable at present. In the setting of an MI it isn't preferred as it can significantly worsen the risk of myocardial ischaemia and increase the risk of further arrhythmia.

B Atropine

Atropine is a first-line drug for bradycardia with adverse features. This patient has no adverse features at present that require immediate atropine administration, but it should be given if she deteriorates with a fall in blood pressure.

C Immediate transcutaneous pacing

Transcutaneous pacing can be used as an interim measure if the response to atropine is inadequate and transvenous pacing is not immediately available. Transcutaneous pacing is painful and less effective than transvenous pacing. It should be reserved for life-threatening bradycardia.

E Amiodarone

There is no clinical indication for amiodarone. Amiodarone would be considered where there is ventricular arrhythmia post-myocardial infarction.

6818

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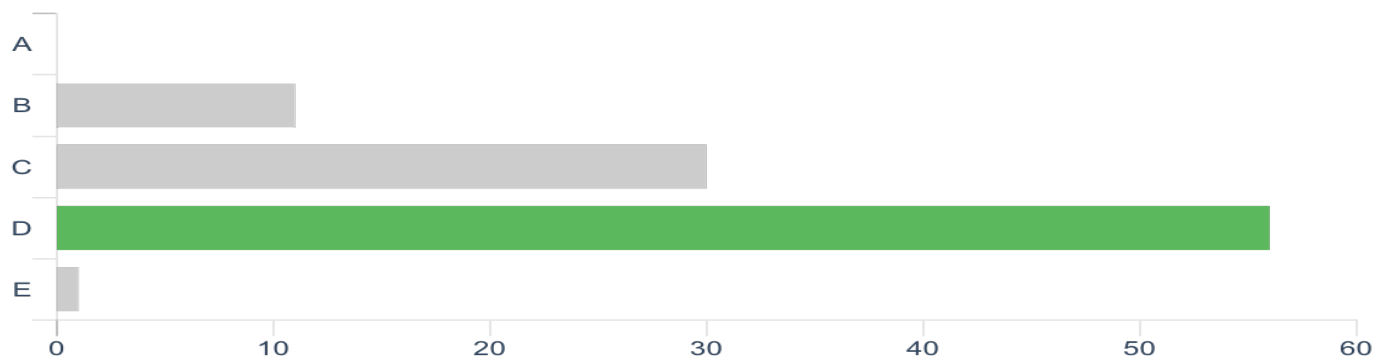
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Session Progress

Responses Correct:	7
Responses Incorrect:	30
Responses Total:	37
Responses - % Correct:	19%



Q38

A 54-year-old man presents to the Emergency Department (ED) with palpitations and dizziness. One month ago, he underwent primary coronary intervention for an anterior ST-elevation myocardial infarction (MI). His echocardiogram (ECHO) at discharge showed antero-septal hypokinesis with an ejection fraction of 38%.

On examination, a twelve-lead electrocardiogram (ECG) confirms monomorphic ventricular tachycardia; he is electrically cardioverted and returns to sinus rhythm and Q waves in leads V1-V4.

Which one of the following is the long-term treatment indicated?

Your answer was correct

- A Amiodarone 200 mg tds
- B Amiodarone 200 mg od
- C Sotalol 80 mg bd
- D Automated implantable cardiac defibrillator
- E Mexiletine

Explanation



- D Automated implantable cardiac defibrillator

Studies have shown that implantable cardioverter-defibrillators are superior to anti-arrhythmic in patients with a history of life-threatening ventricular arrhythmias. Studies suggest they are associated with a reduction in absolute mortality of 7.9%.

- A Amiodarone 200 mg tds

Studies have shown that implantable cardioverter-defibrillators (ICDs) are superior to anti-arrhythmic drugs in patients with a history of life-threatening ventricular arrhythmias. Amiodarone can be considered in patients where ICDs are not appropriate, or in addition where patients have frequent episodes of VT.

B Amiodarone 200 mg od

Studies have shown that implantable cardioverter-defibrillators (ICDs) are superior to anti-arrhythmic in patients with a history of life-threatening ventricular arrhythmias. Amiodarone can be considered in patients where ICDs are not appropriate. This is also the maintenance dose, and a higher loading dose would usually be administered first.

C Sotalol 80 mg bd

Studies have shown that implantable cardioverter-defibrillators are superior to anti-arrhythmic in patients with a history of life-threatening ventricular arrhythmias. Although sotalol is a class III anti-arrhythmic, it isn't a usual first-choice option for patients with VT and LV dysfunction.

E Mexiletine

Mexiletine is structurally similar to lidocaine, a class Ib orally active antiarrhythmic drug acting on sodium channel blockade. Its use is not recommended in this context as it may provoke more frequent, and often more difficult to cardiovert, episodes of sustained VT, and can exacerbate LV dysfunction.

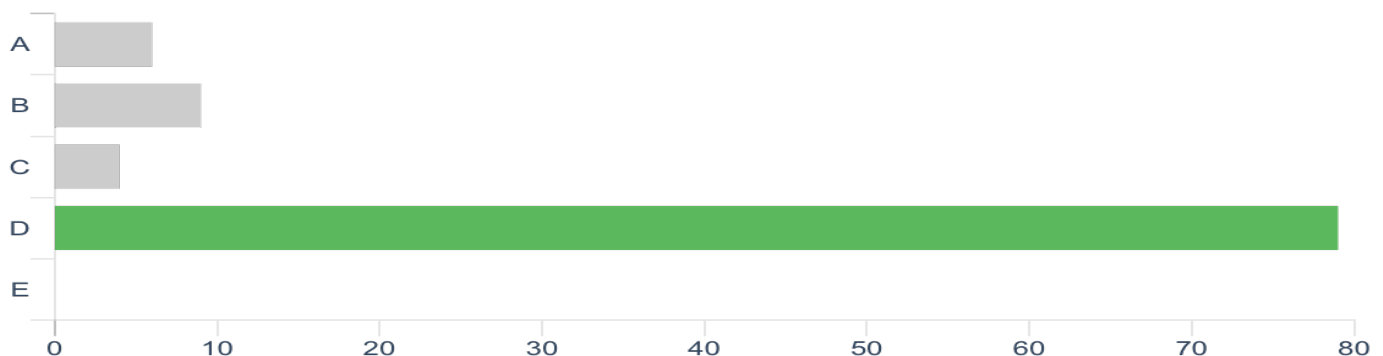
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Responses Correct:	8
Responses Incorrect:	30
Responses Total:	38
Responses - % Correct:	21%



Q39

A 68-year-old man with a history of ankylosing spondylitis is referred to the Cardiology Department following the discovery of a diastolic murmur by his General Practitioner (GP). He does not describe any chest pain or breathlessness, but he has experienced some palpitations over the last six months.

On examination, his blood pressure is 175/95 mmHg, while his pulse is 100 beats per minute (bpm) at rest. Clinical examination reveals a collapsing pulse, cardiac apex displaced to the anterior axillary line, and a diastolic murmur. His chest is clear on auscultation and there is no peripheral oedema.

An electrocardiogram (ECG) shows sinus rhythm with ventricular ectopics and left ventricular hypertrophy.

A chest X-ray (CXR) shows cardiomegaly with clear lung fields.

An echocardiogram (ECHO) confirms the presence of aortic regurgitation with a dilated left ventricle (diastolic diameter > 70 mm) and an ejection fraction of 50%.

A 24 hour ECG shows sinus rhythm with frequent ventricular ectopics that correspond to the patient's experienced palpitations.

Which of the following is the long-term management of choice in this case?

Your answer was incorrect

- A Ramipril
- B Bisoprolol
- C Repeat echo in six months
- D Repeat echo in one year
- E Referral for valve replacement

Explanation



- E Referral for valve replacement

The ESC has produced 2017 guidelines on the management of valvular disease. In regard to chronic aortic regurgitation, they state: 'Surgery should be considered in asymptomatic patients with resting ejection fraction < 50% with severe LV dilatation: LVEDD > 70 mm or LVESD > 50 mm (or LVESD > 25 mm/m² BSA in patients with small body size).' Surgery should be considered in all symptomatic patients, regardless of EF and LV dimensions, and in asymptomatic patients with aortic regurgitation and EF < 50%.

In terms of follow-up, the ESC recommends that all asymptomatic patients with severe aortic regurgitation and normal LV function should be seen for follow-up at least every year. In patients with a first diagnosis, or if LV diameter and/or ejection fraction show significant changes or come close to thresholds for surgery, follow-up should be continued at 3-6-month intervals. In inconclusive cases, BNP may be helpful, as its elevation during follow-up has been related to deterioration in LV function. Patients with mild to moderate aortic regurgitation can be reviewed on a yearly basis and echocardiography performed every two years.

B Bisoprolol

This patient meets the threshold for intervention and should be referred for consideration of valve replacement. Medical therapy can provide symptomatic improvement in individuals with chronic severe aortic regurgitation in whom surgery is not feasible. In patients who undergo surgery but continue to suffer from heart failure or hypertension, angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs) and beta-blockers are useful. In patients with Marfan syndrome, beta-blockers and/or losartan may slow aortic root dilatation and reduce the risk of aortic complications and should be considered before and after surgery. By analogy, while there are no studies that provide evidence, it is common clinical practice to advise beta-blocker or losartan therapy in patients with bicuspid aortic valve if the aortic root and/or ascending aorta is dilated.

A Ramipril

While ramipril represents an important part of the therapy of aortic regurgitation, this patient meets the threshold for intervention and should be referred for consideration of valve replacement.

C Repeat echo in six months

This patient already meets the threshold for intervention and should be referred for consideration of valve replacement.

D Repeat echo in one year

This patient already meets the threshold for intervention and should be referred for consideration of valve replacement.

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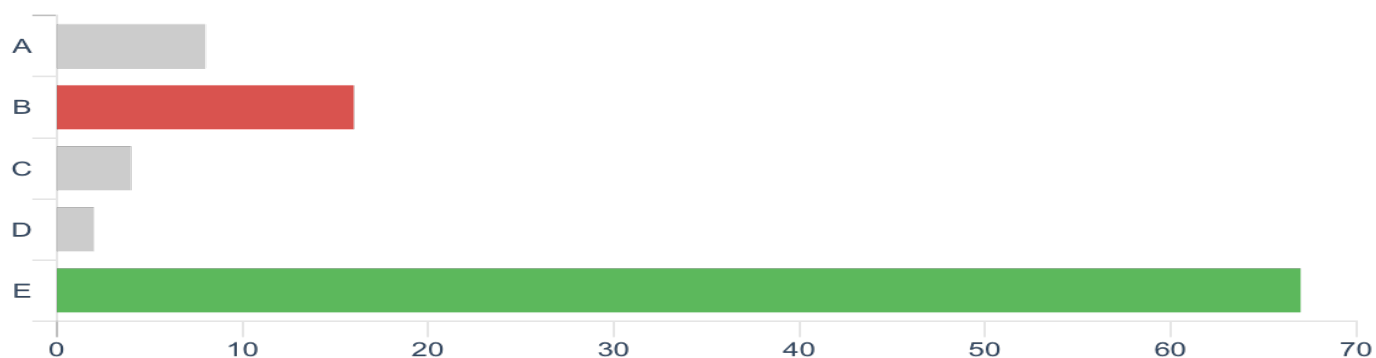
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Responses Correct:	8
Responses Incorrect:	31
Responses Total:	39
Responses - % Correct:	21%

External Links

2017 ESC Guidelines on valvular heart disease

academic.oup.com/eurheartj/article/4095039/2017-ESC-EACTS-Guidelines-for-the-management-of

(<https://academic.oup.com/eurheartj/article/4095039/2017-ESC-EACTS-Guidelines-for-the-management-of>)



Q40

A 30-year-old woman who is 16 weeks pregnant presents to her General Practitioner (GP) complaining of palpitations. A resting electrocardiogram (ECG) reports right bundle branch block (RBBB) with right axis deviation. Clinical examination reveals a heaving precordium with a systolic murmur loudest in the fourth left intercostal space. There is a split second heart sound.

What is the most likely diagnosis?

Your answer was incorrect

- A Mitral valve prolapse
- B Primary pulmonary hypertension
- C Ostium secundum atrial septal defect (ASD)
- D Patent foramen ovale
- E Ostium primum atrial septal defect (ASD)

Explanation



- C Ostium secundum atrial septal defect (ASD)

The clinical and ECG findings are most consistent with this diagnosis. Atrial septal defects (ASDs) make up 30% of congenital heart disease detected in the adult population. The female:male ratio is 2:1, of which 75% are ostium secundum ASDs. These can present during pregnancy with either breathlessness or palpitations. The clinical findings depend on the degree of left-to-right shunt and its effects on the right heart. In addition, ostium primum ASDs are associated with mitral valve abnormalities, and mitral regurgitation may be audible. The combination of right bundle branch block (RBBB) and right axis deviation on the electrocardiogram (ECG) makes an ostium secundum ASD more likely.

- A Mitral valve prolapse

The clinical signs described are not consistent with this diagnosis. Mitral valve prolapse is associated with dynamic mid-to-late systolic click, often followed by a late systolic mitral regurgitant murmur; it is not associated with RBBB.

B Primary pulmonary hypertension

The clinical signs described are not consistent with this diagnosis. Primary pulmonary hypertension is associated with episodes of exertional syncope and atrial fibrillation, and murmurs consistent with pulmonary or tricuspid regurgitation.

D Patent foramen ovale

Approximately 25% of the population have a patent foramen ovale, but it is usually benign and does not cause any symptoms. Case reports suggest that the incidence of migraine is increased in patients with PFO.

E Ostium primum atrial septal defect (ASD)

Ostium primum ASDs are associated with mitral valve abnormalities, and mitral regurgitation may be audible. The most common ECG findings are left axis deviation with RBBB.

6910

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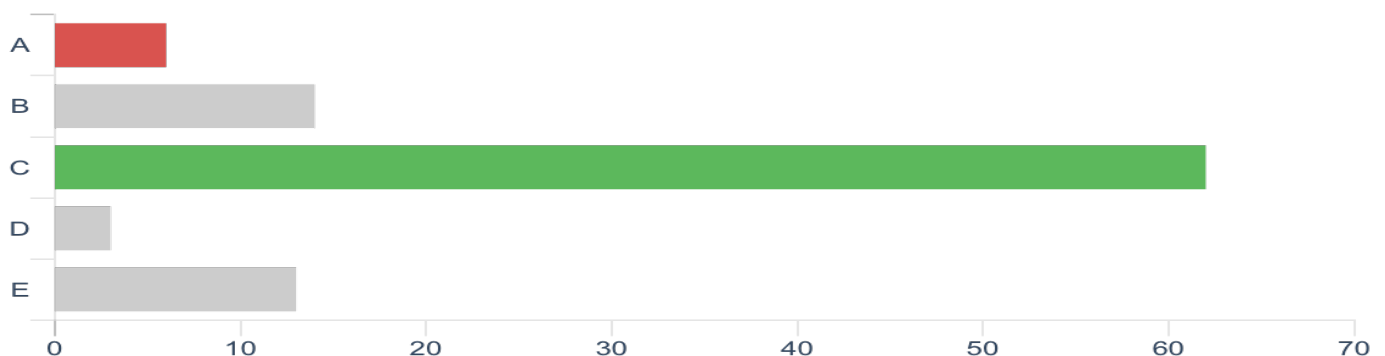
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Responses Total:	40
Responses - % Correct:	20%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q41

A 28-year-old woman is referred to the Cardiology Clinic with exertional breathlessness, which has become progressively worse over the past year. There is no history of wheezing, and she has had no benefit from a trial of salbutamol inhalers. On close questioning she describes intermittent episodes of chest pain on exertion. She has become very concerned as she almost fainted on a couple of occasions in the last month.

On examination, she has a blood pressure of 135/85 mmHg and a pulse of 90 beats per minute (bpm). Her body mass index (BMI) is 22kg/m². Her jugular venous pressure (JVP) is raised, with giant v-waves and there is a left parasternal heave. An electrocardiogram (ECG) shows sinus rhythm with right axis deviation.

Which of the following is the most likely diagnosis?

Your answer was incorrect

- A Chronic pulmonary emboli
- B Idiopathic pulmonary artery hypertension (IPAH)
- C Ischaemic heart disease
- D Loeffler syndrome
- E Hypertrophic cardiomyopathy (HCM)

Explanation



- B Idiopathic pulmonary artery hypertension (IPAH)

PPH is a rare condition characterised by elevated pulmonary artery pressure and without a clear cause. The above case describes a typical presentation for IPAH. IPAH was previously known as (and is often still called) primarily pulmonary hypertension (PPH). Syncope is seen in approximately 13% of patients. The ECG findings point towards right ventricular hypertrophy, which is an end result of this condition. Treatment is typically with calcium channel blockers and anticoagulation; nebulised prostacyclin can also be considered

- C Ischaemic heart disease

Intermittent chest pain on exertion may raise the suspicion of myocardial ischaemia. However, the patient is young and no significant risk factors for coronary artery disease have been described, making this diagnosis unlikely.

A Chronic pulmonary emboli

Chronic emboli can lead to chronic pulmonary hypertension, which may present with similar features to those described above. However, no risk factors for venous thromboembolism are described. Additionally, there is no description of any DVT symptoms that would support this diagnosis

D Loeffler syndrome

Loeffler syndrome is an eponymous term for acute onset pulmonary eosinophilia. Typically this condition occurs secondary to an external trigger (the syndrome was originally described in association with parasitic infection by *Ascaris lumbricoides*). There is no evidence to support an external trigger in this case. Wheeze is often a central feature.

E Hypertrophic cardiomyopathy (HCM)

This lady is presenting with significant breathlessness. Patients with HCM can present this way secondary to heart failure. However, her ECG shows no features to suggest significant left ventricular hypertrophy, which would be expected if HCM was the underlying diagnosis.

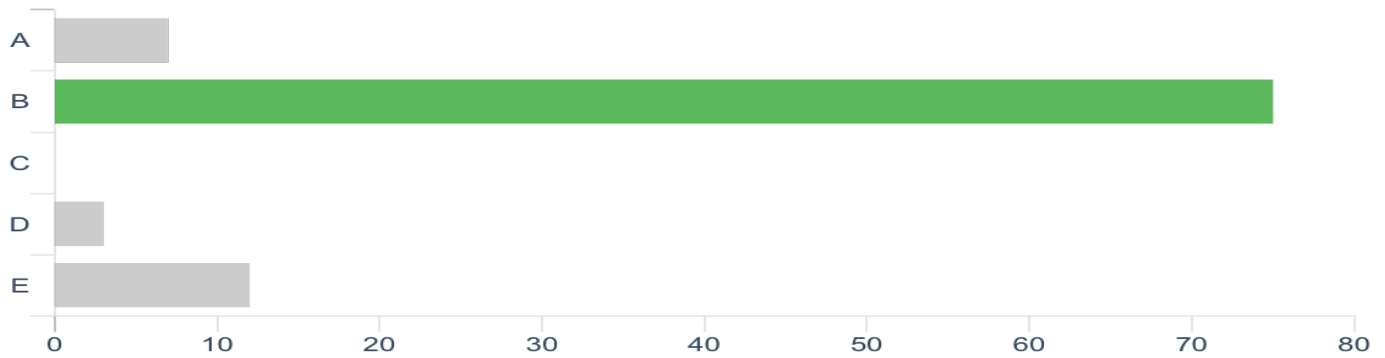
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Responses Incorrect:	33
Responses Total:	41
Responses - % Correct:	20%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q42

A 19-year-old man presents to the Emergency Department of a small District General Hospital in the early hours of the morning, complaining of severe epigastric and retrosternal pain. He describes a history of a pyrexial illness over the preceding few days, which he thought was 'the flu.' He has not been able to sleep, as he finds lying down extremely uncomfortable.

On examination, he is pyrexial - his temperature is 38°C. His blood pressure is 135/85 mmHg, while his pulse is 90 bpm. His saturations are 100% on room air. There is a friction rub heard over the precordium, and the chest is clear on auscultation.

Investigations reveal the following:

Investigation	Result	Normal Value
Haemoglobin (Hb)	131 g/l	135-175 g/l
White Cell Count (WCC)	$11.6 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$253 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na ⁺)	138 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.7 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	79 µmol/l	50-120 µmol/l
Urea	4.0 mmol/l	2.5-6.5 mmol/l
Erythrocyte sedimentation rate (ESR)	60 mm/hour	1-20 mm/hour
Creatine kinase (CK)	250 IU/l	23-175 IU/l

An electrocardiogram (ECG) shows widespread ST elevation.

What would be the most appropriate next step in this patient's care?

Your answer was incorrect

- A Ibuprofen 800 mg
- B Thrombolytic therapy with tissue plasminogen activator
- C Blood cultures and intravenous blind antibiotic treatment pending results
- D Urgent referral to the on-call cardiologist for echocardiogram

E Urgent computerised tomography (CT) pulmonary angiogram

Explanation



A Ibuprofen 800 mg

The clinical features presented here are suggestive of pericarditis, which often occurs with an antecedent viral illness. The pain is reported as positional, and auscultation reveals a pericardial rub (often described as the sound of walking on fresh snow). The presence of ST-elevation on the ECG is also indicative of this diagnosis. Ibuprofen is the first-line therapy for pericarditis and acts to reduce pericardial inflammation.

E Urgent computerised tomography (CT) pulmonary angiogram

The chest pain presented here is not typical for a pulmonary embolism (PE), which should be pleuritic in nature. Furthermore, there are significant features pointing away from the diagnosis of a PE. As such, an acute CT pulmonary angiogram is unnecessary at this time.

B Thrombolytic therapy with tissue plasminogen activator

The widespread ECG changes may initially raise a concern of ischaemic heart disease. However, the young age and the fact that the ST-segment changes are not limited to a specific coronary artery territory point away from this diagnosis.

C Blood cultures and intravenous blind antibiotic treatment pending results

The clinical picture of fever with a raised white cell count should always raise the suspicion of developing sepsis in this patient. However, the remainder of the clinical picture does not support profound sepsis and highlights pericarditis as a likely diagnosis. The majority of pericarditis in the United Kingdom is caused by a viral infection, and, as such, antibiotics will not alter the disease progression.

D Urgent referral to the on-call cardiologist for echocardiogram

This patient does not have significant features of myocarditis (which can develop in conjunction with pericarditis); however, a troponin level would elucidate this further. If myocarditis were suspected, an echocardiogram may be required before a cardiac magnetic resonance imaging (MRI) (the definitive imaging modality of myocarditis). However, this imaging is not required urgently and is unlikely to alter acute management.

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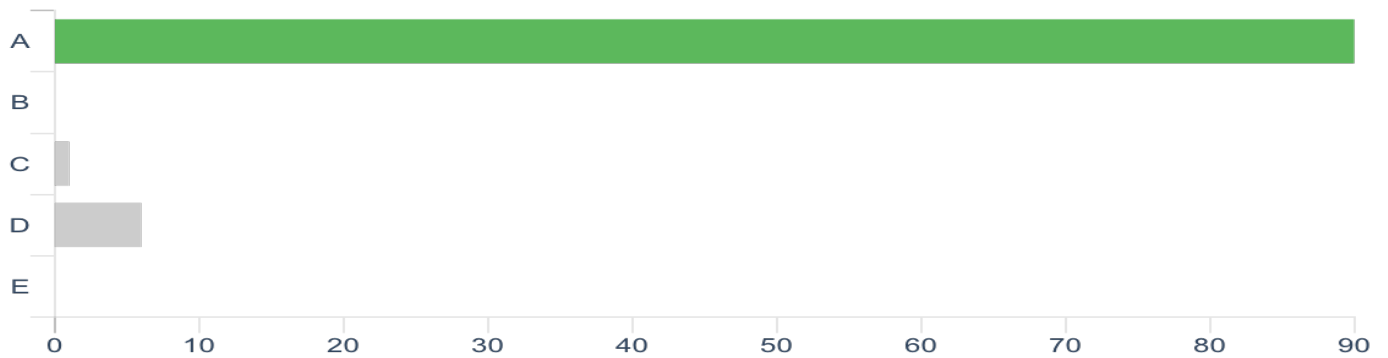
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Responses Total:	42
Responses - % Correct:	19%



Q43

A 73-year-old man presents to the Emergency Department (ED) complaining of central chest and back pain. This started suddenly two hours ago and is getting progressively worse. He has a past medical history of hypertension, for which he is on bendroflumethiazide and perindopril. He denies any history of angina in the past.

On examination, his blood pressure is 90/30 mmHg and his pulse is 120 beats per minute (bpm). There is an early diastolic murmur on auscultation of his heart and reduced air entry in the bases of his lungs bilaterally. He appears not to be moving the left side of his body.

An electrocardiogram (ECG) performed in the resuscitation area shows ST elevation in leads II, III and aVF.

A chest X-ray (CXR) shows an enlarged heart with a small, left-sided pleural effusion.

Which of the following would be the most appropriate next step in the management?

Your answer was incorrect

- A Initiation of thrombolytic therapy with streptokinase
- B Fluid resuscitation and admission to the coronary care unit
- C Urgent computerised tomography of the chest with contrast
- D Bedside echocardiogram and urgent cardiothoracic review
- E Urgent cardiology referral for primary revascularisation

Explanation



- D Bedside echocardiogram and urgent cardiothoracic review

This patient presents with features suggestive of aortic dissection. In particular, the history of chest pain radiating to the back is concerning. The presence of an early diastolic murmur suggests aortic valve regurgitation. The ECG changes are in the inferior territory and indicate occlusion of the right coronary artery. These two features combined suggest that the dissection has tracked back to the heart itself. The enlarged heart on chest X-ray may suggest a haemopericardium, and the patient should be assessed for cardiac tamponade given his low blood pressure. This patient is highly unstable and requires urgent

cardiothoracic involvement if he is to survive. Although a CT would be the gold standard investigation, he is too unstable to be moved. An echocardiogram is likely to visualise some aspect of the dissection in this instance due to the cardiac involvement. Additionally, it will be able to assess cardiac function and assess for the presence of cardiac tamponade.

E Urgent cardiology referral for primary revascularisation

The ST-segment elevation seen on the ECG, combined with chest pain, would be concerning and may suggest an acute right coronary artery occlusion. However, the nature of the chest pain and other clinical features presented should raise the suspicion of aortic dissection. This must be ruled out first before proceeding to coronary angiography.

A Initiation of thrombolytic therapy with streptokinase

The ECG findings here associated with chest pain may suggest a diagnosis of myocardial infarction. However, the nature of the chest pain should raise the concern of aortic dissection, which must be ruled out prior to giving any blood-thinning agents, as these could kill the patient.

B Fluid resuscitation and admission to the coronary care unit

This patient likely does require careful fluid resuscitation as he appears to be developing haemodynamic compromise. However, this does not address the reason for the patient's deterioration. Further investigation is required to confirm the likely cause (in this case a possible type A aortic dissection).

C Urgent computerised tomography of the chest with contrast

This patient likely has a type A aortic dissection. A CT scan of the chest with contrast is the gold standard investigation. However, because this patient has a systolic blood pressure of 90 mmHg and an elevated heart rate, he is probably too unstable to be moved to radiology at this time. The presence of an early diastolic murmur on auscultation suggests the presence of aortic regurgitation secondary to the dissection. If the dissection has involved the aortic valve then it is likely that some aspect of it will be visualised on ECG, which will not require the patient to be moved.

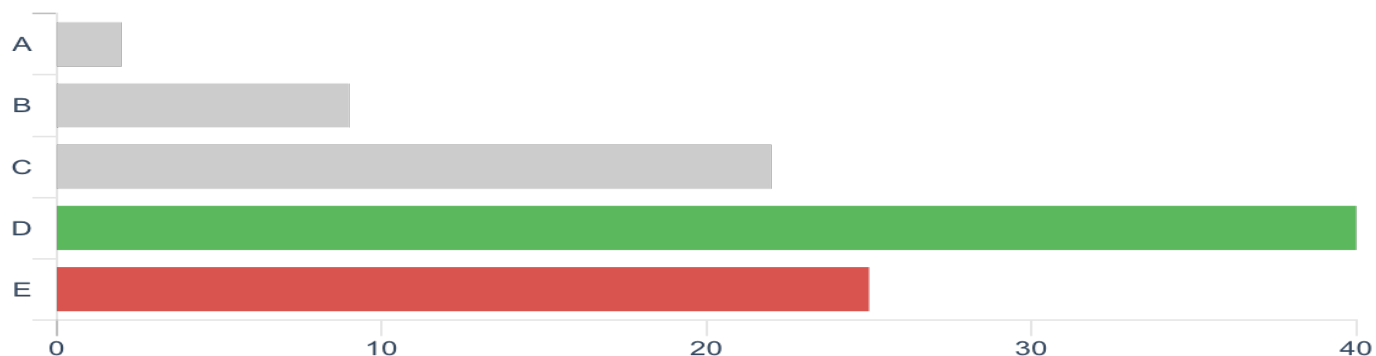
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Responses Incorrect:	35
Responses Total:	43
Responses - % Correct:	19%

Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q44

A 63-year-old man who is a known diabetic presents to the Emergency Department (ED) with sudden onset of severe breathlessness. He says he was feeling completely normal during his evening meal but he suddenly broke out in a cold sweat and felt that he had a major problem in catching his breath. He denies any history of pain or previous episodes of breathlessness. He takes metformin and gliclazide for his diabetes, as well as perindopril for mild hypertension. On arrival in the resuscitation area he is profoundly diaphoretic and looks unwell.

On examination, his blood pressure is 145/95 mmHg and his pulse is 120 beats per minute (bpm). His oxygen saturations are 86% on room air and improve to 95% on inspired oxygen via a reservoir bag. Auscultation of his heart reveals a third heart sound, and there are widespread wheezes and crackles on auscultation of his chest.

A bedside glucose test shows a blood glucose concentration of 13.6 mmol/l. An electrocardiogram (ECG) shows ST elevation of 3 mm in leads V₄-V₆.

What is the most appropriate course of action with respect to his long-term outcome?

Your answer was incorrect

- A Furosemide 80 mg intravenous (IV) and continuous glyceryl trinitrate iv infusion
- B Aspirin 300 mg stat, IV GTN, and referral for urgent PCI
- C Furosemide 80 mg IV and insulin IV sliding scale
- D Salbutamol nebuliser and IV hydrocortisone
- E Non-invasive ventilation (NIV) using a continuous positive airway pressure mask

Explanation



- B Aspirin 300 mg stat, IV GTN, and referral for urgent PCI

The ECG presented here demonstrates an acute anterior ST-elevation myocardial infarction. Diabetic patients often present with atypical features of myocardial ischemia (including a lack of pain). Aspirin should be given immediately. GTN infusion will reduce cardiac afterload by

causing peripheral vasodilation. This should reduce myocardial oxygen requirements and reduce further myocardial injury. However, urgent PCI is required to stent the lesion. This has been shown to have improved outcomes over other treatment options.

C Furosemide 80 mg IV and insulin IV sliding scale

Furosemide may improve the clinical picture of left ventricular failure seen in this patient by reducing circulating volume. Additionally, the patient's blood glucose level is raised and a sliding scale will control this. However, neither tackles the underlying myocardial infarction that has precipitated this patient's admission. Urgent PCI is required to improve prognosis. There is evidence to suggest that a sliding scale can improve outcomes in diabetic patients following PCI, and this will likely be instituted on the coronary care unit.

A Furosemide 80 mg intravenous (IV) and continuous glyceryl trinitrate iv infusion

This patient has clinical features suggestive of left ventricular failure, including the new respiratory auscultatory findings. The use of furosemide to reduce circulating volume may clinically improve the patient. GTN infusion will reduce peripheral resistance and thus cardiac afterload. Together, these two agents may acutely improve the clinical situation. However, neither deals with the underlying ST-elevation myocardial infarction clearly indicated by the ECG. It is probably this event which is causing the left ventricular dysfunction. Treating the coronary artery occlusion is vital to improving the patient's prognosis.

D Salbutamol nebuliser and IV hydrocortisone

The widespread wheeze on respiratory auscultation may be suggestive of an exacerbation of asthma or COPD. However, neither of these diagnoses explains the remaining findings or the ECG changes. The wheeze is probably 'cardiac asthma' secondary to left ventricular failure.

E Non-invasive ventilation (NIV) using a continuous positive airway pressure mask

NIV can be of benefit in patients with significant heart failure, and may be necessary here. However, an underlying cause must be sought for the acute left ventricular dysfunction suggested by the clinical picture. The ECG is supportive of a diagnosis of myocardial infarction. As such, acute angiography ± angioplasty is required to investigate and treat this diagnosis, which will probably improve cardiac function.

6920

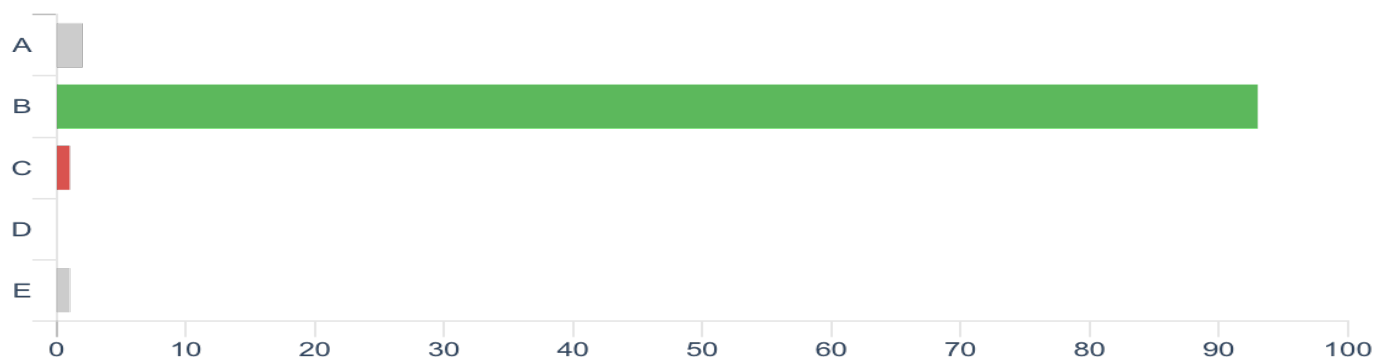
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Responses Incorrect:	36
Responses Total:	44
Responses - % Correct:	18%

Expanded Explanation

[Overview](#)[Clinical Presentation](#)[Differential Diagnosis](#)[Diagnosis / Investigation](#)[Management](#)[Prognosis](#)[Links to NICE guidelines/CKS](#)

Q45

A 26-year-old man, who is a known asthmatic, presents to the Emergency Department (ED) complaining of a fluttering in his chest. This started suddenly following the use of his salbutamol inhaler. He says that he usually feels his heart racing after using salbutamol but that this usually settles after a couple of minutes. On this occasion, the palpitations have lasted for 20 minutes and he is starting to feel uncomfortable.

On examination, his pulse is 190 beats per minute (bpm) and his blood pressure is 125/75 mmHg. Auscultation of his heart reveals no murmurs and his chest is clear.

An electrocardiogram (ECG) shows a narrow complex, regular tachycardia without any obvious P waves. Vagal manoeuvres are unsuccessful.

A venous blood sample is taken and run through the blood gas machine. It reveals the following:

Investigation	Result	Normal Value
pH	7.39	7.35-7.45
Sodium (Na ⁺)	137 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.2 mmol/l	3.5-5.0 mmol/l

Which of the following would be the management of choice?

Your answer was incorrect

- A IV verapamil
- B IV digoxin
- C IV adenosine
- D DC cardioversion
- E IV sotalol

Explanation



- A IV verapamil

This patient has a supraventricular tachycardia. Adenosine is contraindicated in asthmatic patients as is beta-blockade. Resuscitation council (RSC) guidelines recommend the following management for patients with narrow-complex regular tachycardia: trial vagal manoeuvres first, followed adenosine 6 mg, followed by a further 12 mg bolus if this is unsuccessful, and a final 12 mg bolus if required. In patients in whom adenosine is contraindicated, such as this patient, or in whom adenosine fails to terminate the rhythm without demonstrating atrial flutter, verapamil 2.5–5 mg IV should be used. This should be done in a closely monitored environment. A rhythm strip should be recorded continuously during the administration of any drug when dealing with SVTs to capture the termination of the arrhythmia. A post-termination ECG should be examined closely for evidence of pre-excitation.

D DC cardioversion

This would be an appropriate choice in the presence of adverse features: shock, ischaemia, heart failure or syncope. There are no such features given in this history and, as such, vagal manoeuvres and drug therapy should be attempted first line.

B IV digoxin

This can be considered for rate control of arrhythmias such as atrial fibrillation, but in the context of narrow-complex regular tachycardia, adenosine or verapamil is the recommended agent.

C IV adenosine

While an appropriate choice for the termination of a regular narrow-complex tachycardia, it is contra-indicated in this case due to this patient's history of asthma.

E IV sotalol

Adenosine or verapamil is the recommended agent for control of narrow-complex regular tachycardia. In addition, beta-blockade is contra-indicated in this case due to the patient's history of asthma.

6921

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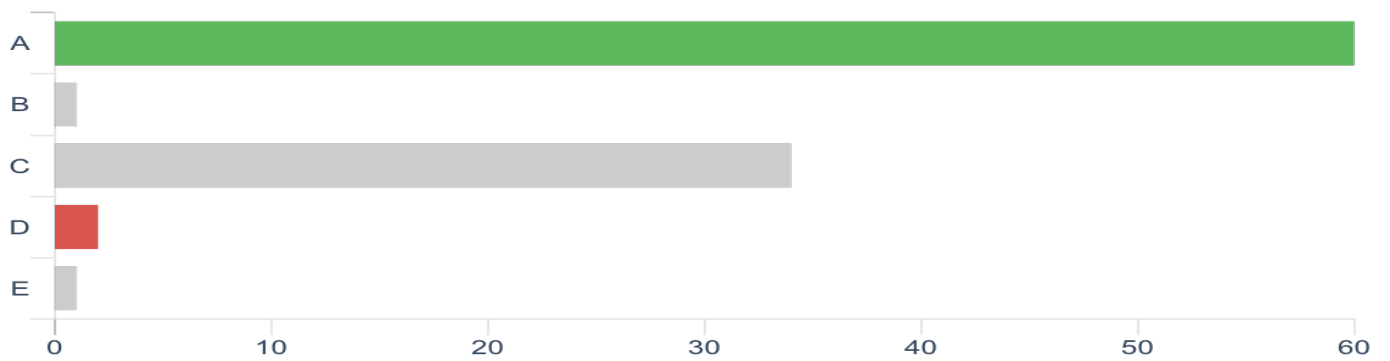
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Responses Incorrect:	37
Responses Total:	45
Responses - % Correct:	18%



Q46

A 54-year-old man presents to the Emergency Department (ED) complaining of a severe headache that has lasted for the past 12 hours. He gives a history of frequent headaches over the last year. There is no history of fevers, neck stiffness or nausea, but he does complain of some vague visual disturbances. There is no history of sick contacts. He has no past medical history of note. He is a smoker of 15 cigarettes a day and he drinks about 30 units of alcohol a week.

On examination, he is found to be hypertensive, with a blood pressure (BP) of 195/105 mmHg and a heart rate of 96 beats per minute (bpm). Auscultation of his heart reveals normal heart sounds and his chest is clear. Abdominal palpation reveals no palpable masses or organomegaly. A bruit is heard over the left renal artery. There are flame-shaped haemorrhages and cotton-wool spots seen on fundoscopy.

An electrocardiogram (ECG) shows sinus rhythm with left ventricular hypertrophy. A urine dipstick is positive for blood and protein.

Which of the following would be the most appropriate management?

Your answer was incorrect

- A Admission to hospital for blood pressure intervention and monitoring
- B Oral ramipril 5 mg, followed by 2 h of observation then discharge
- C Sublingual nifedipine 10 mg and discharge when the blood pressure settles
- D Simple analgesia for the headache, oral nifedipine 10 mg and discharge home with general practitioner (GP) review
- E CT head to rule out a subarachnoid haemorrhage and, if excluded, simple analgesia for the headache

Explanation



- A Admission to hospital for blood pressure intervention and monitoring

This patient has significant hypertension and features of resulting acute end organ damage. In particular the findings on fundoscopy and the urine dipstick are particularly concerning. These features require the patient to undergo acute management and he should be stabilised

prior to discharge. Acute lowering of the blood pressure should be balanced against the risk of stroke if the blood pressure is lowered too quickly. Mean arterial BP should be reduced by no more than 25% during the first few hours of intervention. A number of agents can be considered, and intravenous (iv) labetalol or sodium nitroprusside are potential options.

- C Sublingual nifedipine 10 mg and discharge when the blood pressure settles

Sublingual nifedipine can rapidly lower blood pressure. There is concern over its use in this setting, however, as a significant acute drop in blood pressure may precipitate cerebral ischaemia. As such, short-acting nifedipine should be avoided in the acute setting.

- B Oral ramipril 5 mg, followed by 2 h of observation then discharge

This strategy may be appropriate if the patient was asymptomatic and had no features of end organ damage. However, in this case, the patient must be stabilised prior to discharge. Ramipril would be the first line medication if this was chronic hypertension. However, in the acute setting it is insufficient and unlikely to have a sufficiently rapid effect. Additionally, the presence of a renal bruit may suggest underlying renal artery stenosis, which would be a contraindication for ACE inhibition.

- D Simple analgesia for the headache, oral nifedipine 10 mg and discharge home with general practitioner (GP) review

Amlodipine would be recommended as a first-line agent for chronic hypertension if this patient was > 55 years old or of Afro-Caribbean descent. However, it is not sufficient in this setting where there is significant hypertension with features of end organ damage. GP review is also insufficient as this patient requires close monitoring to ensure end organ effects are not continuing.

- E CT head to rule out a subarachnoid haemorrhage and, if excluded, simple analgesia for the headache

A presentation with an acute, severe headache should prompt consideration of a subarachnoid haemorrhage. However, the presence of significant hypertension with eye signs makes this the more likely cause of the headache. Additionally, a CT scan is insufficient to rule out a subarachnoid haemorrhage.

6923

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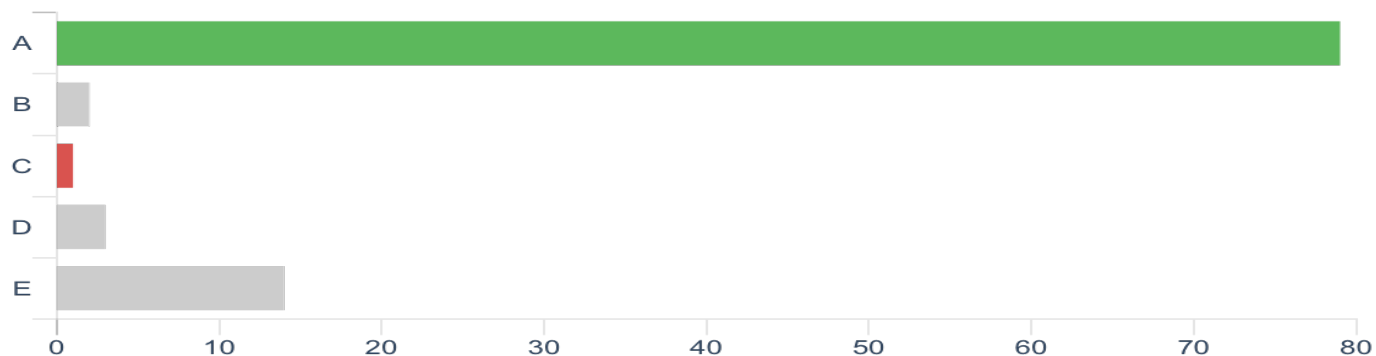
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Responses Incorrect:	38
Responses Total:	46
Responses - % Correct:	17%

External Links

BMJ - Best Practice

bestpractice.bmj.com/best-practice/monograph/27/treatment/step-by-step.html

(<http://bestpractice.bmj.com/best-practice/monograph/27/treatment/step-by-step.html>)

Expanded Explanation

Overview

Clinical Presentation

Diagnosis / Investigation

Management

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Q47

A 68-year-old man, a known hypertensive, presents to the Emergency Department (ED) with a two-day history of severe breathlessness. He says that this has started suddenly and is getting progressively worse. He describes a slight cough with no sputum production. He denies any fevers or chest pains. There is no known history of heart failure or ischaemic heart disease.

On examination, he appears grossly overweight, with a blood pressure of 130/85 mmHg and a pulse of 100 beats per minute (bpm). His respiratory rate is 30 breaths per minute and his saturations on air are 90%. His jugular venous pressure (JVP) is raised, at 4 cm. There are no added sounds on auscultation of his heart and his chest is clear. A bedside qualitative troponin assay is positive.

An electrocardiogram (ECG) shows sinus tachycardia with right bundle branch block. A chest X-ray (CXR) shows enlarged cardiac shadow but clear lung fields.

Which is the most likely diagnosis in this case?

Your answer was incorrect

- A Atypical pneumonia
- B Myocardial infarction
- C Pulmonary embolism
- D Primary pulmonary hypertension
- E Left ventricular failure

Explanation



- C Pulmonary embolism

This clinical vignette is suggestive of a PE. Sinus tachycardia is the most common arrhythmia seen in patients with a PE. The presence of RBBB may be chronic; however, acute RBBB may suggest increased right ventricular pressures secondary to a large PE. Additionally the raised JVP suggests right ventricular strain.

- E Left ventricular failure

Clinical examination revealed no features supportive of this on assessment of either the cardiovascular or respiratory system. For left ventricular dysfunction to have resulted in significant breathlessness and hypoxia, respiratory auscultatory features would be expected.

A Atypical pneumonia

The presence of breathless and tachycardia may raise suspicion of this diagnosis. However, the lack of sputum production points away from this diagnosis. Additionally, there are no signs on respiratory auscultation to support this diagnosis.

B Myocardial infarction

A raised troponin highlights the presence of myocardial damage but is not specific for a myocardial infarction. Although overweight, no other risk factors for ischaemic heart disease are presented here. Furthermore, the ECG does not support the diagnosis and he does not report chest pain. If a PE was ruled out following appropriate investigations, then this diagnosis could be reconsidered.

D Primary pulmonary hypertension

Typically this condition presents with progressive breathlessness associated with features of right heart failure. Although there are features of acute right ventricular strain, the speed of onset is not supportive of this diagnosis.

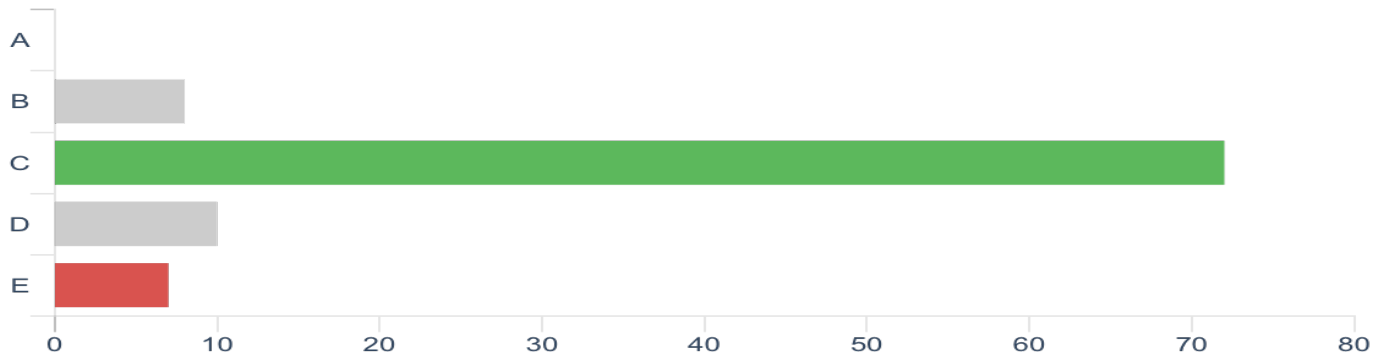
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Responses Correct:	8
Responses Incorrect:	39
Responses Total:	47
Responses - % Correct:	17%

Expanded Explanation

Overview

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Differential Diagnosis

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Links to NICE guidelines/CKS



Q48

A 35-year-old man, who has recently returned from a holiday abroad, presents to the Emergency Department (ED) with a history of general malaise, weight loss, and arthralgia. He also describes episodes of waking up at night feeling really hot. On close questioning, he mentions visiting a tattooing parlour and having an erythematous skin rash around the tattoo site.

On examination, he is found to be pyrexial, with a temperature of 38.1°C. His is tachycardic, with a pulse of 120 beats per minute (bpm). On inspection, there are petechial haemorrhages in his conjunctival and buccal membranes. Auscultation of his heart reveals no murmurs and his chest is clear.

An electrocardiogram (ECG) shows sinus tachycardia with a PR interval of 220 ms.

A urinary dipstick is positive for blood.

Investigations:

Investigation	Result	Normal Value
Haemoglobin (Hb)	141 g/l	135–175 g/l
White cell count (WCC)	$15.6 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$153 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na ⁺)	136 mmol/l	135–145 mmol/l
Potassium (K ⁺)	4.8 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	83 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Urea	5.0 mmol/l	2.5–6.5 mmol/l
C-reactive protein (CRP)	13.5 mg/l	< 10 mg/l

Which of the following is the most likely diagnosis?

Your answer was incorrect

- A Pyelonephritis
- B Infective endocarditis
- C Viral haemorrhagic fever

- D Malaria
- E Rheumatic fever

Explanation



- B Infective endocarditis

Infective endocarditis should be considered as a diagnosis in patients with chronic fever, weight loss and malaise even in the absence of murmurs. Conjunctival petechial haemorrhages are far more common than the classical skin signs of splinter haemorrhages, Osler's nodes and Janeway lesions. The presence of a first-degree atrioventricular block (PR interval 220 ms) suggests the involvement of conducting tissue while dipstick haematuria, indicating renal embolic phenomena, should also point towards subacute bacterial endocarditis. The history of skin infection suggests a *Staphylococcus* species as the probable culprit organism.

- C Viral haemorrhagic fever

Viral haemorrhagic fevers are a group of illnesses caused by RNA families of viruses, including Ebola and Marburg, Lassa fever and yellow fever. Fever and bleeding are common presenting symptoms. It is important to obtain an accurate travel history as some of the viruses are more prevalent in certain countries. Blood tests frequently demonstrate lymphopenia, thrombocytopenia, deranged LFTs and clotting.

- A Pyelonephritis

In pyelonephritis the urine dipstick usually tests positive for leucocytes/nitrites. Dysuria, abdominal and flank pain are common symptoms.

- D Malaria

A mosquito-borne infectious disease, it can present with flu-like symptoms and acute febrile illness associated with *paroxysms* (shivering followed by fever and sweating occurring every 2-4 days). Splenomegaly is common. Thin and thick blood films are used in the diagnostic work-up.

- E Rheumatic fever

This typically occurs 2-4 weeks following a streptococcal throat infection. It is characterised by fever, painful joints, Sydenham's chorea and erythema marginatum. Rheumatic heart disease, resulting in fibrosis and scarring of heart valves, may be a long-term complication of rheumatic fever.

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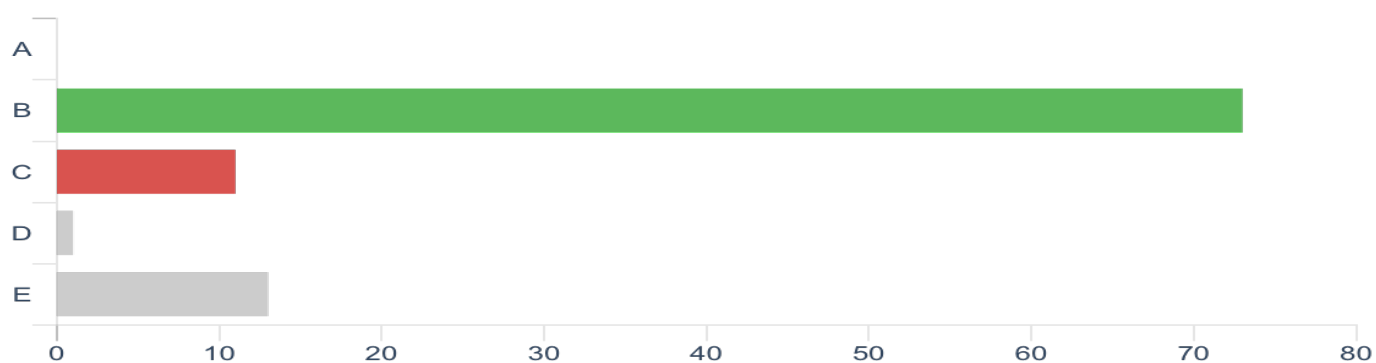
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Responses Correct:	8
Responses Incorrect:	40
Responses Total:	48
Responses - % Correct:	17%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q49

A 25-year-old woman is referred to the Cardiology Department with a history of palpitations. She describes these as of sudden onset and termination associated with a feeling of light-headedness. They have occurred on a couple of occasions while she was running on the treadmill in the gym and she felt she had to stop. She smokes 10 cigarettes a day and denies any heavy alcohol use. There is no past medical history and she is on no regular medication.

On examination, she has a systolic murmur at the left lower sternal edge and a prominent apical impulse. An electrocardiogram (ECG) shows deep T wave inversions in leads V_3 - V_5 .

Which test is the first line investigation to reveal the underlying diagnosis?

Your answer was incorrect

- A Echocardiogram
- B 24-h ECG
- C Exercise ECG
- D MIBI scan
- E Thyroid function tests

Explanation



- A Echocardiogram

The history of palpitations precipitated by exercise and associated with pre-syncope is very sinister. The presence of a systolic murmur and T-wave inversions in the anterior leads makes hypertrophic obstructive cardiomyopathy (HOCM) the most likely diagnosis in this age group. The echocardiogram is key to the diagnosis and monitoring of HOCM. Given the clinical presentation, and echocardiogram should be performed urgently to look for evidence of septal hypertrophy and left ventricular outflow obstruction.

- C Exercise ECG

Although an exercise treadmill test may be performed, it is not a first-line test. An abnormal blood pressure response to exercise is an important, though non-specific, risk factor for sudden death.

B 24-h ECG

Although this may be performed as part of the diagnostic work-up to risk stratify the patient and look for non-sustained VT (NSVT), the echocardiogram represents a first-line diagnostic test in patients with suspected HOCM.

D MIBI scan

MIBI scanning is more commonly performed to look for significant ischaemia in patients with suspected coronary artery disease.

E Thyroid function tests

This patient presents with exercise-induced palpitations and has an abnormal resting ECG. Deep T-wave inversion in leads V_3 - V_5 is not observed with thyroid dysfunction.

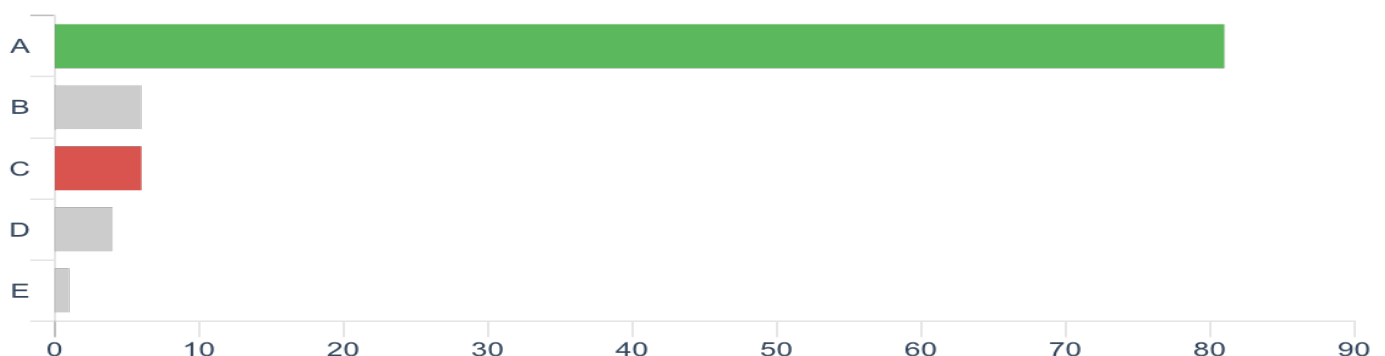
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Responses Incorrect:	41
Responses Total:	49
Responses - % Correct:	16%



Q50

A 39-year-old woman is referred to the Cardiology Department by her General Practitioner (GP) because of the finding of a diastolic murmur on auscultation. She denies any history of rheumatic fever as a child. She has lost about 8 kg in weight over the last six months, and she has had a couple of episodes when she fainted suddenly.

On examination, she has finger clubbing, but no splinter haemorrhages or any petechial haemorrhages. There is a diastolic murmur on auscultation of the heart, which varies greatly with her sitting forward and is associated with a friction rub. Her chest is clear on auscultation.

Investigations ordered by the GP revealed the following:

Investigation	Result	Normal Value
Haemoglobin (Hb)	101 g/l	115–155 g/l
White cell count (WCC)	$12.6 \times 10^9/\text{l}$	$4.0\text{--}11.0 \times 10^9/\text{l}$
Platelets (PLT)	$353 \times 10^9/\text{l}$	$150\text{--}400 \times 10^9/\text{l}$
Sodium (Na^+)	136 mmol/l	135–145 mmol/l
Potassium (K^+)	4.8 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	99 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Mean corpuscular volume (MCV)	85 fl	80–100 fl
Erythrocyte sedimentation rate (ESR)	47 mm/hour	1–20 mm/hour
Urea	5.0 mmol/l	2.5–6.5 mmol/l
Chest X-Ray (CXR)	Intracardiac calcification	

Which one of the following diagnoses could account for all these findings?

Your answer was incorrect

- A Tuberculosis (TB)
- B Subacute infective endocarditis
- C Rheumatic mitral valve disease

- D Systemic lupus erythematosus (SLE)
- E Atrial myxoma

Explanation



- E Atrial myxoma

Although rare (2 per 100,000 with a female: male ratio of 2:1), the diagnosis of atrial myxoma should be considered in a person who presents with finger clubbing, normocytic anaemia, a positional murmur and intracardiac calcification on the CXR. The history of fainting spells suggests transient left ventricular (mitral valve) inflow obstruction. The patient should undergo urgent echocardiography and be referred for surgery if the diagnosis of myxoma is confirmed, as complete removal is curative.

- B Subacute infective endocarditis

Although subacute bacterial endocarditis can cause native aortic valve endocarditis, which may be associated with aortic incompetence, the murmur associated with this lesion (early or holo-diastolic) does not vary significantly and is not associated with a friction rub or intracardiac calcification.

- A Tuberculosis (TB)

TB pericarditis may be associated with pericardial, rather than intracardiac, calcification. A diastolic murmur is not associated with uncomplicated TB pericarditis.

- C Rheumatic mitral valve disease

Mitral valve stenosis is associated with a mid-diastolic murmur, though in the absence of endocarditis would not be associated with a raised ESR or clubbing.

- D Systemic lupus erythematosus (SLE)

SLE may be associated with a raised ESR, but the cardiac and extracardiac features described above are not associated with SLE.

6928

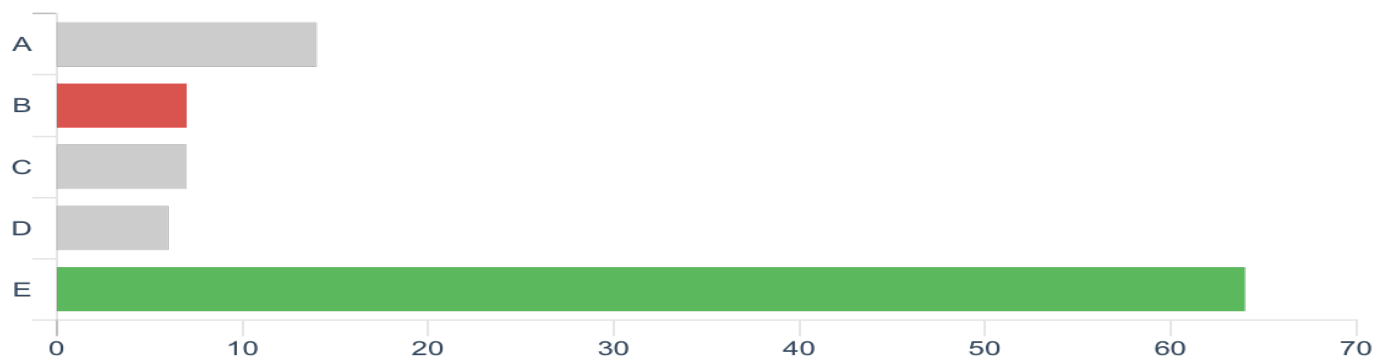
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Responses Correct:	8
Responses Incorrect:	42
Responses Total:	50
Responses - % Correct:	16%

Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Q51

A 67-year-old man presents to the Emergency Department (ED) with exertional breathlessness and intermittent palpitations.

On examination, his pulse is found to be irregular, at a rate of 120 beats per minute (bpm). The apex is displaced to the anterior axillary line. Auscultation of his heart reveals a systolic click associated with a late systolic murmur. There are mild bibasal crackles on auscultation of his chest.

An electrocardiogram (ECG) confirms atrial fibrillation (AF) with left ventricular hypertrophy.

An echocardiogram (ECHO) confirms the presence of mitral valve prolapse with severe regurgitation and left ventricular impairment with an ejection fraction of 50%.

Which of the following is the management of choice for reducing his chances of long-term complications?

Your answer was incorrect

- A Digoxin plus aspirin
- B Digoxin plus formal anticoagulation with warfarin
- C Anticoagulation with warfarin plus bisoprolol for rate control
- D Amiodarone for rate control plus annual echocardiographic follow-up
- E Trans-oesophageal echocardiogram (TOE) with a view to surgical repair/replacement of the mitral valve followed by long-term oral anticoagulation

Explanation



- E Trans-oesophageal echocardiogram (TOE) with a view to surgical repair/replacement of the mitral valve followed by long-term oral anticoagulation

This patient has evidence of cardiac decompensation (breathlessness with bi-basal crackles and a displaced apex beat) in the setting of MVP with associated severe mitral regurgitation. Patients under age 75 with mitral valve prolapse (MVP) and who are in atrial fibrillation, or those who have echocardiographic evidence of left ventricular impairment, should be referred for surgical assessment as early as possible. A TOE can demonstrate whether the valve is amenable to repair or needs replacement. This is often performed intra-operatively.

Progressive mitral regurgitation is the most serious complication, occurring in about 15% of patients over a 15-year period. Acute hemiplegia, transient ischaemic attacks, cerebellar infarcts, amaurosis fugax and retinal arterioral occlusions all occur more frequently in MVP patients, suggesting that cerebral emboli are actually quite common in this condition.

C Anticoagulation with warfarin plus bisoprolol for rate control

Although the patient should be anticoagulated and commenced on a beta-blocker, such as bisoprolol, medical management does not represent definitive treatment in patients with symptomatic severe MR. Surgical work-up and referral should be undertaken.

A Digoxin plus aspirin

Patients with atrial fibrillation and a CHADS2VASC score of 1 (not due to one female sex) should be considered for formal anticoagulation with warfarin or a novel oral anticoagulant.

B Digoxin plus formal anticoagulation with warfarin

If patients are anything other than sedentary then digoxin, as a lone antiarrhythmic, is not particularly effective at controlling a fast-ventricular response in patients with atrial fibrillation.

D Amiodarone for rate control plus annual echocardiographic follow-up

The patient is symptomatic due to the severe mitral regurgitation and therefore requires initiation of medical treatment in addition to surgical referral.

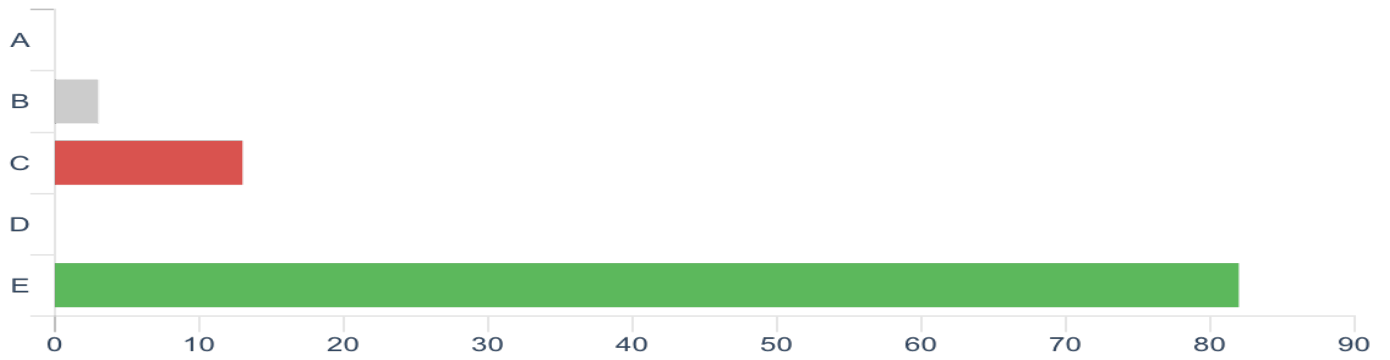
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Responses Correct:	8
Responses Incorrect:	43
Responses Total:	51
Responses - % Correct:	16%



Q52

A 19-year-old girl presents to the Emergency Department (ED) complaining of palpitations that have started suddenly and have lasted for 20 minutes. She is now starting to complain of some chest discomfort and dizziness.

On examination, her pulse is 180 beats per minute (bpm), while her blood pressure of 95/60 mmHg. An initial electrocardiogram (ECG) confirms the diagnosis of supra-ventricular tachycardia (SVT). This is terminated using 6 mg of adenosine intravenously (IV). A subsequent ECG shows sinus rhythm with a PR interval of 0.08 s and delta waves.

Which of the following is the treatment of choice?

Your answer was incorrect

- A Amiodarone
- B Referral for RadioFrequency ablation
- C Flecainide
- D Bisoprolol
- E Mexiletine

Explanation



- B Referral for RadioFrequency ablation

The presence of an accessory connection between the atria and the ventricles by-passing the atrioventricular node leads to the typical ECG appearance of a short PR interval and a delta-wave on the QRS (pre-excitation ECG). The ECG after the termination of the SVT is characteristic of Wolff-Parkinson-White syndrome (WPW). The prevalence of WPW is around 1/1000, with a male:female ratio of 2:1. The patient is symptomatic when in the SVT (chest discomfort and dizziness in association with palpitations) and should therefore be referred to an electrocardiologist for consideration of an electrophysiological study (EPS) and radiofrequency ablation.

- C Flecainide

Although flecainide, a class 1C agent that increases the refractoriness of the accessory pathway and exhibits a useful property known as 'use-dependence', can be used in the treatment of SVT and uncomplicated WPW with structurally normal hearts, the patient is now back in sinus rhythm and definitive treatment consists of modification of the substrate through radiofrequency of ablation.

A Amiodarone

Amiodarone is more commonly used in patients with ventricular arrhythmias and atrial fibrillation.

D Bisoprolol

Bisoprolol prolongs conduction time and increases the refractoriness of the AV node. Although beta-blockers are sometimes used in the treatment of AVNT and AVNRT, they are not considered first-line treatment for WPW and hypotension may preclude their use.

E Mexiletine

Mexiletine, a Class 1B antiarrhythmic which acts as a sodium channel blocker, is used in the treatment of ventricular arrhythmias such as ventricular tachycardia. It is not used in the treatment of WPW.

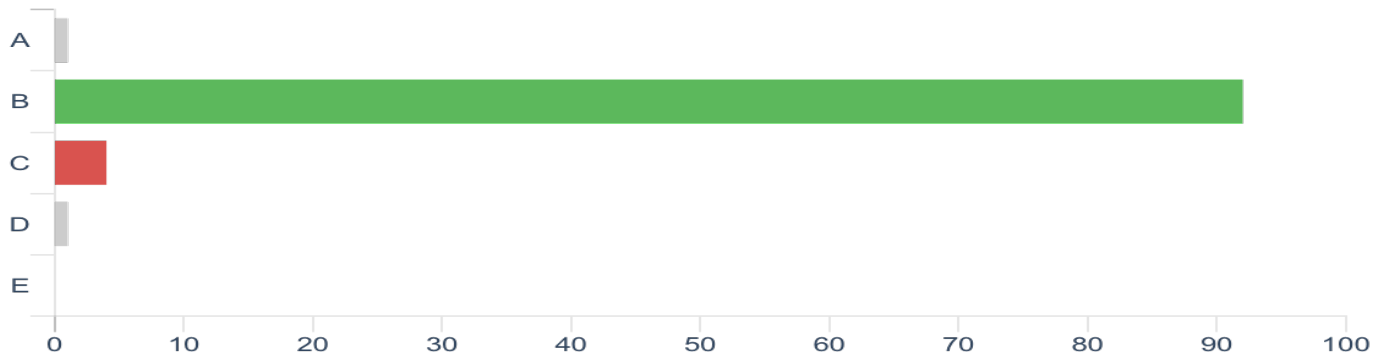
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Responses Incorrect:	44
Responses Total:	52
Responses - % Correct:	15%



Q53

A 45-year-old lorry driver presents to the Emergency Department (ED) with central crushing chest pain. An initial electrocardiogram (ECG) shows ST elevations in leads V_2 - V_5 . The patient undergoes primary percutaneous coronary intervention with one stent to his left anterior descending coronary artery. Following an uneventful five day period he is discharged home on aspirin 75 mg, ticagrelor 90 mg bd, bisoprolol 5 mg, ramipril 2.5 mg and atorvastatin 80 mg. He would like to know when he can go back to work. There is no residual chest pain.

Which of the following statements is correct?

Your answer was incorrect

- A He has to stop driving, inform the Driver and Vehicle Licensing Agency (DVLA) and return for an exercise tolerance test in 6 weeks on the current regime
- B He has to stop driving, inform the DVLA and return for an exercise tolerance test in 6 weeks after he has stopped his bisoprolol for 48 h
- C He has to stop driving, inform the DVLA and return for an exercise tolerance test in 6 weeks after he has stopped all his medications for 48 h
- D He has to stop driving, inform the DVLA and return for a modified exercise tolerance test in 6 weeks after he has stopped all his medications for 48 h
- E He can return to driving in one month provided an echocardiogram shows preserved left ventricular function

Explanation



- B He has to stop driving, inform the DVLA and return for an exercise tolerance test in 6 weeks after he has stopped his bisoprolol for 48 h

For vocational (Group 2) drivers, the DVLA guidelines state that the patient has to complete stage 3 of a Bruce protocol exercise tolerance test. There should be no residual chest pain or significant ECG changes. The only anti-anginal medication this patient is on is bisoprolol, and his symptoms are stable; if it is stopped before the test, this increases the chances of achieving the target heart rate Bruce stage 3. Before speaking to the patient, the DVLA guidelines on the subject can be found on the DVLA website if in doubt (see below).

- C He has to stop driving, inform the DVLA and return for an exercise tolerance test in 6 weeks after he has stopped all his medications for 48 h

Early cessation of anti-platelets is associated with a high risk of stent thrombosis.

- A He has to stop driving, inform the Driver and Vehicle Licensing Agency (DVLA) and return for an exercise tolerance test in 6 weeks on the current regime

The beta-blocker is stopped to ensure a satisfactory response of heart rate to exercise.

- D He has to stop driving, inform the DVLA and return for a modified exercise tolerance test in 6 weeks after he has stopped all his medications for 48 h

A standard Bruce test must be completed.

- E He can return to driving in one month provided an echocardiogram shows preserved left ventricular function

All vocational (Group 2) drivers must not drive and must notify the DVLA after an acute coronary syndrome. Drivers can be re-licensed after at least six weeks if the requirements of the exercise or functional test can be met and there are no other disqualifying conditions.

6933

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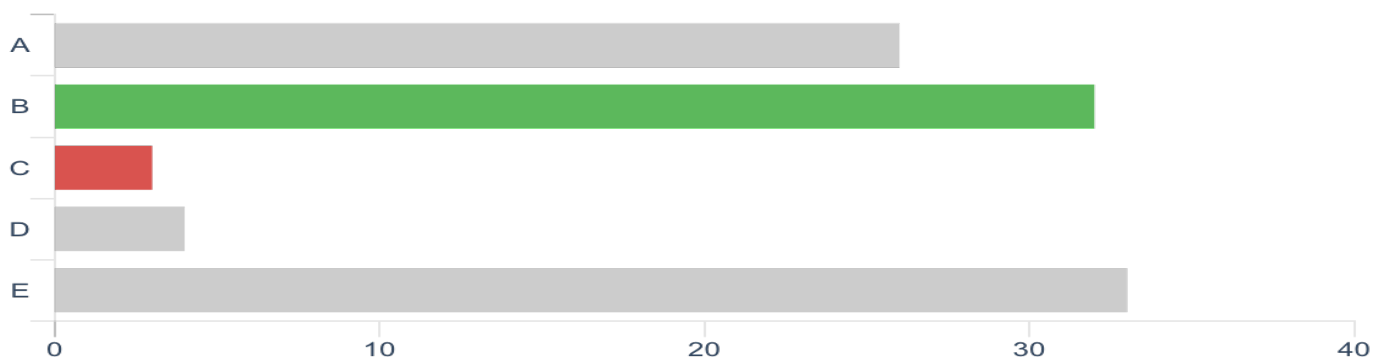
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Responses Correct:	8
Responses Incorrect:	45
Responses Total:	53
Responses - % Correct:	15%

External Links

Check if a health condition affects your driving

[gov.uk/health-conditions-and-driving](https://www.gov.uk/health-conditions-and-driving)

(<https://www.gov.uk/health-conditions-and-driving>)

Expanded Explanation

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Links to NICE guidelines/CKS



Q54

A 76-year-old woman with known rheumatoid arthritis (RA) presents to the Emergency Department (ED) with a three month history of breathlessness. There is no past medical history of ischaemic heart disease (IHD) or hypertension, and she denies any history of chest pains. She took celecoxib for her arthritis up until a year ago, when she was switched to ibuprofen. She has also been on methotrexate for the last 15 years.

On examination, she is found to have a blood pressure of 100/70 mmHg, with a pulse of 125 beats per minute (bpm) and irregular. Her jugular venous pressure (JVP) is raised at 5 cm H₂O, and there is bipedal oedema to the mid calf. Her heart sounds are normal, and her chest is clear on auscultation.

An electrocardiogram (ECG) shows atrial fibrillation (AF), with normal complexes. A chest X-ray (CXR) reveals a small left-sided pleural effusion, but a normal-sized heart.

An echocardiogram (ECHO) shows left ventricular hypertrophy, with a speckled myocardium. There is bi-atrial enlargement, with no significant valvular pathology.

Which of the following medications is used with particular caution in this case?

Your answer was incorrect

- A Digoxin
- B Bisoprolol
- C Atenolol
- D Metoprolol
- E Carvedilol

Explanation



- A Digoxin

This patient has features consistent with restrictive cardiomyopathy. The history of rheumatoid arthritis and the echocardiographic finding of bi-atrial dilatation, ventricular hypertrophy and a speckled appearance to the myocardium make amyloidosis the most likely underlying cause. Digoxin is used with caution in amyloid patients, as digoxin binds irreversibly to amyloid fibrils.

D Metoprolol

This is a short-acting beta-blocker that can be used for rate control in atrial fibrillation.

B Bisoprolol

This beta-blocker is a good first-line choice for achieving ventricular rate control in atrial fibrillation.

C Atenolol

This beta-blocker is not contraindicated in amyloidosis and is an option for rate control in patients with good left ventricular function.

E Carvedilol

Again, this beta-blocker can be used to control the ventricular rate in atrial fibrillation but is more frequently used in heart failure.

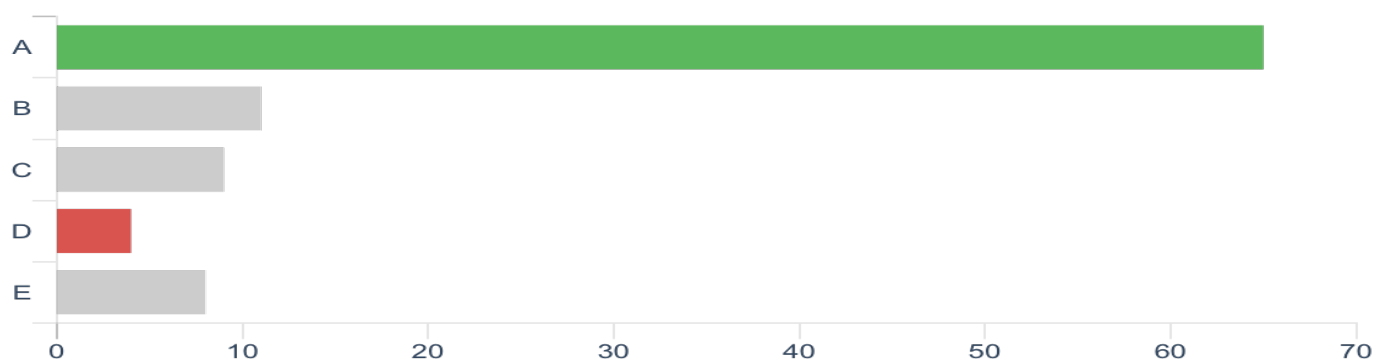
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Q55

A 65-year-old man, who is a known chronic obstructive pulmonary disease (COPD) patient, has been treated for recurrent chest infections over the last month with courses of co-amoxiclav and clarithromycin by his general practitioner (GP).

On a review consultation the GP notices a quiet pan systolic murmur on auscultation and refers the patient for echocardiographic (ECHO) assessment. This shows a normal left ventricle with good function and trivial mitral regurgitation. The right ventricle is reported as at the upper limits of normal, with evidence of increased pressures and pulmonary regurgitation.

A week later the patient is due to undergo root canal treatment by his dentist.

Which of the following measures would you advise?

Your answer was incorrect

- A No need for antibiotic prophylaxis
- B Amoxicillin 3 g orally prior to the procedure
- C Amoxicillin 1 g IV and gentamicin 120 mg IV prior to the procedure
- D Clindamycin 600 mg orally prior to the procedure
- E Amoxicillin 3 g orally prior to the procedure and 4 h following the procedure

Explanation



- A No need for antibiotic prophylaxis

This patient's echocardiogram shows trivial mitral regurgitation (which is a normal finding) and pulmonary regurgitation which is secondary to elevated pulmonary pressures, most likely due to his chronic obstructive pulmonary disease (COPD). Although antibiotic prophylaxis was previously indicated in cases of structural pulmonary valve disease, recent NICE guidelines (see weblink below) indicate that no antibiotic prophylaxis is required for dental procedures, stating that 'Antibiotic prophylaxis against infective endocarditis is not recommended routinely for people undergoing dental procedures.'

- D Clindamycin 600 mg orally prior to the procedure

Antibiotic prophylaxis is no longer routinely recommended for dental procedures. Clindamycin is active against *Bacteroides fragilis*, *P. jiroveci*, *Toxoplasma gondii*, *Clostridium*, *Corynebacterium acnes* and *Pneumocystis carinii*. It is thus useful in the treatment of abdominal and pelvic abscess, respiratory tract infections including lung abscess, and skin and soft-tissue infections.

B Amoxicillin 3 g orally prior to the procedure

Antibiotic prophylaxis is no longer routinely recommended for dental procedures. Amoxicillin is active against Gram-positive bacteria such as *Enterococcus faecalis*, *Staphylococcus* spp., *Streptococcus* spp., *Streptococcus pneumoniae* and Gram-negative bacteria including *Escherichia coli*, *Haemophilus influenzae*, *Proteus mirabilis* and *Neisseria gonorrhoeae*. Amoxicillin is also active against *Helicobacter pylori* but it is not effective against *Pseudomonas*, *Klebsiella*, *Serratia*, *Citrobacter* and some Gram-negative aerobes.

C Amoxicillin 1 g IV and gentamicin 120 mg IV prior to the procedure

Antibiotic prophylaxis is no longer routinely recommended for dental procedures. Amoxicillin is active against Gram-positive bacteria such as *Enterococcus faecalis*, *Staphylococcus* spp., *Streptococcus* spp., *Streptococcus pneumoniae* and Gram-negative bacteria including *Escherichia coli*, *Haemophilus influenzae*, *Proteus mirabilis* and *Neisseria gonorrhoeae*. Amoxicillin is also active against *Helicobacter pylori* but it is not effective against *Pseudomonas*, *Klebsiella*, *Serratia*, *Citrobacter* and some Gram-negative aerobes. Gentamicin is bactericidal and is active against many strains of Gram-positive and -negative pathogens including species of *Escherichia*, *Enterobacter*, *Klebsiella*, *Salmonella*, *Serratia*, *Shigella*, *Staphylococcus aureus*, some *Proteus* and against *Pseudomonas aeruginosa*. Gentamicin is often effective against strains of these organisms which are resistant to other antibiotics such as streptomycin, kanamycin and neomycin. Gentamicin is effective against penicillin-resistant *Staphylococci*, but rarely effective against *Streptococci*.

E Amoxicillin 3 g orally prior to the procedure and 4 h following the procedure

Antibiotic prophylaxis is no longer routinely recommended for dental procedures. Amoxicillin is active against Gram-positive bacteria such as *Enterococcus faecalis*, *Staphylococcus* spp., *Streptococcus* spp., *Streptococcus pneumoniae* and Gram-negative bacteria including *Escherichia coli*, *Haemophilus influenzae*, *Proteus mirabilis* and *Neisseria gonorrhoeae*. Amoxicillin is also active against *Helicobacter pylori* but it is not effective against *Pseudomonas*, *Klebsiella*, *Serratia*, *Citrobacter* and some Gram-negative aerobes.

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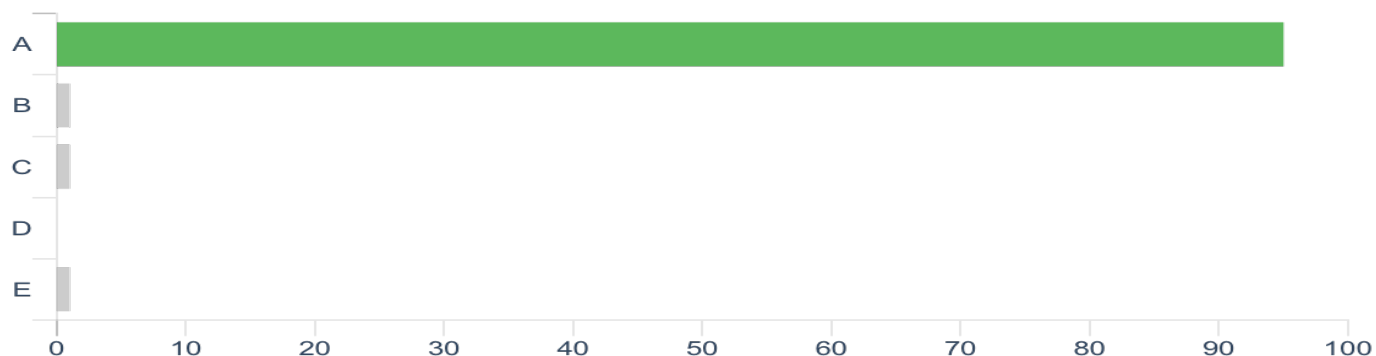
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External Links

NICE. Prophylaxis against infective endocarditis: antimicrobial prophylaxis against infective en...[nice.org.uk/guidance/CG64](http://www.nice.org.uk/guidance/CG64)

(http://www.nice.org.uk/guidance/CG64)

Electronic Medicines Compendium[medicines.org.uk](https://www.medicines.org.uk)

(https://www.medicines.org.uk)

National Information Program on Antibiotics[antibiotics-info.org](http://www.antibiotics-info.org)

(http://www.antibiotics-info.org)



Q56

A 38-year-old man presents to the Emergency Department (ED) with acutely worsening dyspnoea on a background of progressive shortness of breath over the past two weeks. His only past medical history of note includes recurrent shoulder dislocation.

On examination, he is 1.93 m in height and 51 kg in weight. His blood pressure is 110/55 mmHg (equal in both arms), while his pulse 110 beats per minute (bpm). He is peripherally shut down and has pulmonary oedema. There are ejection systolic and short early diastolic murmurs heard best over the right 2nd interspace.

What diagnosis fits best with this clinical picture?

Your answer was correct

- A Acute aortic regurgitation
- B Acute mitral regurgitation
- C Aortic stenosis
- D Acute LV failure
- E Aortic dissection

Explanation



- A Acute aortic regurgitation

The presentation here, with no previous past medical history of note, suggests acute aortic regurgitation, with his phenotype pointing to Marfan as the likely underlying cause. Definitive treatment is aortic valve replacement, with condition at presentation being the major determinant of mortality. Pre-surgery patients should be managed with opiates, if in significant pain or LVF, loop diuretic therapy and nitrates if blood pressure allows. Inotropic support with agents such as dobutamine may also be necessary.

- B Acute mitral regurgitation

While Marfan syndrome can be associated with mitral regurgitation, this is associated with a pan-systolic murmur best heard at the apex with radiation to the axilla.

C Aortic stenosis

While Marfan syndrome is associated with increased incidence of aortic stenosis, aortic regurgitation is the most likely diagnosis in this case. Aortic stenosis is associated with angina, dyspnoea and syncope, and with a slow rising pulse, heaving apex beat and an ejection systolic murmur which radiates to the carotids.

D Acute LV failure

While valvular heart disease can lead to left ventricular failure, the timescale in this case, the examination findings and the phenotypical findings are in keeping with Marfan syndrome, make aortic regurgitation the likely underlying cause.

E Aortic dissection

This is associated with acute 'tearing' chest/back pain, which may radiate to the neck. There may be symptoms of ischaemia if other arteries become involved, such as angina, limb ischaemia, neurological symptoms and pulse deficit between left and right limbs.

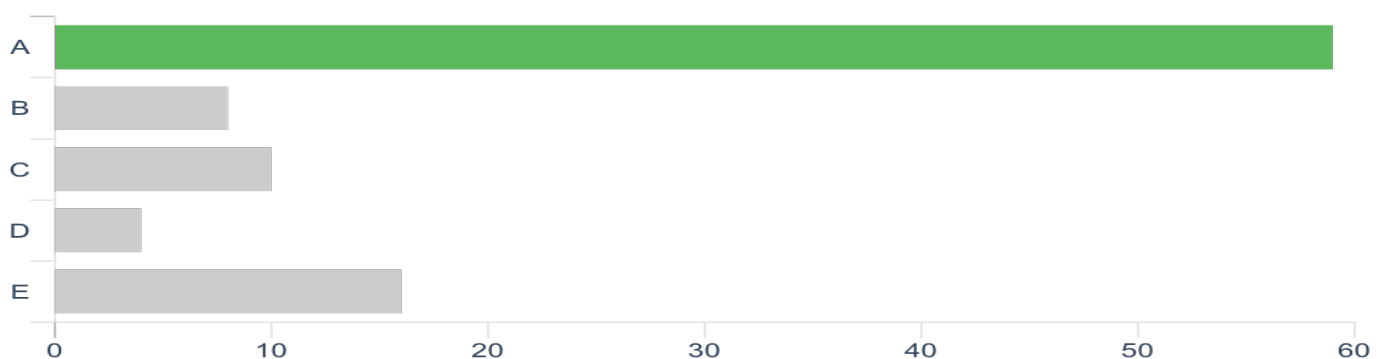
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Q57

A 28-year-old woman attends the Emergency Department (ED) complaining of pleuritic chest pain. The pain is central and retrosternal and is relieved by sitting forward. She has recently returned from a trip to Australia and has a history of viral infection and flu-like symptoms. There appears to be a friction rub on auscultation. An electrocardiogram (ECG) reveals saddle-shaped ST elevation, and blood testing reveals normal D-dimers.

What diagnosis fits best with this clinical picture?

Your answer was correct

- A Acute pericarditis
- B Pulmonary embolus
- C Myocarditis
- D Myocardial infarction
- E Viral pleurisy

Explanation



- A Acute pericarditis

The presenting symptoms are typical of pericarditic pain. The normal D-dimer and ECG changes (saddle-shaped ST elevation) also point more towards a diagnosis of acute pericarditis vs pulmonary embolus. Viral infections, bacterial sepsis, fungal infections and tuberculosis may all cause acute pericarditis. Other causes include acute myocardial infarction, malignancy, autoimmune disease, granulomatous disease, hypothyroidism, drugs such as hydralazine, and trauma and radiotherapy. The mainstay of therapy for acute pericarditis is pain relief with non-steroidal anti-inflammatory agents; a trial of prednisolone may be useful if pain fails to settle within 48 h.

- B Pulmonary embolus

In this instance you would expect the D-dimer to be elevated. The ECG changes are also not typical. A large PE is associated with a sinus tachycardia and ECG features of right ventricular strain. Shortness of breath is also common in this instance.

C Myocarditis

This condition is caused by myocardial inflammation and patients may again present with atypical chest pain and shortness of breath. Patients with myocarditis can either have inflammation limited to the myocardium or it may also extend to involve the pericardium (myopericarditis). Widespread T-wave inversion or saddle-shaped ST segments are common ECG changes. The diagnosis of myocarditis or myopericarditis is based on the presence of there being evidence of myocardial involvement in the inflammatory process; an elevated troponin $\pm$ evidence of systolic dysfunction on the echocardiogram or cardiac MRI scan demonstrates myocardial inflammation.

D Myocardial infarction

The pain in the above case is atypical, rather than being suggestive of ischaemia. The universal definition of myocardial infarction requires detection of a rise and/or fall of cardiac biomarker values [preferably cardiac troponin (cTn)] with at least one value above the 99th percentile upper reference limit (URL) and with at least one of the following:

- Symptoms of ischaemia
- New or presumed new significant ST-segment-T wave (ST-T) changes or new left bundle branch block (LBBB)
- Development of pathological Q waves in the ECG
- Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality
- Identification of an intracoronary thrombus by angiography or autopsy.

ECG changes in the case of an acute myocardial infarction are characterised by ST-segment elevation in the distribution of the affected coronary artery.

E Viral pleurisy

Pleurisy denotes inflammation of the lining of the lungs. Lone viral pleurisy (not involving the pericardium) is not associated with ECG changes. A pleural 'friction rub', associated with pleurisy, is a squeaking/grating noise caused by inflammation of the pleura. It is characterised by a rub audible during inspiration/expiration – whenever the chest moves. In contrast, a pericardial friction rub is caused by inflammation of the pericardium. In this case the rub is audible each time the heart moves (i.e. with every heartbeat) and is still audible during cessation of breathing.

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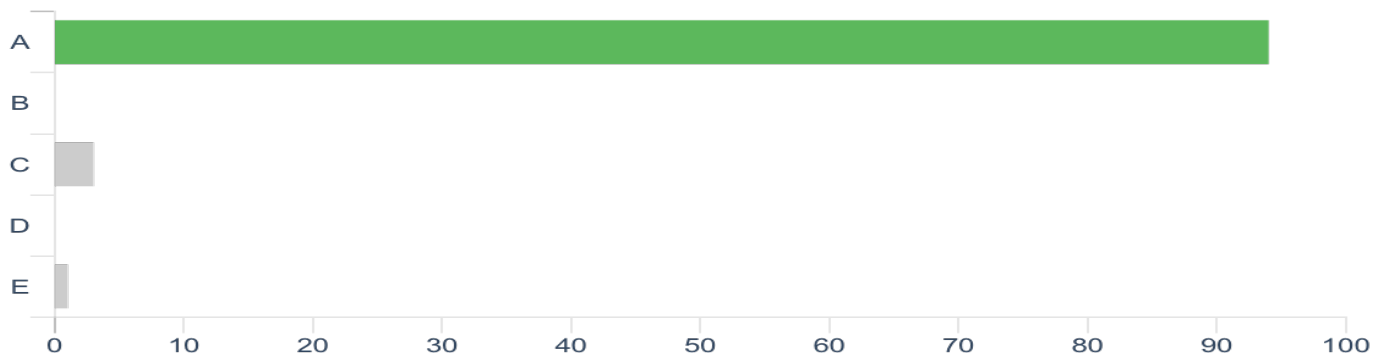
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Q58

A 45-year-old Bulgarian man is admitted via the Emergency Department (ED). He has had a recent history of chronic cough, haemoptysis and weight loss. For the past few days he has suffered increasing shortness of breath, lethargy and exercise intolerance.

On examination, he looks unwell: he is thin and emaciated. His pulse is 105 beats per minute (bpm) and his blood pressure is 100/60 mmHg. His jugular venous pressure (JVP) is markedly elevated and heart sounds are quiet and muffled; the palpable pulse pressure appears to decrease on inspiration.

An electrocardiogram (ECG) reveals small complexes, while his heart shadow looks globular on a chest X-ray (CXR).

Which of following stems represents the best initial management of this case?

Your answer was correct

- A Intravenous furosemide
- B Sodium nitroprusside
- C Pericardial drainage
- D Bronchoscopy
- E Antibiotic therapy

Explanation



- C Pericardial drainage

This man is of Eastern European extraction and has symptoms of possible tuberculous infection. Tuberculosis is a cause of exudative pericardial effusion, and it is likely that this has accumulated to produce symptoms of impending cardiac tamponade. Over the longer term, patients with tuberculous pericarditis are at risk of cardiac constriction. It is important to consider early use of corticosteroids in conjunction with anti-tuberculous therapy in these patients, as there is some evidence that steroids may reduce the risk of constrictive pericarditis. Advice of a cardiac surgeon is recommended, as pericardectomy may be

required in some patients with recurrent pericardial effusions. In this instance drainage is both therapeutic and diagnostic - it allows relief of symptoms and the potential for culture and sensitivity of the fluid.

A Intravenous furosemide

Although pericardial effusions secondary to fluid overload and congestive cardiac failure may be partially responsive to intravenous diuretics, this is not the case for reactive or infective effusions.

B Sodium nitroprusside

Anti-hypertensives are not used in the management of pericardial effusions or tamponade. Its use in this instance would be inappropriate and may worsen the clinical picture.

D Bronchoscopy

Although bronchoscopy, bronchoalveolar washings or transbronchial needle aspiration may be used in the diagnostic work-up for TB, it is not a diagnostic or therapeutic treatment for pericardial effusion.

E Antibiotic therapy

Although antibiotics form the mainstay of treatment for TB, in the current clinical scenario the patient has features of a large pericardial effusion and impending tamponade, which needs to be relieved to prevent further clinical deterioration.

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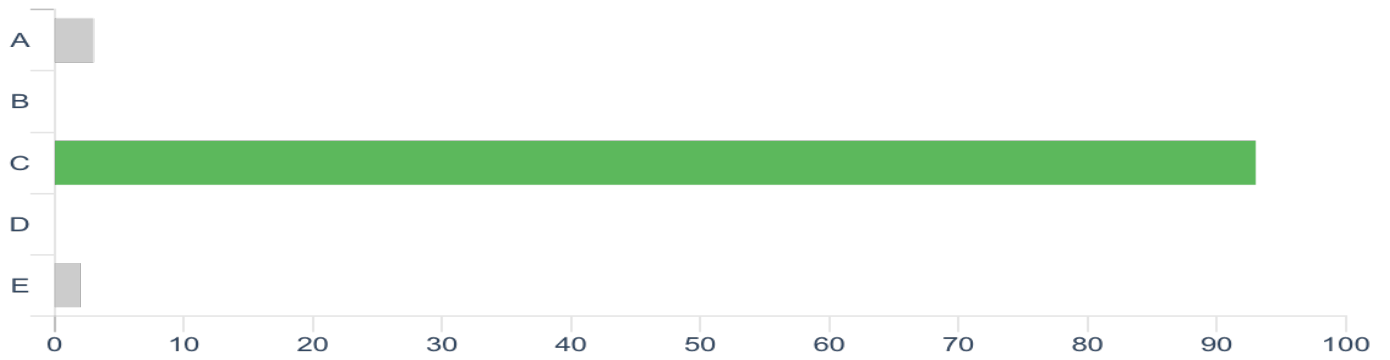
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Q59

A 28-year-old woman is referred by the Emergency Department (ED) to the Cardiology Department after suffering an attack of paroxysmal atrial fibrillation (AF). The ED noticed that she had a mid-systolic murmur, loudest in the pulmonary area, and fixed splitting of the second heart sound. They also observed that the pulmonary arterial tree appeared particularly prominent on a chest X-ray (CXR). The ED was concerned about a valve defect. An electrocardiogram (ECG) reveals right bundle-branch block and right-axis deviation. Routine bloods are unremarkable.

What diagnosis fits best with this clinical picture?

Your answer was incorrect

- A Mitral regurgitation
- B Mitral stenosis
- C Ventricular septal defect
- D Atrial septal defect
- E Subacute bacterial endocarditis

Explanation



- D Atrial septal defect

ASD is often first diagnosed in adulthood and represents one-third of all adult congenital heart disease. It is two to three times more common in women compared to men. Communication at the level of the atria allows left-to-right shunting of blood, leading to considerable increase in right heart output. Eventually this results in pulmonary hypertension. Patients often present with atrial fibrillation. There is fixed splitting of S2 on auscultation, and a mid-systolic murmur loudest in the pulmonary area. Chest X-ray may reveal pulmonary plethora, and the electrocardiogram shows right bundle-branch block. Significant ASDs should be repaired below the age of 10 years, or as soon as possible if diagnosed in adulthood.

- B Mitral stenosis

Mitral stenosis has a loud opening snap and a mid-diastolic rumbling murmur, loudest at the left sternal edge.

A Mitral regurgitation

Mitral regurgitation results in a pan-systolic murmur and left ventricular failure, rather than the picture seen here.

C Ventricular septal defect

VSDs result in a pan-systolic murmur, with haemodynamically significant VSDs presenting earlier than age 28.

E Subacute bacterial endocarditis

There is nothing in the history to suggest subacute bacterial endocarditis, and the normal blood screen also makes this less likely as the underlying diagnosis.

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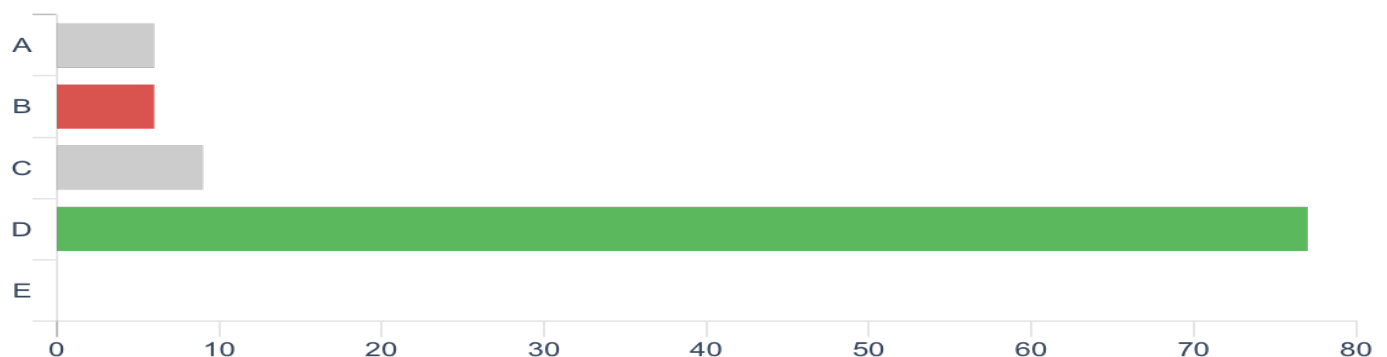
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 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Q60

A 19-year-old man, who was adopted soon after birth, presents to the Cardiology Clinic for a consultation. He had attempted to trace his family and was informed by his blood relatives that his father died suddenly of a 'heart problem'.

On examination, he looks well but has a harsh systolic murmur which increases with the Valsalva manoeuvre and decreases with squatting. Echocardiography (ECHO) reveals ventricular hypertrophy, particularly of the septum, with increased ejection fraction. Outflow gradient measured by the ECHO is 35 mmHg.

What is the treatment of choice in this patient if he was to develop symptoms of dyspnoea?

Your answer was incorrect

- A Cardiac myomectomy
- B Digoxin
- C Beta-blockade
- D Diuretic therapy
- E Nitrate therapy

Explanation



- C Beta-blockade

This patient has hypertrophic obstructive cardiomyopathy (HOCM). The disease exists in two major forms: a familial one that presents in young patients and has been mapped to chromosome 14q, and a sporadic form usually found in the elderly. In HOCM there is marked hypertrophy of the myocardium with a disproportionate increase in the size of the septum. Sufferers are prone to sudden death related to cardiac arrhythmias. Symptoms of cardiac failure respond initially to medical therapy with beta blockade, and this is therefore the initial intervention of choice.

- A Cardiac myomectomy

Myomectomy is reserved for patients where the outflow gradient is greater than 50 mmHg or there are significant symptoms despite beta blocker therapy. Surgery is usually avoided for as long as possible. Ventricular arrhythmias are managed with an implantable cardioverter defibrillator.

B Digoxin

Digoxin has no effect on outcome in HOCM and is now largely reserved for elderly patients with AF not suitable for other interventions, and for those elderly patients with symptomatic heart failure despite other interventions.

D Diuretic therapy

Diuretic therapy does not improve outcomes in HOCM and should be used cautiously because of its effect on left ventricular volume.

E Nitrate therapy

Nitrate therapy can significantly reduce ventricular filling pressure and exacerbate the risk of syncope in HOCM.

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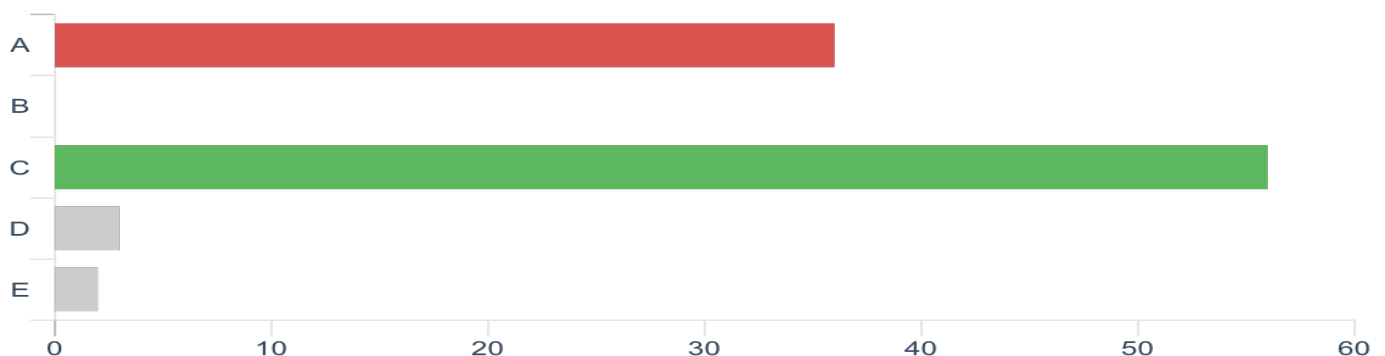
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Q61

A 72-year-old woman is admitted to the Emergency Department (ED) after collapsing in church; this is her second such episode in the last year. A parishioner who felt her neck at the time reports that the woman was pulseless for a few seconds. She quickly recovers on admission to the department and is discharged home. A Holter monitor and MIBI (2-methoxyisobutyl isonitrile) scan as an outpatient are unremarkable. You arrange a tilt-table test, during which carotid sinus massage results in a 4 s asystolic episode with syncope.

What is the best choice for management of this patient?

Your answer was correct

- A Fludrocortisone
- B Single-chamber pacemaker
- C Dual-chamber pacemaker
- D Compression stockings
- E Midodrine

Explanation



- C Dual-chamber pacemaker

This patient has carotid sinus hypersensitivity, demonstrating an exaggerated response to carotid sinus stimulation. The diagnosis is only made after ischaemic heart disease or rhythm disturbance have been reasonably excluded, as in this case. CSH may be predominantly cardio-inhibitory (the most common form, resulting in bradycardia), predominantly vasodepressor (resulting in hypotension with a drop in blood pressure ≥ 50 mmHg) or a mixture of the two.

ESC guidelines recommend insertion of a dual-chamber pacemaker for those with dominant cardio-inhibitory carotid sinus syndrome (Class 1B), but this has no effect on the vasodepressor component of carotid sinus hypersensitivity.

Vasodilatory CSH is can be managed with support stockings, fludrocortisone and midodrine, though no agent has been definitively proven to provide benefit in this patient group.

A Fludrocortisone

In the case of cardioinhibitory carotid sinus hypersensitivity, dual-chamber pacing is the recommended management option. Fludrocortisone can be trialled as a management option in vasodepressor-type carotid sinus hypersensitivity.

B Single-chamber pacemaker

In the case of cardio-inhibitory carotid sinus hypersensitivity, dual-chamber pacing is the recommended management option.

D Compression stockings

In the case of cardio-inhibitory carotid sinus hypersensitivity, dual-chamber pacing is the recommended management option. Compression stockings can be trialled in patients with vasodepressor carotid sinus hypersensitivity.

E Midodrine

In the case of cardio-inhibitory carotid sinus hypersensitivity, dual-chamber pacing is the recommended management option. Midodrine can be trialled in patients with vasodepressor carotid sinus hypersensitivity.

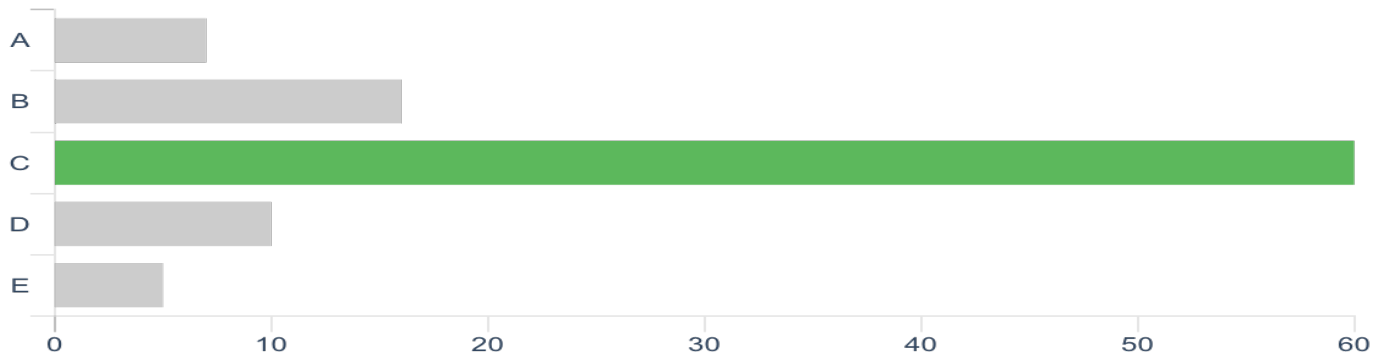
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Q62

A 54-year-old man is referred to the Cardiology Clinic by his General Practitioner (GP). He smokes 20 cigarettes per day and has suffered from exertional angina for the past few months. On this occasion he has been referred after a collapse at a wedding. Atenolol has not improved his symptoms of angina and the GP is looking for further advice.

On examination in the clinic, his blood pressure is 165/120 mmHg. His pulse is 80 beats per minute (bpm) and regular, and he has an ejection systolic murmur radiating to the carotids.

What is the next stage in the management of this patient?

Your answer was incorrect

- A Echocardiography
- B Add isosorbide dinitrate
- C Add amlodipine
- D Refer for exercise rehabilitation
- E Refer for smoking cessation

Explanation



- A Echocardiography

The rapidly increasing angina symptoms, syncopal attack and ejection systolic murmur point to the possibility of aortic stenosis. Assessment of valve status is essential as a range of interventions may exacerbate symptoms in critical valve stenosis.

In this age group, aortic stenosis is most likely to be due to congenital bicuspid aortic valve. In the over-70 age group, aortic stenosis is more likely to be due to senile valvular degeneration. Assessment for valve replacement depends on comorbidity and flow gradient across the aortic valve, as assessed by echocardiography and cardiac catheterisation. In general, surgical mortality from aortic valve replacement in patients with normal left ventricular function is less than 5%.

- B Add isosorbide dinitrate

Nitrates may significantly reduce ventricular filling pressure, reducing cardiac output to a critically low level because of valve stenosis.

C Add amlodipine

This patient may benefit from improved blood pressure control, but with respect to triaging interventions, aortic stenosis should be excluded first.

D Refer for exercise rehabilitation

Although this has been shown to improve prognosis in angina, significant aortic stenosis will limit its impact. Hence an ECHO is the required next step.

E Refer for smoking cessation

Smoking cessation is important in managing future risk of ischaemic cardiovascular events, although it won't significantly impact on symptoms of critical aortic stenosis, which needs excluding first.

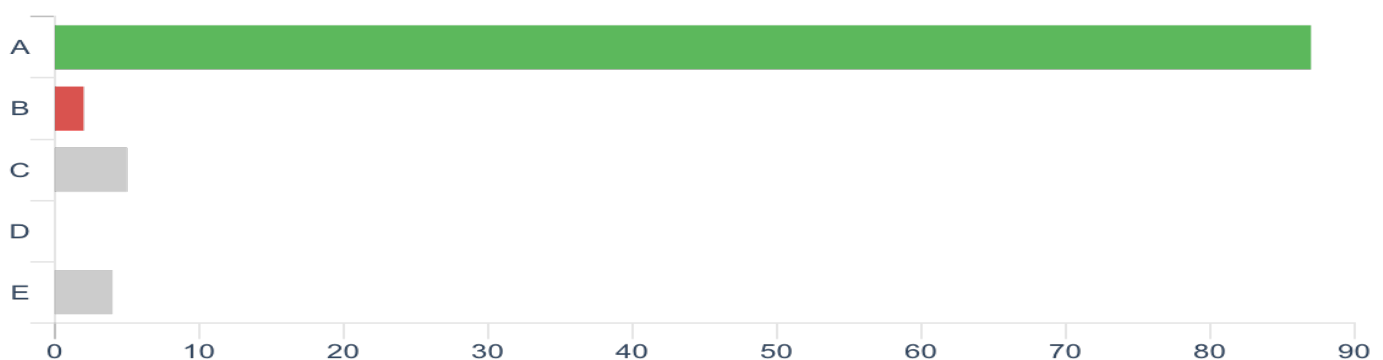
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Q63

You are asked to review a 48-year-old woman in the Cardiology Clinic who has been treated for hypertension, diabetes managed with diet, well-controlled atrial fibrillation (AF), has had two failed cardioversions, and has a ventricular rate of 75 beats per minute (bpm). An echocardiogram (ECHO) reveals a structurally normal heart. She is worried about having a stroke. She has no other significant past medical history.

Which of the following would be an appropriate treatment intervention for her?

Your answer was incorrect

- A Warfarinisation
- B Aspirin
- C Clopidogrel
- D Aspirin and clopidogrel concurrently
- E Reassurance

Explanation



- A Warfarinisation

NICE guidelines suggest that anti-coagulation therapy, such as warfarinisation, is the optimal management for patients with persistent atrial fibrillation and who are at risk of embolic stroke according to their algorithm. CHADS2-VASc supports the use of warfarin: with a score of 3, it incorporates female sex, presence of CHF, blood pressure, age, diabetes mellitus and presence of a prior stroke or TIA. Clearly this patient should be given the option of alternative anti-coagulants such as novel anticoagulants for example apixaban or dabigatran but these are not listed as options here.

- E Reassurance

This patient's CHADS2-vasc score is significantly elevated, driving the need for anti-coagulation.

B Aspirin

Anti-platelet therapy alone is inadequate to reduce stroke risk versus anti-coagulation in this patient.

C Clopidogrel

Although in a secondary prevention population clopidogrel reduced the absolute risk of major adverse cardiovascular events by 0.5% versus aspirin alone, it's still inferior to anti-coagulation in patients with chronic atrial fibrillation.

D Aspirin and clopidogrel concurrently

The MATCH trial in a high-risk secondary prevention population didn't offer a significant advantage with respect to event prevention versus either agent alone, but did increase the risk of bleeding. Anti-platelet agents are known to be ineffective versus anti-coagulation in patients with chronic AF.

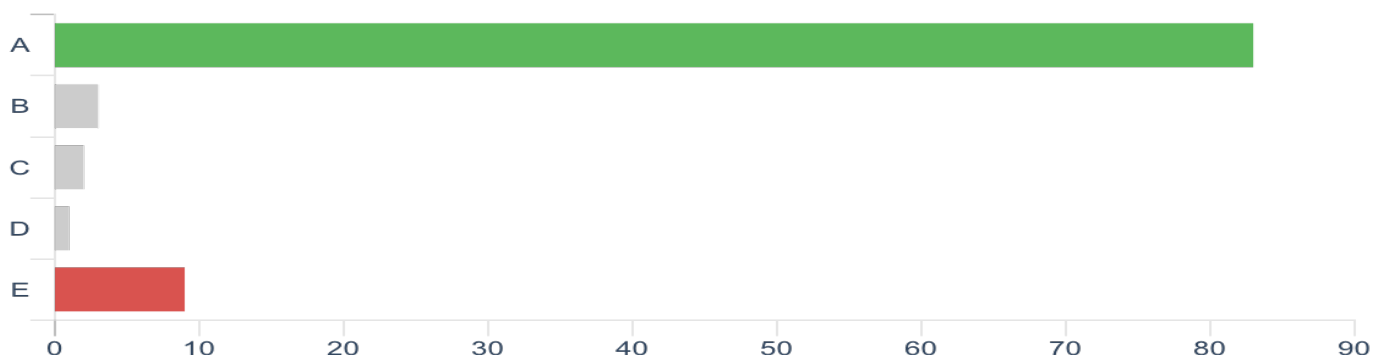
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External Links

NICE. Management for people presenting acutely with atrial fibrillation

[nice.org.uk/guidance/cg180/chapter/1-Recommendations#management-for-people-presenting-acutely-with-atrial-fibrillation...](https://www.nice.org.uk/guidance/cg180/chapter/1-Recommendations#management-for-people-presenting-acutely-with-atrial-fibrillation)

(<https://www.nice.org.uk/guidance/cg180/chapter/1-Recommendations#management-for-people-presenting-acutely-with-atrial-fibrillation>)

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis

Links to NICE guidelines/CKS



Q64

A 47-year-old woman is referred to the Cardiology Clinic by her General Practitioner (GP), who wants an opinion about atrial fibrillation (AF). She has suffered increasing tiredness over the past few months, consulted her GP, and was noted to be in AF.

On examination, she has a small-volume pulse, distended jugular veins (DJV), left parasternal lift, a tapping apex impulse, and there is a loud first heart sound and a mitral early- to mid-diastolic murmur. There also appears to be a mid-diastolic tricuspid murmur.

What diagnosis fits with this clinical picture?

Your answer was correct

- A Mitral stenosis
- B Atrial septal defect
- C Tricuspid regurgitation
- D Lutembacher syndrome
- E Eisenmenger's syndrome

Explanation



- D Lutembacher syndrome

This was first described in 1916 by Lutembacher, and is a syndrome characterised by both mitral stenosis and atrial septal defect (ASD). Both conditions may be congenital and occur concurrently, or the mitral stenosis may occur as a result of rheumatic fever or some other cause. The incidence of Lutembacher syndrome is higher in women due to the greater incidence of congenital ASD. Cardiac signs are mixed due to the two concurrent lesions. Presentation is typically in later life, with fatigue or atrial fibrillation. Ideally, surgery should be performed as early as possible due to the risks of Eisenmenger syndrome in untreated patients.

- A Mitral stenosis

The mid-diastolic tricuspid murmur fits with increased tricuspid valve flow, consistent with a shunt because of an ASD, and hence isolated mitral stenosis is ruled out here.

B Atrial septal defect

An isolated ASD is ruled out because of the presence of the mitral murmur here.

C Tricuspid regurgitation

The presence of the mitral murmur makes Lutembacher syndrome with increased tricuspid flow a much more likely diagnosis than isolated tricuspid regurgitation.

E Eisenmenger's syndrome

Eisenmenger syndrome leads to cyanotic heart disease because of reversal of a long-standing left-to-right shunt to a right-to-left cardiac shunt.

7037

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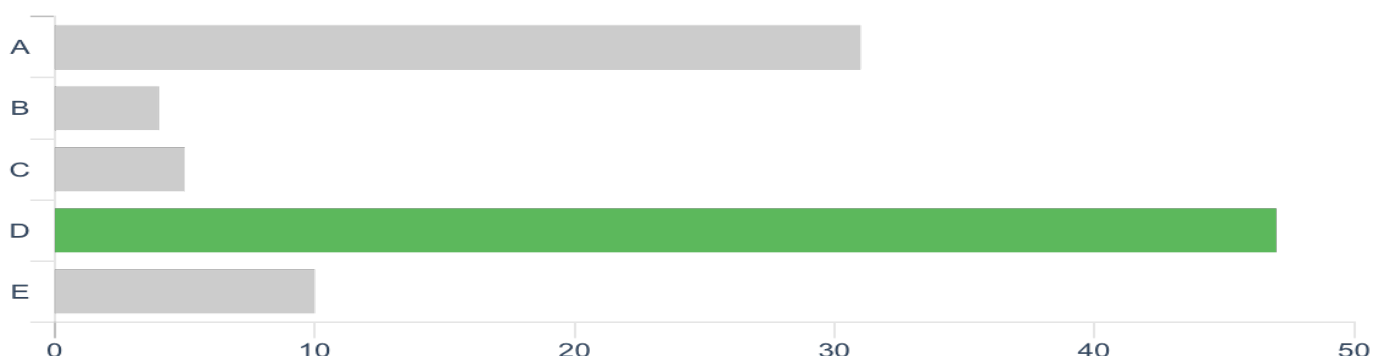
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Responses Incorrect:	51
Responses Total:	64
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

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Prognosis



Q65

A 20-year-old man has been referred to the Cardiology Clinic as part of an investigation related to mild heart failure, for which his General Practitioner has prescribed furosemide 40 mg twice daily. This resulted in some improvement in symptoms.

On examination, the patient appears well. He has a sinus tachycardia of 110 beats per minute (bpm) and his blood pressure is 120/85 mmHg. Chest examination reveals mild, coarse crepitations at both lung bases. You also note that he has hypertrophied calves, but an examination of his lower limbs reveals weakness of both proximal muscles and plantar flexion. His reflexes are normal. The patient has had a trans-thoracic echocardiogram (ECHO) which showed a dilated left ventricle with global hypokinesia and an ejection fraction of < 50%.

Investigations reveal the following:

Investigation	Result	Normal Value
Haemoglobin (Hb)	126 g/l	135-175 g/l
White cell count (WCC)	$8.0 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Urea	6 mmol/l	2.5-6.5 mmol/l
Creatinine (Cr)	90 μ mol/l	60-110 μ mol/l
Potassium (K^+)	3.8 mmol/l	3.5-5.0 mmol/l
Sodium (Na^+)	140 mmol/l	135-145 mmol/l
Chloride (Cl^-)	100 mmol/l	98-106 mmol/l
Creatinine kinase (CK)	2100 U/l	23-175 U/l

What is the most likely diagnosis?

Your answer was incorrect

- A Viral myocarditis
- B Fascio-scapulo-humeral muscular dystrophy
- C Becker's muscular dystrophy
- D Duchenne's muscular dystrophy

E Myotonic dystrophy

Explanation



C Becker's muscular dystrophy

Becker's muscular dystrophy is an X-linked genetic disorder resulting from a mutation in the dystrophin gene. The clinical picture is similar to that of Duchenne's muscular dystrophy but it is much milder. Patients usually present between the ages of 5 and 15 years, though presentation may not be until the fourth or fifth decade. Patients may present with heart failure secondary to dilated cardiomyopathy rather than the classic proximal muscle weakness. Inheritance is X-linked recessive.

A Viral myocarditis

Viral myocarditis presents with a rapid deterioration in ejection fraction leading to marked cardiac failure; patients can often identify a precipitating illness.

B Fascio-scapulo-humeral muscular dystrophy

FMD very rarely affects cardiac or respiratory muscles compared to other forms of muscular dystrophy. It is more likely to be associated with high-tone deafness and defects of night vision.

D Duchenne's muscular dystrophy

DMD presents at a much earlier age and with more severe proximal muscle weakness than that seen here.

E Myotonic dystrophy

Myotonic dystrophy presents as progressive muscle weakness with increased tone and cardiac conduction defects rather than the frank cardiac failure seen here.

7244

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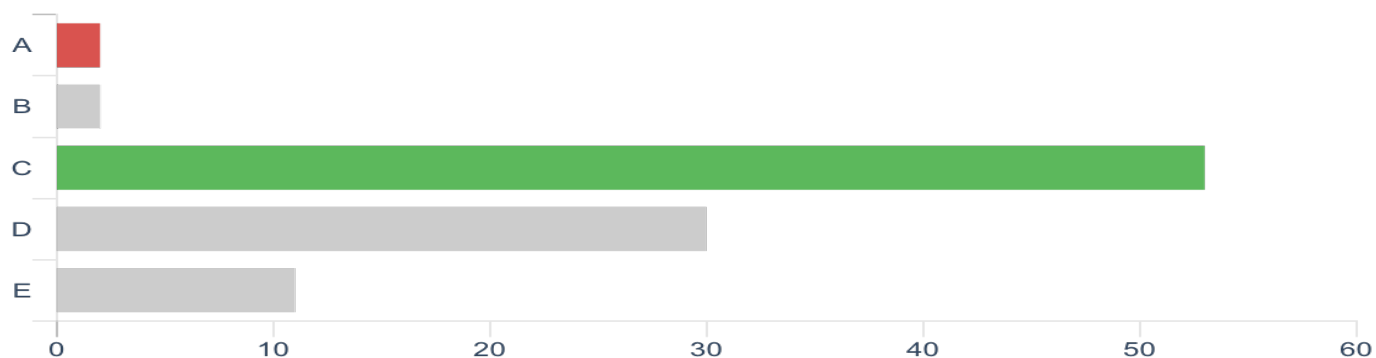
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Responses Correct:	13
Responses Incorrect:	52
Responses Total:	65
Responses - % Correct:	20%

Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Q66

A 40-year-old woman presents to the Emergency Department (ED) with palpitations and light-headedness. The symptoms began suddenly three hours ago while she was playing golf. She is otherwise well, and has no significant past history.

On examination she appears well, with a normal respiratory rate. Her blood pressure is 120/75 mmHg. She is afebrile. An electrocardiogram (ECG) reveals a regular narrow complex tachycardia with a rate of 170 beats per minute (min). There are no flutter waves, but retrograde p-waves are visible in the inferior leads.

What is the most appropriate initial management?

Your answer was incorrect

- A DC cardioversion
- B Amiodarone
- C Adenosine
- D Vagal manoeuvres
- E Anticoagulation, (followed by DC cardioversion in 4 weeks)

Explanation



- D Vagal manoeuvres

The most likely diagnosis is paroxysmal SVT, where vagal manoeuvres are the optimal first-line treatment where blood pressure is stable. These slow conduction in the AV node, potentially interrupting any re-entrant circuit. The absence of flutter waves excludes atrial flutter. Retrograde p-waves in the inferior leads are typical of supraventricular tachycardia. Most of the patients who present with paroxysmal SVT have an AV nodal re-entrant arrhythmia. These arrhythmias depend on AV nodal conduction and therefore can be terminated by transiently blocking AV nodal conduction.

- A DC cardioversion

In this situation, DC cardioversion is only really required for patients resistant to vagal manoeuvres or adenosine, or where there is significant haemodynamic compromise.

B Amiodarone

Amiodarone is the preferred intervention for atrial fibrillation where there is a past history of structural or ischaemic heart disease.

C Adenosine

Adenosine blocks AV nodal conduction and is the preferred intervention in patients who fail to cardiovert with vagal stimulation, where there is no past history of asthma.

E Anticoagulation, (followed by DC cardioversion in 4 weeks)

Anticoagulation is preferred for patients with more prolonged tachycardia due to AF, where risk of embolism is increased.

7245

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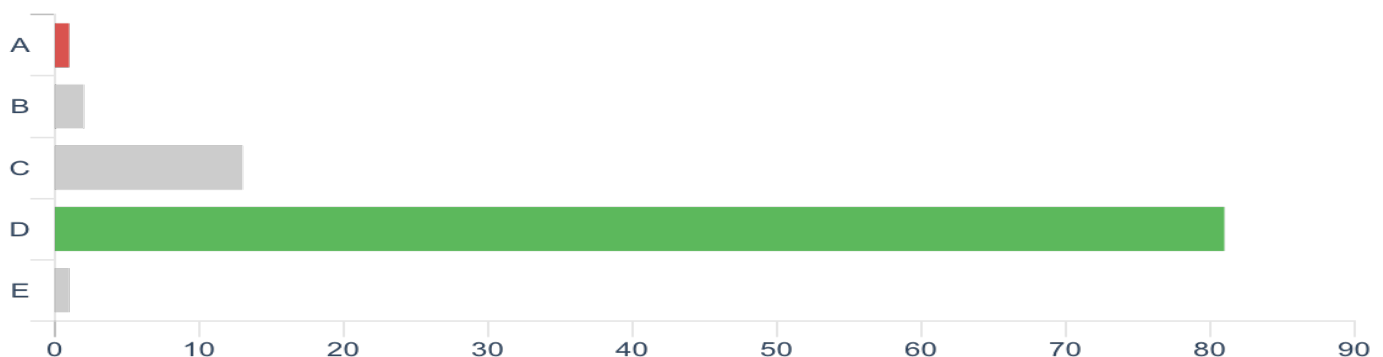
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Responses Correct:	13
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Responses Total:	66
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Q67

A 35-year-old woman presents to the Emergency Department (ED) with a two day history of dyspnoea on minimal exertion, paroxysmal nocturnal dyspnoea, and a non-productive cough. She is 36 weeks' pregnant with twins, the pregnancy having been thus far been uncomplicated. She has had two previous uncomplicated pregnancies which resulted in normal vaginal deliveries. There is no history of headache, visual disturbance, abdominal pain, or peripheral oedema. There is no history of cardiovascular disease. There is no history of alcohol or illicit drug ingestion. She is a non-smoker.

On examination, she is tachypnoeic with a respiratory rate of 28 breaths per minute and she has a tachycardia of 130 beats per minute (bpm). Her pulse is regularly regular. She has an elevated jugular venous pulse (JVP), a loud P2 and coarse crackles at both lung bases. Her blood pressure is 100/60 mmHg. There is no hyper-reflexia or clonus. She is afebrile.

A chest X-ray (CXR) performed with abdominal shielding reveals cardiomegaly and bilateral pulmonary oedema. Transthoracic echocardiography (ECHO) reveals left systolic dysfunction with an ejection fraction of 30%. Urinalysis is normal. Full blood count (FBC), urea and electrolytes (U&Es), troponin and liver function tests (LFTs) are all within normal limits. The ECG reveals sinus tachycardia. There are no ischaemic changes.

What is the most likely diagnosis?

Your answer was incorrect

- A Pre-eclampsia
- B Eclampsia
- C Hypertensive cardiomyopathy
- D Non-cardiogenic pulmonary oedema of pregnancy
- E Peripartum cardiomyopathy

Explanation



- E Peripartum cardiomyopathy

Peripartum cardiomyopathy is a dilated cardiomyopathy of uncertain aetiology occurring in the last month of pregnancy or within 5 months after delivery. Symptoms are the same as those of cardiac failure in non-pregnant patients. In order to make the diagnosis there must be (1) absence of any other cause for the cardiac failure, (2) absence of heart disease before the last month of pregnancy and (3) documented systolic dysfunction.

D Non-cardiogenic pulmonary oedema of pregnancy

The reduced ejection fraction of 30% suggests this patient has cardiac failure rather than non-cardiogenic pulmonary oedema.

A Pre-eclampsia

Pre-eclampsia is an important differential and must be excluded. A history of visual disturbance, headache, abdominal pain and peripheral oedema along with hyper-reflexia, clonus, right-upper-quadrant tenderness, renal impairment and proteinuria all suggest pre-eclampsia.

B Eclampsia

Eclampsia presents with precipitously high blood pressure, decreased consciousness and seizures.

C Hypertensive cardiomyopathy

Hypertensive cardiomyopathy is unusual in the context of pregnancy, and the blood pressure of 100/60 effectively rules this out.

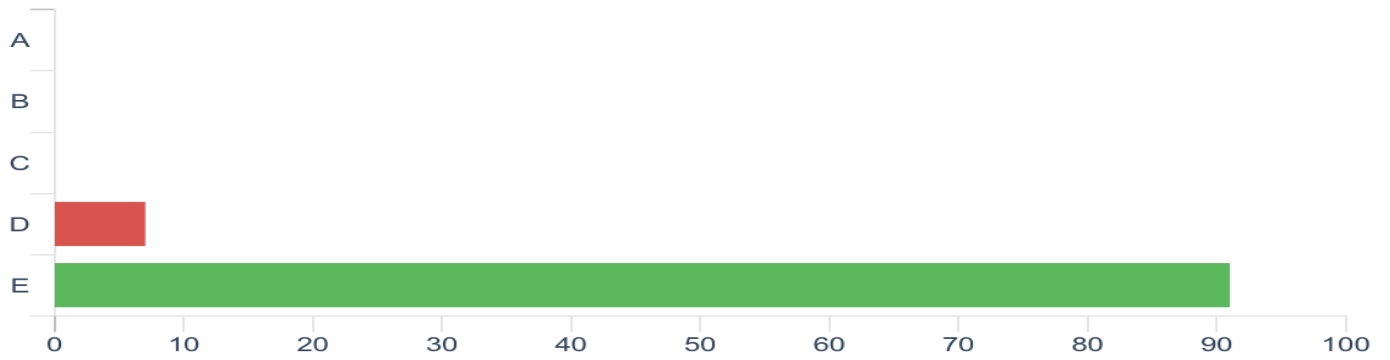
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Responses Total:	67
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Q68

A 16-year-old congenitally deaf girl is brought into the Emergency Department (ED) following an episode of collapse which occurred while she was playing tennis. She had fallen to the ground unconscious and spontaneously recovered consciousness a couple of minutes later. The previous week she had begun a course of clarithromycin for a chest infection.

On examination, her vital signs are stable and examination of the cardiovascular and respiratory systems is unremarkable. An electrocardiogram (ECG) is performed which reveals sinus rhythm with a rate of 70 beats per minute (bpm), a PR interval of 0.15 s, a QRS interval of 0.11 s, and a corrected QT interval of 0.48 s.

What of the following syndromes is the most likely diagnosis?

Your answer was correct

- A Romano-Ward
- B Jervell-Lange-Nielsen
- C Wolff-Parkinson-White
- D Lown-Ganong-Levine
- E Brugada

Explanation



- B Jervell-Lange-Nielsen

The normal range for the duration of the corrected QT interval (QT_c) is 0.35–0.43 s. Long-QT syndrome is a congenital disorder characterised by a prolonged QT interval; when it is associated with congenital deafness it is termed Jervell-Lange-Nielsen syndrome. Long-QT syndrome carries a risk of ventricular tachy-arrhythmias which may present with syncope, cardiac arrest or sudden death. The risk of tachy-arrhythmias is increased by hypomagnesaemia, hypokalaemia and drugs which prolong the QT interval, of which clarithromycin is one. Beta-blockers are the drugs of choice for patients with long-QT syndrome.

- A Romano-Ward

This is associated with long QT but there is no associated deafness in this condition.

C Wolff-Parkinson-White

This is a pre-excitation syndrome associated with short PR interval, broad QRS complex, and the presence of a delta wave.

D Lown-Ganong-Levine

This is a pre-excitation syndrome associated with very short PR, normal QRS, and no delta wave (in contrast to WPW syndrome).

E Brugada

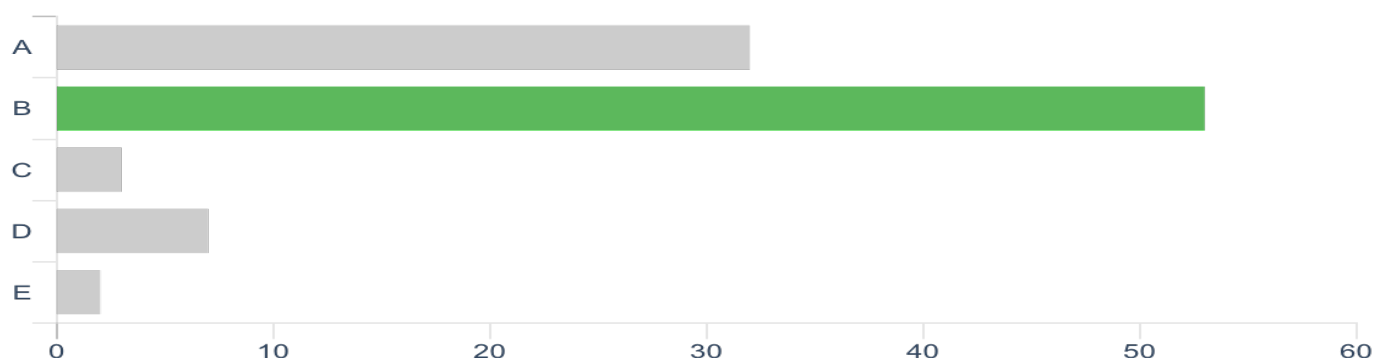
This is associated with ST elevation in leads V1-V3, and a RBBB pattern.

7248

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Responses Total:	68
Responses - % Correct:	21%



Q69

An 88-year-old woman presents to the Medical Outpatient Department for assessment. She describes episodic loss of consciousness, which is increasing in frequency. Attacks are stereotyped and consist of a feeling of lightheadedness followed by collapse to the ground. Attacks are always on standing and she has had to attend the Emergency Department (ED) on several occasions with lacerations and bruising from the falls. She believes loss of consciousness is for seconds only and does not occur with all attacks. She has been incontinent of urine on at least one occasion, but otherwise feels well after the attacks. There are no witnesses at the consultation to provide a collateral history. She has no past medical history and has no regular medication.

Her General Practitioner (GP) has already organised some tests, which reveal the following:

Investigation	Result
Ambulatory electrocardiogram (ECG) monitor	Sinus rhythm throughout
Electroencephalogram (EEG)	Runs of 8-12 cycles/s potentials, most marked over the occipital cortex

Given the EEG findings, she has been commenced on oral phenytoin. This has had no effect on the attack frequency or severity.

What further investigation would you request to elucidate the cause of her falls?

Your answer was incorrect

- A CSF examination
- B CT brain
- C Serum phenytoin levels
- D Tilt-table testing
- E Serum glucose after 48 h fast

Explanation



D Tilt-table testing

This scenario highlights the dangers of inappropriate use of the electroencephalogram (EEG). The clinical history is suggestive of postural hypotension with occasional syncope. Urinary incontinence and brief limb movements are common in syncope and do not suggest generalised seizure (faecal incontinence is more specific for generalised seizures). There are no other features in the history to suggest epileptogenic attacks, e.g. post-event headache, confusion, muscle pain or damage to the oral mucosa. The EEG findings described are normal. Even an 'abnormal' EEG, such as spike and slow-wave complexes, would not diagnose epilepsy in this patient, as such changes are found in 0.5% of the 'normal' population. Diagnosis of postural hypotension can be made in the clinic by measuring lying and standing blood pressures, and looking for a >10 mmHg deficit accompanied by symptoms. Tilt-table testing allows any cause of neurocardiogenic syncope to be better characterised. Principle management of postural hypotension involves searching for a cause – most often iatrogenic, but occasionally pathology such as adrenal insufficiency is discovered. Therapy consists of compression stockings and advice on slow rising. If drug therapy is needed, fludrocortisone is used first line.

B CT brain

CT brain would be indicated in the event there was fluctuating consciousness or focal neurological deficit to suggest subdural haematoma.

A CSF examination

CSF examination is not indicated, given that this lady appears to be suffering from multiple syncopal episodes. CSF examination would be indicated were there evidence to support a subarachnoid haemorrhage, or other chronic symptoms consistent with dementia.

C Serum phenytoin levels

There is no history of previous epilepsy, nor phenytoin use, to suggest toxicity as the underlying cause for her symptoms.

E Serum glucose after 48 h fast

Symptoms of sympathetic activation, such as sweating, tachycardia and anxiety, would be expected if hypoglycaemia were the cause of these episodes.

7365

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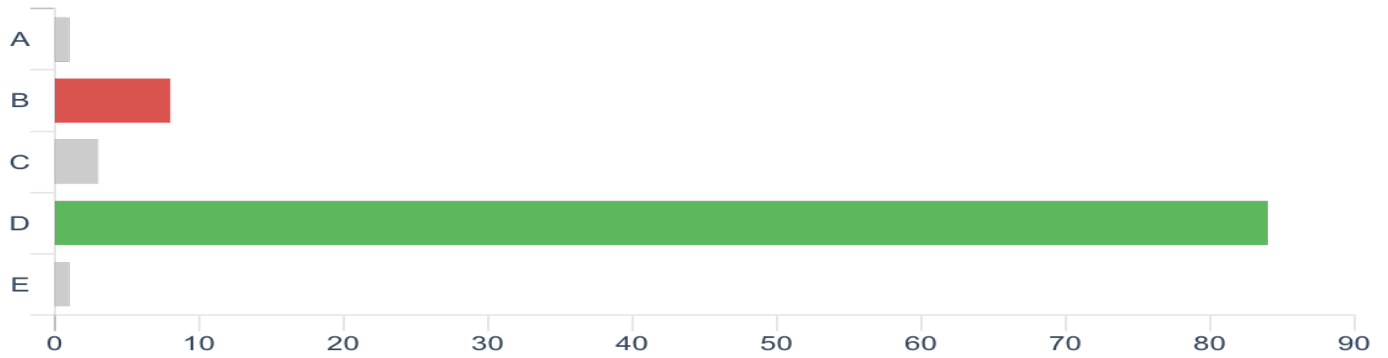
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Responses Incorrect:	55
Responses Total:	69
Responses - % Correct:	20%



Q70

A 55-year-old man is referred to the Cardiology Clinic by his General Practitioner (GP) for evaluation of syncope, which occurred during his brisk morning walk. The patient is known to have hypercholesterolaemia and is taking simvastatin 20 mg once a day. He is a lifelong non-smoker and has no family history of coronary artery disease. On further questioning he admits to passing out on two previous occasions over the past three months.

On examination, he weighs 72 kg and his height is 170 cm. His blood pressure (BP) is 110/90 mmHg. His carotid pulse is slow rising and apex beat is palpable at the 5th intercostal space. The first heart sound is normal, the second heart sound is soft; there is an ejection systolic murmur at the 2nd right intercostal space, radiating to both carotids.

Investigations reveal the following:

Investigation	Result	Normal Value
Total cholesterol	6.4 mmol/l	< 5.2 mmol/l
Low-density lipoprotein (LDL)	3.8 mmol/l	< 3.5 mmol/l
High-density lipoprotein (HDL)	1.05 mmol/l	> 1.0 mmol/l

An electrocardiogram (ECG) reveals left ventricular hypertrophy. A chest X-ray (CXR) is unremarkable. An echocardiogram (ECHO) reveals a mean aortic valve area of 0.5 cm² and a peak transvalvular gradient of 80 mmHg.

What is the next step in this patient's management?

Your answer was incorrect

- A Percutaneous aortic balloon valvulotomy
- B Aortic valve replacement
- C Treadmill stress test
- D Coronary angiography
- E Start an ACE inhibitor

Explanation



D Coronary angiography

This patient has severe symptomatic (syncope) aortic stenosis (AS) as shown by the mean aortic valve area of 0.5 cm² and mean peak transvalvular gradient of 80 mmHg. All symptomatic patients with severe AS should undergo aortic valve replacement, as prognosis without surgery is poor. Coronary artery disease (CAD) is common in patients with AS and this patient's age, sex and hypercholesterolaemia put him at risk of CAD. Therefore he should undergo cardiac angiography to assess the need for revascularisation at the time of surgery, in the form of coronary artery bypass grafting.

B Aortic valve replacement

Progressing straight to aortic valve replacement is not advised; significant coronary artery disease should be ruled out first, as CABG may be required at the same time as valve replacement.

A Percutaneous aortic balloon valvulotomy

Balloon valvotomy is inferior with respect to outcomes versus surgical valve replacement. It may be considered as a bridge to surgery in unstable patients.

C Treadmill stress test

In a patient with severe aortic stenosis, a treadmill stress test may precipitate a syncopal episode and should therefore be avoided.

E Start an ACE inhibitor

This risks a significant reduction in ventricular filling pressure and increases the risk of collapse.

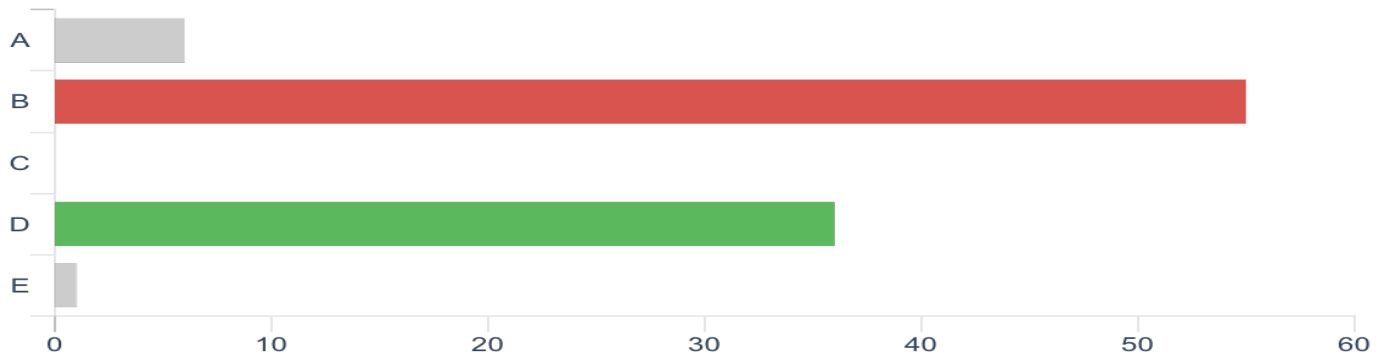
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Responses Incorrect:	56
Responses Total:	70
Responses - % Correct:	20%



Q71

A 45-year-old man, who is known to have idiopathic dilated cardiomyopathy and an ejection fraction of 30% is evaluated in the Cardiology Clinic. He is taking digoxin 0.125 mg once a day, furosemide 40 mg twice a day and enalapril 10 mg twice a day. He is able to walk 200 m on the flat, although he reports significant shortness of breath.

On examination, he weighs 78 kg. His pulse is 70 beats per minute (bpm), while his jugular venous pulse (JVP) is 1 cm above the sternal notch. His blood pressure (BP) is 123/82 mmHg. Both of his heart sounds are normal with no murmur. His chest is clear on auscultation and there is a trace of pedal oedema. He is started on bisoprolol 5 mg per day. The patient comes to the clinic four weeks later and still reports tiredness and shortness of breath on minimal exercise. Now, his blood pressure (BP) is 127/82 mmHg, while his pulse 67 beats per minute (bpm) and regular.

What is the most appropriate next step in this patient's management?

Your answer was incorrect

- A Increase the digoxin dose to 0.25 mg OD
- B Change enalapril to sacubitril/valsartan
- C Increase the furosemide dose to 120 mg per day
- D Add bendroflumethiazide 2.5 mg
- E Add ivabradine 5 mg BD

Explanation



- B Change enalapril to sacubitril/valsartan

In patients with symptoms of heart failure not controlled on ACE inhibitors alone, switching to the combination of ARB and neprilysin inhibitor can further improve symptoms and quality of life. In the PARADIGM-HF trial, the combination of sacubitril and valsartan reduced cardiovascular death and heart failure hospitalisations by 20%.

- E Add ivabradine 5 mg BD

Ivabradine is only indicated where pulse rate is greater than 75 beats per minute.

A Increase the digoxin dose to 0.25 mg OD

Increasing the digoxin is not appropriate; although modest doses may reduce symptoms of heart failure, digoxin itself has no positive impact on cardiovascular outcomes and may increase mortality in certain patient groups.

C Increase the furosemide dose to 120 mg per day

There is no indication of a worsening of fluid overload, and increasing the loop diuretic won't have a positive impact on outcomes.

D Add bendroflumethiazide 2.5 mg

Although adding a thiazide diuretic may have a positive impact on fluid overload, it isn't indicated here given that fluid status is stable and furosemide dose has not been maximised.

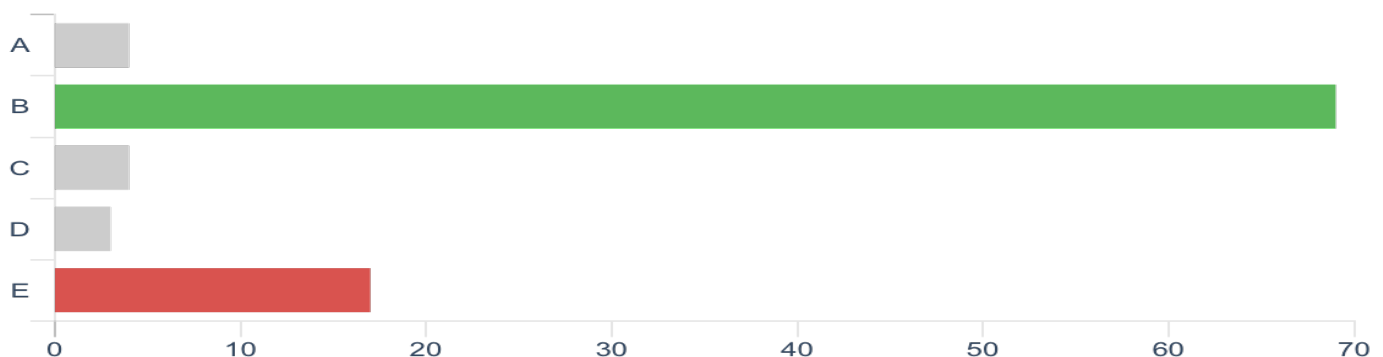
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Responses Correct:	14
Responses Incorrect:	57
Responses Total:	71
Responses - % Correct:	20%

External Links

Angiotensin-neprilysin inhibition versus enalapril in heart failure

[ncbi.nlm.nih.gov/pubmed/25176015](https://www.ncbi.nlm.nih.gov/pubmed/25176015)

(<https://www.ncbi.nlm.nih.gov/pubmed/25176015>)

Expanded Explanation

Overview

Clinical Presentation

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Q72

A 58-year-old man presents to the Emergency Department (ED) with a history of left-sided chest pain on exertion. He has a 30-pack-year history of smoking.

On examination, he has a blood pressure (BP) of 98/65 mmHg. His pulse is 88 beats per minute (bpm) and his respiratory rate is 14 breaths per minute. There is a delayed carotid upstroke, sustained apex beat, normal 1st heart sound, the aortic component of the 2nd heart sound is soft. and the 4th heart sound is audible.

Investigations reveal the following:

Investigation	Result
Electrocardiogram (ECG)	Left ventricular hypertrophy
Chest X-ray (CXR)	Normal
Echocardiography (ECHO)	Calcific aortic stenosis with valve surface area of 0.5 cm ² and peak systolic gradient of 90 mmHg

The patient undergoes coronary angiography that reveals 80% stenosis in the proximal left anterior descending (LAD) artery.

Which of the following is the best management option for this patient?

Your answer was incorrect

- A Balloon aortic valvotomy plus angioplasty and stenting of the LAD
- B Angioplasty and stenting of the LAD followed by aortic valve replacement (AVR)
- C AVR and bypass grafting of the LAD using the left internal mammary artery (LIMA)
- D AVR and LAD bypass grafting using saphenous vein graft
- E Saphenous vein grafting followed by balloon valvotomy

Explanation



- C AVR and bypass grafting of the LAD using the left internal mammary artery (LIMA)

This patient has severe symptomatic aortic stenosis, which is an indication for aortic valve replacement. He also has LAD stenosis. As the patient is to have AVR, a concomitant bypass grafting of the LAD using the LIMA is the most appropriate option. The long-term patency of the LIMA is superior to that of a saphenous vein graft.

B Angioplasty and stenting of the LAD followed by aortic valve replacement (AVR)

This combines two separate treatment episodes, when both the CABG and valve replacement can be carried out in one operation, with superior outcomes.

A Balloon aortic valvotomy plus angioplasty and stenting of the LAD

This potentially combines two inferior approaches, both with respect to fixing the aortic valve stenosis and relieving myocardial ischaemia.

D AVR and LAD bypass grafting using saphenous vein graft

Outcomes are slightly less good when a vein graft rather than a LIMA graft is employed.

E Saphenous vein grafting followed by balloon valvotomy

Saphenous vein grafting is inferior to LIMA grafting, and balloon valvotomy is inferior to surgical valve replacement.

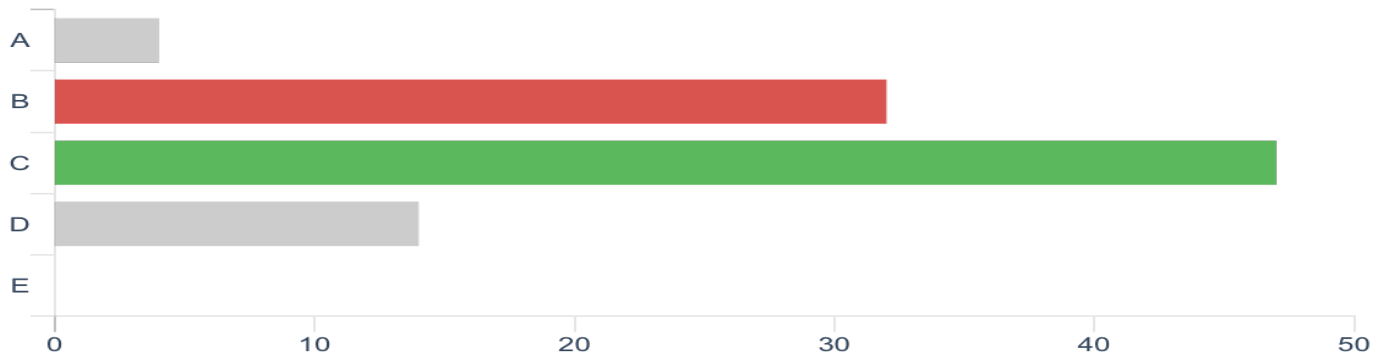
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Responses Correct:	14
Responses Incorrect:	58
Responses Total:	72
Responses - % Correct:	19%



Q73

A 55 year old Indian man, who is known to have ankylosing spondylitis (AS), is referred to the Cardiology Clinic by his General Practitioner (GP) for evaluation of a murmur. The patient has no history of chest pain, orthopnoea, paroxysmal nocturnal dyspnoea, pedal oedema or abdominal swelling. He is a lifelong non-smoker, has no family history of premature coronary artery disease, and his lipid profile is normal. Apart from AS, he has no other past medical history of note. He takes no medications apart from occasional diclofenac for his back pain.

On examination, he has a blood pressure of 140/50 mmHg. He has a bounding pulse of 88 beats per minute (bpm), no jugular venous distension (JVD), apex beat at the 6th intercostal space that is diffuse and hyperdynamic, and a diastolic murmur at the left sternal edge. The lung fields are clear on auscultation and there is no pedal oedema.

An echocardiogram (ECHO) reveals severe aortic regurgitation (AR) and an ejection fraction (EF) of 45%.

What is the most appropriate management for this patient?

Your answer was incorrect

- A Start nifedipine and repeat echocardiography after 6 months
- B Start enalapril and repeat echocardiography after 6 months
- C Start enalapril and repeat echocardiography after 3 months
- D Start bisoprolol and repeat echocardiography after 3 months
- E Aortic valve replacement

Explanation



- E Aortic valve replacement

All symptomatic patients with severe AR should have AVR. Asymptomatic patients with severe AR should also undergo AVR if they have depressed left ventricular (LV) function (ejection fraction (EF) <55%) or if they have severe LV dilatation (end-diastolic dimension >70 mm and end-systolic dimension >50 mm). Similarly patients with severe AR undergoing coronary artery bypass grafting or surgery on the aorta or any other valve should have AVR at the time of surgery.

D Start bisoprolol and repeat echocardiography after 3 months

Conventional teaching suggests that because beta blockade is not appropriate in the treatment of AR, this is best avoided here. Retrospective data do, however, suggest a mortality benefit associated with beta blockade, such that the contra-indication for beta blockade in AR may be challenged in the future.

A Start nifedipine and repeat echocardiography after 6 months

Although vasodilators, including nifedipine, may be useful in the management of lesser degrees of AR, in severe disease a trial of nifedipine will not significantly improve symptoms.

B Start enalapril and repeat echocardiography after 6 months

Although enalapril will have a positive impact on LV function and potentially reduce further valve deterioration, the patient has already reached the point where valve replacement is the only potential intervention.

C Start enalapril and repeat echocardiography after 3 months

By this stage of valve deterioration, reducing pre-load with enalapril has little impact and delaying 3 months only prolongs the patient's symptoms whilst awaiting definitive intervention.

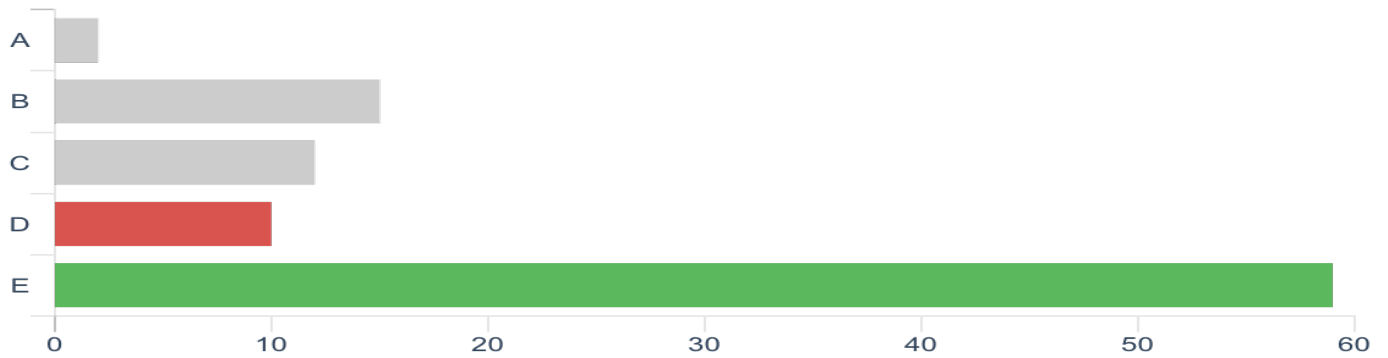
7433

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Responses Incorrect:	59
Responses Total:	73
Responses - % Correct:	19%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q74

A 26-year-old man is referred to the Cardiology Clinic by his General Practitioner (GP) for an electrocardiogram (ECG) abnormality discovered on routine pre-employment check-up. The ECG reveals a prolonged QT interval (QTcF) of 0.52 s. The patient has no history of palpitations or syncope and has no family history of sudden cardiac death. The physical examination is unremarkable and blood chemistry shows normal levels of potassium and magnesium. The patient is not taking any drugs and leads a sedentary life. An exercise test does not reveal shortening of the QT interval with increased heart rate.

What is the best management for this patient?

Your answer was incorrect

- A Left stellate cardiac ganglionectomy
- B Atenolol 50 mg a day
- C Dual chamber pacemaker
- D Implantable cardioverter defibrillator (ICD)
- E Implantable cardioverter defibrillator (ICD) and atenolol

Explanation



- B Atenolol 50 mg a day

Beta blockers are the mainstay of therapy for asymptomatic, as well as symptomatic, patients with idiopathic long QT syndrome. Beta blockers decrease sympathetic activation from the left stellate ganglion (which drives QT prolongation). They also decrease the maximal heart rate achieved during exertion and thereby prevent exercise-related arrhythmic events that occur in long QT syndrome.

- D Implantable cardioverter defibrillator (ICD)

An ICD isn't usually used as a single intervention in managing long QT syndrome, but may be implanted in conjunction with starting of beta blocker therapy in very high-risk patients.

A Left stellate cardiac ganglionectomy

Left stellate cardiac ganglionectomy is an invasive procedure and results in Horner syndrome. It is performed in patients who have symptoms despite beta blockers and have frequent shocks with ICD.

C Dual chamber pacemaker

Dual-chamber pacing might be beneficial in the subset of patients with long QT syndrome type 3 (resulting from a mutation in the alpha subunit of the sodium channel).

E Implantable cardioverter defibrillator (ICD) and atenolol

In a patient without history of collapse, atenolol as a single intervention is appropriate. In asymptomatic patients with prolonged QTc > 500 ms who have specific genetic mutations: KCNH2 or SCN5A, should have ICD considered as well as beta blocker therapy. These mutations are especially pathogenic. Without this being listed in the question, we have to assume that this patient does not have either of these mutations.

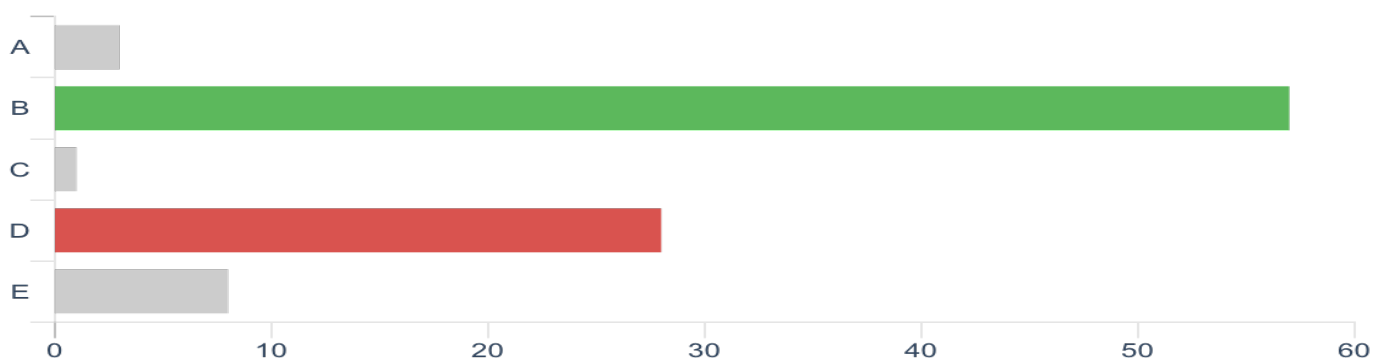
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Responses Correct:	14
Responses Incorrect:	60
Responses Total:	74
Responses - % Correct:	19%



Q75

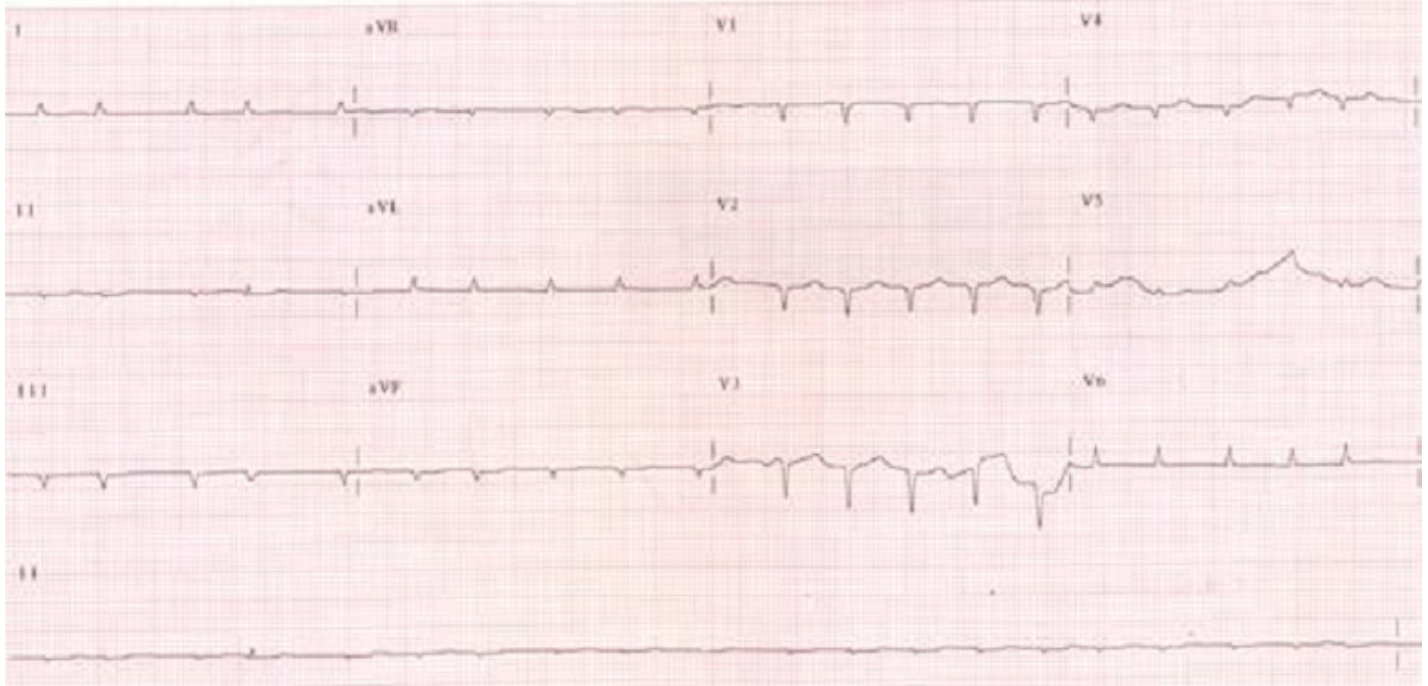
A 55-year-old man presents to the Cardiology Clinic with a history of progressive swelling of his feet of three months duration. He has also noticed gradually increasing abdominal distension. He has no history of chest pain, orthopnoea or paroxysmal nocturnal dyspnoea. He has been diabetic for the past two years, which is well controlled on metformin 850 mg which he takes twice a day.

On examination, his pulse is 85 beats per minute (bpm). His blood pressure is 115/95 mmHg with a systolic postural drop of 20 mmHg and jugular venous distension (JVD). His heart sounds are normal and the chest is clear on auscultation. The liver edge is palpable 3 cm below the costal margin. There is bilateral pitting oedema up to the knees.

Investigations reveal the following:

Investigation	Result	Normal Value
White cell count (WCC)	$10.0 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Haemoglobin (Hb)	125 g/l	135-175 g/l
Platelets (PLT)	$165 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	138 mmol/l	135-145 mmol/l
Potassium (K^+)	4.0 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	129 mmol/l	50-120 μ mol/l
Urea	3.8 mmol/l	2.5-6.5 mmol/l
Corrected calcium (Ca^{2+})	2.32 mmol/l	2.20-2.60 mmol/l
Chest X-ray (CXR)	Normal cardiothoracic ratio and clear lung fields	

The results of an electrocardiogram (ECG) is shown below:



This shows mild dilatation of the atria, concentric left ventricular thickening, impaired diastolic relaxation and an ejection fraction of 55%.

Which of the following is the most likely diagnosis in this patient?

Your answer was incorrect

- A Cardiac amyloidosis
- B Haemochromatosis
- C Cardiac sarcoidosis
- D Diabetic nephropathy
- E Ischaemic cardiomyopathy

Explanation



- A Cardiac amyloidosis

Cardiac amyloidosis most commonly presents as restrictive cardiomyopathy. The clinical findings are those of right heart failure, i.e. jugular venous distension and peripheral oedema, whereas orthopnoea and paroxysmal nocturnal dyspnoea are typically absent. In more advanced stages, systolic dysfunction also occurs. Postural hypotension can occur as a result of poor ventricular filling or associated autonomic neuropathy. The combination of low-voltage ECG and thickened ventricular walls is one of the characteristic features of cardiac

amyloidosis. Other echocardiographic abnormalities include atrial dilatation, thickened interatrial septum, diastolic dysfunction and small-volume ventricles. The most distinctive feature of cardiac amyloidosis is a sparkling, granular appearance of the myocardium, but this is a relatively insensitive feature occurring only in about 25% of cases.

D Diabetic nephropathy

Although this causes peripheral oedema, it wouldn't account for the ECG and ECHO findings seen here.

B Haemochromatosis

Haemochromatosis can cause a restrictive cardiomyopathy, but the combination of ventricular wall thickness and low-voltage ECG makes the diagnosis of cardiac amyloidosis more likely. There are also no other features in the scenario, apart from diabetes, to suggest haemochromatosis, and the condition is much rarer in patients of African origin.

C Cardiac sarcoidosis

Like haemochromatosis, sarcoidosis is associated with a restrictive cardiomyopathy, although there is an absence of other features suggestive of sarcoidosis, including a dry cough or hypercalcaemia.

E Ischaemic cardiomyopathy

There is no history of previous ischaemic heart disease to suggest a diagnosis of ischaemic cardiomyopathy.

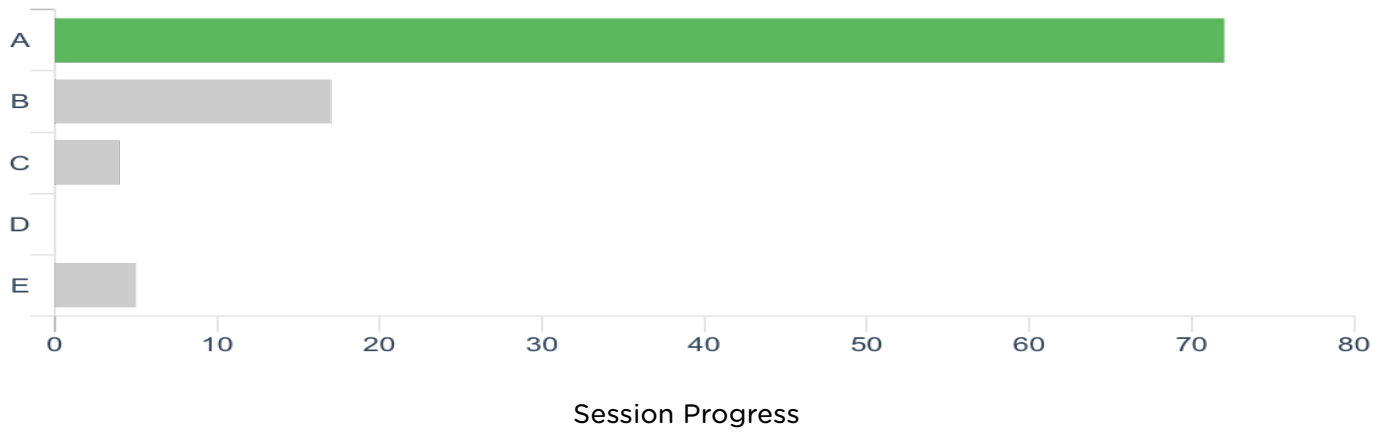
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Responses Correct:	14
Responses Incorrect:	61
Responses Total:	75
Responses - % Correct:	19%



Q76

A 56-year-old man presents to the Outpatient Clinic for evaluation prior to his coronary angiography that is scheduled for the next day. The patient has had diabetes mellitus for eight years and is currently taking metformin 500 mg three times per day and gliclazide 40 mg twice a day. He had suffered from recent onset of chest discomfort on exertion, and on a treadmill test was found to be positive for stress-induced ischaemia. He is currently taking clopidogrel 75 mg per day, atenolol 50 mg per day, indapamide 2.5 mg and fosinopril 10 mg per day.

On examination, his pulse is 62 beats per minute (bpm). His blood pressure is 105/65 mmHg and he has jugular venous distension (JVD) up to 2 cm above the sternomanubrial angle. His heart sounds are normal and his chest is clear on auscultation. An electrocardiogram (ECG) reveals T-wave inversion in leads I and aVL.

In order to protect his kidneys, which of the following medications should be stopped for 24 hours prior to his coronary angiography?

Your answer was incorrect

- A Metformin
- B Indapamide
- C Clopidogrel
- D Atenolol
- E Gliclazide

Explanation



- A Metformin

About 5% of patients undergoing cardiac catheterisation experience contrast-induced renal dysfunction. Patients with diabetes and prior renal dysfunction are at increased risk. Renal impairment increases the risk of accumulation of metformin and lactic acidosis. Therefore, metformin should be stopped prior to coronary angiography and reinstated 48 h after the procedure if renal function is found to be normal. Although recent data on acute angioplasty have not supported any risk associated with metformin therapy and angioplasty, the guidelines recommending cessation of therapy for elective angioplasty persist.

D Atenolol

Myocardial oxygen demand may increase at the time of elective angiography, and atenolol can reduce the risk of peri-procedural ischaemia.

B Indapamide

Although diuretics need not necessarily be discontinued, adequate hydration is essential before angiography.

C Clopidogrel

Aspirin and clopidogrel are important adjuncts to any percutaneous coronary intervention that might be done during coronary angiography.

E Gliclazide

Although continuing the gliclazide may increase the risk of hypoglycaemia, as long as the patient is eating it need not be discontinued.

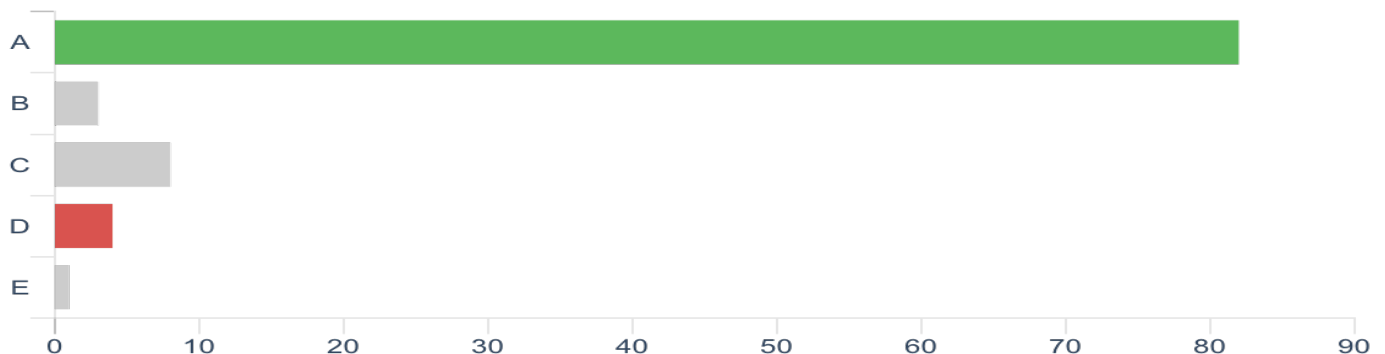
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Responses Incorrect:	62
Responses Total:	76
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External Links

Contrast-induced nephropathy following angiography and cardiac interventions

heart.bmj.com/content/early/2016/02/08/heartjnl-2014-306962

(<http://heart.bmj.com/content/early/2016/02/08/heartjnl-2014-306962>)



Q77

A 45-year-old man was diagnosed with idiopathic dilated cardiomyopathy eight years ago. Two months ago he was admitted to the Emergency Department (ED) with decompensated congestive heart failure (CHF). An echocardiogram (ECHO) performed at that time revealed an ejection fraction of 20%. He was discharged on furosemide 60 mg (morning) and 40 mg in (afternoon), enalapril 10 mg twice daily and digoxin 125 mcg daily.

He now presents to the ED with progressively increasing swelling of the lower limbs and shortness of breath over one week.

On examination, his blood pressure is 130/90 mmHg. His heart rate is 105 beats per minute (bpm). He has jugular venous distension (JVD), a third heart sound gallop, and diffuse crackles all over the chest. He improves after receiving morphine 5 mg and two boluses of furosemide 60 mg intravenously. An electrocardiogram (ECG) reveals sinus tachycardia.

Investigations reveal the following:

Investigation	Result	Normal Value
Sodium (Na ⁺)	122 mmol/l	135-145 mmol/l
Potassium (K ⁺)	3.7 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	130 mmol/l	50-120 µmol/l
Chloride (Cl ⁻)	92 mmol/l	98-106 mmol/l
Bicarbonate (HCO ₃ ⁻)	21 mmol/l	24-30 mmol/l

Which of the following is the most appropriate step in correcting this patient's hyponatraemia?

Your answer was incorrect

- A Fluid restriction
- B Stop furosemide
- C Administer hypertonic saline
- D Start lithium 100 mg TID
- E Administer normal saline

Explanation



A Fluid restriction

Hyponatraemia is a frequent finding in patients with advanced heart failure and is associated with poor outcomes in terms of both morbidity and mortality. Patients with congestive heart failure (CHF) have decreased cardiac output and effective blood circulating volume. This results in activation of the renin-angiotensin system and release of antidiuretic hormone (ADH) in an attempt to preserve blood pressure, and subsequent retention of water and sodium. The overall effect is one of raised total sodium, but disproportionately increased total body water, leading to dilutional hyponatraemia.

Fluid restriction is the first-line and mainstay of therapy in hyponatraemic patients with CHF, though compliance with strict restriction of 1 l/day can limit the efficacy of this approach. Daily weights are recommended to assess response to therapy, and it may take several days of fluid restriction before meaningful progress is seen.

ESC guidelines in the management of heart failure suggest that AVP antagonists such as tolvaptan can also be considered in the management of hyponatraemic patients with volume overload. In refractory or severe cases, IV inotropic support and/or ultrafiltration can be considered.

C Administer hypertonic saline

It is inadvisable to provide additional fluid loading to a patient who is overloaded in the absence of symptomatic hyponatraemia.

B Stop furosemide

As per ESC guidelines, in the context of heart failure and volume overload, furosemide should be increased, not withheld.

D Start lithium 100 mg TID

The use of lithium is limited by significant cardiac and renal side effects and does not represent the most appropriate pharmacological management of hyponatraemia; AVP antagonists such as tolvaptan are preferred agents.

E Administer normal saline

It is inadvisable to provide additional fluid loading to a patient who is overloaded in the absence of symptomatic hyponatraemia.

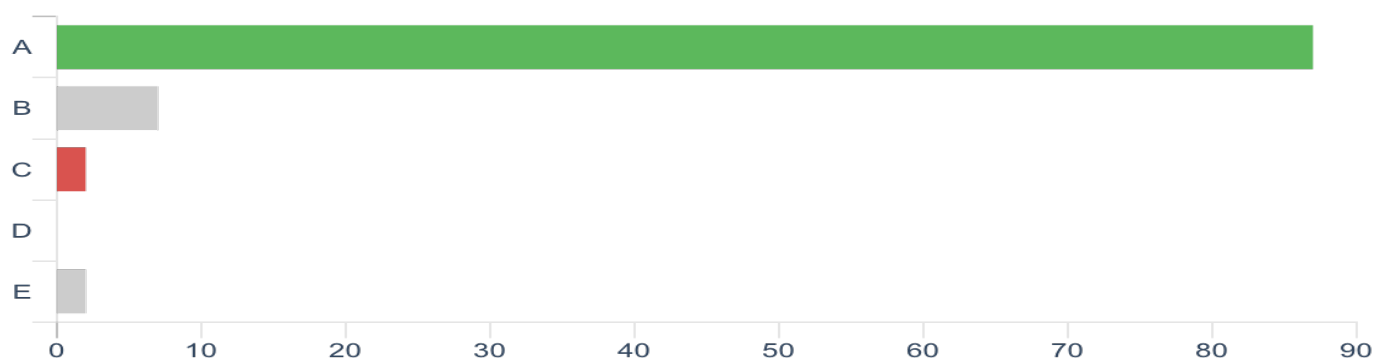
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Responses Total:	77
Responses - % Correct:	18%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q78

A 45-year-old woman presents to the Emergency Department (ED) with a history of severe retrosternal chest pain of one day's duration. The pain radiates to the back and left shoulder and increases with inspiration, coughing and changes in body posture.

On examination, her blood pressure is 105/85 mmHg and her heart rate is 110 beats per minute (bpm). Her respiratory rate is 22 breaths per minute. Her temperature is 38.1 °C. Her heart sounds are normal and a friction rub is heard during expiration.

An electrocardiogram (ECG) reveals ST segment elevation in both limb and chest leads and ST segment depression in aVR. She has a white cell count (WCC) of 14,000/ml, with left shift and erythrocyte sedimentation rate (ESR) of 55 mm in the first hour. A chest X-ray (CXR) is unremarkable. She responds well over the next few days to ibuprofen 800 mg four times per day and is discharged home.

She presents five months later with low-grade fever and chest pain. She describes similar symptoms three months after the initial episode that responded to ibuprofen which she self-administered. She is started on ibuprofen again and work-up for autoimmune screening is requested, which turns out to be negative. However, despite seven days therapy with ibuprofen, she experiences bouts of chest pain.

What is the next step recommended in the management of this patient?

Your answer was incorrect

- A Pericardial biopsy
- B Prednisolone
- C Pericardectomy
- D Colchicine
- E Cyclosporin

Explanation



- D Colchicine

Between 15 and 30% of patients with apparently idiopathic acute pericarditis may have recurrent attacks, and this is considered to be an autoimmune phenomenon. Colchicine is useful both in acute episode and to prevent recurrence of pericarditis.

C Pericardectomy

Pericardectomy is only indicated for recurrent pericarditis once medical interventions have failed.

A Pericardial biopsy

Pericardial biopsy in patients with recurrent pericarditis without effusion is unlikely to be revealing and is not needed.

B Prednisolone

Prednisolone can be considered in patients who fail to respond to non-steroidal anti-inflammatory drug and colchicine therapy. It is reserved for patients who fail to respond to initial intervention because of the adverse effects of steroid therapy including weight gain, loss of bone mineral density and dysglycaemia.

E Cyclosporin

Cyclosporine is used in the treatment of recurrent pericarditis post-transplant, but colchicine is preferred as a first-line agent in the non-transplant setting.

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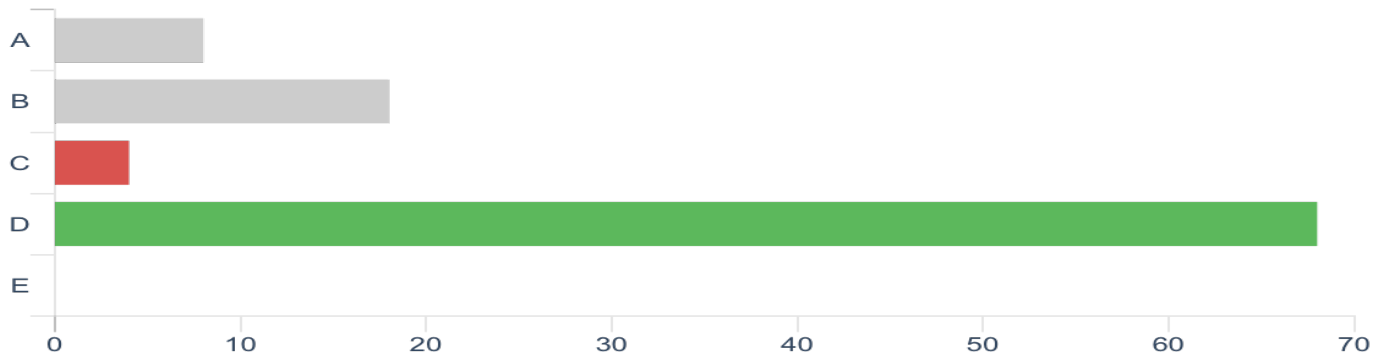
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Responses Total:	78
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Q79

A 38-year-old man has been found to have elevated blood pressure (BP) on several occasions over the last three months. His systolic BP has been around 155 mmHg and his diastolic BP around 95 mmHg. He has five-pack-year history of smoking and consumes 3-4 units of alcohol per day. He has no personal or family history of coronary artery disease, stroke or diabetes. His weight is 93 kg and height 162 cm, and the rest of physical examination is unremarkable. An electrocardiogram (ECG) and chest X-ray (CXR) are normal.

Investigations reveal the following:

Investigation	Result	Normal Value
Cholesterol	5.2 mmol/l	< 5.2 mmol/l
High-density lipoprotein (HDL)	1 mmol/l	> 1.0 mmol/l
Triglycerides	2.9 mmol/l	< 1.5 mmol/l
Sodium (Na ⁺)	140 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.1 mmol/l	3.5-5.0 mmol/l
Bicarbonate (HCO ₃ ⁻)	26 mmol/l	24-30 mmol/l
Chloride (Cl ⁻)	104 mmol/l	98-106 mmol/l
Creatinine (Cr)	93 mmol/l	50-120 µmol/l

You have advised him about lifestyle modification.

Which of the following lifestyle modifications will produce the most reduction in BP?

Your answer was incorrect

- A Weight reduction to 83 kg
- B Diet rich in fruits and vegetables and low in fat
- C Moderation of alcohol consumption
- D Reduce dietary sodium to less than 6 g/day

E Regular exercise without significant weight reduction

Explanation



A Weight reduction to 83 kg

This patient has mild hypertension (systolic BP 140–159 mmHg, diastolic BP 90–99 mmHg) and has no evidence of target organ damage. The British Hypertensive Society does not recommend starting antihypertensive therapy in such patients, but lifestyle modifications should be encouraged. Of all the lifestyle modifications described, weight reduction produces the greatest reduction in BP. A 10 kg weight loss is expected to decrease BP by 15–20 mmHg; the effect of other lifestyle modifications on hypertension, as mentioned in the other options, is less than this.

D Reduce dietary sodium to less than 6 g/day

This measure will only reduce the blood pressure by 2–8 mmHg.

B Diet rich in fruits and vegetables and low in fat

This will only reduce the blood pressure by 8–14 mm Hg.

C Moderation of alcohol consumption

This is defined as less than 14 units a week for both men and women. It will only reduce the blood pressure by 2.5–4.0 mmHg.

E Regular exercise without significant weight reduction

This measure will only reduce the blood pressure by 4–9 mmHg.

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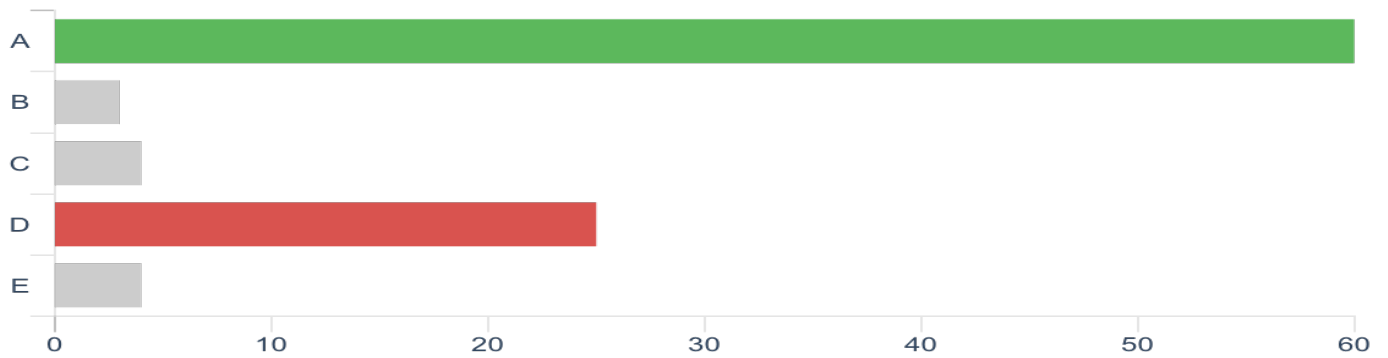
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Responses Total:	79
Responses - % Correct:	18%

 Expanded Explanation**Overview****Clinical Presentation****Diagnosis / Investigation****Management****Prognosis**

Q80

A 54-year-old Indian immigrant presents to the Emergency Department (ED) with rapidly progressive dyspnoea that has lasted for three hours duration. He is a known hypertensive, on atenolol 50 mg per day, and hyperlipidaemic, on simvastatin 20 mg per day. He has type II diabetes for which he takes metformin and glicazide. The patient states that he had a similar episode in India four months ago.

On examination, he appears breathless, and is using the accessory muscles of respiration. His blood pressure is 185/110 mmHg, while his heart rate 114 beats per minute (bpm). His respiratory rate is 28 breaths per minute. He has raised jugular venous pressure (JVP), summation gallop, and inspiratory crackles all over the chest.

Investigations reveal the following:

Investigation	Result	Normal Value
Electrocardiogram (ECG)	Sinus tachycardia with left ventricular hypertrophy and strain pattern, antero-lateral ST-segment depression	
ECHO	No acute valvular abnormalities noted	
pH	7.38	7.35–7.45
p(CO ₂)	4.5 kPa	4.6–6.0 kPa
p(O ₂)	10 kPa	10.5–13.5 kPa
O ₂ saturation	93%	
White cell count (WCC)	14.0 × 10 ⁹ /l	4.0–11.0 × 10 ⁹ /l
Haemoglobin (Hb)	120 g/l	135–175 g/l
Platelets (PLT)	188 × 10 ⁹ /l	150–400 × 10 ⁹ /l
Sodium (Na ⁺)	138 mmol/l	135–145 mmol/l
Potassium (K ⁺)	4.5 mmol/l	3.5–5.0 mmol/l

Creatinine (Cr)	112 µmol/l	50-120 µmol/l
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What is the most likely cause of this patient's symptoms?

Your answer was incorrect

- A Acute aortic regurgitation
- B Bilateral renal artery stenosis
- C Myocardial ischaemia
- D Community-acquired pneumonia
- E Pulmonary embolism

Explanation

- C Myocardial ischaemia

This patient has presented with rapidly worsening dyspnoea and clinical findings namely, tachycardia, raised jugular venous pressure (JVP), gallop rhythm and inspiratory crackles, which suggest acute pulmonary oedema. Rapidly developing pulmonary congestion, as in this patient, is also termed flash pulmonary oedema. The most common cause of flash pulmonary oedema is myocardial ischaemia. He has three risk factors for coronary artery disease - hypertension, high cholesterol and diabetes - and therefore he should be evaluated for it.

- B Bilateral renal artery stenosis

Bilateral renal artery stenosis can also present with a similar clinical picture but is a less common cause of flash pulmonary oedema. We would expect difficult-to-treat hypertension and different-sized kidneys on abdominal ultrasound in bilateral renal artery stenosis.

- A Acute aortic regurgitation

Aortic regurgitation can cause acute heart failure with flash pulmonary oedema, but is rare. There is no history to suggest the presence of aortic regurgitation. The echocardiographic findings do not include a regurgitant aortic valve.

D Community-acquired pneumonia

Clinical findings are not in favour of community-acquired pneumonia. Typical findings we would expect include a fever, raised white cell count, crepitations in one lung lobe and JVP would not be raised.

E Pulmonary embolism

Clinical findings are not in favour of pulmonary embolism. Typical findings we would expect include haemoptysis and pleuritic chest pain. There may be signs of risk factors such as swollen calves to suggest deep vein thrombosis.

7457

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Responses Correct:	14
Responses Incorrect:	66
Responses Total:	80

Responses - % Correct:

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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis

Links to NICE guidelines/CKS



Q81

A 55-year-old woman is admitted to the Emergency Department (ED) for the second time in two months with an exacerbation of dyspnoea and peripheral oedema. She is known to have dilated cardiomyopathy, and echocardiography (ECHO) performed on previous admission revealed an ejection fraction of 25% and moderate mitral and tricuspid regurgitation. Her heart failure regimen includes furosemide 60 mg twice daily, digoxin 0.25 mg per day, enalapril 15 mg twice daily, carvedilol 12.5 mg twice daily, and spironolactone 50 mg/day. She has type II diabetes mellitus maintained on pioglitazone 15 mg twice daily. However, she had poor glycaemic control and was started on insulin lente 15 units twice daily and insulin lispro 5 units twice daily.

On examination, her blood pressure is 105/75 mmHg. Her pulse is 90 beats per minute (bpm). Her respiratory rate is 25 breaths per minute. She has jugular venous distension (JVD), bilateral inspiratory crackles halfway up the lung fields, and pitting oedema up to the knees. She improves on intravenous (IV) diuretics over the next three days.

Investigations reveal the following:

Investigation	Result	Normal Value
Sodium (Na ⁺)	135 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.5 mmol/l	3.5-5.0 mmol/l
Urea	8 mmol/l	2.5-6.5 mmol/l
Creatinine (Cr)	120 µmol/l	50-120 µmol/l
Glucose (random)	13 mmol/l	3.5-5.5 mmol/l
Electrocardiogram (ECG)	Sinus tachycardia and poor R-wave progression in chest leads	

What change in her regular medications should be made to decrease recurrent exacerbations of heart failure?

Your answer was correct

A Add hydrochlorothiazide

- B Decrease the dose of carvedilol to 6.25 mg twice daily
- C Discontinue pioglitazone
- D Stop carvedilol
- E Start warfarin 5 mg per day

Explanation



- C Discontinue pioglitazone

Thiazolidinediones can cause fluid retention and precipitate heart failure. Therefore, pioglitazone should be avoided in patients with symptomatic heart failure, especially those with New York Heart Association Class III and IV. Metformin should also be avoided in heart failure patients who require drug therapy because of increased risk of lactic acidosis.

Other drugs that should be avoided in heart failure include non-steroidal anti-inflammatory agents, cilostazol and sildenafil.

- A Add hydrochlorothiazide

Hydrochlorothiazide may be added if oedema is resistant to loop diuretics, but in this case the heart failure exacerbation has responded well so that it is not required.

- B Decrease the dose of carvedilol to 6.25 mg twice daily

There is no need to reduce the dose of carvedilol, as it improves morbidity and mortality in heart failure. It can cause fluid retention when initiated, but this should be managed by increasing the dose of diuretics.

- D Stop carvedilol

There is no need to discontinue carvedilol, as it improves morbidity and mortality in heart failure. It can cause fluid retention when initiated, but this should be managed by increasing the dose of diuretics.

- E Start warfarin 5 mg per day

In some patients, warfarin may be advocated in severe cardiomyopathy to prevent pulmonary embolism. However, it will not prevent recurrent heart failure episodes.

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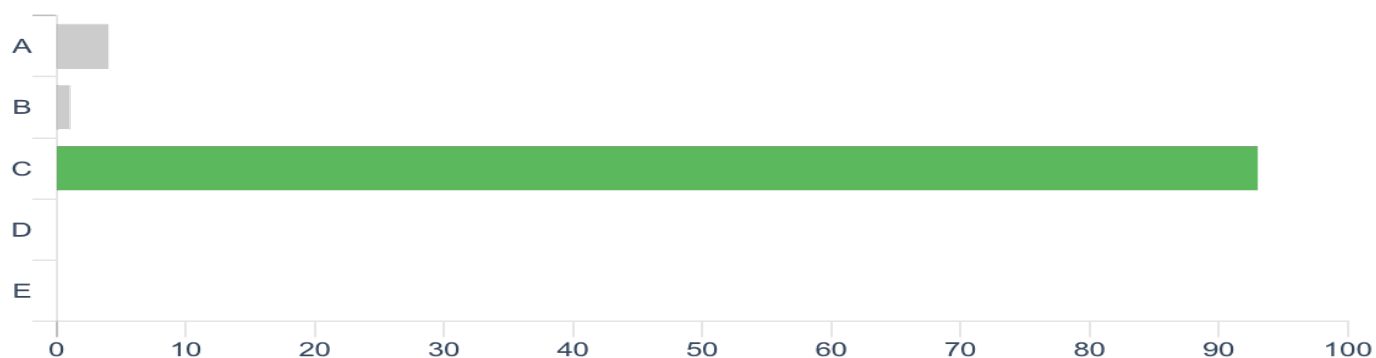
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Responses Total:	81
Responses - % Correct:	19%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q82

A 52-year-old man presents to the Emergency Department (ED) with a history of intermittent chest pain of three months' duration. The pain is perceived as a burning sensation, at times associated with epigastric fullness. It responds partially to antacids and for the last 10 days he has been taking lansoprazole 30 mg per day, but the frequency of chest pain has not decreased. He says it also sometimes comes on after exercise. The patient is a known hypertensive on indapamide 1.5 mg per day. He is a lifelong non-smoker and has no family history of premature coronary artery disease (CAD). A lipid profile checked a year ago was normal.

On examination, his body mass index is 29 kg/m². His blood pressure (BP) is 140/85 mmHg, while his pulse is 88 beats per minute (bpm). His respiratory rate is 12 breaths per minute. Examination of the cardiovascular system is normal.

Investigations reveal the following:

Investigation	Result	Normal Value
Sodium (Na ⁺)	135 mmol/l	135–145 mmol/l
Potassium (K ⁺)	4.5 mmol/l	3.5–5.0 mmol/l
Urea	8 mmol/l	2.5–6.5 mmol/l
Creatinine (Cr)	120 µmol/l	50–120 µmol/l
Haemoglobin (Hb)	140 g/l	135–175 g/l
White cell count (WCC)	10.0 × 10 ⁹ /l	4.0–11.0 × 10 ⁹ /l
Cardiac markers	Normal	
Chest X-ray (CXR)	Normal	
Electrocardiogram (ECG)	Right bundle branch block (also seen in ECGs performed a year ago).	

What is the next best step in the evaluation of this patient?

Your answer was incorrect



- A 24 h oesophageal PH monitoring
- B Thallium myocardial perfusion imaging
- C Dobutamine stress echocardiography
- D Exercise electrocardiography
- E Oesophagoscopy

Explanation



- B Thallium myocardial perfusion imaging

This patient has an intermediate likelihood of coronary artery disease (CAD). His chest pain is atypical but as he is above 40 years and is hypertensive, he should be evaluated for coronary artery disease. Because exercise electrocardiography is not useful in this patient (see below), myocardial perfusion imaging is the preferred modality for evaluation of CAD. This patient has right bundle branch block. Exercise-induced ST segment depression in leads V_1 to V_4 is common in these patients, even in the absence of myocardial ischaemia. This reduces the specificity of stress electrocardiography as a diagnostic tool in such patients. When comparing dobutamine stress versus thallium scanning, thallium has greater sensitivity, versus greater specificity for dobutamine with respect to coronary artery disease. As such, in this case with intermediate-likelihood CAD, thallium is the preferred option rather than dobutamine stress echocardiography. You may like to refer to the reference below for further information.

- D Exercise electrocardiography

Exercise electrocardiography is not useful in patients with any of the following:

- conduction abnormalities
- resting electrocardiogram (ECG) abnormalities such as ST-segment depression of >1 mm
- Wolff-Parkinson-White syndrome
- those taking digitalis
- those with ventricular paced rhythm.

- A 24 h oesophageal PH monitoring

This patient might have gastro-oesophageal reflux disease; however, 24 h oesophageal pH monitoring cannot determine whether the symptoms are definitely caused by reflux or by myocardial ischaemia.

C Dobutamine stress echocardiography

Pharmacological stress in the form of dobutamine can be used in patients who are unable to exercise because of stroke, peripheral vascular disease or arthritis, although it should be avoided in WPW syndrome, patients with conduction abnormalities and those with ischaemia on resting ECG. When comparing dobutamine stress versus thallium scanning, thallium has greater sensitivity, versus greater specificity for dobutamine with respect to coronary artery disease. As such, in this case with intermediate-likelihood CAD, thallium is the preferred option rather than dobutamine stress echocardiography.

E Oesophagoscopy

This patient might have gastro-oesophageal reflux disease; however, oesophagoscopy cannot determine whether the symptoms are definitely caused by reflux or by myocardial ischaemia.

7461

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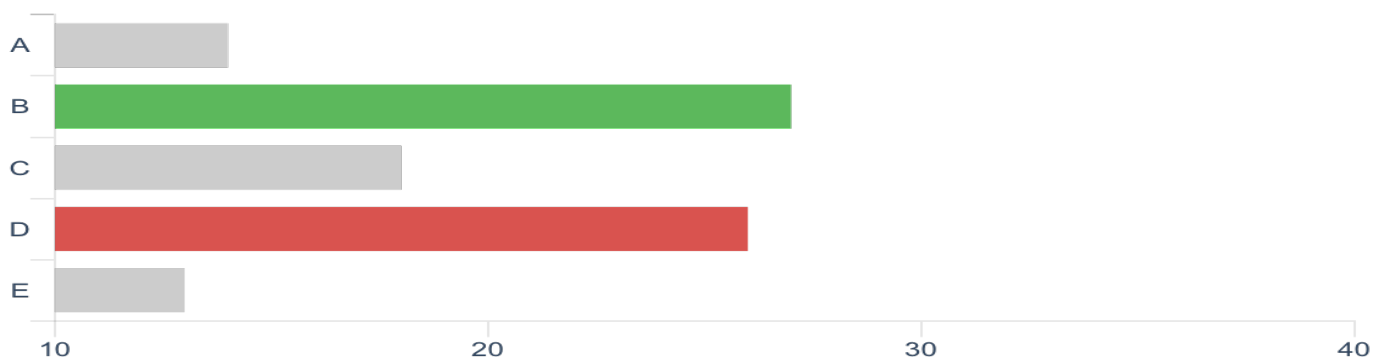
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Difficulty: Difficult

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Responses Correct:	15
Responses Incorrect:	67
Responses Total:	82
Responses - % Correct:	18%

External Links

Noninvasive evaluation of ischaemic heart disease

eurheartj.oxfordjournals.org/content/ehj/24/9/789.full.pdf

(<http://eurheartj.oxfordjournals.org/content/ehj/24/9/789.full.pdf>)

Expanded Explanation

Overview

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Links to NICE guidelines/CKS



Q83

A 27-year-old woman in the 12th week of pregnancy is referred to the Cardiology Clinic for an evaluation for progressively worsening exercise intolerance, fatigue, and dyspnoea.

On examination, she has a respiratory rate of 20 breaths per minute. Her blood pressure (BP) is 120/90 mmHg and her pulse is 91 beats per minute (bpm). She has jugular venous distension (JVD), left parasternal heave, a loud pulmonary component of the second heart sound, a pan-systolic murmur at the left sternal border, and pedal oedema up to the knees.

Investigations reveal the following:

Investigation	Result	Normal Value
White cell count (WCC)	$8.0 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Haemoglobin (Hb)	167 g/l	115-155 g/l
Platelets (PLT)	$150 \times 10^9/l$	$150-400 \times 10^9/l$
Electrocardiogram (ECG)	Right atrial and right ventricular hypertrophy	
Lung perfusion scintigraphy	No perfusion defects	
Pulmonary function test	Mild restrictive defect and a moderate decrease in diffusion capacity of carbon monoxide	
Echocardiography (ECHO)	Severe pulmonary hypertension with right ventricular systolic pressure of 80 mmHg and tricuspid regurgitation	

Intravenous (IV) injection of microbubbles does not show any intracardiac shunting.

Which of the following is most appropriate management step in this patient?

Your answer was incorrect

- A Heparin, bosentan and Caesarean section at 32 weeks of pregnancy
- B Heparin, furosemide and Caesarean section at 32 weeks of pregnancy

- C Warfarin, bosentan and induction of labour at 32 weeks of pregnancy
- D Warfarin, furosemide and Caesarean section at 32 weeks of pregnancy
- E Point out the risks to her own health of continuing with the pregnancy

Explanation



- E Point out the risks to her own health of continuing with the pregnancy

This patient has primary pulmonary hypertension (PPH). Severe pulmonary hypertension in pregnancy has a high mortality, approaching 50%, and therefore this patient should be advised about this risk versus considering a termination. Patients who opt against termination of pregnancy should be closely followed up and managed with anticoagulation, oxygen and pulmonary vasodilator therapy such as prostacyclin. The patient should be advised regarding contraception in future, but oral contraceptive pills should not be used for possible increased risk of thrombo-embolism.

- D Warfarin, furosemide and Caesarean section at 32 weeks of pregnancy

The use of frusemide during pregnancy should be avoided because placental perfusion can be reduced, and therefore there is a need for fetal growth monitoring if frusemide is used. It is contraindicated in breast feeding as it passes into the breast milk and may inhibit lactation.

- A Heparin, bosentan and Caesarean section at 32 weeks of pregnancy

Bosentan is teratogenic and should not be used in pregnancy.

- B Heparin, furosemide and Caesarean section at 32 weeks of pregnancy

The use of frusemide during pregnancy should be avoided because placental perfusion can be reduced, and therefore there is a need for fetal growth monitoring if frusemide is used. It is contraindicated in breast feeding as it passes into the breast milk and may inhibit lactation.

- C Warfarin, bosentan and induction of labour at 32 weeks of pregnancy

Bosentan and warfarin are teratogenic and should not be used in pregnancy.

7462

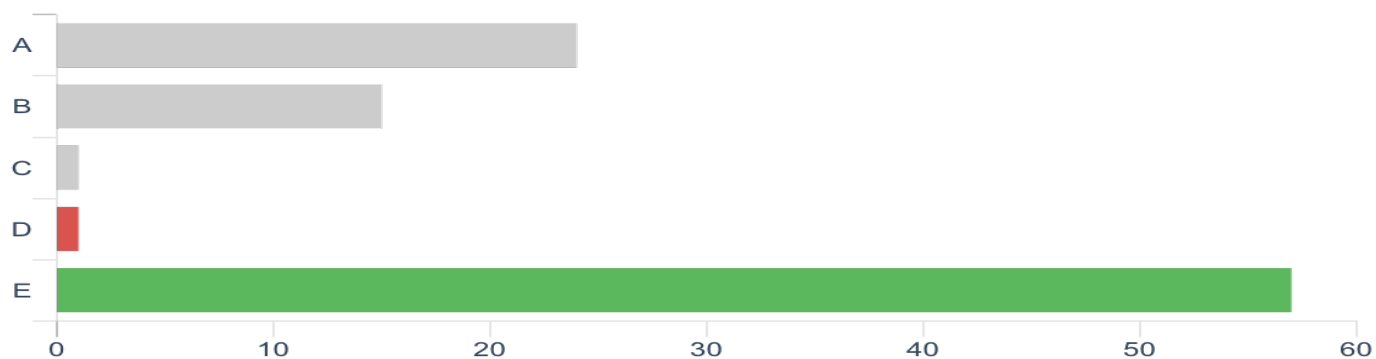
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Session Progress

Responses Correct:	15
Responses Incorrect:	68
Responses Total:	83
Responses - % Correct:	18%

Expanded Explanation

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Q84

A 68-year-old man with ischaemic cardiomyopathy presents to the Cardiology Clinic with worsening effort tolerance of three months duration. He becomes short of breath even after mild exertion. Five years ago he had an anterior myocardial infarction (MI). Coronary angiography at that time showed three-vessel disease, and he underwent coronary artery bypass grafting. His last echocardiography (ECHO) two months ago showed an ejection fraction of 20%. His current medications are: aspirin 75 mg, digoxin 125 mcg, furosemide 60 mg twice daily, lisinopril 10 mg/day, metoprolol 50 mg twice daily, simvastatin 20 mg/day and lansoprazole 30 mg daily.

On examination, his blood pressure (BP) is 105/65 mmHg. His pulse is 68 beats per minute (bpm). He has mild jugular venous distension (JVD), fine bibasal crepitations, and mild pedal oedema.

Investigations reveal the following:

Investigation	Result	Normal Value
White cell cells (WCC)	$8.0 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Haemoglobin (Hb)	131 g/l	135-175 g/l
Sodium (Na^+)	132 mmol/l	135-145 mmol/l
Potassium (K^+)	5.3 mmol/l	3.5-5.0 mmol/l
Chloride (Cl^-)	92 mmol/l	98-106 mmol/l
Bicarbonate (HCO_3^-)	26 mmol/l	24-30 mmol/l
Creatinine (Cr)	110 μ mol/l	50-120 μ mol/l
Electrocardiogram (ECG)	QRS > 120 ms. Left bundle branch block (LBBB)	
Angiogram	No vessel or graft amenable to intervention	

Which of the following interventions would be most likely to improve the patient's symptoms?

Your answer was incorrect

- A Hydralazine and isosorbide dinitrate
- B Biventricular pacing

- C Increase digoxin to 250 mcg/day
- D Spironolactone
- E Warfarin

Explanation



- B Biventricular pacing

Bundle branch blocks or intraventricular conduction delay (IVCD) causes ventricular dyssynchrony and reduce the cardiac contractile function. This leads to worsening of heart failure symptoms. Such patients have poorer exercise tolerance and worse prognosis compared to patients with normal sinus rhythm. Cardiac resynchronisation therapy by biventricular pacing improves left ventricular contractile function in patients with left bundle branch block (LBBB or IVCD, and thus improves symptoms. National Institute for Health and Care Excellence (NICE) guidelines recommend that cardiac resynchronisation therapy should be considered in patients with left ventricular ejection fraction less than 35%, drug-refractory symptoms and QRS duration >120 ms.

- C Increase digoxin to 250 mcg/day

Increasing serum digoxin in this patient, who has slightly raised serum creatinine, can lead to digoxin toxicity and is unlikely to improve symptoms.

- A Hydralazine and isosorbide dinitrate

Hydralazine and nitrates in combination are recommended in patients who do not tolerate angiotensin-converting enzyme inhibitors.

- D Spironolactone

Spironolactone has been shown to decrease hospitalisation and improve survival in patients with severe heart failure; however, this patient's serum potassium level is slightly higher than normal, and adding spironolactone in such cases can further increase the serum potassium to dangerous levels. That said, if there was no bundle branch block it would be an avenue worth exploring with regular U&E monitoring.

- E Warfarin

Patients with cardiomyopathy are at high risk of thromboembolism; warfarin may be prescribed to prevent systemic embolization, but it would be unlikely to improve this patient's symptoms because there is no indication that there is embolism. We would expect tachycardia, tachypnoea and pleuritic chest pain if pulmonary embolism was present.

7464

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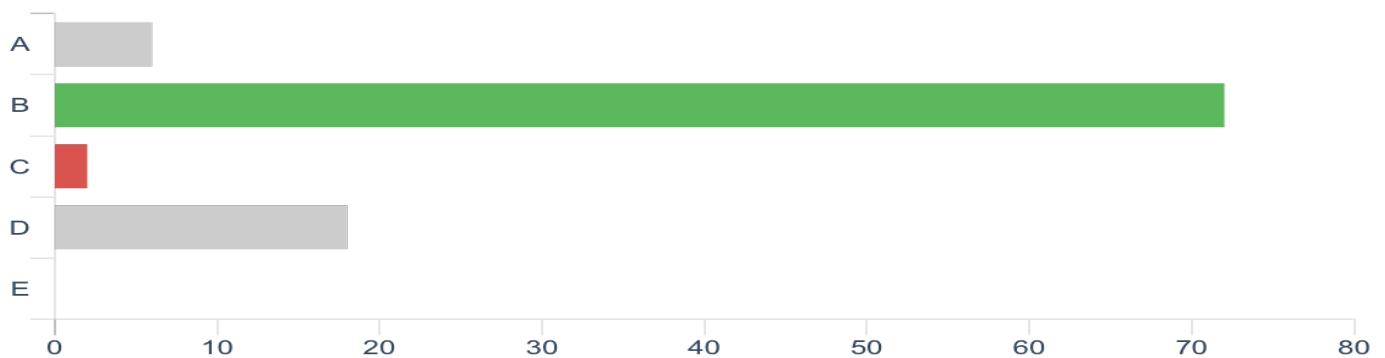
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Difficulty: Easy

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Session Progress

Responses Correct:	15
Responses Incorrect:	69
Responses Total:	84
Responses - % Correct:	18%

External Links

NICE. IVCD

[nice.org.uk/guidance/ta314](https://www.nice.org.uk/guidance/ta314)<https://www.nice.org.uk/guidance/ta314>

Expanded Explanation

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Links to NICE guidelines/CKS



Q85

A 72-year-old man presents to the Emergency Department (ED) with a history of passage of two black tarry stools over the last day. He is known to have idiopathic dilated cardiomyopathy and his current medications include lisinopril 20 mg/day, furosemide 40 mg twice daily, carvedilol 12.5 mg twice daily and warfarin 3 mg/day. He has never had any rhythm disturbances, stroke or history of venous or arterial thromboembolism. He has not used any painkillers recently but admits to drinking five to eight pints of beer per day. Other recent history includes two admissions to the casualty unit after falls. His last echocardiography three months ago revealed global hypokinesia and an ejection fraction of 18%.

On examination, his blood pressure is 98/48 mmHg. His pulse is 110 beats per minute (bpm) and his respiratory rate is 18 breaths per minute. There is no jugular venous distension (JVD), and lung fields are clear to auscultation. Per rectal examination reveals black stool.

Investigations reveal the following:

Investigation	Result	Normal Value
Haemoglobin (Hb)	110 g/l	135-175 g/l
Platelets (PLT)	$155 \times 10^9/l$	$150-400 \times 10^9/l$
International normalised ratio (INR)	2.8	< 1.1
Electrocardiogram (ECG)	Sinus tachycardia	
Chest X-ray (CXR)	Cardiomegaly with clear lung fields	

He is administered intravenous (IV) fluids, vitamin K, and fresh-frozen plasma. An upper gastrointestinal (GI) endoscopy shows a clean-based duodenal ulcer and no active bleeding. Biopsy specimen for *Helicobacter pylori* (*H. pylori*) is positive. The patient recovers well and is begun on eradication therapy for *H. pylori*.

What is the most appropriate step in managing the anticoagulation in this patient?

Your answer was incorrect

- A Restart warfarin therapy after confirming eradication of *H. pylori* with a target INR of 1.5-2.0
- B Restart warfarin therapy after one month with a target INR of 1.5 to 2
- C Restart warfarin therapy after one month with a target INR of 2-3

- D Restart warfarin therapy after confirming eradication of *H. pylori* with a target INR 2-3
- E Do not restart warfarin

Explanation



- E Do not restart warfarin

The objective of this question is to know the indications of anticoagulation in patients with heart failure. Anticoagulation should be considered for patients with heart failure and a low ejection fraction, particularly in those who have any of the following:

- A previous thromboembolic event
- Intracardiac thrombus
- Left ventricular aneurysm

He does, however, admit to relatively significant alcohol use, and two admissions to the casualty unit with falls, and therefore the benefit risk profile of warfarin use means it is probably not appropriate to continue therapy in this case, although the falls themselves may have been related to LV dysfunction/rhythm disturbance.

- A Restart warfarin therapy after confirming eradication of *H. pylori* with a target INR of 1.5-2.0

Due to the alcohol use and recurrent falls, restarting warfarin is high risk in this scenario.

- B Restart warfarin therapy after one month with a target INR of 1.5 to 2

Due to the alcohol use and recurrent falls, restarting warfarin is high risk in this scenario.

- C Restart warfarin therapy after one month with a target INR of 2-3

Due to the alcohol use and recurrent falls, restarting warfarin is high risk in this scenario.

- D Restart warfarin therapy after confirming eradication of *H. pylori* with a target INR 2-3

Due to the alcohol use and recurrent falls, restarting warfarin is high risk in this scenario.

7465

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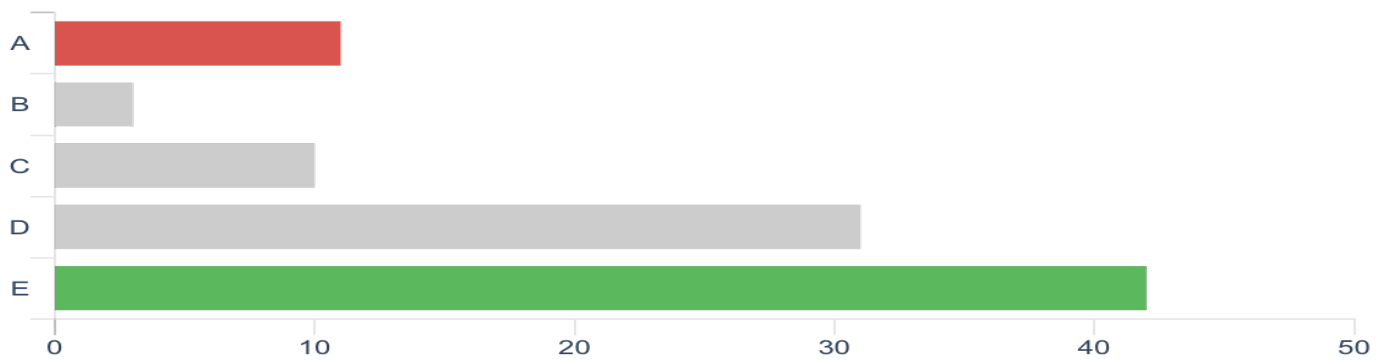
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Responses Correct:	15
Responses Incorrect:	70
Responses Total:	85
Responses - % Correct:	18%



Q86

A 63-year-old man with ischaemic cardiomyopathy presents for a follow-up visit to the Cardiology Clinic. He has been diabetic for the last five years and had an anterior myocardial infarction (MI) four years ago. Subsequent coronary angiography revealed three-vessel disease, and he underwent coronary artery bypass grafting. One year ago he was admitted with a history of palpitations, and electrocardiogram (ECG) showed atrial fibrillation (AF) but no ST segment changes. Serial cardiac enzymes were normal and echocardiography (ECHO) showed an ejection fraction of 23%. He was started on amiodarone and warfarin. Other medications include carvedilol 25 mg twice daily, foscinopril 20 mg once a day, furosemide 40 mg twice daily, digoxin 0.25 mg once a day and pravastatin 40 mg once a day. Over the last year he has had two recurrences of AF and a progressive deterioration in his exercise tolerance, although he can walk slowly to the bus stop.

On examination, his pulse is 68 beats per minute (bpm) and no evidence of fluid retention.

Investigations reveal the following:

Investigation	Result	Normal Value
Sodium (Na ⁺)	135 mmol/l	135–145 mmol/l
Potassium (K ⁺)	4.5 mmol/l	3.5–5.0 mmol/l
Urea	8 mmol/l	2.5–6.5 mmol/l
Creatinine (Cr)	70 µmol/l	50–120 µmol/l
Haemoglobin (Hb)	140 g/l	135–175 g/l
White cell count (WCC)	10.0 × 10 ⁹ /l	4.0–11.0 × 10 ⁹ /l
Digoxin Level	In therapeutic range	
Thyroid function tests	normal	
Electrocardiogram (ECG)	sinus rhythm with no QT prolongation	

Holter monitor	no evidence of atrial fibrillation but two episodes of non-sustained ventricular tachycardia (VT) each lasting 4 s and a few premature ventricular beats. The patient had no symptoms during the period of Holter monitoring	
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What is the next best step in management of this patient?

Your answer was incorrect

- A Discontinue amiodarone
- B Discontinue warfarin
- C Discontinue warfarin and amiodarone
- D Evaluation for implantable cardioverter defibrillator device (ICD)
- E Discontinue warfarin, amiodarone and digoxin

Explanation



- D Evaluation for implantable cardioverter defibrillator device (ICD)

Patients with heart failure are at increased risk of sudden cardiac death from ventricular arrhythmias. Implantable cardioverter defibrillator devices (ICD) are indicated for primary prevention of sudden cardiac death in patients who have history of prior myocardial infarction and all of the following:

- non-sustained ventricular tachycardia (VT)
- inducible arrhythmias on electrophysiological testing
- left ventricular ejection fraction of less than 35% and no worse than New York Heart Association Class III functional classification of heart failure.

ICD is also recommended in familial cardiac conditions with high risk of sudden cardiac death such as long QT syndrome, hypertrophic cardiomyopathy, Brugada syndrome, arrhythmogenic right ventricular dysplasia and following repair of tetralogy of Fallot.

- C Discontinue warfarin and amiodarone

This patient has paroxysmal atrial fibrillation and in the setting of left ventricular dysfunction he should continue to receive anticoagulation therapy. In addition, amiodarone can reduce the paroxysms of atrial fibrillation and is usually well tolerated in patients with heart failure.

A Discontinue amiodarone

Amiodarone can reduce the paroxysms of atrial fibrillation and is usually well tolerated in patients with heart failure.

B Discontinue warfarin

This patient has paroxysmal atrial fibrillation and in the setting of left ventricular dysfunction he should continue to receive anticoagulation therapy.

E Discontinue warfarin, amiodarone and digoxin

This patient has paroxysmal atrial fibrillation and in the setting of left ventricular dysfunction he should continue to receive anticoagulation therapy. In addition, amiodarone can reduce the paroxysms of atrial fibrillation and is usually well tolerated in patients with heart failure. Digoxin may help in rate control.

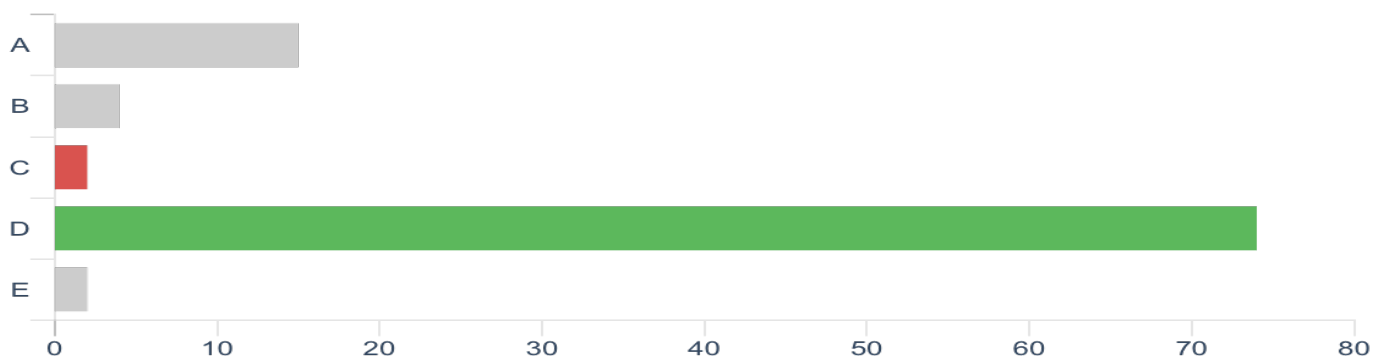
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Responses Incorrect:	71
Responses Total:	86
Responses - % Correct:	17%

Expanded Explanation

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Q87

A 38-year-old woman presents to the Cardiology Clinic with a history of progressive shortness of breath of three months duration. She gets short of breath on ordinary physical activity at home. She has also noticed swelling of the feet and abdomen.

On examination, her pulse is 96 beats per minute (bpm) and she has a regular blood pressure of 110/70 mmHg. Her respiratory rate is 20 breaths per minute. She has jugular venous distension (JVD), bibasilar inspiratory crepitations, diminished first heart sound, and widely split second heart sound with loud pulmonary component. A rumbling diastolic murmur is heard at the apex.

Investigations reveal the following:

Investigation	Result	Normal Value
Sodium (Na ⁺)	135 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.5 mmol/l	3.5-5.0 mmol/l
Urea	8 mmol/l	2.5-6.5 mmol/l
Creatinine (Cr)	70 µmol/l	50-120 µmol/l
Haemoglobin (Hb)	140 g/l	115-155 g/l
White cell count (WCC)	10.0 × 10 ⁹ /l	4.0-11.0 × 10 ⁹ /l
Electrocardiogram (ECG)	Left atrial hypertrophy, right ventricular hypertrophy and right axis deviation	
Chest X-ray (CXR)	Straightening of the left heart border and prominent pulmonary arteries and Kerley B lines	
Echocardiogram (ECHO)	Heavily calcified mitral leaflets, mitral area 0.9 cm ² and pulmonary hypertension	

What is the most appropriate management of this patient?

Your answer was incorrect



- A Observe and follow up in clinic in 2 weeks
- B Mitral valve replacement
- C Blood cultures and intravenous antibiotics
- D Medical therapy
- E Percutaneous mitral valvotomy

Explanation



- B Mitral valve replacement

This patient has severe symptomatic mitral stenosis and therefore should have either valvotomy or mitral valve replacement. Most of these patients can be managed with percutaneous mitral balloon valvotomy unless they have contraindications. Contraindications to percutaneous balloon valvotomy include:

- moderate to severe mitral regurgitation
- left atrial thrombus
- heavily calcified mitral valve
- concomitant coronary artery or other valve disease requiring surgery.

These patients should undergo mitral valve replacement.

- D Medical therapy

This patient has severe symptomatic mitral stenosis therefore surgery is in preference to medical therapy. Medical management is reserved for patients who are asymptomatic or mitral stenosis is not severe.

- A Observe and follow up in clinic in 2 weeks

This patient has severe symptomatic mitral stenosis and therefore to merely observe the patient will not suffice as symptoms will worsen.

- C Blood cultures and intravenous antibiotics

There is no suspicion of bacterial endocarditis therefore blood cultures and intravenous antibiotics is inappropriate. For bacterial endocarditis in addition to a new onset murmur there may be fever, Janeway lesions and Roth's spots.

E Percutaneous mitral valvotomy

This patient has a contraindication to valvotomy because she has a heavily calcified mitral valve.

7470

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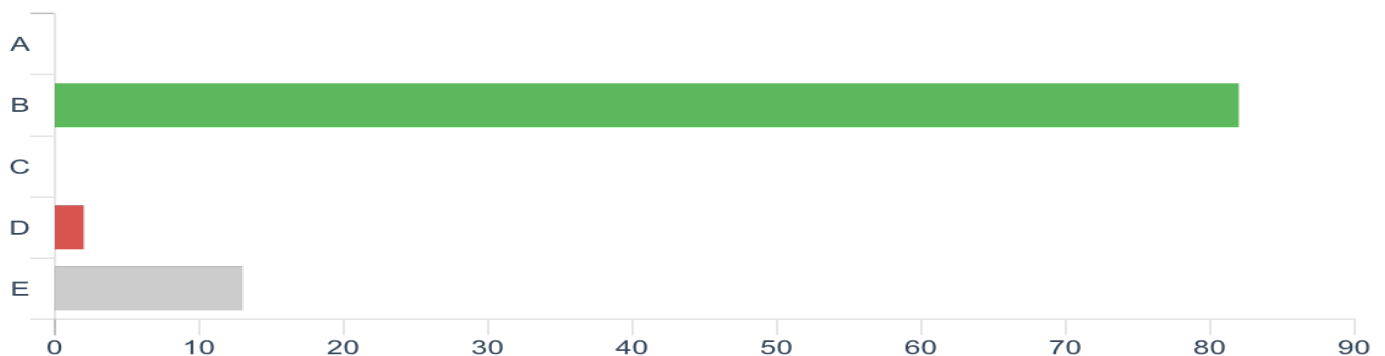
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Difficulty: Easy

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Responses Correct:	15
Responses Incorrect:	72
Responses Total:	87
Responses - % Correct:	17%



Q88

A 32-year-old man presents to the Cardiology Clinic with a history of cramping pain in his right calf of three months duration. Pain usually starts after walking a couple of blocks and forces him to stop. After stopping for few minutes, the pain is relieved. He is a lifelong non-smoker, and has no family history of cardiovascular disease. He consumes three to four units of alcohol every week.

On examination reveals an obese young male with absent right pedal pulse. He also has palmar and tuberous xanthomas. His ankle-brachial index is 0.6 on the right and 0.9 on the left.

Investigations reveal the following:

Investigation	Result	Normal Value
Electrocardiogram (ECG)	Normal	
Chest X-ray (CXR)	Normal	
White cell count (WCC)	$8.0 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Haemoglobin (Hb)	119 g/l with normal mean corpuscular volume and mean corpuscular haemoglobin	135-175 g/l
Platelets (PLT)	$188 \times 10^9/l$	$150-400 \times 10^9/l$
Serum cholesterol	8.2 mmol/l	< 5.2 mmol/l
Triglycerides	4.1 mmol/l	0.0-1.5 mmol/l
High-density lipoprotein (HDL)	1 mmol/l	> 1.0 mmol/l
Thyroid-stimulating hormone (TSH)	28 $\mu U/l$	0.17-3.2 $\mu U/l$
Total thyroxine	50 nmol/l	58-155 nmol/l

What is the most likely cause of his lipid abnormality?

Your answer was correct

- A Familial combined hyperlipidaemia
- B Hyperchylomicronaemia
- C Hypothyroidism
- D Dysbetalipoproteinaemia
- E Obesity

Explanation



- D Dysbetalipoproteinaemia

Palmar xanthomas are pathognomonic of dysbetalipoproteinaemia (type III hyperlipoproteinaemia). It is caused by mutation in apoprotein E, and transmitted as an autosomal recessive trait and usually requires a secondary exacerbating metabolic factor for expression of the phenotype. Therefore, secondary causes of hyperlipidaemia such as hypothyroidism, obesity, diabetes mellitus, renal insufficiency, high-calorie, high-fat diet or alcohol are often encountered at diagnosis, as in this patient who has hypothyroidism and obesity. Patients are predisposed to peripheral vascular disease and coronary artery disease. Lipid profile in these patients reveals elevated cholesterol and triglycerides while high-density lipoprotein (HDL) is normal and low-density lipoprotein (LDL) low. Definitive diagnosis can be made by lipoprotein electrophoresis or genotyping of apoprotein E. Treatment involves management of secondary causes, which in this case are hypothyroidism and obesity. Drug therapy can be employed if treatment of secondary causes yields unsatisfactory results.

- A Familial combined hyperlipidaemia

There is no palmar xanthomas in Familial combined hyperlipidaemia. This type of lipid disorder runs in families and is typified by high cholesterol levels, increased LDL and triglyceride concentrations, often accompanied by a decreased HDL. On lipoprotein electrophoresis there is hyperlipoproteinemia type IIB. It affects around one in 200 persons. Individuals who have coronary artery disease before age 60 years have this disorder.

- B Hyperchylomicronaemia

There is no palmar xanthomas in hyperchylomicronaemia. There is lipoprotein lipase deficiency, apolipoprotein (apo) CII deficiency or LPL inhibition. This syndrome is characterized by hyperchylomicronaemia, attacks of epigastric pain, recurrent pancreatitis

and the presence of eruptive xanthomas, may ultimately lead to necrotizing pancreatitis or pancreatic insufficiency. The treatment involves lifelong adherence to a low-fat diet to prevent hyperchylomicronaemia and its sequelae.

C Hypothyroidism

There is no palmar xanthomas in hypothyroidism. Hypothyroid patients have increased levels of total cholesterol and LDL. Hypothyroidism is a common cause of secondary dyslipidaemia.

E Obesity

There is no palmar xanthomas in obesity. Body mass index is positively correlated with triglyceride levels and negatively correlated with HDL cholesterol.

7472

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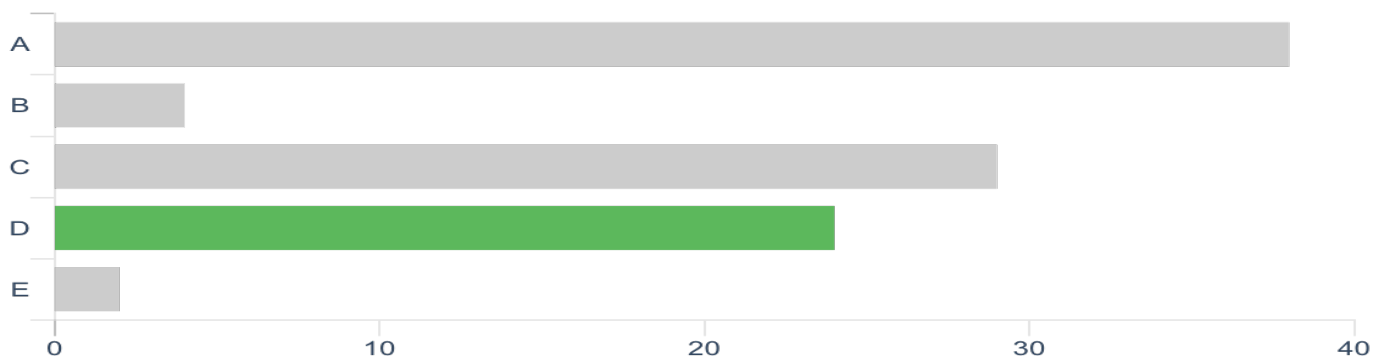
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Difficulty: Difficult

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Responses Correct:

16

Responses Incorrect:

72

Responses Total:	88
Responses - % Correct:	18%

Expanded Explanation

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Q89

A 19-year-old man presents to the Cardiology Clinic with history of three episodes of transient loss of consciousness over the past 2 months. All three episodes happened while the patient was standing, and were preceded by a feeling of nausea, warmth and light-headedness. He regains consciousness shortly after the collapse but he continues to feel nauseated and fatigued for about 15 min. There is no past medical history of note. His father had died of myocardial infarction at age of 60 years.

His physical examination is unremarkable and there is no orthostatic hypotension.

Investigations reveal the following:

Investigation	Result	Normal Value
Sodium (Na ⁺)	135 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.5 mmol/l	3.5-5.0 mmol/l
Urea	8 mmol/l	2.5-6.5 mmol/l
Creatinine (Cr)	70 µmol/l	50-120 µmol/l
Haemoglobin (Hb)	140 g/l	135-175 g/l
White cell count (WCC)	10.0 × 10 ⁹ /l	4.0-11.0 × 10 ⁹ /l
Electrocardiogram (ECG)	Normal	
Chest X-ray (CXR)	Normal	
Echocardiogram (ECHO)	Normal	

What is the best investigation in evaluation of this patient?

Your answer was correct

- A 24-hour electrocardiogram (ECG) monitoring
- B Computed tomography (CT) of the head
- C Electroencephalogram (EEG)
- D Exercise electrocardiography

E Tilt table test

Explanation



E Tilt table test

The history in this case suggests vasovagal syncope. The patients with vasovagal syncope are usually young and healthy, episodes occur while standing and there is a prodrome of nausea, warmth, pallor or sweating. The syncope lasts briefly, but nausea, warmth and sweating may persist for some time. Patients may also report fatigue on recovery. If structural heart disease is excluded and syncope is reproduced on tilt table testing along with fall in blood pressure and heart rate, then this is diagnostic of vasovagal syncope.

A 24-hour electrocardiogram (ECG) monitoring

Syncope associated with arrhythmias is usually sudden, without prodromal symptoms and has rapid recovery. This patient has normal electrocardiogram (ECG) and echocardiography therefore 24-hour electrocardiogram is unlikely to contribute anything. It is unlikely to be an arrhythmia.

B Computed tomography (CT) of the head

Symptoms are not suggestive of seizures or structural brain disease. We may expect added symptoms of post-ictal confusion or incontinence during loss of consciousness episodes if there was indication of seizures.

C Electroencephalogram (EEG)

Symptoms are not suggestive of seizures or structural brain disease. We may expect added symptoms of post-ictal confusion or incontinence during loss of consciousness episodes if there was indication of seizures.

D Exercise electrocardiography

Syncope associated with arrhythmias is usually sudden, without prodromal symptoms and has rapid recovery. This patient has normal electrocardiogram (ECG) and echocardiography therefore an exercise electrocardiography is unlikely to add anything. It is unlikely to be due to angina or coronary ischaemia inducing arrhythmia.

7473

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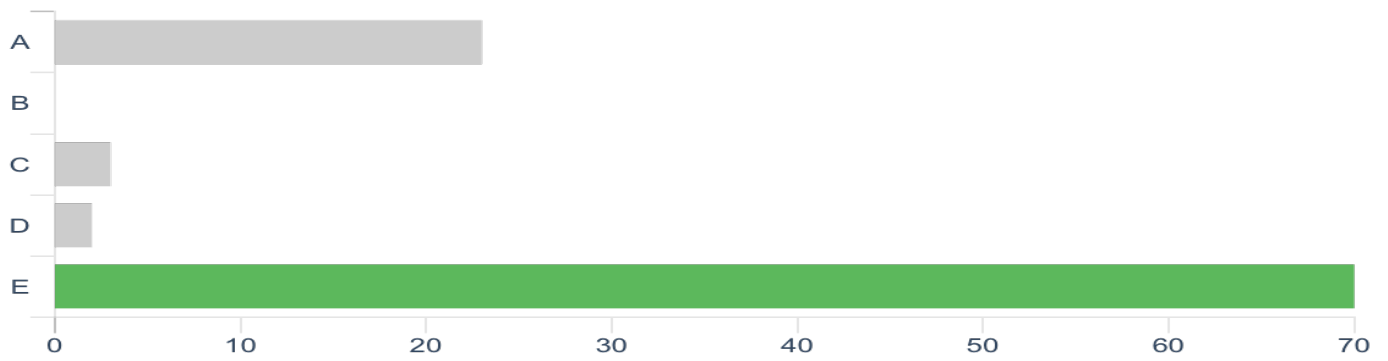
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Q90

You asked to evaluate a pregnant woman in the Obstetrics Department who has been complaining of severe shortness of breath for the last five hours. She was admitted one day earlier, in her 30th week of gestation for premature labour. She was started on intravenous (IV) terbutaline and had been doing well. About six hours ago she started complaining of shortness of breath that has been progressively worsening. She denies any chest pain, palpitations or lower limb pain and swelling. She has no past medical history of note and her prenatal examination had been normal.

On examination, she is a dyspnoeic lady with a respiratory rate of 25 breaths per minute. Her blood pressure (BP) is 115/90 mmHg. Her pulse is 122 beats per minute (bpm). She has jugular venous distension (JVD) and bilateral diffuse inspiratory crackles.

Investigations reveal the following:

Investigation	Result	Normal Value
White cell count (WCC)	$11.0 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Haemoglobin (Hb)	120 g/l	115-155 g/l
Platelets (PLT)	$660 \times 10^9/l$	$150-400 \times 10^9/l$
Electrocardiogram (ECG)	Sinus tachycardia	
Chest X-ray (CXR)	Bilateral alveolar type infiltrates and normal cardiothoracic ratio	

Which of the following is most likely diagnosis?

Your answer was incorrect

- A Mitral stenosis
- B Myocarditis
- C Peripartum cardiomyopathy
- D Pulmonary embolism

E Tocolysis-associated pulmonary oedema

Explanation



E Tocolysis-associated pulmonary oedema

Tocolytics are medications administered for the suppression of premature contractions. Acute pulmonary oedema can occur with administration of β_2 agonists for tocolysis in up to 5-15% of cases. It usually occurs after 24 h of administration of these agents. The chest X-ray reveals pulmonary infiltrates and normal heart size. Concomitant use of corticosteroids that are often administered for lung maturation have also been implicated as risk factor for development of tocolysis-associated pulmonary oedema. Treatment involves stopping the tocolytics, oxygen and careful volume control.

B Myocarditis

Myocarditis cause systolic dysfunction and will be expected to show cardiomegaly on chest X-ray. Other symptoms of myocarditis will include fever, sweats, chills and shortness of breath. In viral myocarditis there is typically a 1-2 week history of preceeding flulike symptoms of fevers, arthralgia and malaise with pharyngitis, tonsillitis or upper respiratory tract symptoms.

A Mitral stenosis

As the patient's examination was normal prior to this event, mitral stenosis is less likely. A mitral stenosis murmur will present with an loud first heart sound which may be palpable because of the increased force in closing the mitral valve. An opening snap that is a high pitched sound heard after second heart sound may be heard. There is a mid-diastolic rumbling murmur with presystolic accentuation heard after the opening snap.

C Peripartum cardiomyopathy

Peripartum cardiomyopathy cause systolic dysfunction and will be expected to show cardiomegaly on chest X-ray. Peripartum cardiomyopathy typically presents in the last month of pregnancy and up-to 6 months postpartum.

D Pulmonary embolism

Pulmonary embolism is unlikely to cause bilateral chest infiltrates. Symptoms of pulmonary embolism include haemoptysis, pleuritic chest pain, tachycardia and tachypnoea.

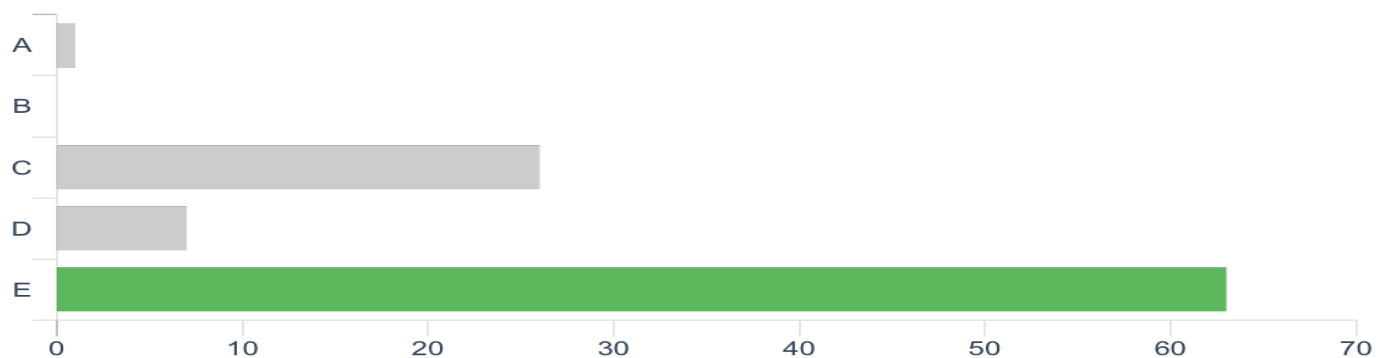
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Responses Correct:	17
Responses Incorrect:	73
Responses Total:	90
Responses - % Correct:	19%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q91

A 67-year-old woman is admitted to the Emergency Department (ED) with central chest pains that started 3 hours ago. The pain is crushing in nature, radiating to both arms, and associated with nausea and vomiting. She has a past medical history of angina, hypertension and type II diabetes. She is on the following medications: glyceryl trinitrate (GTN) spray prn, amlodipine 10 mg once a day, atorvastatin 40 mg at night, metformin 500 mg twice a day and aspirin 75 mg once a day.

On examination, she is sweaty, with blood pressure (BP) of 155/95 mmHg. Her pulse is 98 beats per minute (bpm) and regular. Her respiratory rate is 24 breaths per minute. Her chest is clinically clear. Her jugular venous pulse (JVP) is just visible: first and second heart sounds are heard with no added murmurs. An electrocardiogram (ECG) shows ST elevation of 3 mm in V₁-V₄, with reciprocal ST depression in the inferior leads.

Investigations reveal the following:

Investigation	Result	Normal Value
Haemoglobin (Hb)	138 g/l	115-155 g/l
White cell count (WCC)	14.1 × 10 ⁹ /l	4.0-11.0 × 10 ⁹ /l
Platelets (PLT)	240 × 10 ⁹ /l	150-400 × 10 ⁹ /l
Sodium (Na ⁺)	141 mmol/l	135-145 mmol/l
Potassium (K ⁺)	3.8 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	121 µmol/l	50-120 µmol/l
Mean Corpuscular Volume (MCV)	88.6 fl	80-100 fl
Urea	7.1 mmol/l	2.5-6.5 mmol/l

A bolus infusion of tenecteplase is given, together with diamorphine and metoclopramide.

Over the next 30 minutes, she suddenly starts becoming progressively hypotensive with a blood pressure of 72/53 mmHg, and a pulse of 124 bpm sinus rhythm. Auscultation of her chest reveals a pan-systolic murmur loudest at the lower left sternal edge associated with an audible third heart sound.

What is the most likely diagnosis?

Your answer was incorrect

A Acute mitral regurgitation

- B Ruptured ventricular free wall
- C Ruptured ventricular septum
- D Pulmonary embolism
- E Pericardial tamponade

Explanation



- C Ruptured ventricular septum

The most likely diagnosis is ruptured ventricular septum. This rare complication (according to autopsy studies, occurring in 1-3% of cases of MI as opposed to around 10% incidence for ventricular free wall rupture) occurs most commonly after anterior myocardial infarction. The clinical presentation ranges from asymptomatic murmur to cardiogenic shock. Post-infarction ventricular septal defects complicate approximately 1-3% of cases of acute MI, and account for about 5% of early deaths after MI. The average time from infarction to rupture has been reported to be between 2 and 4 days, but it may be as short as a few hours or as long as 2 weeks. An echocardiogram would confirm the diagnosis, and Swan-Ganz catheterisation would help determine the degree of biventricular failure. Mortality is very high, in the order of 80%, and the outlook in this patient is poor given her age, female sex and medical history of diabetes and hypertension. Although right-sided failure is more common in patients with post-infarction ventricular septal rupture, left-sided failure and refractory pulmonary oedema are more prominent in patients with ruptured papillary muscle. Papillary muscle rupture is rarer, with a reported incidence of <1%.

- B Ruptured ventricular free wall

Rupture of the ventricular free wall will result in sudden death of the patient, and this may be the first manifestation of coronary artery disease in a small percentage of patients with acute myocardial infarction.

- A Acute mitral regurgitation

Whilst mitral regurgitation would also result in a pan-systolic murmur and hypotension, the time to onset is arguably far too short here. Median onset of MR post-myocardial is 7-10 days, although it can be seen earlier with acute papillary muscle rupture.

- D Pulmonary embolism

In pulmonary embolism the signs would include tachycardia, haemoptysis and shortness of breath, and there may be signs of the cause of the pulmonary embolism such as a swollen calf, suggesting a deep vein thrombosis.

E Pericardial tamponade

With cardiac tamponade, the clinical features will include a low arterial blood pressure, distended neck veins and distant heart sounds. There is also a narrow pulse pressure.

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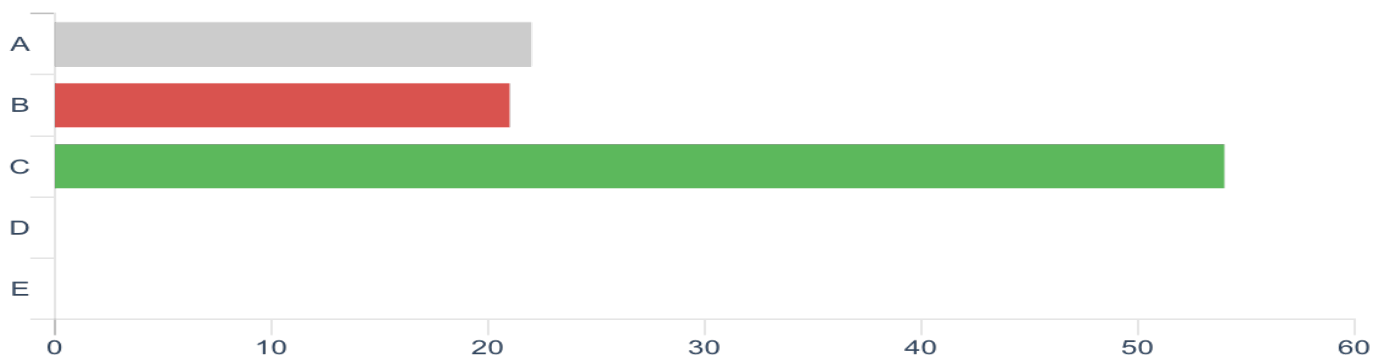
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Responses Total:	91
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis

Links to NICE guidelines/CKS



Q92

A 67-year-old woman is admitted to the Emergency Department (ED) with central chest pains commencing 3 hours ago. The pain is crushing in nature, radiating to both arms, and associated with nausea and vomiting. She has a past medical history of angina, hypertension and type II diabetes. She is on the following medications: glyceryl trinitrate (GTN) spray prn, amlodipine 10 mg once a daily, atorvastatin 40 mg at night, metformin 500 mg twice daily and aspirin 75 mg once a day.

On examination, she is sweaty, with a blood pressure (BP) of 155/95 mmHg. Her pulse is 98 beats per minute (bpm) and regular. Her respiratory rate is 24 breaths per minute and her chest is clinically clear. Her jugular venous pulse (JVP) is just visible, and first and second heart sounds are heard with no added murmurs.

Investigations reveal the following:

Investigation	Result	Normal Value
Electrocardiogram (ECG)	ST-elevation of 3 mm in V1-V4, with reciprocal ST depression in the inferior leads	
Haemoglobin (Hb)	138 g/l	115-155 g/l
Mean corpuscular volume (MCV)	88.6 fl	80-100 fl
Platelets (PLT)	$240 \times 10^9 /l$	$150-400 \times 10^9 /l$
White Cell Count (WCC)	$14.1 \times 10^9 /l$	$4.0-11.0 \times 10^9 /l$
Sodium (Na ⁺)	141 mmol/l	135-145 mmol/l
Potassium (K ⁺)	3.8 mmol/l	3.5-5.0 mmol/l
Urea	7.1 mmol/l	2.5-6.5 mmol/l
Creatinine (Cr)	121 μ mol/l	50-120 μ mol/l

A bolus infusion of tenecteplase is given, together with diamorphine and metoclopramide. She is transferred to the Coronary Care Unit.

You are asked to see her on day four post-infarct because the nurses are very concerned as she has become progressively more short of breath. She has hypotension, BP of 72/53 mmHg and a pulse of 124 bpm sinus rhythm. Auscultation of her chest reveals a pan-systolic murmur, loudest at the lower left sternal edge, and associated with an audible third heart sound.

An urgent echocardiogram (ECHO) shows hyper-dynamic left ventricular function, muscular ventricular septal defect, dilated right ventricle and moderate tricuspid regurgitation.

You arrange a review with respect to intra-aortic balloon pump insertion.

What is the most important additional intervention for this lady?

Your answer was correct

- A Afterload reduction
- B Immediate surgery
- C Dobutamine
- D Diuretics
- E Dopamine

Explanation



- B Immediate surgery

Immediate surgery is recommended whatever the clinical status of the patient. The most important determinant of early outcome following post-infarction ventricular septal rupture is the development of heart failure. The associated cardiogenic shock leads to end-organ malperfusion, which may be irreversible. Clearly, performing surgery so close to both the infarct and thrombolysis carries a very high operative mortality, but you are left with little choice in this situation.

- A Afterload reduction

Medical management is usually futile in post-infarction ventricular septal rupture, but afterload reduction may be tried. Afterload reduction increases effective left ventricular stroke volume by reducing left-to-right shunting. Intravenous afterload-reducing pharmacotherapy, such as sodium nitroprusside, has the advantage of being rapidly titrated or emergently discontinued compared with oral agents.

- C Dobutamine

Dobutamine helps improve cardiac contractility in cardiogenic shock. However, dopamine would be a preferred agent in hypotension. In post-infarction ventricular septal rupture, immediate surgery is the only intervention that may potentially improve outcome.

D Diuretics

Diuretics may reduce pre-load on the heart, which may help in cardiac failure from other causes, but in this situation it would be ineffective because immediate surgery is the only intervention that may potentially improve outcome.

E Dopamine

Dopamine, an endogenous catecholamine, has been suggested to improve renal function in patients with congestive heart failure. However, there is insufficient evidence supporting its use and it is now not regularly used for this purpose. Certainly, it would not have a role in improving outcome in post-infarction ventricular septal rupture.

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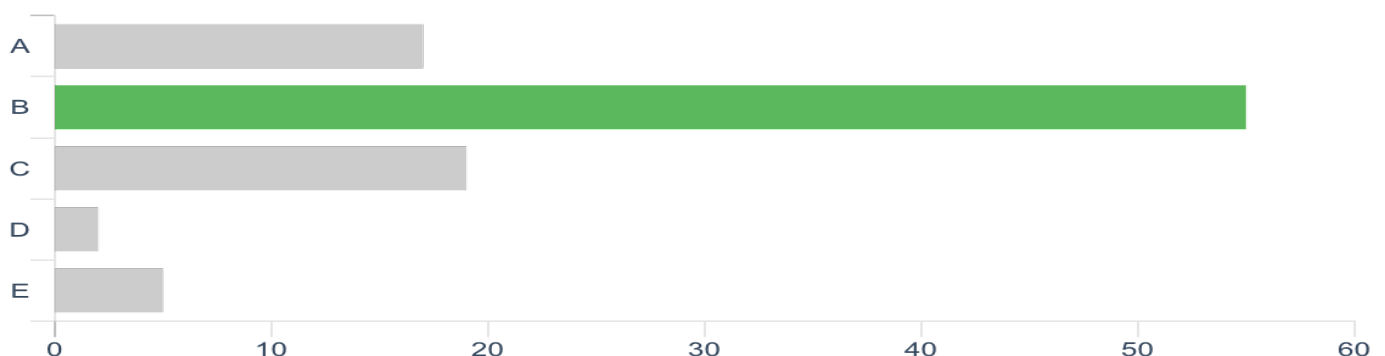
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Responses Total:	92
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 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q93

A 70-year-old man is admitted to the Emergency Department (ED) with central chest pains, which started three hours earlier. The pain is crushing in nature, radiating to both arms and associated with nausea and vomiting. He has a past medical history of angina, hypertension and type II diabetes. He is on the following medications: glyceryl trinitrate (GTN) spray prn, amlodipine 10 mg once daily, atorvastatin 40 mg at night, metformin 500 mg twice a day and aspirin 75 mg once a day.

On examination, he is sweaty with blood pressure (BP) of 155/95 mmHg. His pulse is 98 beats per minute (bpm) and regular. His respiratory rate is 24 breaths per minute and his chest is clinically clear. His jugular venous pulse (JVD) is just visible; first and second heart sounds were heard with no added murmurs.

Investigations reveal the following:

Investigation	Result	Normal Value
Haemoglobin (Hb)	158 g/l	135-175 g/l
White Cell Count (WCC)	$14.1 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$240 \times 10^9 /l$	$150-400 \times 10^9/l$
Sodium (Na ⁺)	141 mmol/l	135-145 mmol/l
Potassium (K ⁺)	3.8 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	121 μ mol/l	50-120 μ mol/l
Mean Corpuscular Volume (MCV)	88.6 fl	80-100 fl
Urea	7.1 mmol/l	2.5-6.5 mmol/l
Electrocardiogram (ECG)	ST elevation of 3 mm in V ₁ -V ₄ , with reciprocal ST depression in the inferior leads	

He is given diamorphine and metoclopramide before being taken to the Cardiac Catheterisation Laboratory, where he receives urgent coronary angioplasty. Subsequently, he is transferred to the Coronary Care Unit (CCU) for further care. Two days into his recovery he suddenly develops recurrent chest pain. His blood pressure becomes unrecordable and he goes into profound shock with electromechanical dissociation. Resuscitative measures are started but the patient dies within a few minutes.

What is the most likely complication?

Your answer was incorrect

- A Ventricular free wall rupture
- B Acute mitral regurgitation
- C Extension of the infarct
- D Pulmonary embolism
- E Ruptured ventricular septum

Explanation



- A Ventricular free wall rupture

Autopsy studies reveal that ventricular free wall rupture occurs about 10 times more frequently than post-infarction ventricular septal rupture, in about 11% of patients following acute myocardial infarction. Ventricular rupture and cardiogenic shock are now the leading causes of death following acute myocardial infarction, and together account for over two-thirds of early deaths in patients suffering their first acute infarction.

- E Ruptured ventricular septum

Post-infarction ventricular septal rupture is less common than ventricular free wall rupture. Therefore this option is less likely.

- B Acute mitral regurgitation

Coronary ischemia is responsible for 3-25% of mitral regurgitation. The classical presentation is acute heart failure with a murmur of mitral regurgitation, which is a high-pitched systolic murmur beginning with the first heart sound and extending to the second heart sound. There is no murmur in this case.

C Extension of the infarct

For infarct extension there is a progressive increase in the amount of myocardial necrosis in the infarct zone of the original myocardial infarction. After fibrinolytic therapy, re-occlusion with extension of infarct occurs in 5-10% of patients. Patients with infarct extension present with continuous or intermittent chest pain, with protracted elevation in the creatine kinase level and occasionally new electrocardiographic changes.

D Pulmonary embolism

Pulmonary embolism will present with haemoptysis, tachycardia and tachypnoea, with some signs of the source of pulmonary embolism such as swollen calf, consistent with deep vein thrombosis. It is not the clinical presentation in this scenario.

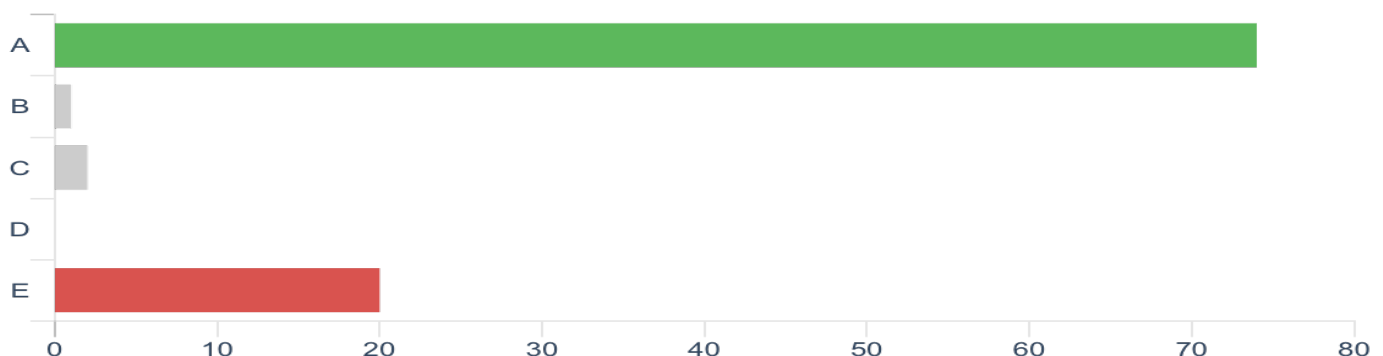
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

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Links to NICE guidelines/CKS



Q94

A 53-year-old man is referred to the Cardiology Clinic by his General Practitioner (GP) for an abnormal pulse. The man had gone to see his GP for a regular check-up when he was found to have an incidental abnormal heart rhythm. This has not caused him any symptoms at present, and he remains at work. His past medical history is unremarkable and he is not on any regular medication. He does not smoke and consumes about seven units of alcohol per week.

On examination, he is comfortable at rest with a blood pressure (BP) of 125/65 mmHg and a pulse of 68 beats per minute (bpm), which is irregularly irregular. His jugular venous pressure (JVP) is not raised and his chest is clinically clear. He has a variable S1 but no murmurs. Full blood count (FBC), urea and electrolytes (U&Es), thyroid function tests (TFTs), liver function tests (LFTs), lipids and transthoracic echocardiogram (ECHO) are all within normal limits. An electrocardiogram (ECG) shows atrial fibrillation (AF).

Which one of the following medications would you start this patient on?

Your answer was incorrect

- A NOAC with a view to elective cardioversion
- B Diltiazem
- C Digoxin
- D Bisoprolol
- E Amiodarone

Explanation



- A NOAC with a view to elective cardioversion

This is a patient with no previous medical history and no obvious precipitant of his new-onset atrial fibrillation. Current NICE guidelines on the management of atrial fibrillation state that rate control [should be offered] as the first-line strategy to people with atrial fibrillation, except in those (1) whose atrial fibrillation has a reversible cause; (2) who have heart failure thought to be primarily caused by atrial fibrillation; (3) with new-onset atrial fibrillation; (4)

with atrial flutter and whose condition is considered suitable for an ablation strategy to restore sinus rhythm; and (5) for whom a rhythm control strategy would be more suitable based on clinical judgement.

It would therefore seem appropriate in this case to offer elective cardioversion after a period of anticoagulation (minimum 3 weeks).

D Bisoprolol

While a beta blocker (other than sotalol) represents an appropriate rate control choice for patients with atrial fibrillation, this patient's young age and new-onset atrial fibrillation make rhythm control an appropriate management option.

B Diltiazem

While a rate-limiting calcium channel blocker such as diltiazem or verapamil represents an appropriate rate control choice for patients with atrial fibrillation, this patient's young age and new-onset atrial fibrillation make rhythm control an appropriate management option.

C Digoxin

Current NICE guidelines state that digoxin monotherapy is suitable for people with non-paroxysmal atrial fibrillation only if they are sedentary (do no or very little physical exercise). This patient's young age and new-onset AF make rhythm control an appropriate management option.

E Amiodarone

While amiodarone represents an appropriate choice for pharmacological cardioversion and rate control, the uncertain onset of this patient's atrial fibrillation makes it an inappropriate choice prior to the initiation of suitable anticoagulation due to the risk of precipitating thromboembolic events if he were to cardiovert.

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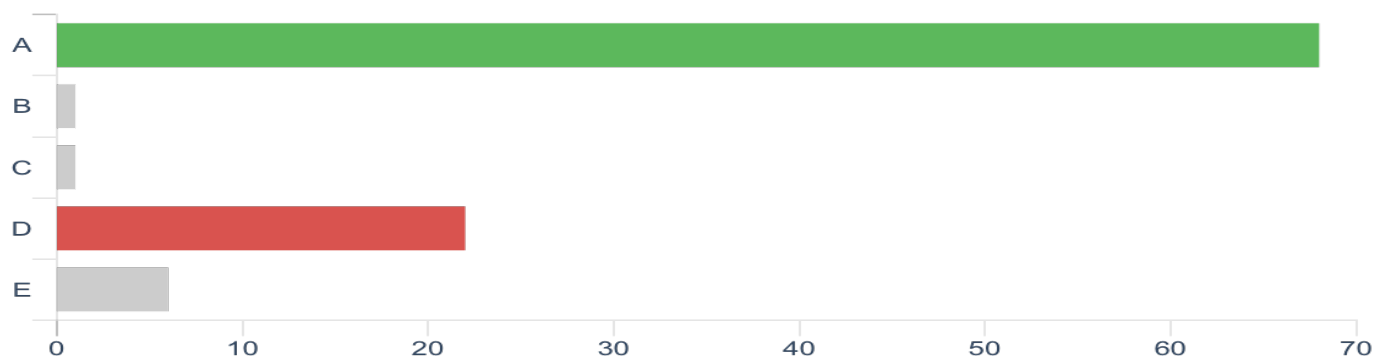
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Responses Total:	94
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External Links

NICE. Atrial fibrillation: management[nice.org.uk/guidance/cg180/resources/guidance-atrial-fibrillation-the-management-of-atrial-fibrillation-pdf](https://www.nice.org.uk/guidance/cg180/resources/guidance-atrial-fibrillation-the-management-of-atrial-fibrillation-pdf)[\(https://www.nice.org.uk/guidance/cg180/resources/guidance-atrial-fibrillation-the-management-of-atrial-fibrillation-pdf\)](https://www.nice.org.uk/guidance/cg180/resources/guidance-atrial-fibrillation-the-management-of-atrial-fibrillation-pdf)

Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**



Q95

A 69-year-old man is admitted to the Emergency Department (ED) with sudden onset of palpitations. The palpitations started three hour ago and are associated with shortness of breath, light-headedness, and chest discomfort. He has had two similar episodes of palpitations in the last two months that have lasted only a few seconds. He had never sought any medical advice on these previous palpitations. His past medical history is unremarkable, and he is not on any medication.

On examination, he is dyspnoeic with a blood pressure (BP) of 102/55 mmHg. His pulse is greater than 120 beats per minute (bpm) and he has a respiratory rate of 28 breaths per minute. His oxygen saturation on air is 90%, and his chest is clinically clear. His jugular venous pressure (JVP) is not raised. First and second heart sounds are heard but you cannot appreciate whether there is any murmur. Initial attempts at carotid sinus massage have failed and he is becoming increasingly distressed.

Investigations reveal the following:

Investigation	Result
Electrocardiogram (ECG)	Heart rate of 188 bpm with a narrow QRS complex
Chest X-ray (CXR)	Normal

How would you best determine the underlying cardiac rhythm?

Your answer was correct

- A Ask patient to do a Valsalva manoeuvre
- B Give rapid intravenous adenosine
- C Give 100% oxygen
- D Give intravenous β -blocker
- E Give intravenous calcium channel blocker

Explanation



- B Give rapid intravenous adenosine

To determine the underlying rhythm, adenosine 6 mg in a large peripheral vein should slow the heart rate sufficiently to unveil the underlying rhythm. If the patient does not respond to 6 mg adenosine, the dose could be increased to 12 mg. Adenosine will have the following effects on the narrow complex: atrial fibrillation or atrial flutter (transient atrioventricular block), atrioventricular nodal re-entrant tachycardia or atrioventricular re-entrant tachycardia (may terminate), atrial tachycardia – transient AV block.

A Ask patient to do a Valsalva manoeuvre

As the patient is dyspnoeic and hypoxic, it would not be appropriate to carry out a Valsalva manoeuvre because of the practical difficulty due to poor patient compliance.

C Give 100% oxygen

Although oxygen should be administered to correct hypoxia, it will not correct the underlying rhythm.

D Give intravenous β -blocker

It is important to establish the underlying rhythm with adenosine. Giving a β -blocker will not help in diagnosing the exact rhythm.

E Give intravenous calcium channel blocker

It is important to establish the underlying rhythm with adenosine. Giving a calcium channel blocker will not help in diagnosing the exact rhythm.

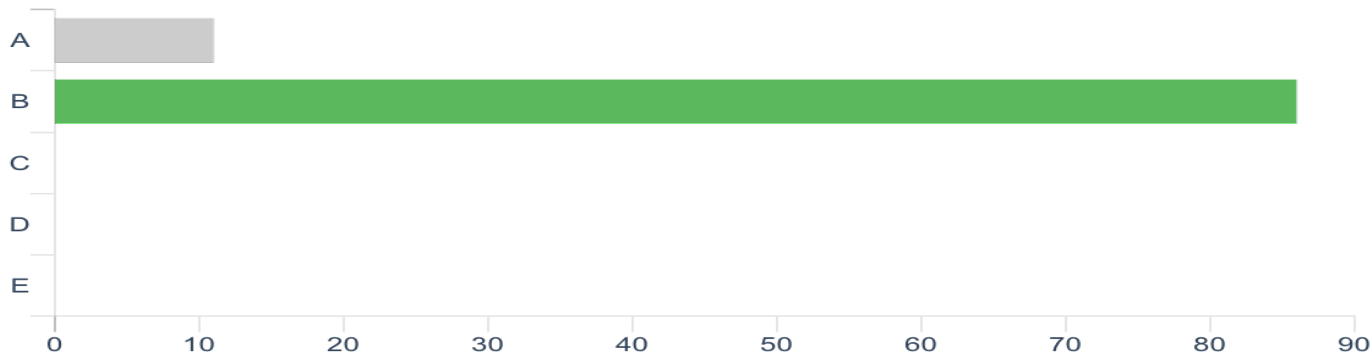
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Responses Correct:	19
Responses Incorrect:	76
Responses Total:	95
Responses - % Correct:	20%



Q96

A 72-year-old man is referred to the Cardiology Clinic as a result of two syncopal episodes over the past month. Both episodes have happened while he had been doing some chores around the house. His past medical history is unremarkable and he is not on any medication. On each occasion he has noticed a feeling of sounds becoming muffled, a sensation that his heart is pounding, some nausea and then his vision going black before collapsing to the ground. His wife has witnessed one episode and said that he was very pale and rather clammy, he recovered consciousness within a few minutes of falling and was shortly after back to his normal self.

His physical examination is essentially normal and there is no postural drop in his blood pressure.

Investigations reveal the following:

Investigation	Result	Normal Value
Haemoglobin (Hb)	128 g/l	135-175 g/l
Platelets (PLT)	$240 \times 10^9 /l$	$150-400 \times 10^9 /l$
White Cell Count (WCC)	$12.1 \times 10^9 /l$	$4.0-11.0 \times 10^9 /l$
Sodium (Na ⁺)	141 mmol/l	135-145 mmol/l
Potassium (K ⁺)	3.8 mmol/l	3.5-5.0 mmol/l
Urea	7.1 mmol/l	2.5-6.5 mmol/l
Creatinine (Cr)	78 μ mol/l	50-120 μ mol/l
Lipids	Normal	
Liver function tests (LFTs)	Normal	
Thyroid function tests (TFTs)	Normal	
Electrocardiogram (ECG)	Sinus rhythm, old inferior myocardial infarction (MI)	
Echocardiogram (ECHO)	Normal	

What would you advise this gentleman?

Your answer was incorrect

- A Sit down whenever he feels dizzy
- B He needs an angiogram
- C He needs a computed tomography (CT) scan of his chest
- D He needs a CT scan of his head
- E He needs Dopplers of his carotids

Explanation



- A Sit down whenever he feels dizzy

In dealing with blackouts, it is vital to establish what the patient means by 'blackout'. You need to take a detailed history from both the patient and the witness. The differential diagnosis is wide and includes vasovagal syncope, situational syncope, epilepsy and Stokes-Adams attacks, to mention only a few. The detailed history should be able to narrow down the likely diagnosis, which in the above patient is vasovagal syncope. Onset is over a few seconds and is often preceded by sweating, pallor and visual field defects. The patient falls to the ground and is unconscious for about 2 min. Incontinence of urine is rare, there is no tonic-clonic sequence and there is no prolonged confusion or amnesia. It is rare for anyone to faint through vasovagal mechanisms while seated or lying flat (such an occurrence being suggestive rather of a possible cardiac cause). If symptoms persist, then a tilt-table test may be sensible.

- C He needs a computed tomography (CT) scan of his chest

There is no indication that any intra-thoracic lesion may be responsible, and so any dissection would cause severe chest pain. Intra-thoracic lesions that may lead to syncope include dissecting aorta. However, dissecting thoracic aorta will present with central chest pain that would radiate to the back, often described as a 'tearing' pain. There are other symptoms such as vomiting, sweating and nausea. Other symptoms may manifest from decreased blood supply, such as stroke or mesenteric ischaemia.

- B He needs an angiogram

There is no indication this may be related to coronary ischaemia. We would expect an abnormal electrocardiogram or chest pain if angina was suspected. The most common symptom of myocardial infarction is central chest pain that radiates to the left shoulder, arm,

back, neck or jaw. It lasts for more than a few minutes and is associated with autonomic symptoms such as heartburn, shortness of breath, nausea, pre-syncope or lethargy. About 30% of patients have atypical symptoms – these may include little or no history of symptoms.

D He needs a CT scan of his head

It is unlikely to be an intracranial lesion as there is no seizure or fitting. Neurological disorders associated with seizures may manifest with a variety of presentations, from brief unconsciousness to prolonged periods of uncontrollable shaking. There may be associated incontinence of urine or faeces. Some seizures may occur without any warning, whilst in others focal seizures are often preceded by certain experiences known as auras, where there may be visual, hearing or abnormal olfactory sensations.

E He needs Dopplers of his carotids

There is no indication of carotid abnormality, such as dizziness on head turning or carotid bruit heard on examination. Carotid insufficiencies may cause transient ischaemic attacks. These may present with sudden, severe headache of unknown cause, dizziness or loss of balance and there may be weakness in the limbs or temporary loss of vision.

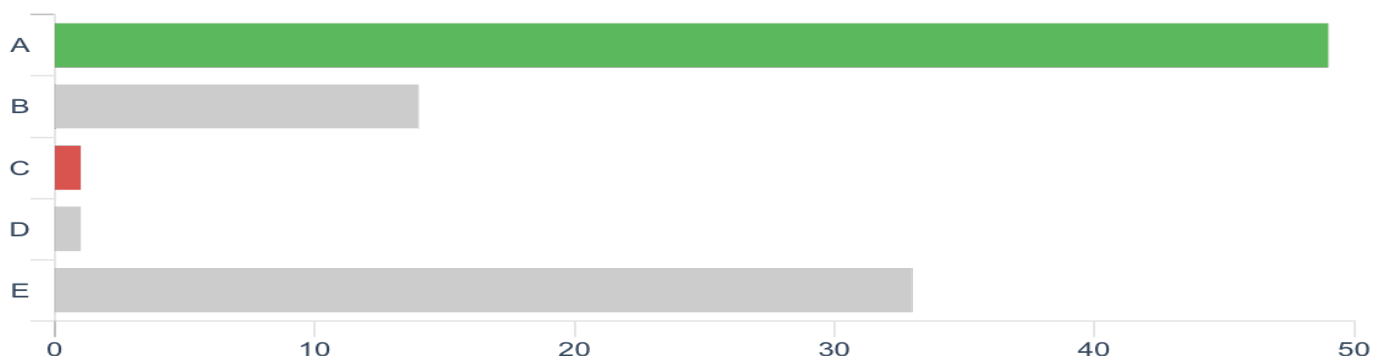
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Responses Correct:	19
Responses Incorrect:	77
Responses Total:	96
Responses - % Correct:	20%



Q97

A 72-year-old man comes to the Cardiology Clinic for follow-up for his heart failure. He had been hospitalised for the fourth time in four months for congestion. Shortness of breath interrupts his sleeping and any physical activity he tries to engage in. He has chronic coronary artery disease and had a quadruple by-pass three years ago. He is taking 120 mg furosemide, 125 µg digoxin, 25 mg spironolactone, 10 mg ramipril, and 10mg bisoprolol and for his heart failure, and is being followed up on an advanced heart failure programme.

Investigations reveal the following:

Investigation	Result	Normal Value
Sodium (Na ⁺)	125 mmol/l	135-145 mmol/l
Potassium (K ⁺)	5.5 mmol/l	3.5-5.0 mmol/l
Estimated glomerular filtration rate (eGFR)	30 ml/min	
Chest X-Ray (CXR)	Bilateral interstitial shadowing, cardiomegaly	
Echocardiogram (ECHO)	Left ventricular ejection fraction 22% (normal 55-75%)	

He expresses a willingness to try anything to feel better.

Which of the following options would be the most likely beneficial treatment?

Your answer was incorrect

- A Increase spironolactone
- B Increase digoxin
- C No treatment would be useful because he is already on maximal medication
- D Left ventricular assist device
- E Stop rampril

Explanation



D Left ventricular assist device

The Randomised Evaluation of Mechanical Assistance Therapy as an alternative in Congestive Heart failure (REMATCH) trial demonstrated 52% overall survival at 1 year in 68 non-transplantation candidates randomised to a left ventricular assist device. Subsequent 1-year survival in registries also centres around 50%. Outcomes are improving with device modifications and with strong emphasis on preventing infection. Therefore, of the options available, a left ventricular assist device is the most appropriate option.

C No treatment would be useful because he is already on maximal medication

This patient is on maximal medical therapy for his heart failure, but a left ventricular assist device would still be appropriate.

A Increase spironolactone

A landmark study, 'RALES Trial', reported that the use of spironolactone in addition to standard medical therapy for patients with heart failure resulted in a reduction in mortality and hospitalization rate. Aldosterone antagonism with spironolactone is therefore considered for all patients with left ventricular ejection fraction of less than 35% and NYHA Class III-IV. However, a subsequent study showed that since this increased prescription of spironolactone there has been a rise in morbidity associated with hyperkalaemia. In this patient with renal impairment, because the potassium is already slightly elevated at 5.5 mmol/l, further increase in spironolactone may not confer additional benefit with larger increase in potassium, and therefore this is not the correct answer.

B Increase digoxin

Evidence from clinical trials supports the use of digoxin in heart failure with left ventricular systolic dysfunction, especially in patients with advanced symptoms. However, there is no evidence that digoxin improves survival. Digoxin is excreted by the kidneys; because there is renal impairment in this patient, increasing digoxin further may make the risk of digoxin toxicity higher. This is not the correct answer, therefore.

E Stop rampril

It is well established that ACE-I improves long-term outcomes in patients with reduced left ventricular ejection fraction. Furthermore, in a landmark trial, the 'HOPE Trial', ramipril was reported to significantly reduce cardiovascular events in high-risk patients with *normal* ejection fractions. In the current scenario, stopping the ACE-I would not be appropriate because there are both cardiac and renal benefits with administration of an ACE-I.

7493

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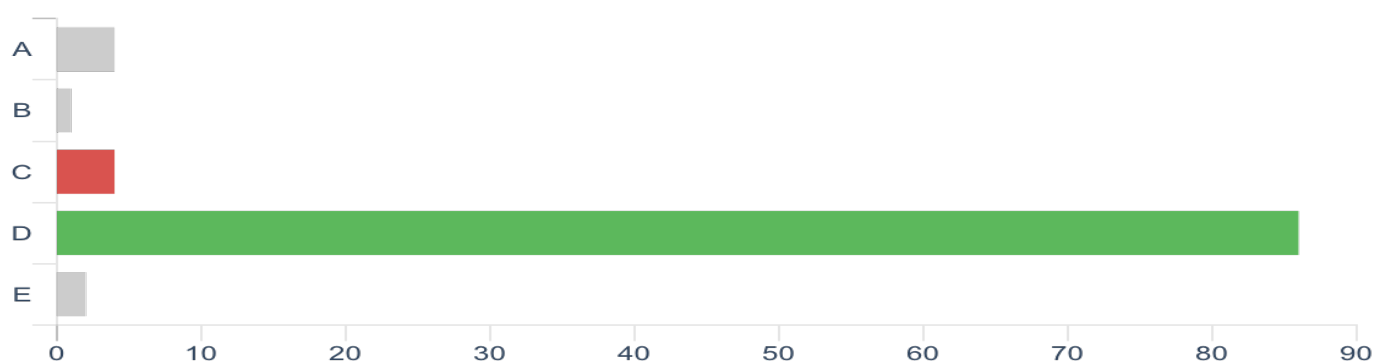
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Responses Correct:	19
Responses Incorrect:	78
Responses Total:	97
Responses - % Correct:	20%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q98

A 66-year-old man, admitted to the Emergency Department (ED) with infective endocarditis caused by *Streptococcus faecalis*, is treated with intravenous (IV) antibiotics for six weeks. He had a prosthetic metallic aortic valve put in three years ago for significant aortic stenosis.

Investigations reveal the following:

Investigation	Result
Repeated blood cultures	Negative
Inflammatory markers (after 5 weeks' antibiotics)	Upper end of the normal range
Most recent trans-oesophageal echocardiogram (after 6 weeks' antibiotics)	Some tiny vegetations on the prosthetic aortic valve

How should this patient be managed?

Your answer was incorrect

- A Change to oral antibiotics for another two weeks
- B Discharge the patient
- C Continue intravenous antibiotics for another week
- D Do a trans-thoracic echocardiogram
- E Replace the metallic aortic valve

Explanation



- B Discharge the patient

The patient could be discharged and followed up as an outpatient. Stratification of patients into groups that are at high and low risk for heart failure, systemic embolisation, need for surgical intervention and death, based on the presence or absence of vegetations, remains controversial. In this patient, whose inflammatory markers have returned to normal, he could

be followed as an outpatient because this indicates that it is unlikely there has been a further resurgence of infection. If there was a para-prosthetic leak or obstruction of the valve, the patient would probably need surgical intervention.

A Change to oral antibiotics for another two weeks

Inflammatory markers have returned to normal, and there is no evidence that continuing antibiotics is beneficial. The patient has completed the course.

C Continue intravenous antibiotics for another week

Inflammatory markers have returned to normal, and there is no evidence that continuing antibiotics is beneficial. The patient has completed the course.

D Do a trans-thoracic echocardiogram

Trans-oesophageal echo is more sensitive in picking up micro-vegetations than trans-thoracic echo.

E Replace the metallic aortic valve

In this patient, whose inflammatory markers have returned to normal, he could be followed as an outpatient because this indicates that it is unlikely there has been a further resurgence of infection. If there was a para-prosthetic leak or obstruction of the valve, the patient would probably need surgical intervention.

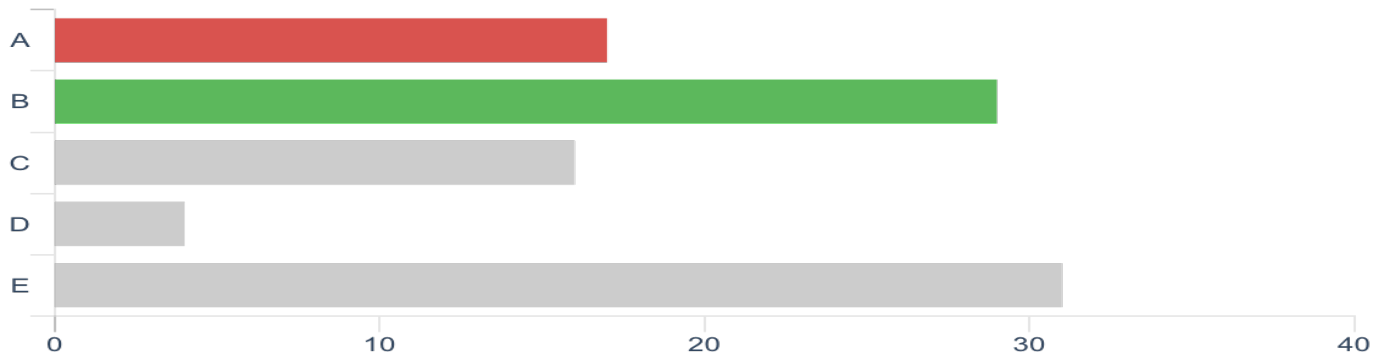
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Responses Correct:	19
Responses Incorrect:	79
Responses Total:	98
Responses - % Correct:	19%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q99

A 50-year-old man comes to the Cardiology Clinic for follow-up. He has been annually followed up in the Clinic for 10 years for his aortic stenosis. He informs you that his exercise tolerance has decreased. He gets some chest discomfort and dizziness on strenuous exertion.

On examination, he is comfortable, with a blood pressure (BP) of 125/85 mmHg and a pulse of 76 beats per minute (bpm) and regular. His jugular venous pressure (JVP) is not raised; there are bibasal crackles on auscultation of the chest. His first and second heart sounds are heard, and there is an ejection systolic murmur grade 3/6 in the aortic distribution. An echocardiogram (ECHO) reveals a peak gradient of 32 mmHg across the aortic valve, with generalised poor left ventricular (LV) function and an ejection fraction of 35%.

How should this patient be managed?

Your answer was incorrect

- A Continue yearly follow-ups
- B Isolated replacement of the aortic valve
- C Discharge the patient from clinic
- D Start the patient on digoxin
- E Consideration for replacement of the aortic valve $\pm$ coronary artery bypass graft (CABG)

Explanation



- E Consideration for replacement of the aortic valve $\pm$ coronary artery bypass graft (CABG)

Normally, a gradient of between 50 and 60 mmHg is required for surgical intervention of a stenotic aortic valve, but in this case, the gradient across the aortic valve would not be the sole determinant. Since the patient is symptomatic, there is a high likelihood of LV dysfunction, hence the lower-than-expected aortic gradient.

The patient would also need an angiogram to determine the patency of his coronary arteries before surgery. If there were any coronary artery disease, both valve replacement and bypass surgery could be carried out at the same time.

B Isolated replacement of the aortic valve

Aortic valve replacement would help restore valvular function. However, the patient would also need an angiogram to determine the patency of his coronary arteries before surgery. If there were any coronary artery disease, both valve replacement and bypass surgery could be carried out at the same time.

A Continue yearly follow-ups

Given the fact that the patient has now become symptomatic, he requires an intervention in an attempt to improve his quality of life and halt any further deterioration of his ventricular function.

C Discharge the patient from clinic

The fact that the patient has become symptomatic can lead to a reduced quality of life and an increased mortality. He requires an intervention to improve his quality of life and halt any further deterioration of his ventricular function.

D Start the patient on digoxin

Treatment with digoxin would not be treating his underlying problem (aortic stenosis). In addition, even though digoxin was commonly used in the past for the treatment of heart failure, it is no longer considered the first choice, as it may increase the risk of death.

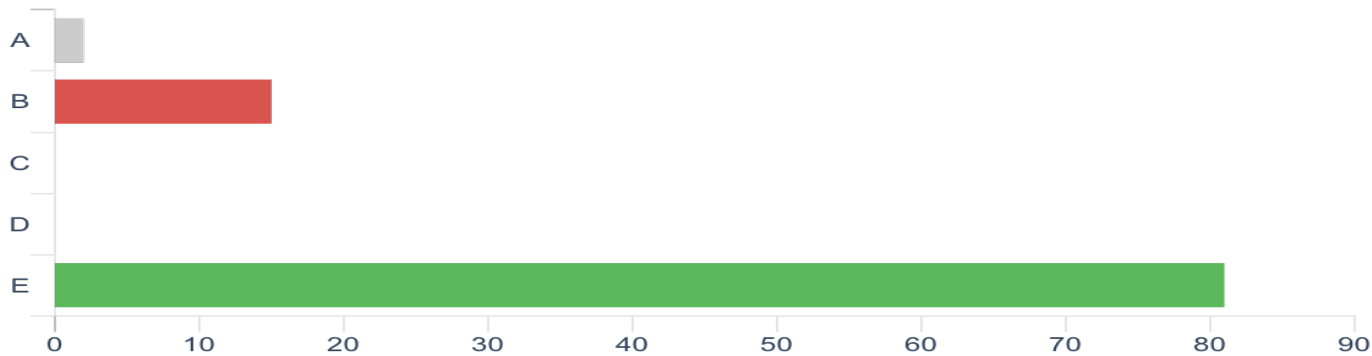
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Session Progress

Responses Correct:	19
Responses Incorrect:	80
Responses Total:	99
Responses - % Correct:	19%



Q100

A 50-year-old man comes to the Cardiology Clinic for follow-up. He has been annually followed up in the clinic for 10 years for his aortic stenosis. He informs you that his exercise tolerance has decreased. He experiences some chest discomfort and dizziness on strenuous exertion.

On examination, he is comfortable, with a blood pressure (BP) of 125/85 mmHg and a pulse of 76 beats per minute (bpm) and regular. His jugular venous pulse (JVP) is not raised and his chest is clinically clear. His first and second heart sounds are heard and there is an ejection systolic murmur grade 3/6 in the aortic distribution.

On echocardiogram (ECHO), a gradient of 60 mmHg is found across the aortic valve.

You explain to the patient that he will need a valve replacement. He would like to know the pros and cons of the different heart valves.

Which one of the following statements is true of prosthetic heart valves?

Your answer was incorrect

- A A tissue valve would be most suitable for this patient
- B Both tissue and metallic valves need anticoagulation for life
- C Tissue valves last as long as metallic valves
- D A metallic valve would be most suitable for this patient
- E Tissue valves last for 5 years on average

Explanation



- D A metallic valve would be most suitable for this patient

A metallic valve would be most suitable for this patient because he is young. The negative side of metallic valves is that he will need anticoagulation for life. Data from a review published in 2012 also support the view that haemodynamic performance of mechanical valves and anti-coagulation may drive better outcomes versus tissue valves.

- B Both tissue and metallic valves need anticoagulation for life

Metallic heart valves require anticoagulation for life to prevent thromboembolism, while tissue valves do not require anticoagulation. The latter type does not increase the risk of thromboembolism.

A A tissue valve would be most suitable for this patient

Tissue valves do not require anticoagulation but on average they only last for about 10 years. Therefore, since the patient is young, a metal valve is more appropriate.

C Tissue valves last as long as metallic valves

Tissue valves on average last for about 10 years, so metallic valves last longer. Mechanical heart valves are more resistant than tissue valves to the constant demands placed on them, such as opening and closing with every heartbeat. The materials used in mechanical valves stand up well to wear and tear as opposed to tissue valves.

E Tissue valves last for 5 years on average

Tissue heart valves on average last for about 10 years. Fortunately, there is adequate time to prepare for valve replacement. It is important to remember that any valve replacement surgery carries a significant risk of death, so a patient's life expectancy is a major criterion in considering whether to insert a tissue valve.

7497

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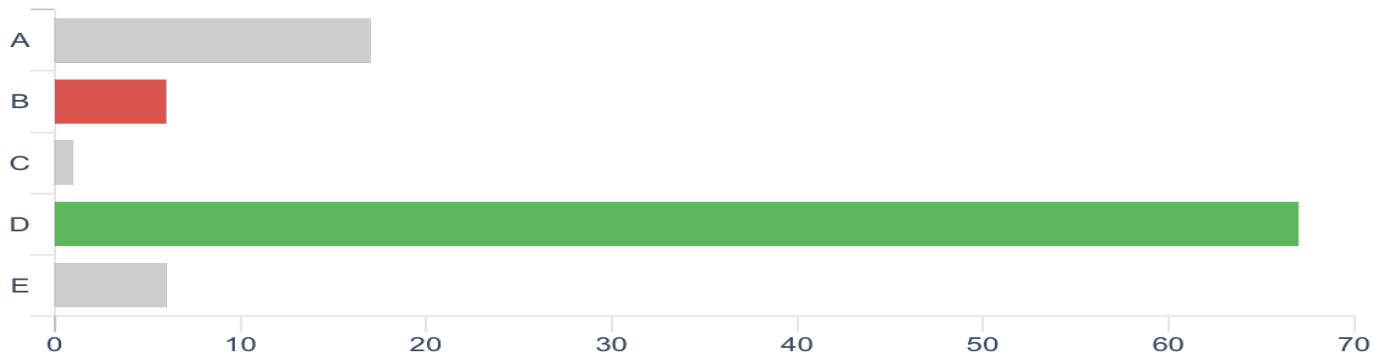
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Responses Correct:	19
Responses Incorrect:	81
Responses Total:	100
Responses - % Correct:	19%



Q101

A 27-year-old man is referred to the Emergency Department (ED) by his General Practitioner (GP) after having collapsed at home. This event had happened earlier in the day while he was sitting on the couch listening to music. He does not remember having any chest pains or shortness of breath. He just passed out and this was the first time it had ever happened. He has never had any serious illness in the past and his family history is unremarkable. He is not on any medication and he is not allergic to any medication.

On examination, he is alert and comfortable, his blood pressure (BP) is 125/70 mmHg and his pulse is 74 beats per minute (bpm) and regular. His first and second heart sounds are heard and there is no murmur. His chest is clear. His central nervous system (CNS) and abdomen are normal. His full blood count (FBC) and biochemistry are normal.

Investigations reveal the following:

Investigation	Result
Electrocardiogram (ECG)	ST elevation in V1-V3 and right bundle branch block (RBBB)
Chest X-ray (CXR)	Normal
Echocardiography (ECHO)	Normal
Troponin T	Normal

What is the likely diagnosis?

Your answer was incorrect

- A Acute anterior myocardial infarction
- B Arrhythmogenic right ventricular dysplasia (ARVD)
- C Early repolarisation variant
- D Brugada syndrome (BrS)
- E Primary pulmonary hypertension

Explanation



D Brugada syndrome (BrS)

In 1992, Brugada et al. described this novel clinical entity. It is an inherited form of cardiac arrhythmia, presenting with a typical electrocardiogram (ECG) pattern of ST segment elevation in leads V1-V3 and incomplete or complete right bundle branch block (RBBB). The underlying cause of BrS is a genetic defect in the SCN5A gene, which encodes the sodium channel controlling the depolarisation phase of the cardiac action potential. There are usually no structural abnormalities in Brugada syndrome (BrS) patients, and the disease may be defined as a pure electrical abnormality of myocardial cells. BrS manifests with syncope and cardiac arrest, typically occurring in the third or fourth decade of life, and usually at rest or during sleep. The implant of an implantable cardiac defibrillator (ICD) may markedly improve quality of life. Studies suggest that the majority of BrS patients are likely to remain asymptomatic and are at relatively low risk of relapsing.

C Early repolarisation variant

Early repolarisation describes ST elevation without underlying disease. It is commonly seen in young men. The characteristic findings are an upward concave elevation of the RS-T segment with distinct J waves. There is slurred downstroke of R waves or distinct J points, or both. The ECG findings in this scenario are not consistent with early repolarisation variant.

A Acute anterior myocardial infarction

An anterior myocardial infarction will have electrocardiogram findings of ST elevation in leads V1-V6 with later pathological Q waves in the precordial leads V2 to V4-V5. Therefore in this scenario, the electrocardiogram is not consistent.

B Arrhythmogenic right ventricular dysplasia (ARVD)

ST segment elevation in right precordial leads and right RBBB has rarely been reported in arrhythmogenic right ventricular dysplasia (ARVD). Morphological analysis of the right ventricle should be carried out by echo and nuclear magnetic resonance (NMR) in order to exclude the presence of a structural cardiac abnormality.

E Primary pulmonary hypertension

In primary pulmonary hypertension there is an elevated pulmonary artery pressure with no apparent cause. There is an increased pressure in the pulmonary vessels with symptoms of breathlessness, dizziness, syncope and leg swelling. There is a raised jugular venous pressure with pulmonary hypertension, of which there is no mention in this scenario.

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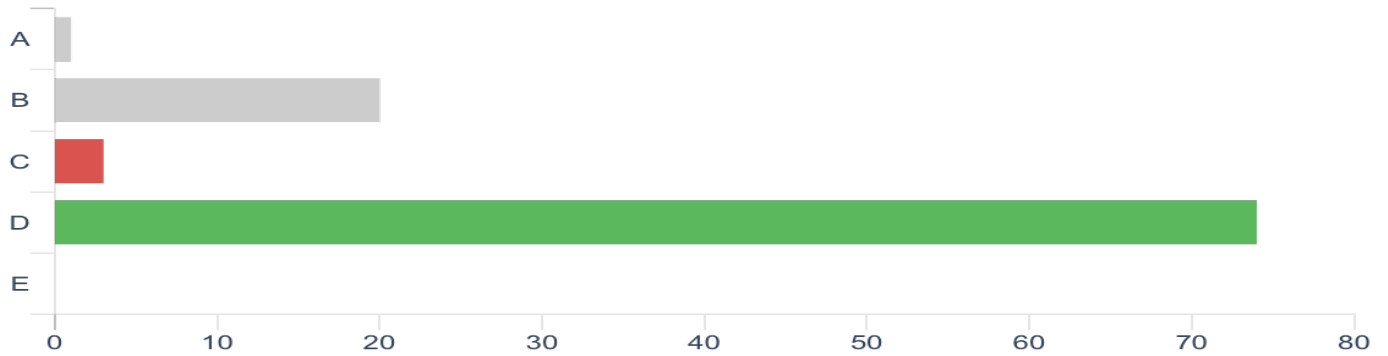
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Responses Correct:	19
Responses Incorrect:	82
Responses Total:	101
Responses - % Correct:	19%



Q102

A 73-year-old woman is brought into the Emergency Department (ED) by an ambulance because of a sudden onset of palpitations and shakes. This is the second time she has had such an experience. The first incidence only lasted about one minute, a month ago. She did not seek medical attention because she thought it was just one of those things that come with old age. The current episode has been going on for about an hour. She also has some shortness of breath but no dizziness. The ambulance crew noted that her blood pressure (BP) was very high, at 230/110 mmHg. Her past medical history and family history are unremarkable.

On examination in the ED, she is dyspnoeic, sweating and shaking. Her BP is 237/115 mmHg and her pulse is > 150 beats per minute (bpm). Her chest is clear.

Investigations reveal the following:

Investigation	Result
Electrocardiogram (ECG) monitor	Heart rate 188 bpm
12-lead electrocardiogram (ECG)	Narrow complex tachycardia

You start the patient on high-flow oxygen (15 l) and you give her a fast intravenous (IV) dose of adenosine 6 mg. She experiences some chest tightness and the ECG monitor shows the heart rate slowing down. After a few minutes she calms down, her heart rate is 90 bpm and regular and her BP is 140/80mmHg.

What type of supraventricular tachycardia is this likely to be?

Your answer was incorrect

- A Atrial flutter
- B Atrial fibrillation
- C Multifocal atrial tachycardia
- D Sinus tachycardia
- E Atrioventricular re-entrant tachycardia (AVRT)

Explanation



E Atrioventricular re-entrant tachycardia (AVRT)

AVRT and atrioventricular nodal re-entrant tachycardia (AVNRT) may be terminated with adenosine. Other manoeuvres that may unmask underlying rhythms include valsalva manoeuvres and carotid sinus massage.

D Sinus tachycardia

Sinus tachycardia is unlikely to be treated with adenosine; there may be just transient AV block.

A Atrial flutter

Transient atrioventricular (AV) block will unmask atrial flutter but is unlikely to terminate it.

B Atrial fibrillation

Transient atrioventricular (AV) block will unmask atrial fibrillation but is unlikely to terminate it.

C Multifocal atrial tachycardia

Transient atrioventricular (AV) block will unmask multifocal atrial tachycardia but is unlikely to terminate it.

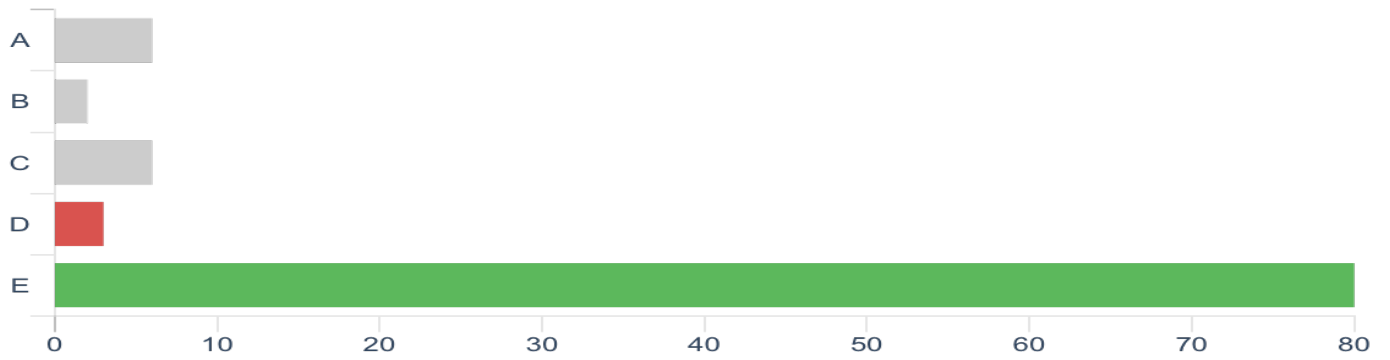
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Responses Correct:	19
Responses Incorrect:	83
Responses Total:	102
Responses - % Correct:	19%



Q103

A 27-year-old man comes to the Emergency Department (ED) complaining of palpitations. In the past year, he has had some occasional palpitations only lasting a few seconds. This particular episode is different because it has been going on for about 45 minutes. He also complains of worsening shortness of breath. He was diagnosed with Wolff-Parkinson-White (WPW) syndrome a year ago when he presented with similar symptoms.

On examination, he is apprehensive. His pulse is 130 beats per minute (bpm) and his blood pressure (BP) is 85/60 mmHg. There are crackles on auscultation at both lung bases.

Investigations reveal the following:

Investigation	Result
Urea and electrolytes (U&Es)	Normal
Full blood count (FBC)	Normal
Chest X-ray (CXR)	Normal
Electrocardiogram (ECG)	Narrow complex regular tachycardia with heart rate of 150 bpm

What is the next appropriate immediate step in his management?

Your answer was correct

- A Digoxin
- B DC cardioversion
- C Infusion of amiodarone
- D Intravenous (IV) flecainide
- E IV verapamil

Explanation



- B DC cardioversion

DC cardioversion should be used early if the tachycardia is causing haemodynamic compromise. The presence of a low systolic blood pressure and bibasal crackles on auscultation indicate that cardioversion is the most appropriate intervention here.

A Digoxin

Digoxin should be avoided as it may accelerate conduction down the accessory pathway. This could potentially lead to further cardiovascular compromise. It is also highly unlikely to achieve sinus rhythm.

C Infusion of amiodarone

Amiodarone is slightly less effective in achieving cardioversion in this situation than flecainide, and DC cardioversion is preferred given the systolic blood pressure.

D Intravenous (IV) flecainide

Intravenous flecainide or disopyramide should be used for chemical cardioversion, but it is not the treatment of choice if, as here, there is haemodynamic compromise.

E IV verapamil

IV verapamil should be avoided as it may accelerate conduction down the accessory pathway. This could potentially lead to a further increase in pulse rate, risk of ventricular tachycardia, and cardiac arrest.

7549

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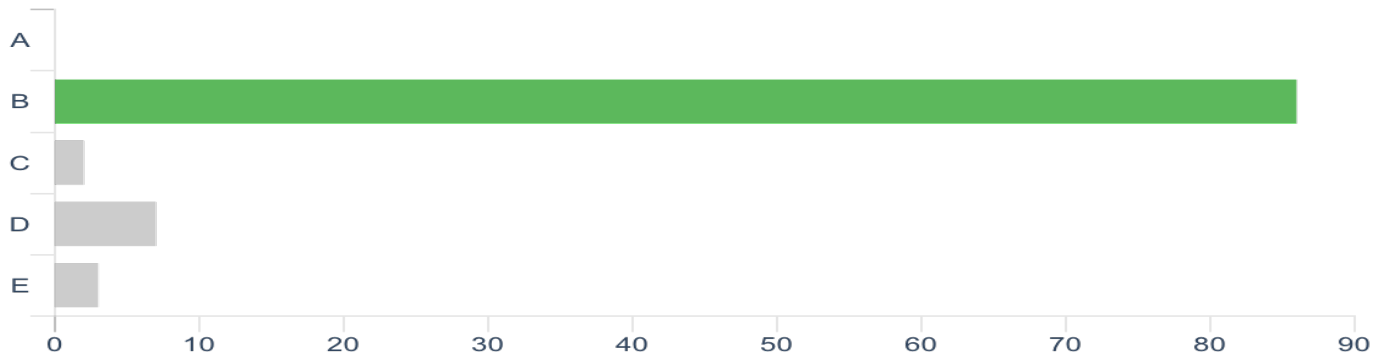
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Responses Correct:	20
Responses Incorrect:	83
Responses Total:	103
Responses - % Correct:	19%



Q104

You have been called to the Cardiology Ward to review a patient who has suddenly changed condition. You quickly browse through the medical notes of the patient while walking up to his bed. He is a 60-year-old man who was admitted the previous day with an acute coronary syndrome.

His troponin was 0.03 ng/ml (normal range < 0.01 ng/ml) and his admission electrocardiogram (ECG) showed an ST segment depression of 1.0 mm in the inferior leads. He was started on aspirin 300 mg, glyceryl trinitrate (GTN) spray prn and enoxaparin 80 mg twice a day. His full blood count (FBC) and urea and electrolytes (U&Es) are within normal limits.

On examination, he is dyspnoeic. His pulse is 140 beats per minute (bpm) and his blood pressure (BP) is 90/45 mmHg. His chest is clinically clear, and he is on high-flow oxygen (15 l). You give him 6 mg of adenosine, without any response. You repeat the same dose of 6 mg and then increase it to 12 mg. With the 12 mg dose, the pulse on the monitor slows down to 105 bpm. A 12-lead ECG is taken at the same time. It reveals flutter waves best seen in the inferior leads and V1.

After a couple of minutes, his pulse shoots back up to 150 bpm. You recheck his BP that is still low at 92/50 mmHg. The patient starts complaining of chest tightness.

How would you control this man's tachycardia?

Your answer was incorrect

- A DC cardioversion
- B Beta-blockers
- C Digoxin
- D Intravenous (IV) flecainide
- E Verapamil

Explanation



- A DC cardioversion

DC cardioversion is the therapy of choice as flutter can be resistant to pharmacological therapy. Additionally, given that he has been admitted with ACS and his initial systolic was only 90 mmHg, cardioversion versus flecainide or verapamil would be the most appropriate option. This patient would need to be sedated or have general anaesthesia before cardioverting him. Very low energies are needed for cardioversion (50–100 J).

C Digoxin

Flutter can be resistant to pharmacological therapy, and therefore digoxin would not be the appropriate treatment.

B Beta-blockers

Beta-blockers would slow down the rate but would not cardiovert the patient, and therefore this is an incorrect option.

D Intravenous (IV) flecainide

Given that he has a history of myocardial ischaemia, flecainide should be avoided.

E Verapamil

Given that he has been admitted with ACS, and his initial systolic was only 90 mmHg, verapamil would not be a good option compared with cardioversion.

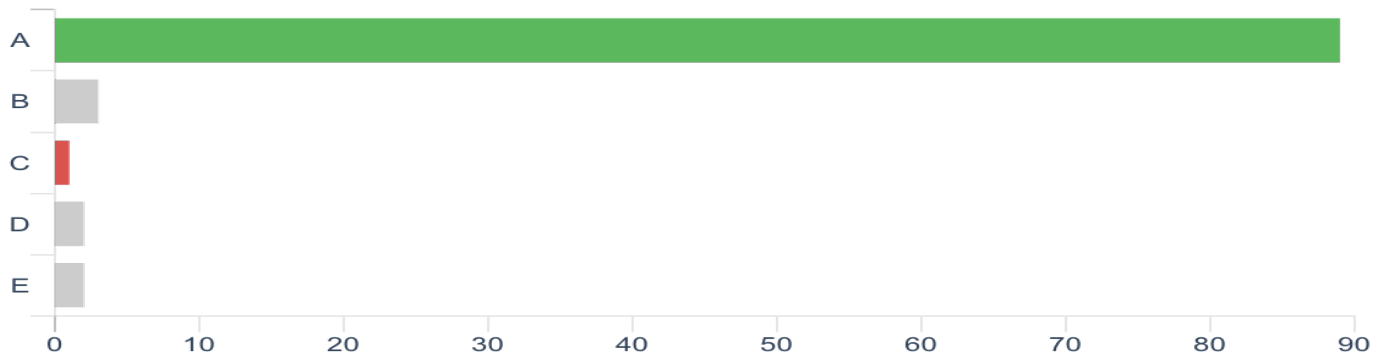
7550

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Responses Correct:	20
Responses Incorrect:	84
Responses Total:	104
Responses - % Correct:	19%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis

Links to NICE guidelines/CKS



Q105

You accompany a patient for an exercise test. This was the patient's 7th day post-myocardial infarction (MI). He had an inferolateral MI and he was having an exercise test for the purpose of risk stratification. At rest, his blood pressure (BP) is 130/75 mmHg. He was able to manage eight minutes on the treadmill using the Bruce protocol. He could have gone on for some more minutes but was limited by shortness of breath and not chest pain. At maximum exercise, his BP was 160/72 mmHg.

Investigations reveal the following:

Investigation	Result
Urea and electrolytes (U&Es)	Normal
Full blood count (FBC)	Normal
Chest X-ray (CXR)	Normal
Resting Electrocardiogram (ECG)	Q waves in leads II, III, aVF

How would you best describe this BP response to exercise?

Your answer was incorrect

- A Both systolic and diastolic responses were abnormal
- B The diastolic response was normal but not the systolic
- C The systolic response was excessive
- D The systolic response was normal but not the diastolic
- E Both systolic and diastolic responses were normal

Explanation



- E Both systolic and diastolic responses were normal

With exercise, systolic pressure progressively increases until maximum exercise. Diastolic BP remains the same and may decrease slightly with progressive exercise. With heart disease, abnormalities in BP response to exercise are common. A fall in blood pressure, failure to rise or excessive rise (systolic >250 mmHg) in blood pressure is an indication to terminate the exercise test.

B The diastolic response was normal but not the systolic

With exercise, systolic pressure progressively increases until maximum exercise – it is a normal response in this case.

A Both systolic and diastolic responses were abnormal

With exercise, systolic pressure progressively increases until maximum exercise. Diastolic BP remains the same and may decrease slightly with progressive exercise. This is the case in this scenario, and therefore responses are normal.

C The systolic response was excessive

Providing systolic rises to <250 mmhg with exercise, then this is not excessive.

D The systolic response was normal but not the diastolic

Diastolic BP remains the same and may decrease slightly with progressive exercise, as in this case, so it is a normal diastolic response.

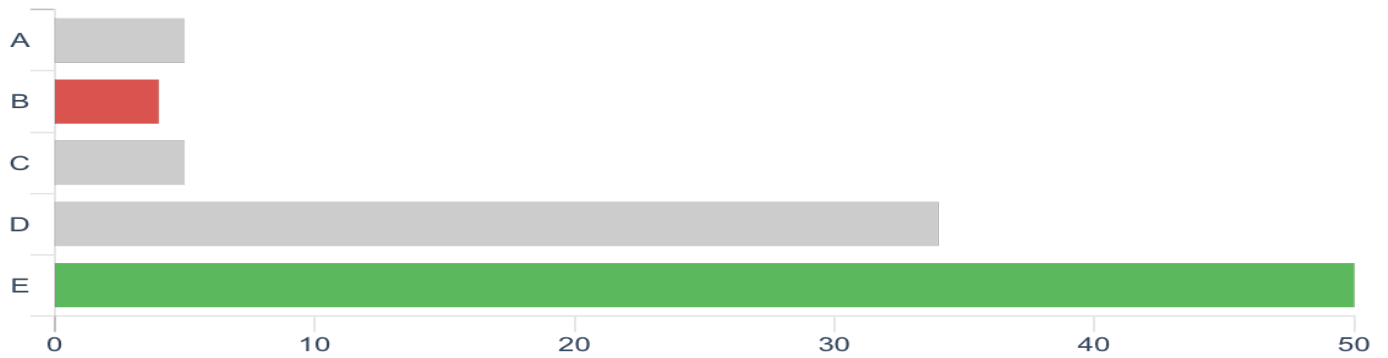
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Responses Correct:	20
Responses Incorrect:	85
Responses Total:	105
Responses - % Correct:	19%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis

Links to NICE guidelines/CKS



Q106

Your Registrar has asked you to carry out some blood gases on a patient who presented to the Emergency Department (ED) with chest pain and is now on the Coronary Care Unit. They have a previous history of deep vein thrombosis (DVT) five years ago. The patient is a 65-year-old lady who just presented with severe chest pain that started six hours earlier. The chest pain was central, radiated to the neck and lasted for about 45 minutes. The chest pains have resolved some two hours earlier, although she says she feels light headed. Her admission electrocardiogram (ECG) revealed sinus rhythm with T wave inversion in the anterior chest leads and her troponin at six hours is negative.

While trying to draw some blood, the patient suddenly becomes restless and starts complaining of shortness of breath. The ECG monitor shows a pulse of 188 beats per minute (bpm) and her blood pressure (BP) is 105/60 mmHg. You immediately start the patient on high-flow oxygen using a mask and request a 12-lead ECG. This ECG reveals a narrow complex tachycardia.

What would you immediately do for this patient?

Your answer was incorrect

- A DC cardioversion
- B Give the patient a bolus dose of intravenous (IV) lidocaine 100 mg
- C Start the patient on amiodarone infusion of 300 mg in 1 h
- D Give the patient a bolus dose of IV adenosine 6 mg
- E Start patient on oral beta-blockade

Explanation



- D Give the patient a bolus dose of IV adenosine 6 mg

This lady is likely to be suffering an acute coronary syndrome episode. Giving her a fast intravenous (IV) dose of adenosine 6 mg and repeating it if there is no response is the most appropriate immediate action. The patient's response to adenosine would depend on the underlying arrhythmia. In rare cases adenosine has been reported to cause destabilisation of

VT and lead to further deterioration of blood pressure and heart rate, but on the balance of probabilities adenosine would still be the best course of action here. The response to giving adenosine in the following situations is tabulated here.

Sinus tachycardia	Transient atrioventricular (AV) block
Atrial fibrillation	Transient AV block
Atrial flutter	Transient AV block
Atrioventricular nodal re-entrant tachycardia (AVNRT)	May terminate
Atrioventricular re-entrant tachycardia (AVRT)	May terminate
Ventricular tachycardia	Likely to have no effect

C Start the patient on amiodarone infusion of 300 mg in 1 h

Amiodarone would be more appropriate for ventricular tachycardia.

A DC cardioversion

Her blood pressure (BP) is 105/60 mmHg and so she is not haemodynamically compromised; therefore, giving DC cardioversion is not required and adenosine should be tried first.

B Give the patient a bolus dose of intravenous (IV) lidocaine 100 mg

Her blood pressure (BP) is 105/60 mmHg and so she is not haemodynamically compromised; giving lidocaine is incorrect.

E Start patient on oral beta-blockade

Oral beta-blockers are slow to act and could worsen any heart failure in the acute setting.

7552

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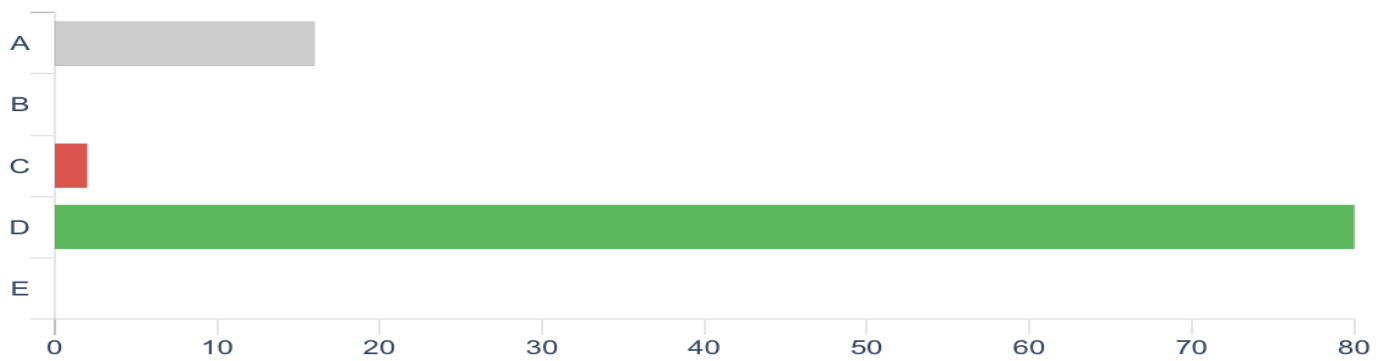
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Responses Total:	106
Responses - % Correct:	19%



Q107

A 23-year-old woman presents to the Emergency Department (ED) complaining that she is feeling unwell. She was playing tennis when she suddenly felt faint but didn't lose consciousness. This is her second episode of pre-syncope; the other occurred when she went swimming as part of a charity event. Extensive investigations were carried out on the first occasion but none revealed anything diagnostic.

The investigations included an electrocardiogram (ECG), a 24 hour ECG monitor, echocardiography (ECHO), a chest X-ray (CXR), routine full blood count (FBC), and biochemistry, which were all reported as unremarkable. There is no past medical history of any serious illness apart from syncope. She is not on any medication.

On examination she is alert. Her blood pressure (BP) is 120/65 mmHg and her pulse 70 beats per minute (bpm) and regular. Cardiovascular, respiratory, nervous and abdominal examinations are all normal.

Investigations reveal the following:

Investigation	Result
Urea and electrolytes (U&Es)	Normal
FBC	Normal
CXR	Normal
ECG	QT prolongation: QTc 0.49 s

How would you manage this young lady?

Your answer was incorrect

- A Electrophysiological studies
- B Insert a cardioverter-defibrillator
- C Start her on a beta-blocker
- D Start her on amiodarone
- E Start her on a calcium channel blocker

Explanation



C Start her on a beta-blocker

Long-QT syndrome (LQTS) is a congenital disorder characterised by a prolongation of the QT interval on electrocardiogram (ECG) and a propensity to ventricular tachyarrhythmias, which may lead to syncope, cardiac arrest or sudden death. LQTS is caused by mutations of cardiac ion channel genes, and two forms have been recognised: Romano-Ward syndrome and Jervell and Lang-Nielsen. Beta-blockers are the drugs of choice for patients with LQTS. The protective effect of beta-blockers is related to their adrenergic blockade diminishing the risk of cardiac arrhythmias.

D Start her on amiodarone

Amiodarone will prolong the QT interval, so it would not be given in this case.

A Electrophysiological studies

Electrophysiological studies are minimally invasive procedures that test the electrical conduction system of the heart to assess its electrical activity and conduction pathways. It is not needed in this scenario, as we know that QT is prolonged and it has a certain set of potential differentials.

B Insert a cardioverter-defibrillator

Implantation of cardioverter-defibrillators appears to be the most effective therapy for high-risk patients, and left cervicothoracic stellectomy is another antiadrenergic therapeutic measure used in high-risk patients with LQTS. High risk in this context is usually described by a history of collapse. Given this woman's age, it may be preferable to have a trial of beta-blockade before committing to an implantable cardioverter-defibrillator.

E Start her on a calcium channel blocker

Calcium channel blockers are not useful in this case of prolonged QT interval; in fact, some calcium channel blockers are responsible for prolongation of QT interval.

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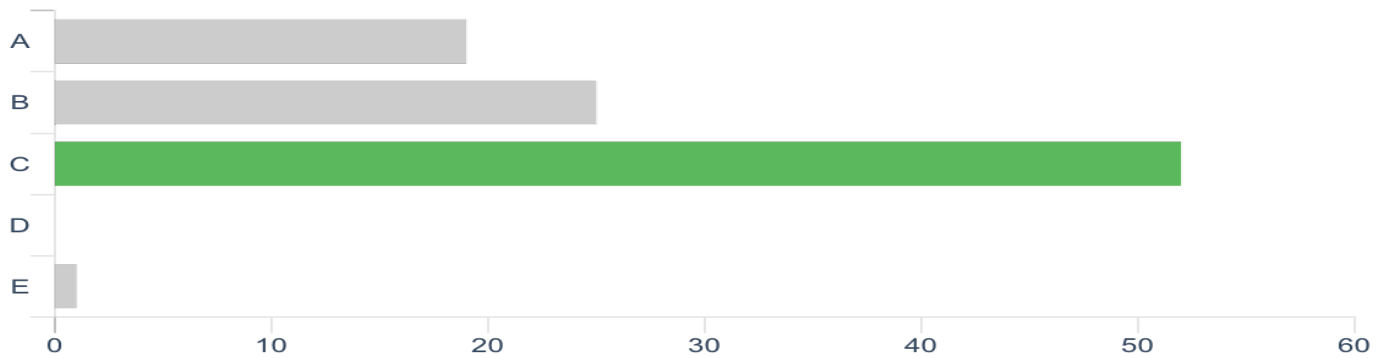
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Responses Correct:	20
Responses Incorrect:	87
Responses Total:	107
Responses - % Correct:	19%



Q108

You have just finished resuscitating a 69-year-old woman who was in ventricular fibrillation (VF). You managed to cardiovert her back to sinus rhythm after three shocks at 360 J. This is the second time she has had VF. The first time was about six hours ago and she was cardioverted back to sinus rhythm. This lady had suffered an anterior myocardial infarction (MI) and was thrombolysed two days previously. She is taking aspirin 75 mg, isosorbide mononitrate 30 mg twice a day and atenolol 50 mg once a day.

Investigations reveal the following:

Investigation	Result	Normal Value
Haemoglobin (Hb)	141 g/l	115-155 g/l
White cell count (WCC)	$12.3 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$203 \times 10^9/l$	$150-400 \times 10^9/l$
Mean corpuscular volume (MCV)	80.1 fl	80-100 fl
Sodium (Na ⁺)	132 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.1 mmol/l	3.5-5.0 mmol/l
Urea	7.2 mmol/l	2.5-6.5 mmol/l
Creatinine (Cr)	121 μ mol/l	50-120 μ mol/l

Blood gases reveal the following:

Investigation	Result	Normal values
pO ₂	23 kPa	10.5-13.5 kPa
pCO ₂	3.1 kPa	4.6-6.0 kPa
pH	7.29	7.35-7.45

What prophylactic medication would you start her on to prevent further arrhythmias?

Your answer was incorrect

- A Amiodarone infusion
- B Flecainide

- C Lidocaine infusion
- D Propafenone
- E Verapamil

Explanation



- A Amiodarone infusion

Amiodarone infusion should be started (300 mg over the first hour and then 900 mg over the next 23 h), and then oral doses should be continued.

- B Flecainide

Flecainide has been shown to be associated with increased mortality in studies that have been done in patients with arrhythmias post-myocardial infarction, and should be avoided.

- C Lidocaine infusion

Lignocaine is negatively inotropic and would therefore be a subsidiary choice in this situation.

- D Propafenone

Propafenone has been shown to be associated with increased mortality in studies that have been done in patients with arrhythmias post-myocardial infarction, and should be avoided.

- E Verapamil

Verapamil is negatively inotropic, so would not be a good choice in this scenario.

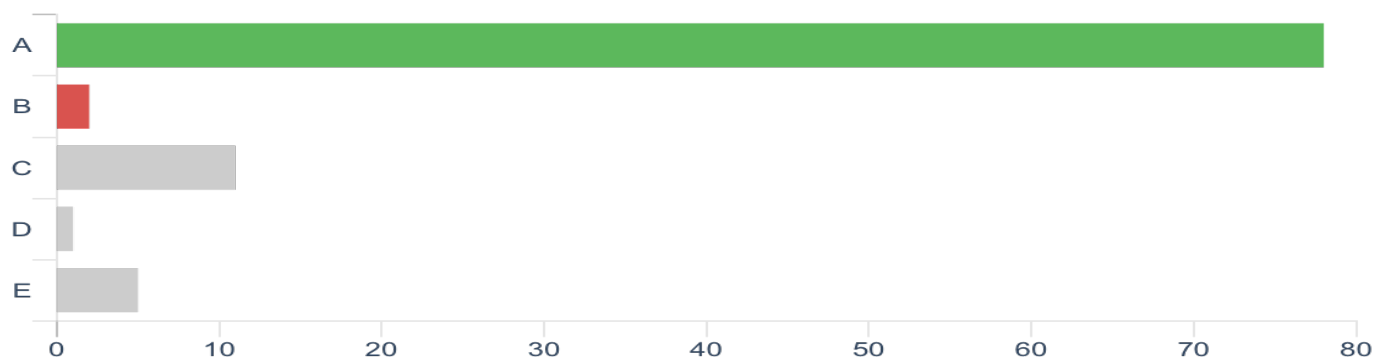
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Session Progress

Responses Correct:	20
Responses Incorrect:	88
Responses Total:	108
Responses - % Correct:	19%

Expanded Explanation

Overview

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Links to NICE guidelines/CKS



Q109

A 72-year-old man comes for a review in the Cardiology Clinic. He had an inferolateral myocardial infarction (MI) that was thrombolysed four weeks ago. He had recovered uneventfully, and was discharged on the fifth day post-MI. Now, he comes to your clinic and he is asymptomatic. His regular medication includes atenolol 100 mg and ramipril 10 mg.

On examination, his blood pressure (BP) is 135/80 mmHg and his pulse is 40 beats per minute (bpm) and regular.

Investigations reveal the following:

Investigation	Result
Echocardiogram (ECHO)	Normal
Electrocardiogram (ECG)	Sinus bradycardia with RR interval of 2.0 s, Q waves in leads II, III, aVF, V5-V6

What would you do for this patient?

Your answer was incorrect

- A Give adrenaline
- B Give atropine
- C Give isoprenaline
- D Insert a permanent pacemaker
- E Reduce his atenolol

Explanation



- E Reduce his atenolol

This man is likely to be over-beta-blocked. Management of choice would be to reduce his atenolol to 50 mg and arrange follow-up with his GP.

D Insert a permanent pacemaker

Pacemaker insertion may be used for treatment of symptomatic complete heart block. In this scenario, the heart rate would improve with reduction in atenolol. There is no heart block here.

A Give adrenaline

Adrenaline is given in a number of conditions, including anaphylaxis, cardiac arrest and superficial bleeding. Side effects include shakiness, anxiety and sweating. It is not a cardiac arrest situation in this scenario and therefore adrenaline is the wrong option.

B Give atropine

Atropine is given for reversing bradycardia and hypotension in beta-blocker overdose. This patient's blood pressure is normal, and therefore although he is over-beta-blocked there is no need for urgent reversal; instead, reduction in atenolol will be sufficient.

C Give isoprenaline

Isoprenaline is a medication used for treatment of bradycardia, heart block and rarely for asthma. This patient's blood pressure is normal, and therefore although he is over-beta-blocked, there is no need for urgent reversal; instead, reduction in atenolol will be sufficient.

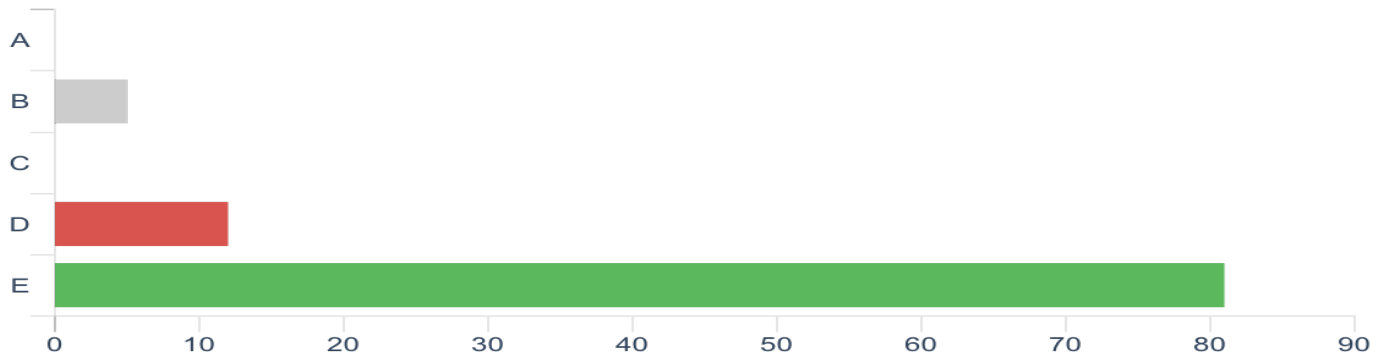
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Responses Correct:	20
Responses Incorrect:	89
Responses Total:	109
Responses - % Correct:	18%

Expanded Explanation

Overview

Clinical Presentation

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Links to NICE guidelines/CKS



Q110

You are reviewing a 70-year-old lady who you last saw in the Cardiology Clinic last week. You requested a 24 hour Holter monitor for her. She had an inferior myocardial infarction (MI) that was thrombolysed four weeks ago. She recovered uneventfully and was discharged on the fifth day post-MI. She came to your clinic last week with symptoms of palpitations and dizziness occurring simultaneously. She got those episodes about twice a day in the preceding two weeks.

On examination, her blood pressure (BP) is 130/70 mmHg. Her pulse is 72 beats per minute (bpm) and regular. Her jugular venous pressure (JVP) is not raised, first and second heart sounds are heard, and there are no murmurs. Her chest is clinically clear. Her full blood count (FBC) and blood biochemistry are normal.

Investigations reveal the following:

Investigation	Result
Chest X-ray (CXR)	Normal
Electrocardiogram (ECG)	Normal sinus rhythm with Q waves in II, III and aVF. The PR interval is prolonged.
Echocardiography (ECHO)	Normal findings
24 hour Holter monitor	Two episodes of bradycardia with a heart rate of 30/min; during these periods P waves appear unrelated to the QRS complexes. These episodes coincided with the symptoms

How are you going to manage this lady?

Your answer was correct

- A Calcium channel blocker
- B Permanent pacemaker
- C Do nothing
- D Electrophysiology studies
- E Start a beta-blocker

Explanation



B Permanent pacemaker

This lady has symptomatic complete heart block and she would definitely benefit from a pacemaker. The frequency of events and the heart rate fit best with complete heart block rather than episodes of ischaemia.

A Calcium channel blocker

Calcium channel blockers are negatively inotropic and may cause third-degree heart block; these therefore have no role in this scenario as this patient has symptomatic complete heart block.

C Do nothing

This patient has symptomatic complete heart block; doing nothing will not be appropriate as her symptoms will persist.

D Electrophysiology studies

Electrophysiological studies are minimally invasive procedures that test the electrical conduction system of the heart to assess its electrical activity and conduction pathways. The 24 h Holter readings are already consistent with complete heart block, so there is no need for electrophysiology studies.

E Start a beta-blocker

This patient already has bradycardia, and therefore adding a beta-blocker will exacerbate problem and will be potentially harmful.

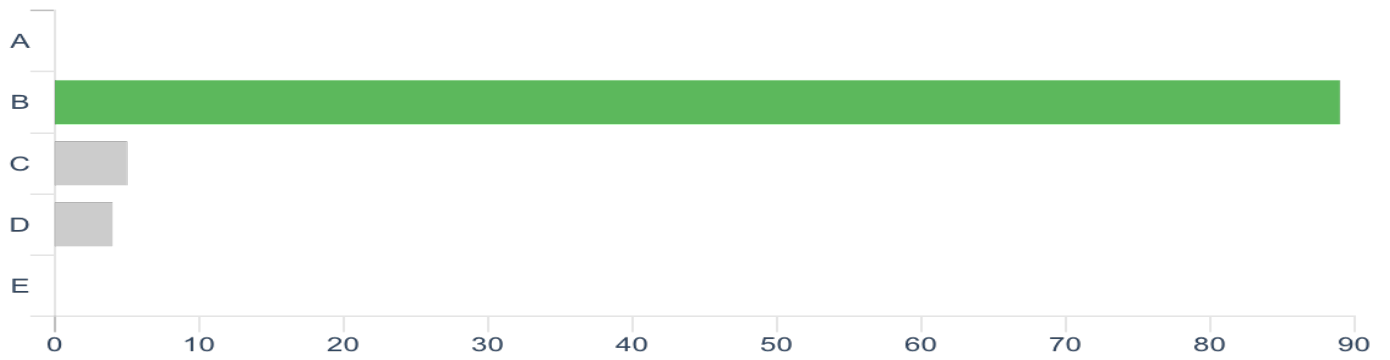
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Responses Incorrect:	89
Responses Total:	110
Responses - % Correct:	19%



Q111

A 70-year-old woman comes to your Cardiology Clinic for follow-up. She is a known patient with stable heart failure (NYHA II) due to ischaemic cardiomyopathy. She has chronic atrial fibrillation (AF) and has been anticoagulated with warfarin. Her last echocardiogram (ECHO) showed biatrial dilation.

Her other medications include: digoxin 125 µg once a day, furosemide 40 mg once a day, ramipril 2.5 mg once a day and bisoprolol 2.5 mg.

On examination, her resting pulse is 61 beats per minute (bpm) with a blood pressure (BP) of 132/82 mmHg.

Today, her international normalised ratio (INR) was 2.7. She would like to know whether there would be any benefits if she was cardioverted to normal sinus rhythm.

How would you advise this woman?

Your answer was incorrect

- A Rate control is better than rhythm control with respect to stroke
- B She should be referred for electrical cardioversion
- C She should be switched to amiodarone in an attempt to cardiovert her
- D Rhythm control has no survival benefit over a rate control strategy
- E She would benefit from ivabradine

Explanation



- D Rhythm control has no survival benefit over a rate control strategy

Current evidence suggests that rhythm control has no benefit over a rate control strategy, and indeed there was a trend to decreased mortality and decreased cardiovascular events in patients treated with a rate control intervention.

- C She should be switched to amiodarone in an attempt to cardiovert her

Amiodarone is highly unlikely to help her attain sinus rhythm, and carries significant risk with respect to long-term side effects including photosensitivity and thyroid dysfunction.

A Rate control is better than rhythm control with respect to stroke

Any difference between rate control and rhythm control on outcomes did not reach statistical significance.

B She should be referred for electrical cardioversion

In this situation, with dilated cardiomyopathy, electrical cardioversion is unlikely to be successful and would not impact on outcomes.

E She would benefit from ivabradine

Patients who benefit most are those with persistent resting tachycardia who are suffering from either heart failure or angina.

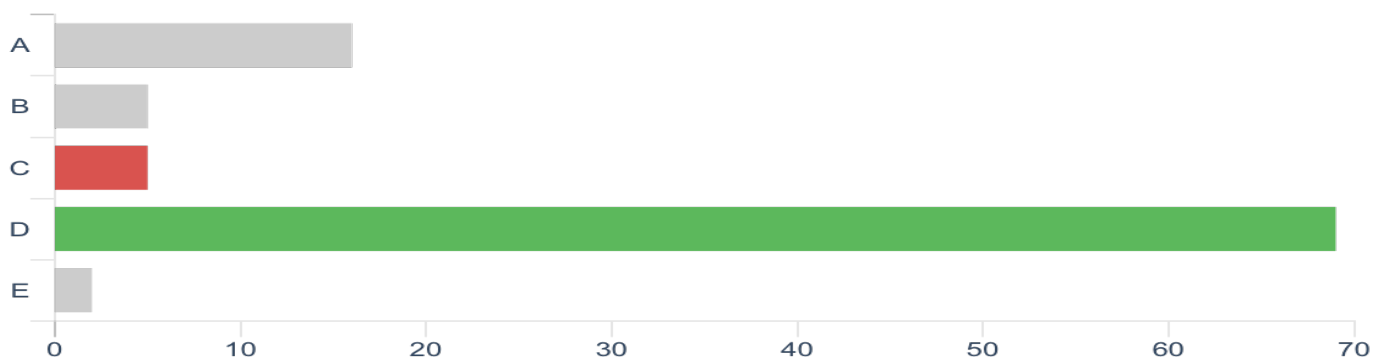
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Session Progress

Responses Correct:	21
Responses Incorrect:	90
Responses Total:	111
Responses - % Correct:	19%

 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q112

A 31-year-old man presents to his General Practitioner (GP) complaining of fainting episodes which have a recent onset. He does not attribute his faints to any particular activity, and sometimes he has noticed light-headedness even as he has changed position at rest. On further questioning, he admits to having felt increasingly tired and short of breath with minimal exertion. His appetite has decreased and he has lost about 5 kg of weight in the preceding two months. He had been otherwise fit and well, and is not on any medication. He is a non-smoker. He admits to being very concerned since his father died suddenly at a similar age to himself, but he does not know the cause of death.

Positive findings on examination of the patient include clubbing of his fingers and a raised jugular venous pressure (JVP). Auscultation of the heart reveals a loud first heart sound, a third heart sound and a systolic murmur at the lower sternal border. His blood pressure is 142/82 mmHg. Neurological examination is normal.

What is the most likely diagnosis?

Your answer was correct

- A Infective endocarditis
- B Takayasu's disease
- C Rheumatic fever
- D Atrial myxoma
- E Bornholm disease

Explanation



- D Atrial myxoma

An atrial myxoma is the most common primary heart tumour and produces symptoms either through distant embolisation or mechanical interference with cardiac function. Three-quarters of cases of atrial myxoma occur in females, and sudden death may occur in 15% of patients. Patients may experience symptoms related to left- or right-sided heart failure. Exertional dyspnoea is present in three-quarters of patients. Dizziness or syncope results from the atrial myxoma obstructing the mitral valve. The patient may also have constitutional symptoms that include fever, weight loss and arthralgias. On examination, a loud first heart sound is often

heard due to a delay in mitral valve closure due to the prolapse of the tumour into the mitral valve orifice. However, atrial myxoma can cause a variety of findings on cardiac auscultation: for example, diastolic tumour 'plop', systolic murmur if tricuspid regurgitation occurs, or a diastolic rumble if mitral valve obstruction is present. Although most cases of atrial myxoma are sporadic, an autosomal dominant variety may also exist within families.

A Infective endocarditis

The more prolonged period of symptoms seen here, without more marked features of sepsis, is less consistent with a diagnosis of infective endocarditis versus atrial myxoma.

B Takayasu's disease

Takayasu's arteritis is an idiopathic arteritis causing narrowing of the proximal innominate, carotid and subclavian arteries and commonly affects females.

C Rheumatic fever

There is no history of antecedent streptococcal infection to suggest rheumatic fever.

E Bornholm disease

Bornholm's disease is intercostal muscle pain associated with Coxsackie B virus infection.

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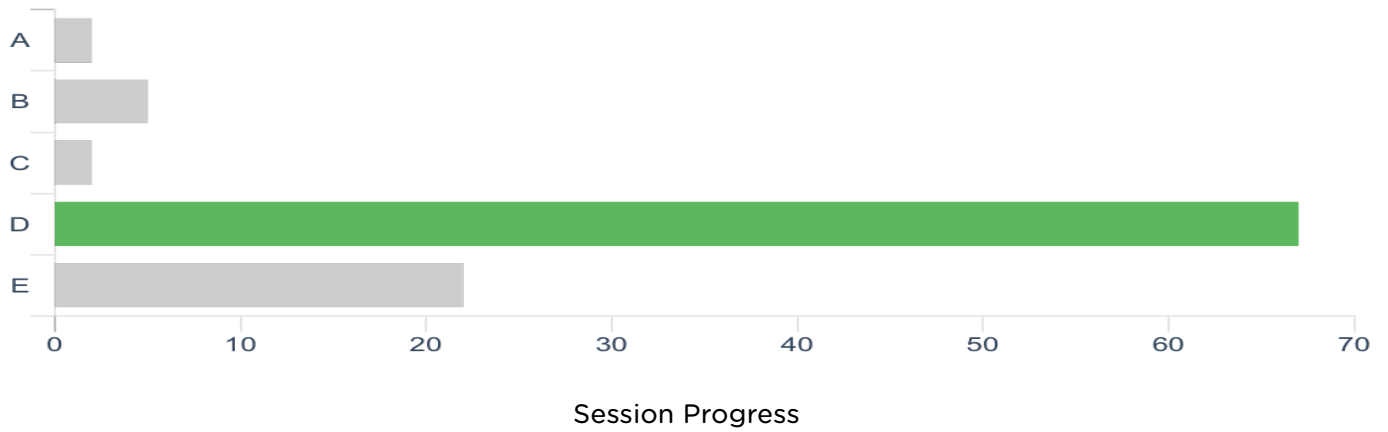
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Responses Correct:	22
Responses Incorrect:	90
Responses Total:	112
Responses - % Correct:	20%

Expanded Explanation

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Q113

A pre-registration House Officer asks for advice about an electrocardiogram (ECG) recording he has been shown from a young, 20-year-old female patient admitted unconscious after taking a paracetamol overdose. The ECG showed sinus rhythm, but with a P-axis of +120 degrees and prominent QRS amplitudes in the right leads that diminish in size over the left precordial leads. No other abnormalities were noted. After seeing the ECG the Registrar becomes interested in examining the patient.

Which of the following is seen with increased frequency in patients with her underlying condition?

Your answer was incorrect

- A Colon cancer
- B Bronchiectasis
- C Haemolytic anaemia
- D Hypertrophic obstructive cardiomyopathy
- E Wolff-Parkinson-White syndrome

Explanation



- B Bronchiectasis

This patient has dextrocardia, and so the cardiac apex now points rightwards with the morphological right atrium and right ventricle now being on the left. It is commonly associated with reversal in the position of the abdominal organs, known as situs inversus. Dextrocardia is a rare condition and occurs with equal frequency in males and females. The classical features on an ECG are inverted P-waves in lead I, a shift of the P-axis (usually about +120 degrees) and reversed R-wave progression. Reverse placement of the precordial leads on the right chest at sites corresponding to the left chest positions corrects this trend. Typically patients have a normal life expectancy if no cardiac anomalies are present. Bronchiectasis is seen with increased frequency in patients with dextrocardia, as part of Kartagener syndrome, which is the combination of bronchiectasis, chronic sinusitis, subfertility and situs inversus with dextrocardia.

D Hypertrophic obstructive cardiomyopathy

HOCM is not associated with dextrocardia although pulmonary hypertension may be, because of chronic chest disease due to immotile cilia.

A Colon cancer

Colon cancer is associated with a number of adenomatous polyposis syndromes such as Gardener, which follows an autosomal dominant pattern of inheritance.

C Haemolytic anaemia

Haemolytic anaemia is associated with a range of inherited conditions including hereditary spherocytosis, elliptocytosis and G6PD deficiency.

E Wolff-Parkinson-White syndrome

WPW syndrome and other conditions associated with tachyarrhythmias are not seen with increased frequency in dextrocardia.

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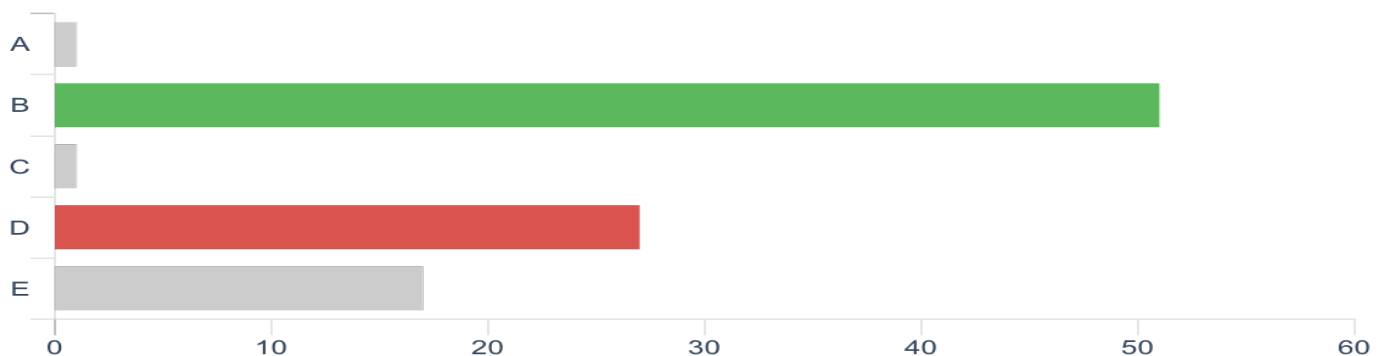
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Session Progress

Responses Correct:	22
Responses Incorrect:	91
Responses Total:	113
Responses - % Correct:	19%

Expanded Explanation

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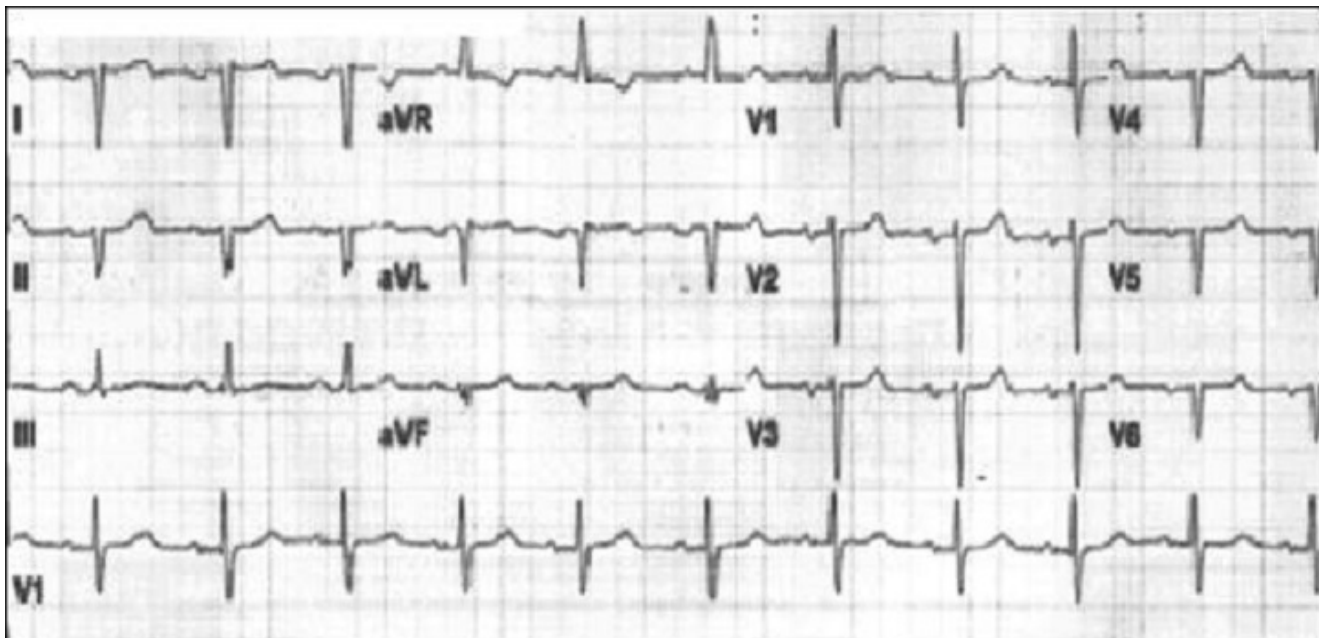


Q114

You are a General Medical Senior House Officer (SHO) in a District General Hospital. You are asked to see a 20-year-old man in the Emergency Department (ED) who is breathless. He gives a history of recent air travel to South America within the last 10 days. He denies any past medical history, but says that he has a chronic smokers' cough. The patient is not taking any regular medications.

On examination, he is a thin man with tachypnoea at rest. His baseline observations include a blood pressure (BP) of 120/80 mmHg, and a pulse of 100 beats per minute (bpm). His oxygen saturation is 89% on room air and his temperature is 38.5°C. He is noted to have bi-basal crepitations and ill-defined heart sounds on auscultation. Routine bloods reveal an elevated white blood cell count (WCC) and c-reactive protein (CRP).

An electrocardiogram (ECG) conducted on admission is shown below:



What is the next step in his management?

Your answer was incorrect

- A Echocardiogram to rule out an atrial septal defect (ASD)
- B Organise a VQ scan and commence low-molecular weight heparin
- C Measure alpha-1 antitrypsin level and arrange a thoracic CT
- D Organise a chest X-ray and commence antibiotic therapy

E Perform delta F508 genetic screening

Explanation



D Organise a chest X-ray and commence antibiotic therapy

Although the story is of a young man having travelled to South America, the faint heart sounds, 'chronic smokers' cough and abnormal ECG all point towards dextrocardia, bronchiectasis and therefore Kartagener syndrome.

The clinical features are consistent with an acute lower respiratory tract infection.

The ECG with leads in the usual precordial position reveals inverted P-waves in lead I with a negative major QRS deflection. Upright P-waves with a positive QRS deflection are seen in lead aVR with mirror image findings in lead aVL, and an abnormal precordial progression of R wave from lead V1 to V6.

B Organise a VQ scan and commence low-molecular weight heparin

The pyrexia and abnormal chest findings on auscultation make respiratory tract infection more likely as the underlying cause of his symptoms versus a pulmonary embolism.

A Echocardiogram to rule out an atrial septal defect (ASD)

The most pressing problem here is the likely acute lower respiratory tract infection, with antibiotic therapy the key intervention. An ASD is less likely versus dextrocardia, for which the ECG findings are very consistent.

C Measure alpha-1 antitrypsin level and arrange a thoracic CT

Alpha-1 antitrypsin deficiency is associated with emphysema rather than bronchiectasis.

E Perform delta F508 genetic screening

Some patients who are heterozygous for the cystic fibrosis mutation are at increased risk of bronchiectasis, although in this case the ECG changes seen here would not be expected.

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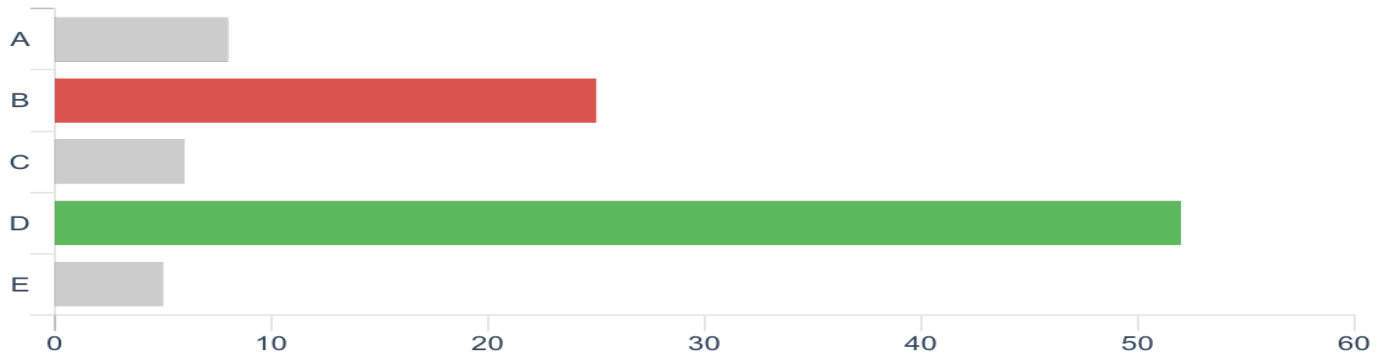
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Difficulty: Average

Peer Responses %



Session Progress

Responses Correct:	22
Responses Incorrect:	92
Responses Total:	114
Responses - % Correct:	19%



Q115

A 70-year-old man presents to your clinic. Looking through his medical notes, you see that he has had a single ventricular lead (VVIR) pacemaker implanted six years previously for episodes of sinus arrest. At the time, he had symptoms of sudden collapse with pre-syncope. Since the pacemaker, he has not experienced such symptoms but on occasions, he has been tired and listless, with a feeling of pounding in the neck or chest. His wife says that she can sometimes see large, pulsating veins in his neck. The pulsations last only a matter of seconds and are not associated with chest pain. He has mentioned this on several occasions in previous clinics but has always been reassured that nothing was wrong, and to sit down when it occurs. Otherwise, he is well in himself with a mild degree of prostatism.

On examination, there is nothing of note in his cardiovascular or respiratory characteristics. In his neurological system, the power is equal in both upper and limbs with intact reflexes. His plantar responses are down-going.

The interrogation of the pacemaker has shown no adverse complications. The battery life is good and the lead impedance is satisfactory.

What is your advice to this patient?

Your answer was incorrect

- A He needs his VVIR pacemaker box changed
- B He needs repositioning of his pacemaker lead
- C He needs a DDDR upgrade of the VVIR pacemaker
- D He needs a tilt test
- E He needs treatment with amiodarone

Explanation



- C He needs a DDDR upgrade of the VVIR pacemaker

This is pacemaker syndrome. The VVIR prefix denotes a single ventricular lead pacemaker, which senses and paces the ventricle and inhibits responses to a sensed event. An untimely contraction of the atria caused by retrograde conduction of the ventricular pacemaker impulse mimics complete heart block, and the pounding is the feeling of atria contracting

against a closed tricuspid valve causing cannon waves in the neck. The treatment is to upgrade the system to a dual-chamber pacemaker, which allows the atria to sense any retrograde electrical impulse and thus inhibiting native atrial depolarisation.

E He needs treatment with amiodarone

Only a dual-chamber pacemaker will lead to resolution of this patient's symptoms.

A He needs his VVIR pacemaker box changed

Changing the VVIR pacemaker box for another one won't impact on the risk of pacemaker syndrome, and it is therefore not advised.

B He needs repositioning of his pacemaker lead

It isn't failure of capture that is driving pacemaker syndrome but retrograde conduction of the ventricular pacemaker impulse, and hence lead repositioning won't resolve the problem.

D He needs a tilt test

The tilt table test is used to diagnose syncope related to autonomic nervous system dysfunction.

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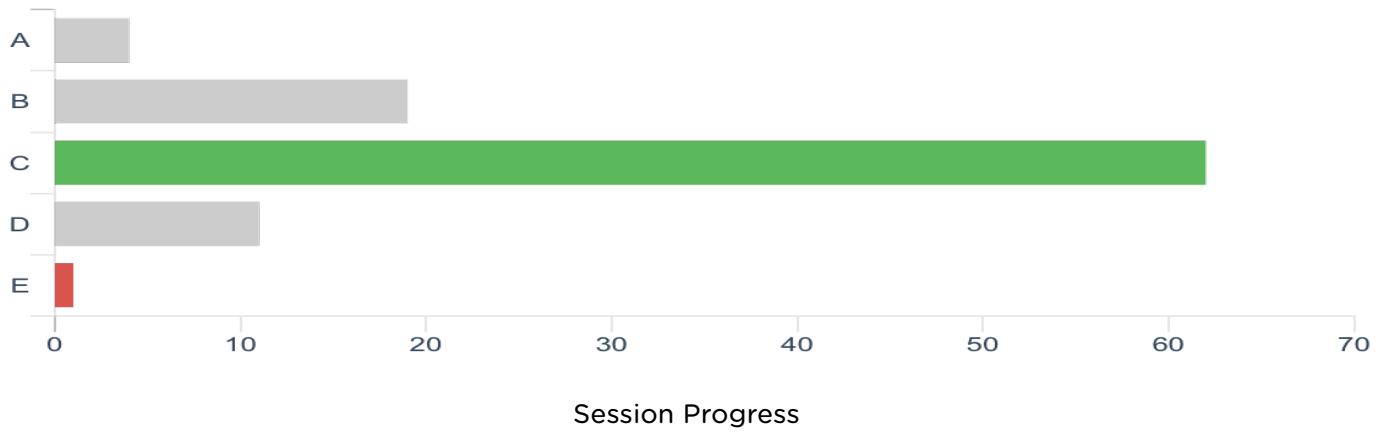
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Responses Correct:	22
Responses Incorrect:	93
Responses Total:	115
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Expanded Explanation

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Q116

A General Practitioner (GP) calls you, asking for advice regarding a 25-year-old man who came to his surgery complaining of chest pain, which was subsequently diagnosed as musculoskeletal in origin. During his initial assessment the patient's blood pressure was 150/105 mmHg and on subsequent checks it has remained around this level. His body mass index (BMI) is normal, at 23 kg/m², and he works out at the gym each day. There is a strong family history of ischaemic heart disease (IHD) and hypertension. The GP wants advice regarding treating his blood pressure.

What is your advice to the GP?

Your answer was incorrect

- A Start amlodipine
- B Arrange a 24 h ABPM to decide on the best therapeutic intervention
- C Start ramipril
- D Start bendroflumethiazide
- E Start atenolol

Explanation



- B Arrange a 24 h ABPM to decide on the best therapeutic intervention

In this patient, where there are no obvious risk factors for hypertension, 'white coat syndrome' should be avoided first. NICE guidelines therefore recommend ambulatory blood pressure monitoring.

- D Start bendroflumethiazide

Thiazides are no longer recommended first-line agents for the treatment of hypertension, because of the negative effects on glucose tolerance over the longer term.

- A Start amlodipine

Calcium channel blockers are the first-line intervention of choice for patients of Afro-Caribbean ethnic origin and those who are above 55 years of age.

C Start ramipril

ACE inhibition would only be recommended in this situation once hypertension has actually been confirmed by ambulatory blood pressure monitoring. Urea and electrolytes should of course be checked first before starting therapy.

E Start atenolol

Beta blockers are not a first-line intervention for hypertension, and are best avoided in young men because of possible negative effects on erectile function.

7677

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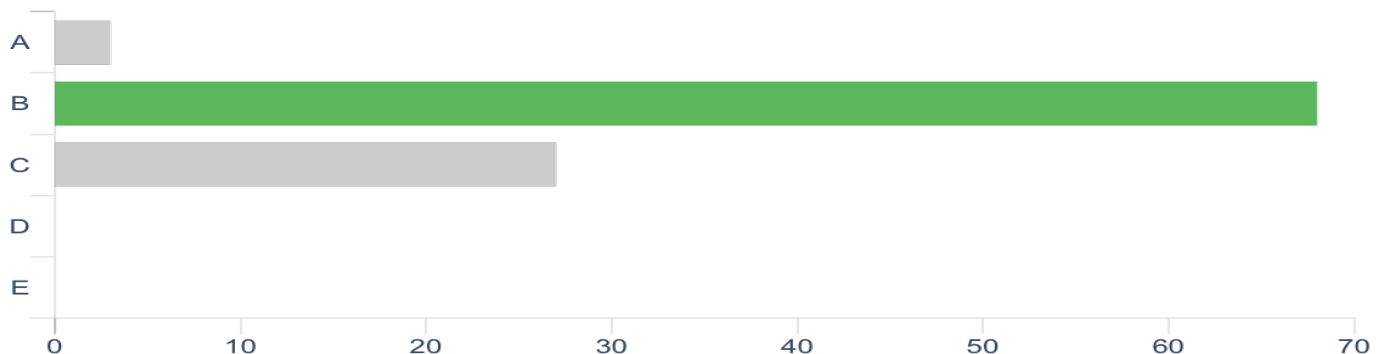
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External Links

NICE. Hypertension overview

pathways.nice.org.uk/pathways/hypertension

(<https://pathways.nice.org.uk/pathways/hypertension>)

Expanded Explanation

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Q117

A General Practitioner (GP) calls you asking for advice regarding a 52-year-old man who came to his surgery, complaining of chest pain, which was subsequently diagnosed as musculoskeletal in origin because of tenderness in the upper chest wall and a recent history of moving heavy boxes at home.

During his initial assessment, the patient's blood pressure was 170/100 mmHg, and on subsequent visits, it has remained at around this level. Ambulatory blood pressure measurement has confirmed moderate hypertension.

He is an ex-smoker of four years. There is a strong family history of ischaemic heart disease (IHD) and hypertension. He says that there is no evidence of left ventricular hypertrophy on his electrocardiogram (ECG), and his urine dipstick did not show proteinuria.

The GP wants advice regarding treating his blood pressure.

What is your advice to the GP?

Your answer was correct

- A You suggest reassurance and a 'do-nothing approach'
- B You suggest a low-salt diet and regular exercise
- C You suggest treatment with an angiotensin-converting enzyme (ACE) inhibitor
- D You suggest treatment with a calcium channel inhibitor
- E You suggest treatment with an angiotensin II receptor blocker (ARB)

Explanation



- C You suggest treatment with an angiotensin-converting enzyme (ACE) inhibitor

The National Institute for Health and Care Excellence (NICE) guidelines give separate guidance for adults over and under the age of 55 years. A meta-analysis of all currently available evidence indicates that first-line therapy for those aged < 55 years should be an ACE inhibitor.

ACE inhibitors have been shown to be effective not only against hypertension, but also in the prevention of diabetic nephropathy, congestive heart failure and the prophylaxis of cardiovascular events.

A You suggest reassurance and a 'do-nothing approach'

This man has moderate hypertension, confirmed over several readings. Even though there is no evidence of end-organ damage (and without knowing his total cholesterol to high-density lipoprotein (HDL) ratio) he falls into the cardiovascular disease risk group of 10–20% over the next 10 years on the Framingham charts, which warrants pharmacological interventions.

B You suggest a low-salt diet and regular exercise

Given the above risk of cardiovascular disease, the patient warrants treatment with pharmacological interventions, and not just lifestyle modification.

D You suggest treatment with a calcium channel inhibitor

NICE guidelines recommend that in patients over 55 years of age, initial therapy should be with a calcium channel inhibitor or a thiazide-like diuretic if the calcium channel inhibitor is unsuitable.

E You suggest treatment with an angiotensin II receptor blocker (ARB)

Treatment with an ARB is advocated by NICE guidelines for patients in whom treatment with an ACE inhibitor is not tolerated.

Data from meta-analyses have shown no difference in total mortality or cardiovascular outcomes for ARBs, as compared with ACE inhibitors. However, unlike ACE inhibitors, ARBs have not been directly studied in placebo-controlled trials for hypertension. Thus, the use of ARBs has weaker evidence regarding mortality and morbidity outcomes, compared with ACE inhibitors.

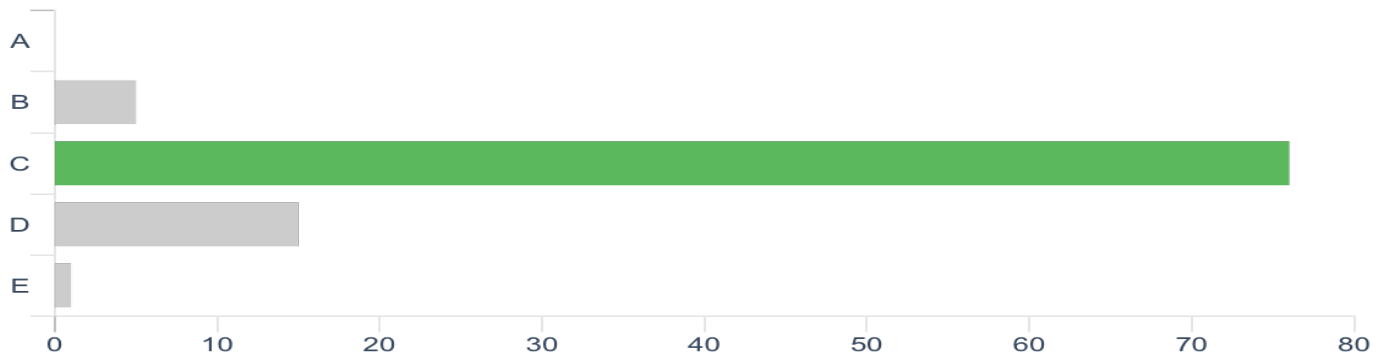
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Responses Incorrect:	94
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External Links

Framingham Heart Study. Coronary heart disease (10-year risk).

[framinghamheartstudy.org/fhs-risk-functions/coronary-heart-disease-10-year-risk/](http://www.framinghamheartstudy.org/fhs-risk-functions/coronary-heart-disease-10-year-risk/)

(<http://www.framinghamheartstudy.org/fhs-risk-functions/coronary-heart-disease-10-year-risk/>)

nNICE 2016. Assessing cardiovascular risk and target organ damage.

[nice.org.uk/guidance/cg127/chapter/1-Guidance#assessing-cardiovascular-risk-and-target-organ-damage](https://www.nice.org.uk/guidance/cg127/chapter/1-Guidance#assessing-cardiovascular-risk-and-target-organ-damage)

(<https://www.nice.org.uk/guidance/cg127/chapter/1-Guidance#assessing-cardiovascular-risk-and-target-organ-damage>)

Li, E C, Heran, B S, Wright, J M. 2014. Angiotensin converting enzyme (ACE) inhibitors versus a...

[ncbi.nlm.nih.gov/pubmed/25148386](https://www.ncbi.nlm.nih.gov/pubmed/25148386)

(<https://www.ncbi.nlm.nih.gov/pubmed/25148386>)

Expanded Explanation

Overview**Clinical Presentation****Diagnosis / Investigation****Management**

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Q118

A 66-year-old man was admitted to the Coronary Care Unit (CCU) two days ago following an anterior myocardial infarction (MI). He was successfully re-perfused with thrombolysis prior to arrival, and has been pain free since admission. Aspirin, atenolol, ramipril, atorvastatin and prophylactic low-molecular weight heparin have been started. His latest electrocardiogram (ECG) revealed Q waves across the anterior chest leads.

You are fast-bleeped to the CCU, and, on arrival, the sister tells you that the patient has suddenly become extremely breathless, but has had no chest pain. He is hypotensive and tachycardic: his blood pressure (BP) is 80/60 mmHg and his heart rate 138 beats per minute (bpm). Looking through his admission notes there is nothing of note on examination and his chest X-ray (CXR) showed only minimal basal pleural effusions.

On examination, he looks unwell and feels clammy to touch. His jugular venous pressure (JVP) is elevated, and the apex beat is diffuse but not displaced. The heart sounds are difficult to hear, but there is no overt murmur. There is very little to find on respiratory examination other than tachypnoea. He has passed 500 ml of urine over the last 10 hours.

You request an urgent ECG, which shows Q waves in the anterior chest leads but no evidence of acute ischaemia. There appears to be electrical alternans in the rhythm strip.

What is the most appropriate management option?

Your answer was incorrect

- A Give 50 mg IV furosemide and organise an urgent chest X-ray
- B Start intravenous inotropes
- C Immediate cardioversion with 200J synchronised shock
- D Intra-aortic balloon pump insertion
- E Pericardiocentesis

Explanation



- E Pericardiocentesis

The diagnosis is cardiac tamponade, a known complication of an acute myocardial infarction. The clues in this question are sudden onset of breathlessness with clear lung fields, cardiogenic shock and electrical alternans, consistent with ventricular rupture. In this case the patient is shocked and needs haemodynamic support, but the definitive treatment is drainage of the pericardial sac with emergency ventricular repair. An aortic balloon pump is often used in conjunction with inotropes and fluid replacement to stabilise the patient before a pericardiocentesis takes place.

B Start intravenous inotropes

While inotropes such as dopamine and dobutamine can be used as stabilising agents, they do not represent the definitive management in cases of cardiac tamponade.

A Give 50 mg IV furosemide and organise an urgent chest X-ray

IV furosemide would be the treatment of choice for pulmonary oedema and his blood pressure precludes this.

C Immediate cardioversion with 200J synchronised shock

Electrical alternans does not represent a shockable arrhythmia; this is a rare phenomenon seen in cases of pericardial effusion in which consecutive QRS complexes alternate in height or direction, and is related to movement of the heart within a fluid-filled pericardial sac.

D Intra-aortic balloon pump insertion

While a balloon pump may be considered as a stabilising measure, it does not represent the definitive management in cases of cardiac tamponade.

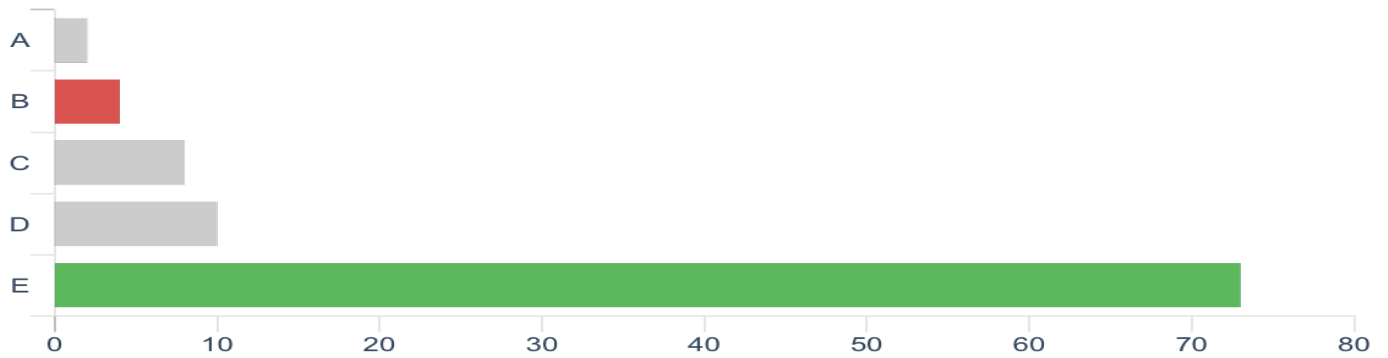
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Expanded Explanation

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Q119

A 65-year-old man, known to have rheumatoid arthritis (RA), presents to the Cardiology Clinic with a two month history of breathlessness and orthopnoea. He initially presented to his General Practitioner (GP), who diagnosed a chest infection and prescribed a course of antibiotic treatment that had helped his breathlessness; however, his symptoms soon returned.

He comes to see you today in the clinic. He gives no history of rheumatic fever, tuberculosis, or chest pain. His only medication is co-dydramol for pain relief.

On examination, you find classical arthritic small joint changes and distended neck veins. He is breathless at rest, and has normal heart sounds, with ascites and ankle oedema. There are bibasal lung crepitations posteriorly.

You arrange admission for this man. His blood tests are normal. An electrocardiogram (ECG) shows sinus rhythm. A transthoracic echocardiogram (ECHO) reports global biventricular failure, with gross biatrial dilatation. There is a high-intensity echo signal around the heart.

He is treated for heart failure with intravenous (IV) furosemide and fluid restriction, and he has a good response.





What further investigation is most likely to determine the underlying diagnosis?

Your answer was incorrect

- A Left heart catheterisation and myocardial biopsy
- B Left and right heart catheterisation with pressure studies
- C Transoesophageal echocardiography (TOE)
- D Mantoux testing
- E Surgical pericardial biopsy

Explanation



- E Surgical pericardial biopsy

Treatment for this patient consists of treating both the heart failure and the underlying cause of the constrictive pericarditis (portrayed by the echocardiogram finding of a high-intensity signal around the heart), hence the need for pericardial biopsy and examination of the tissue.

B Left and right heart catheterisation with pressure studies

Right and left heart catheterisation will demonstrate equal left and right ventricular and right atrial pressures, confirming constrictive pericarditis. However, pressure studies will not help identify the underlying cause of the constrictive pericarditis.

A Left heart catheterisation and myocardial biopsy

This is a case of constrictive pericarditis. This is suggested by calcification of the pericardium on lateral chest X-rays, and typical echo findings. Neither left heart catheterisation nor myocardial biopsy are going to add useful information to the diagnosis.

C Transoesophageal echocardiography (TOE)

The advantage of TOE over transthoracic echocardiography (TTE) is clearer images, especially of structures that are difficult to view through the chest wall such as the aorta, pulmonary artery, valves of the heart and atria. TOE, in particular, has a much higher sensitivity for locating a blood clot inside the left atrium. TOE would not be of help in determining the underlying pathology of the pericardial disease.

D Mantoux testing

Constrictive pericarditis is suggested by calcification of the pericardium on lateral chest X-rays, and typical echo findings.

The Mantoux test is used for the screening and diagnosis of tuberculosis (TB). Even though TB is a well-recognised cause of constrictive pericarditis, an isolated positive Mantoux test would not be enough to reach that diagnosis.

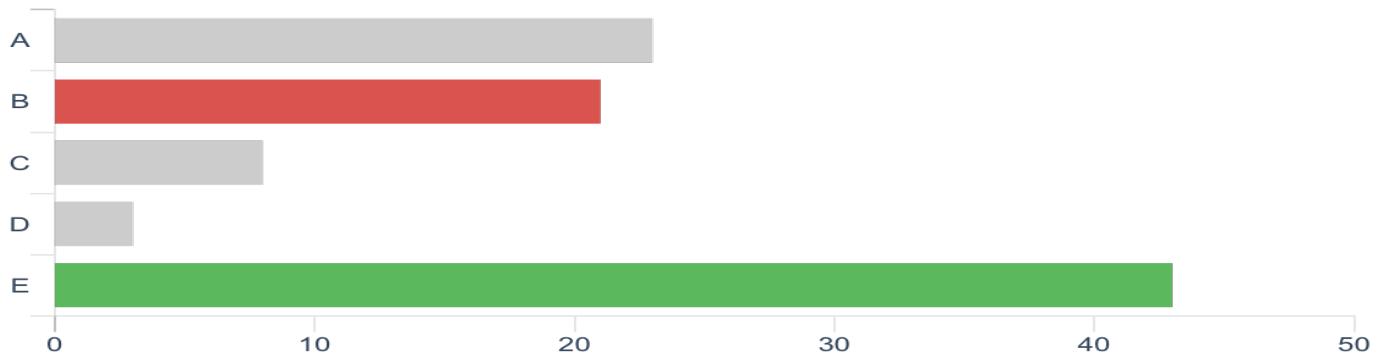
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Expanded Explanation

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Q120

You are a Gastroenterology Senior House Officer (SHO). A cardiology SHO has called you, asking for some advice. A 70-year-old man has been admitted with signs of heart failure. An echocardiogram (ECHO) reports severe calcific aortic stenosis, with a gradient of 110 mmHg across the valve, and a valve area of 0.6 cm². Routine blood tests have shown this man to have microcytic hypochromic anaemia, with a haemoglobin level of 87 g/l.

Over the past five years, the patient has undergone several gastric endoscopies and colonoscopies in search of an underlying cause of his anaemia, the last only a year ago. However, on each occasion, nothing was found. The patient is taking lansoprazole and iron tablets.

Which of the following is the most appropriate course of action with respect to long-term management of his clinical condition?

Your answer was incorrect

- A Replace the aortic valve
- B Serial blood transfusions
- C Continue with serial endoscopies until a source of bleeding is identified
- D Add ranitidine to the patient's pharmacological treatment
- E Refer to a haematologist for bone marrow examination

Explanation



- A Replace the aortic valve

This is Heyde syndrome, a well-known association between microcytic anaemia and calcific aortic stenosis.

Heyde syndrome occurs due to the depletion of von Willebrand factor (vWF) in blood that flows through the narrowed valvular stenosis, with subsequent gastrointestinal bleeding from angiodysplastic lesions.

Treatment is to replace the aortic valve.

D Add ranitidine to the patient's pharmacological treatment

Given the fact that no gastric ulcers have been identified and that the patient has a clearly identified source of bleeding, adding ranitidine would not be of any benefit.

B Serial blood transfusions

Blood transfusions would help to acutely restore haemoglobin levels but would not deal with the underlying Heyde syndrome. Repeated transfusions are known to carry a risk of alloimmune reactions and iron overload.

C Continue with serial endoscopies until a source of bleeding is identified

The investigation of choice after valve replacement is mesenteric angiography, as the bleeding vessels are poorly visualised on colonoscopy. This would look for the presence of angiodysplasia, which may be associated with aortic stenosis.

E Refer to a haematologist for bone marrow examination

The patient is suffering from microcytic anaemia, a sequela of chronic bleeding. Even more, he is found to have a well-recognised cause of bleeding from the gut (Heyde syndrome) and no signs of bone marrow failure. Bone marrow examination is likely going to yield normal findings and would not be of diagnostic help.

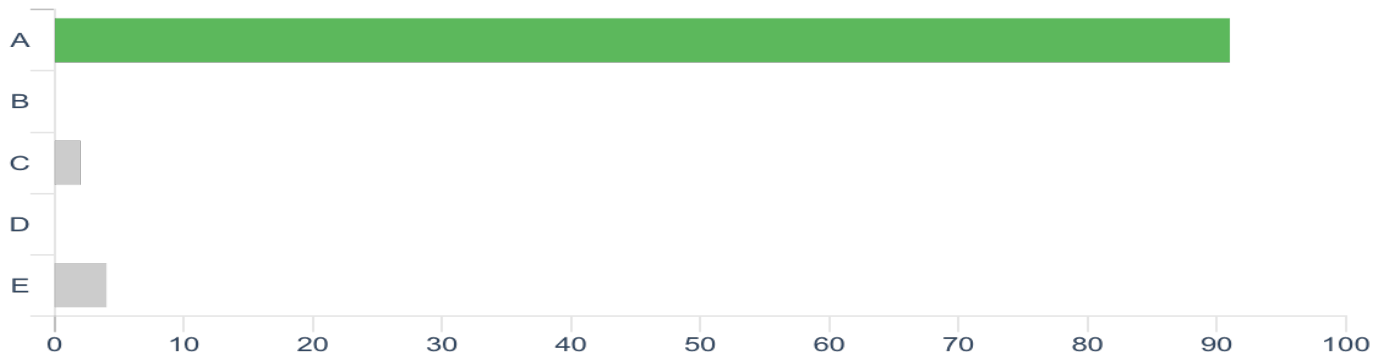
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Q121

A 45-year-old man, a known smoker, presents to the Emergency Department (ED) following a prolonged episode of chest discomfort lasting three hours. His initial electrocardiogram (ECG) shows segment (ST) elevation in the chest wall leads. Thrombolysis therapy with tissue plasminogen activator is given on the advice of the cardiology team. The patient is admitted onto a coronary-care bed and is discharged after an uneventful five day period. He represents after one-month complaining of palpitations and dizziness. The electrocardiogram (ECG) shows a broad complex tachycardia.

Investigations reveal the following:

Investigation	Result	Normal Value
Haemoglobin (Hb)	142 g/l	135-175 g/l
White cell count (WCC)	$7.8 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$310 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	140 mmol/l	135-145 mmol/l
Potassium (K^+)	3.7 mmol/l	3.5-5.0 mmol/l
Urea	6.0 mmol/l	2.5-6.5 mmol/l
Creatinine (Cr)	95 μ mol/l	50-120 μ mol/l
Corrected calcium (Ca^{2+})	2.21 mmol/l	2.20-2.60 mmol/l
Magnesium (Mg^{2+})	0.88 mmol/l	0.75 -1.00 mmol/l

A central line is inserted and the patient is loaded with amiodarone. His ECG reverts to sinus rhythm with anterior Q waves. An echocardiogram (ECHO) shows anteroseptal hypokinesis with moderate left ventricle (LV) impairment.

Which one of the following is the definitive intervention?

Your answer was incorrect

- A Amiodarone 200 mg tds
- B Amiodarone 200 mg od
- C Sotalol 80 mg bd

- D Automated implantable cardiac defibrillator
- E Mexiletine

Explanation



- D Automated implantable cardiac defibrillator

Automated implantable cardiac defibrillator, is correct. The development of ventricular tachycardia/fibrillation (VT/VF) on the first day following an acute myocardial infarction (MI) is thought to be of no prognostic significance if dealt with promptly. However, the late development of VT/VF in the context of a full-thickness myocardial scar, as evidenced by the Q waves on the ECG, carries a very poor prognosis.

Given that there is no evidence of any reversible cause (i.e. electrolyte abnormality) to VF/VT, it is very likely to be scar tissue-related ventricular arrhythmia, especially with the presence of Q waves on ECG indicating a full-thickness infarct. Pharmacological therapy with amiodarone to terminate or prevent recurrence in the acute setting is effective, but in terms of secondary prevention and long-term outcomes, ICD is superior to amiodarone (MADIT-2 trial). Therefore, ICD is indicated in this patient.

- C Sotalol 80 mg bd

Sotalol is a class III antiarrhythmic drug with beta-blocker properties. It has fewer long-term side effects compared with amiodarone and is therefore preferred as a long-term drug. However, in the setting of secondary prevention, ICD is still the gold standard although sotalol could be used as adjunct therapy to reduce risk of shocks.

- A Amiodarone 200 mg tds

Amiodarone is a class III antiarrhythmic drug which works by slowing the conduction rate and prolonging the refractory period of the SA and AV nodes. Pharmacological therapy with amiodarone to terminate or prevent recurrence in the acute setting is effective, but in terms of secondary prevention and long-term outcomes, ICD is superior to amiodarone. Therefore, ICD is indicated in this patient.

- B Amiodarone 200 mg od

This is the maintenance dose of amiodarone normally used for patients who have been loaded with amiodarone. It is therefore the wrong dose of amiodarone to use in the current setting. However, we should consider that ICD is the appropriate therapy in this case.

- E Mexiletine

Mexiletine is a class Ib antiarrhythmic drug. It is used for the prevention of VF/VT and is commonly paired with sotalol or amiodarone.

8528

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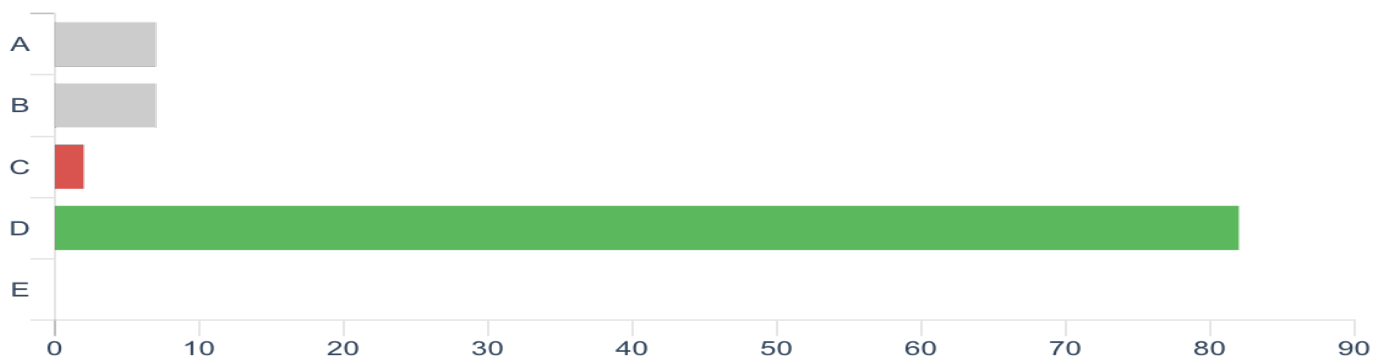
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External Links

Prophylactic Implantation of a Defibrillator in Patients with Myocardial Infarction and Reduced ...
[nejm.org/doi/full/10.1056/NEJMoa013474](http://www.nejm.org/doi/full/10.1056/NEJMoa013474)
(<http://www.nejm.org/doi/full/10.1056/NEJMoa013474>)

Expanded Explanation

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Q122

A 68-year-old man with a history of ankylosing spondylitis (AS) is referred to the Cardiology Department following the discovery of a diastolic murmur by his General Practitioner (GP). He does not describe any chest pain or breathlessness, but he has experienced some palpitations over the last six months.

On examination, his blood pressure (BP) is 175/95 mmHg, while his pulse is 100 beats per minute (bpm) at rest. Clinical examination reveals a collapsing pulse, cardiac apex displaced to the anterior axillary line, and a diastolic murmur. The chest is clear on auscultation and there is no peripheral oedema. An electrocardiogram (ECG) shows sinus rhythm with ventricular ectopics and left ventricular hypertrophy. A chest X-ray (CXR) shows cardiomegaly with clear lung fields. An echocardiogram (ECHO) confirms the presence of aortic regurgitation with a vena contracta of 7 mm, LVEDD of 80 mm and an ejection fraction of 50%. A 24 hour ECG shows sinus rhythm with frequent ventricular ectopics that correspond to the patient's experienced palpitations.

Which of the following is the most appropriate management option?

Your answer was incorrect

- A Start ramipril
- B Start bisoprolol
- C Start furosemide
- D Annual echocardiogram follow-up
- E Referral for consideration of aortic valve replacement

Explanation



- E Referral for consideration of aortic valve replacement

This patient, although relatively asymptomatic, needs to be considered for valve replacement given the echocardiographic findings of severe aortic regurgitation and a dilated left ventricle. In the case of regurgitant murmurs, patients tend to be relatively asymptomatic till later on in the course of the disease, so regular echocardiographic follow-up is required to pick up individuals with early features of left ventricular failure (LVF) that would benefit from valve replacement.

The current 2017 ESC guidelines on valvular disease make the following recommendations for consideration of referral for surgery in the case of aortic regurgitation:

- A) Significant enlargement of the ascending aorta (regardless of AR severity)
- B) Symptomatic severe aortic regurgitation
- C) Asymptomatic severe aortic regurgitation with
 - Ci) LVEF $\leq 50\%$ or
 - Cii) LVEDD > 70 mm
 - Ciii) LVESD > 50 mm.

Surgery should also be considered if significant changes in LV or aortic size occur during follow-up.

C Start furosemide

Start furosemide would be an appropriate management option for heart failure/pulmonary oedema. This patient does not have clinical features of fluid overload, and meets the echocardiographic criteria for consideration of valve replacement.

A Start ramipril

Whilst ACE inhibitor therapy represents a component of the management of aortic regurgitation (and would have an important anti-hypertensive effect), this patient meets the echocardiographic criteria for consideration of valve replacement.

B Start bisoprolol

Start bisoprolol is an appropriate management option for patients with heart failure, but this patient meets the echocardiographic criteria for consideration of valve replacement.

D Annual echocardiogram follow-up

This patient already has an echo suggestive of severe aortic regurgitation with secondary dilation of the LV. He already meets echocardiographic criteria for consideration of valve replacement; it would be inappropriate to wait for his echo features to worsen prior to referral.

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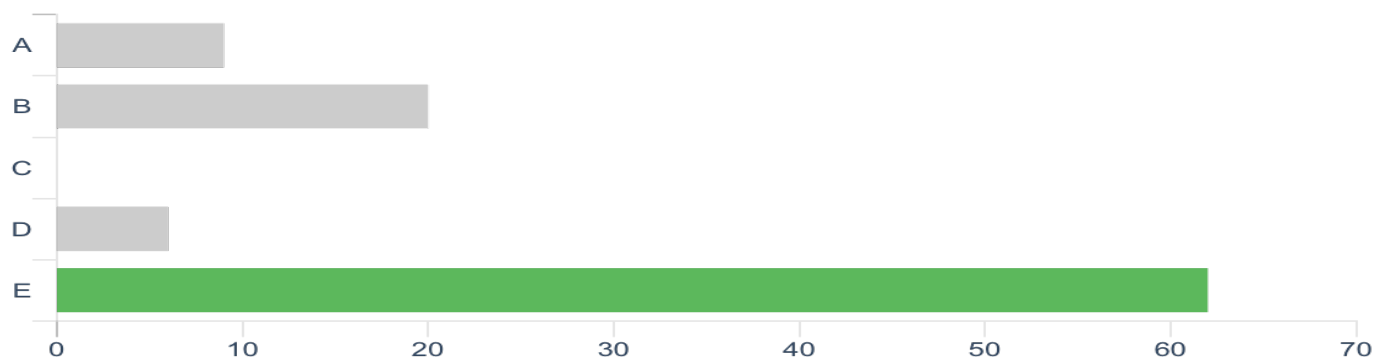
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Responses Total:	122
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External Links

2017 ESC Guidelines on valvular heart disease

academic.oup.com/eurheartj/article/4095039/2017-ESC-EACTS-Guidelines-for-the-management-of

(<https://academic.oup.com/eurheartj/article/4095039/2017-ESC-EACTS-Guidelines-for-the-management-of>)



Q123

A 59-year-old heavy goods vehicle driver is admitted to the Emergency Department (ED) with chest pain. An electrocardiogram (ECG) shows T-wave inversion in leads II, III and aVF. His pain settles within one hour and a repeat ECG is normal. His troponin T level after 12 hours is $< 0.05 \mu\text{g/l}$ (normal range $0-0.05 \mu\text{g/l}$). He undergoes coronary angiography and had a stent to his right coronary artery. At angiography, the other coronary arteries were mildly stenosed. He is sent home five days post-admission.

What advice should have been given to him regarding driving?

Your answer was incorrect

- A Do not drive for one month
- B Do not drive the heavy goods vehicle until assessed by the DVLA. Car driving is permitted after one week if pain free
- C Inform the DVLA and do not drive until assessed further
- D He will never be able to drive heavy goods vehicle again but car driving permitted in one month if pain free
- E No restriction on driving

Explanation



- B Do not drive the heavy goods vehicle until assessed by the DVLA. Car driving is permitted after one week if pain free

Car driving is permitted after one week if pain free after an episode of unstable angina, is correct. This is the correct response according to the DVLA guidelines. Car driving is allowed in 1 week if there is no urgent planned revascularisation and LVEF is $>40\%$ before discharge. If not treated by angioplasty, the patient must wait 1 month.

For Class 2 vehicles, driving may be permitted, by the DVLA, after six weeks, providing the exercise test requirements are met. For further information refer to DVLA website given below.

- D He will never be able to drive heavy goods vehicle again but car driving permitted in

one month if pain free

A Class 2 licence is at the discretion of DVLA (until after at least 6 weeks) and car driving should be 1 week after the event.

A Do not drive for one month

This is for patients with a Class 1 driving license who have not had successful coronary intervention.

C Inform the DVLA and do not drive until assessed further

This is for a Class 2 licence. The patient should still be able to drive Class 1 vehicles.

E No restriction on driving

Car driving is allowed in a week if there is no urgent planned revascularisation and LVEF is >40% before discharge. For a Class 2 licence, the patient should be in contact with DVLA and not drive until relicensing after at least 6 weeks.

8535

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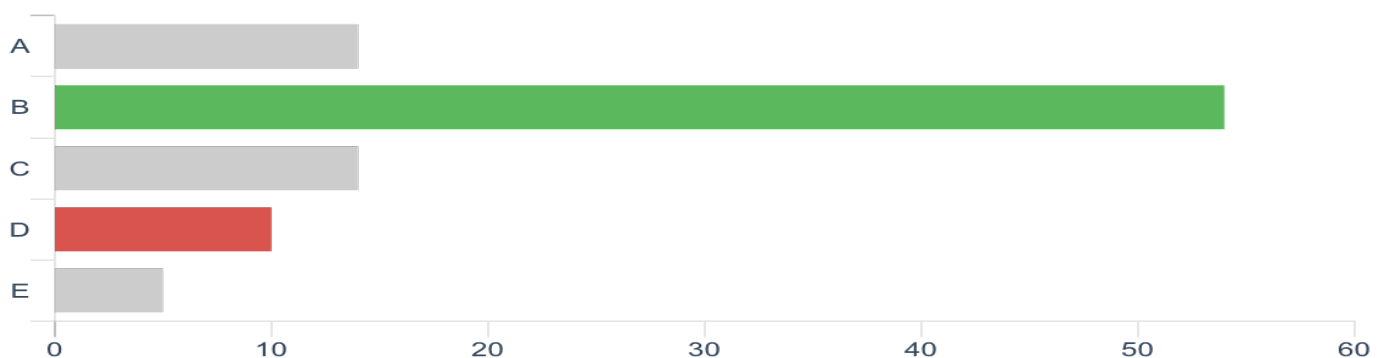
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Responses Correct:	23
Responses Incorrect:	100
Responses Total:	123
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External Links

Cardiovascular disorders: assessing fitness to drive

[gov.uk/guidance/cardiovascular-disorders-assessing-fitness-to-drive](https://www.gov.uk/guidance/cardiovascular-disorders-assessing-fitness-to-drive)

(<https://www.gov.uk/guidance/cardiovascular-disorders-assessing-fitness-to-drive>)

Expanded Explanation

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Q124

A 40-year-old man attends his General Practitioner (GP) Surgery for review. He reports pain in his calves while walking his dog after only quite modest exercise. He is a current smoker with a 60-pack-year history. He has a family history of early cardiovascular disease.

On examination, he has tendon xanthomas affecting the extensor tendons of his fingers and at the elbows. You notice that he appears to have corneal arcus.

Which of the following represents the most likely diagnosis in this case?

Your answer was incorrect

- A Heterozygous familial hypercholesterolaemia
- B Homozygous familial hypercholesterolaemia
- C Familial hypertriglyceridaemia
- D Apo CII deficiency
- E Tangier disease

Explanation



- A Heterozygous familial hypercholesterolaemia

Heterozygous familial hypercholesterolaemia is an autosomal dominant condition that affects around 1 in 500 people. Although the diagnosis is mainly biochemical, two physical signs may be present, in corneal arcus and tendon xanthomata. The Simon Broome criteria are used to diagnose familial hypercholesterolaemia:

- Total cholesterol level >7.5 mmol/l and LDL >4.9 mmol/l; plus
- Tendon xanthomata or evidence of these in a 1st or 2nd degree relative; or
- DNA evidence of an LDL receptor mutation, familial defective apo-B-100 or a PCSK9 mutation.

Heterozygotes rarely present before the age of 30. In this case the patient has presented with intermittent claudication. Treatment is with aggressive lipid-lowering therapies, such as high-dose statins $\pm$ the addition of ezetimibe.

D Apo CII deficiency

This condition causes an accumulation of chylomicrons. It tends to present with hepatosplenomegaly, abdominal pain and eruptive xanthomas.

B Homozygous familial hypercholesterolaemia

Homozygotes present with very early cardiovascular disease, sometimes as early as the 2nd decade of life.

C Familial hypertriglyceridaemia

Patients with hypertriglyceridaemia are often asymptomatic. They may present with abdominal pain due to pancreatitis, lipaemia retinalis or eruptive xanthomas over extensor surfaces or buttocks.

E Tangier disease

Tangier disease is also known as familial alpha-lipoprotein deficiency. Cholesterol deposition is common in the tonsils, lymph nodes, bone marrow, liver and spleen.

9270

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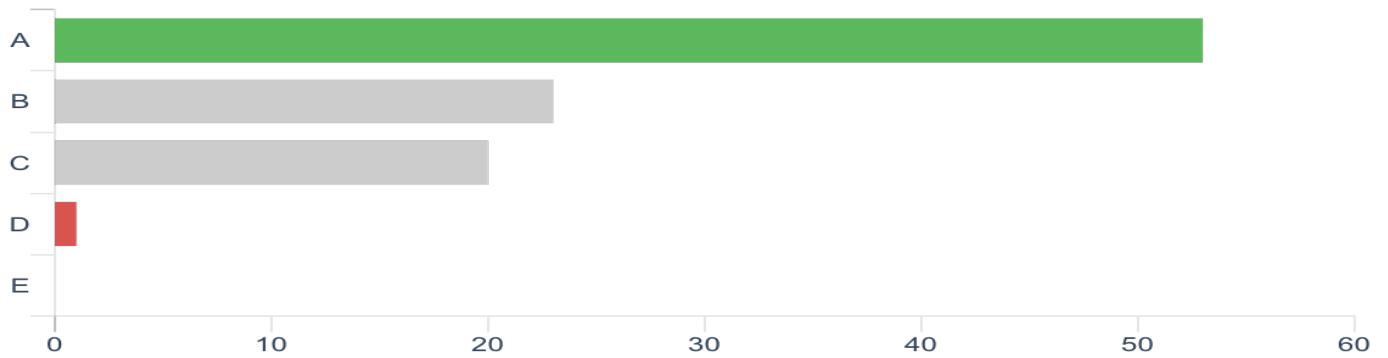
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Responses Total:	124
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

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Links to NICE guidelines/CKS



Q125

An 18-year-old man is referred to the hospital Cardiology Clinic complaining of severe headaches. His General Practitioner (GP) notes that he is hypertensive with a blood pressure of 155/80 mmHg. He has suffered nose bleeds and feels too fatigued to perform any physical exercise.

On examination, there appears to be radiofemoral delay and a late systolic murmur is heard on auscultation. A chest X-ray (CXR) shows cardiac enlargement with evidence of rib-notching.

Which of the following diagnoses fits best with this clinical picture?

Your answer was incorrect

- A Congenital aortic stenosis
- B Congenital mitral regurgitation
- C Coarctation of the aorta
- D Transposition of the great vessels
- E Atrial septal defect

Explanation



- C Coarctation of the aorta

Coarctation of aorta produces a late systolic murmur and radio-femoral delay. Rib-notching present on chest X-ray is due to pressure erosion from enlarged collateral vessels.

This is a narrowing of the aorta, usually found just distal to the origin of the left subclavian artery. It represents 5–10% of all congenital cardiac lesions and patients repaired before the age of 14 years have a 20-year survival of 91%. Survival rates then steadily fall, the later repair is attempted. Associated conditions include Turner syndrome. Older patients may present with hypertension, headaches, nose bleeds, cold peripheries or intermittent claudication. A continuous or late systolic murmur is heard on auscultation.

- B Congenital mitral regurgitation

This produces a pan-systolic murmur on auscultation. It does not cause radio-femoral delay.

A Congenital aortic stenosis

Congenital aortic stenosis accounts for 3-6% of congenital heart disease. Clinical examination findings include ejection-systolic murmur and a narrow pulse pressure. It does not cause a radio-femoral delay and therefore is not the answer in this case.

D Transposition of the great vessels

Transposition of the great vessels is one of the commonest cyanotic congenital heart diseases. Patients who are not treated have a high mortality rate – 30% in the first week, 50% in the first month and 90% in the first year. Treatment is surgical, commonly with an arterial switch procedure.

E Atrial septal defect

ASD is commonly associated with Down syndrome and Ebstein anomaly. Clinical examination findings include fixed splitting of the second heart sound, which does not change with respiration.

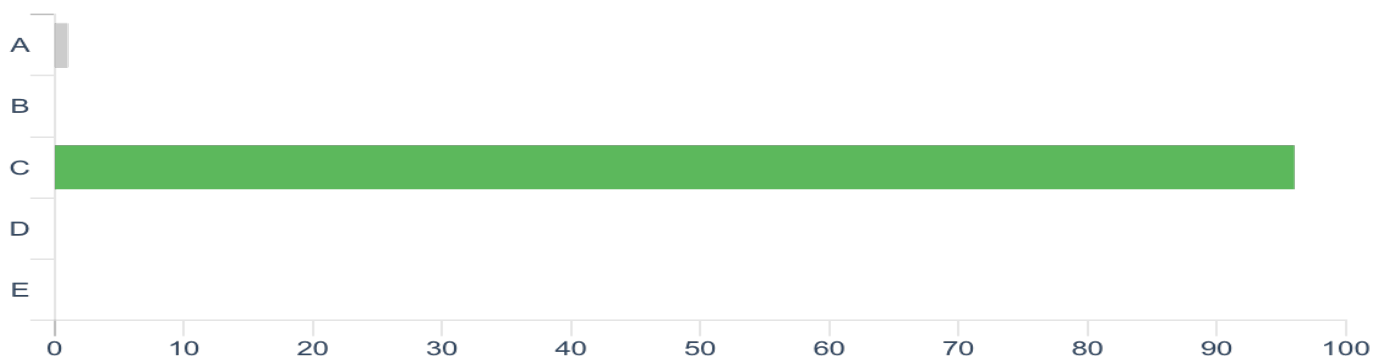
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Responses Total:	125
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Expanded Explanation

Overview

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Q126

A 48-year-old van driver presents to the Emergency Department (ED) with central chest pain. His past history of note includes type I diabetes, hypertension, and smoking with a 30 pack-year history. The pain is pleuritic, retrosternal and relieved on sitting forward.

On examination, his blood pressure (BP) is 148/90 mmHg and his pulse is 85 beats per minute (bpm) and regular. There is generalised saddle-shaped ST elevation on electrocardiogram (ECG). Routine bloods including serum creatinine are normal.

Which of the following is the most appropriate treatment in this case?

Your answer was incorrect

- A Ibuprofen
- B Indometacin
- C Streptokinase
- D Tissue plasminogen activator
- E Paracetamol

Explanation



- A Ibuprofen

Although the patient has multiple risk factors for coronary artery disease, the description of chest pain and ECG appearance is highly suggestive of acute pericarditis. The most common viral cause is Cocksackie B virus; other causes include adenovirus, echovirus and influenza viruses. Acute viral pericarditis may occasionally be associated with accumulation of a pericardial effusion.

ESC guidelines have defined the diagnosis of acute pericarditis as 2 out of 4 of the following: (1) pericarditic chest pain; (2) pericardial rub; (3) new widespread ST-elevation or PR depression; and (4) pericardial effusion (new or worsening).

Ibuprofen is a NSAID which is considered first-line therapy for pericarditis. Aspirin or colchicine is the other alternative. Treatment duration should be guided by symptoms and blood tests (CRP), but normally it is for 1-2 weeks' duration. If patients are unable to take

NSAIDs, colchicine is the alternative. Corticosteroids should only be used as second line due to the risk of drug dependence. Patients should be told to reduce physical activity for a minimum of 3 months from initial onset.

B Indometacin

Indometacin is also a NSAID. The recommended NSAID according to ESC guidelines is either ibuprofen or aspirin. However, ESC do recommend the use of indometacin in the context of recurrent pericarditis.

C Streptokinase

In the presence of generalised saddle-shaped ST elevation, this is most likely to be pericarditis. Therefore, the use of thrombolysis with streptokinase is not warranted.

D Tissue plasminogen activator

In the presence of generalised saddle-shaped ST elevation, this is most likely to be pericarditis. Therefore, the use of thrombolysis with streptokinase is not warranted.

E Paracetamol

Paracetamol is useful as a generic painkiller, but in the context of acute pericarditis the use of NSAIDs or aspirin should be considered as first line.

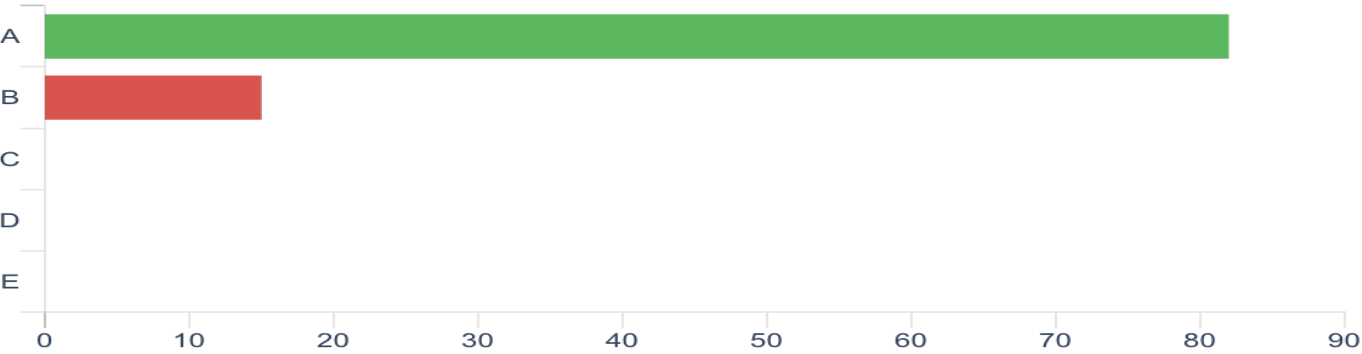
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Responses Incorrect:	103
Responses Total:	126
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Q127

A 78-year-old man is referred to the Cardiology Clinic complaining of increased tightness in his chest. He gets chest tightness and shortness of breath on walking up a hill and going out in very cold weather. His exercise tolerance has been reduced over the past few months but he is still easily able to walk his dog. He has a past medical history of angina although he has never had any diagnostic tests.

He has been using his glyceryl trinitrate (GTN) spray two times per day over the past six months, which has prompted his General Practitioner (GP) to add a long-acting nitrate preparation. His other medication includes ramipril, aspirin, and atorvastatin.

On examination, he is comfortable at rest with a blood pressure (BP) of 135/80 mmHg and his pulse is 72 beats per minute (bpm) and regular. He has no peripheral oedema and his jugular venous pulse (JVP) is not raised. First and second heart sounds are heard and there are no murmurs. His chest is clinically clear.

Investigations reveal the following:

Investigation	Result
Electrocardiogram (ECG)	Sinus rhythm with Q waves in the inferior leads
Chest X-ray (CXR)	Normal
Full blood count (FBC)	Urea and electrolytes (U&Es) and lipid profile are within normal range

What is the next step in the treatment of this gentleman?

Your answer was incorrect

- A Further medical management for angina
- B Angiography
- C Technetium scan
- D Exercise stress testing
- E Positron emission tomography

Explanation



A Further medical management for angina

From the history, this patient has stable angina with good exercise tolerance. He is already on the appropriate medications, i.e. aspirin, ACE-I and statin as per NICE guidelines (see External Links). Medical management with anti-anginals would be the first step. Beta-blocker or calcium channel blockers are recommended by NICE. Long-acting nitrates could be used if either of the drugs is not tolerated or insufficient. If the patient continues to have chest pain despite being on optimal medical therapy, then he should be considered for revascularisation with PCI or CABG.

B Angiography

Given that the patient has stable angina, the first line would be to use medical therapy. If we are unable to control his symptoms with medical therapy, then angiography should be the next investigation to plan revascularisation strategy with either PCI or CABG.

C Technetium scan

This patient clearly has stable angina and therefore does not need further investigations to confirm that. Should the patient warrant further investigations to diagnose significant coronary artery disease, the use of CT coronary angiogram is recommended as first line followed on by non-invasive functional testing (stress echo, MPS or stress CMR).

D Exercise stress testing

As above, ETT has grown out of favour in diagnosing/ruling out coronary artery disease due to its poor sensitivity. However, it can still be used to guide prognosis and treatment of patients with established ischaemic heart disease.

E Positron emission tomography

Cardiac PET scanners are not widely available in the UK; these are currently used mostly in the research setting and are useful in identifying coronary artery disease and how it affects myocardial blood flow. Therefore, PET plays a role in a specialist setting to determine whether interventions would be beneficial for some groups of patients.

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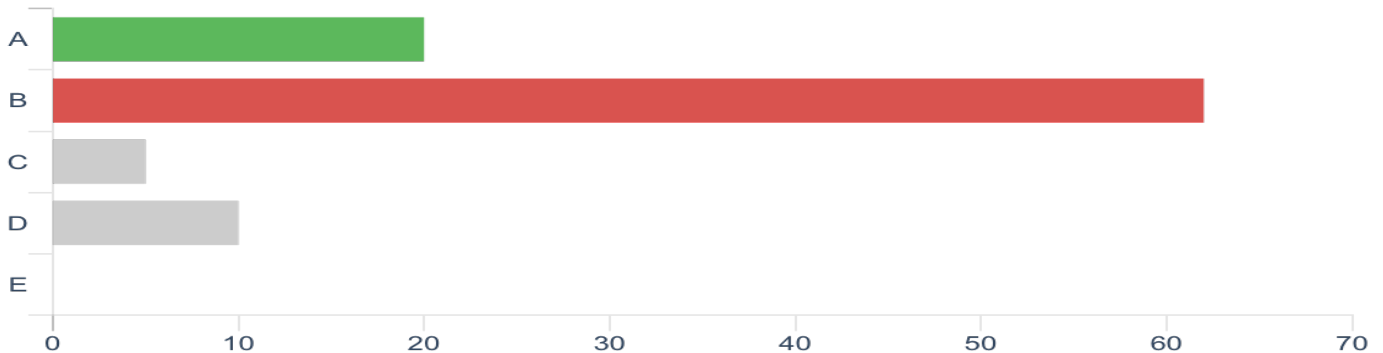
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External Links

NICE. Stable angina: management[nice.org.uk/guidance/cg126/chapter/1-Guidance#general-principles-for-treating-people-with-stable-angina](https://www.nice.org.uk/guidance/cg126/chapter/1-Guidance#general-principles-for-treating-people-with-stable-angina)

(https://www.nice.org.uk/guidance/cg126/chapter/1-Guidance#general-principles-for-treating-people-with-stable-angina)

NICE. Chest pain of recent onset: assessment and diagnosis[nice.org.uk/guidance/cg95/chapter/recommendations](https://www.nice.org.uk/guidance/cg95/chapter/recommendations)

(https://www.nice.org.uk/guidance/cg95/chapter/recommendations)

Expanded Explanation

Overview**Clinical Presentation**

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Q128

A 71-year-old man is admitted to the Emergency Department (ED) with shortness of breath. He had taken his dog for a walk two hours ago when he started having palpitations, felt very dizzy, and short of breath. He sat down and called for an ambulance. He has a past medical history of two myocardial infarctions (MI) sustained over the previous couple of years, and heart failure. He is on the following medications: bisoprolol 2.5 mg once a day, spironolactone 25 mg once a day, ramipril 2.5 mg once a day and aspirin 75 mg once a day.

On examination, he is breathless, with a blood pressure (BP) of 86/50 mmHg. His pulse is greater than 100 beats per minute (bpm) and his respiratory rate is 28 breaths per minute. His jugular venous pulse (JVP) is raised and he has pedal oedema. First, second and third heart sounds are heard producing a gallop rhythm. Respiratory examination reveals bibasal crackles.

An electrocardiogram (ECG) reveals a broad complex tachycardia and you decide that he needs a direct current (DC) shock. You DC cardiovert him and he reverts back to sinus rhythm. His BP rises to 110/60 mmHg and his pulse to 76 bpm and regular.

What measure is most likely to prolong this gentleman's life?

Your answer was correct

- A Start him on furosemide
- B Start him on amiodarone
- C Start him on flecainide
- D Start him on procainamide
- E Insert an implanted cardioverter defibrillator

Explanation



- E Insert an implanted cardioverter defibrillator

The patient has had scar tissue-related ventricular arrhythmia. This fits the criteria for the insertion of a secondary prevention ICD. As we were not informed of his LV function and resting ECG morphology, we do not know whether he would fit the criteria for biventricular pacing (CRT). Therefore, the use of an ICD is the most appropriate in this instance. ICDs have

been shown to prolong life in patients with left ventricular dysfunction and sustained ventricular arrhythmias. Patients with an ejection fraction higher than 35% did no better with an ICD than with drug treatment.

A Start him on furosemide

Furosemide is useful to treat the symptoms of heart failure via diuresis. However, it does not confer any prognostic benefit for patients.

B Start him on amiodarone

Amiodarone is a class III antiarrhythmic drug which works by slowing the conduction rate and prolonging the refractory period of the SA and AV nodes. Pharmacological therapy with amiodarone to terminate or prevent recurrence in the acute setting is effective, but in terms of secondary prevention and long-term outcomes, ICD is superior to amiodarone. Therefore, ICD is indicated in this patient.

C Start him on flecainide

Flecainide is contraindicated in patients with coronary artery disease. The Cardiac Arrhythmia Suppression Trial (CAST) revealed that when encainide and flecainide were used to prevent arrhythmias in patients post-myocardial infarction, these drugs were detrimental to survival.

D Start him on procainamide

Procainamide is mainly used for SVT and can cause significant hypotension. Its use in pulseless VT/VF is supported by a retrospective comparison study of 20 patients. It is therefore less commonly used compared to amiodarone.

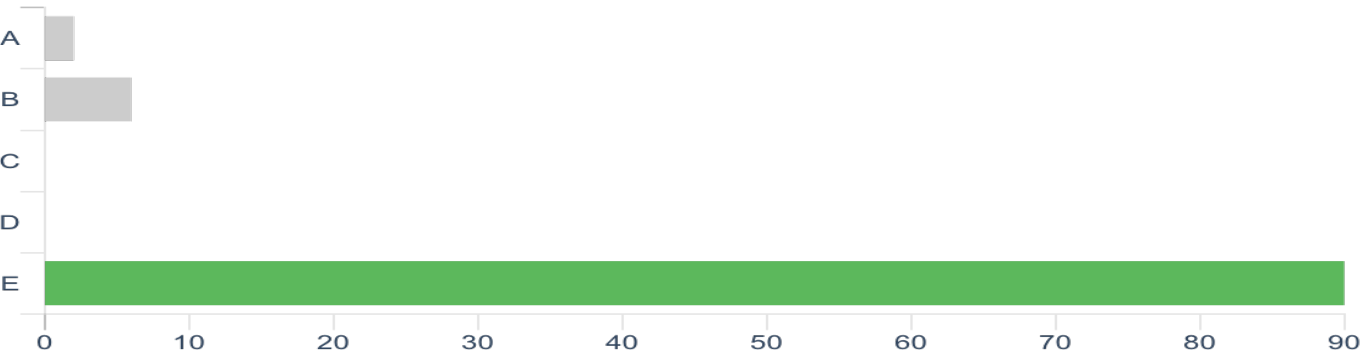
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Q129

A 57-year-old man is referred to the Cardiology Clinic by his General Practitioner (GP) for an abnormality on an electrocardiogram (ECG). He had gone to see his GP for a general medical check-up. His past medical history is unremarkable and he is not on any medication. He plays squash up to four times per week.

On examination, he is essentially normal, with a blood pressure (BP) of 121/82mmHg and pulse of 56 beats per minute (bpm).

Investigations reveal the following:

Investigation	Result
ECG	Sinus rhythm with second-degree heart block (Mobitz type I)
Chest X-ray (CXR)	Normal
Full blood count (FBC)	Urea and electrolytes (U&Es), liver function tests (LFTs), and lipid profile are within normal range.

How would you manage this gentleman?

Your answer was incorrect

- A Refer him for a pacemaker assessment
- B Arrange an outpatient 24hr tape
- C Suggest he buys an ECG recording device for his smartphone
- D Advise him that he shouldn't drive because of risk of blackouts
- E Discharge him from the clinic

Explanation



- E Discharge him from the clinic

This asymptomatic man who has second-degree (Mobitz type I) heart block should be discharged from the clinic. Second-degree atrioventricular block Mobitz type I (Wenckebach phenomenon) is characterised by progressive PR interval prolongation until a P wave fails to conduct. The PR interval before the blocked P wave is much longer than the PR interval after the blocked P wave. The risk of progression to complete heart block with Mobitz type I in an asymptomatic man is very low, unlike in Mobitz type II where pacemaker insertion should be considered. The risk factors for cardiovascular disease are very low in this man and he can be safely discharged from the clinic.

B Arrange an outpatient 24hr tape

This isn't indicated bearing in mind there are no symptoms of either tachycardic or bradycardic episodes, as such it isn't an appropriate use of resources and may increase anxiety.

A Refer him for a pacemaker assessment

Pacemaker assessment would be considered in Mobitz type II, where risk of progression to complete heart block is considered significant.

C Suggest he buys an ECG recording device for his smartphone

This is a waste of money given that he is reporting symptoms of rhythm disturbance.

D Advise him that he shouldn't drive because of risk of blackouts

This patient has very low risk second degree heart block and is fit and well. With no history of palpitations or syncope, he is able to continue driving without restriction.

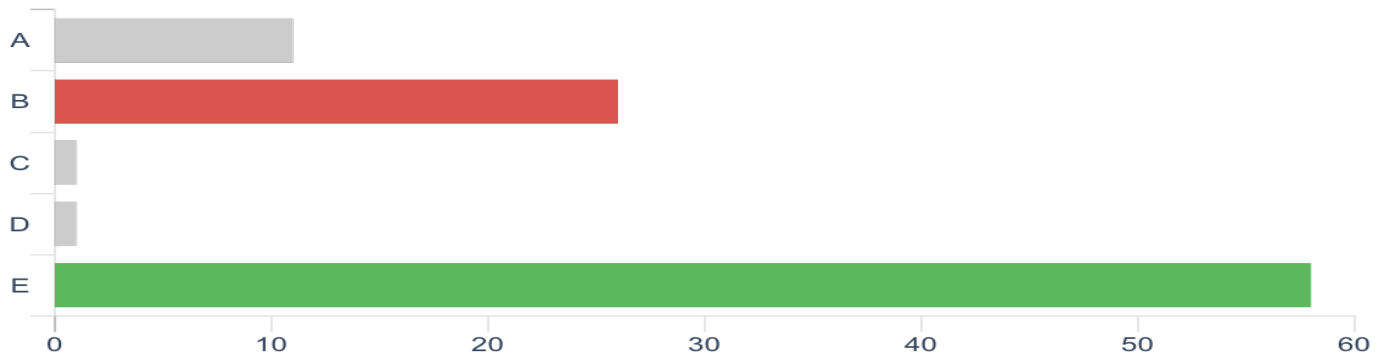
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Q130

A 67-year-old man is referred to the Cardiology Clinic by his General Practitioner (GP) for an abnormal heart sound. He had gone to see his GP for a general medical check-up. His past medical history is unremarkable and he is not on any medication.

On examination, he is comfortable at rest, with a blood pressure of 145/65 mmHg. His pulse is 66 beats per minute (bpm) and regular. He has no pedal oedema, and his jugular venous pressure (JVP) is not raised. He has an early diastolic murmur best heard at the left sternal edge in expiration with the patient leaning forward. His chest is clinically clear.

Investigations reveal the following:

Investigation	Result
Chest X-ray (CXR)	Normal
Electrocardiogram (ECG)	Sinus rhythm
Echocardiogram (ECHO)	LV enlargement seen. There is a mild to moderate aortic regurgitation
Full blood count (FBC)	Urea and Electrolytes (U&E), Liver function tests (LFTs), and lipid profile are within normal range

How are you going to manage this man?

Your answer was incorrect

- A Start him on a bisoprolol
- B Start him on ramipril
- C Start him on amlodipine
- D Discharge him from the clinic
- E Start him on aspirin

Explanation



B Start him on ramipril

This asymptomatic man with aortic regurgitation should be started on an ACE inhibitor. The Studies Of Left Ventricular Dysfunction (SOLVD) trial did show that enalapril did improve the prognosis in asymptomatic left ventricular dysfunction. ACEI slowed the development of left ventricular dysfunction. This same trial also showed symptomatic improvement and prognosis in patients with symptomatic heart failure.

C Start him on amlodipine

Although amlodipine is effective as an anti-hypertensive, it may actually unmask symptoms of cardiac failure in AR because of tachycardia and peripheral vasodilatation.

A Start him on a bisoprolol

As initial therapy, beta blockade was thought to prolong diastole and potentially worsen AR. This hasn't been borne out in clinical data, however, and larger trials are required. This places beta blockade as a second-line option for management of AR.

D Discharge him from the clinic

This patient has established AR with signs of left ventricular failure, if he is discharged without medical intervention there is a risk of accelerating the worsening of her symptoms.

E Start him on aspirin

This patient has not had a previous ischaemic cardiovascular event, and it is possible that his AR is merely degenerative, hence aspirin is unlikely to significantly improve his outcome.

9487

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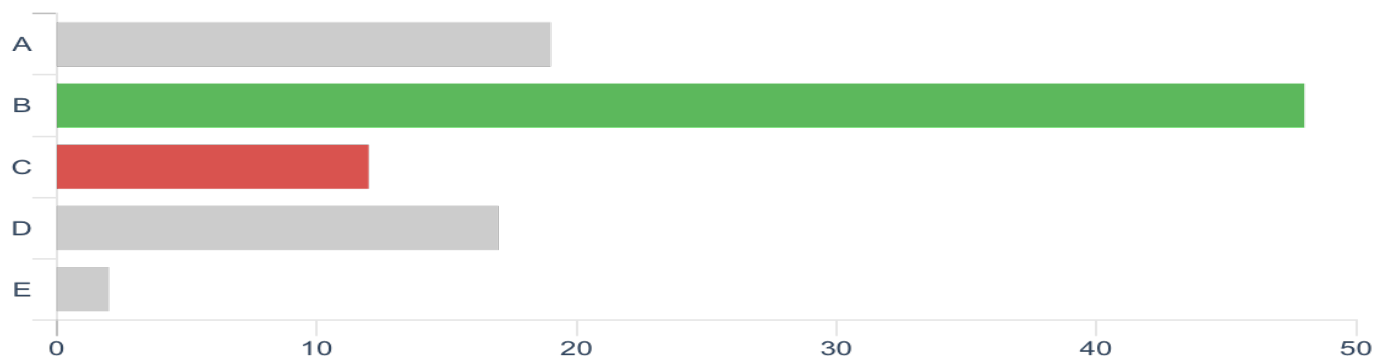
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External Links

Valvular Heart Disease

[escardio.org/Guidelines/Clinical-Practice-Guidelines/Valvular-Heart-Disease-Management-of](https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Valvular-Heart-Disease-Management-of)

(<https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Valvular-Heart-Disease-Management-of>)



Q131

A 65-year-old woman comes to the Cardiology Clinic for follow up of her chest pain. She attended clinic six weeks ago, and an exercise test was requested (against current NICE guidelines). The following is the summary of her exercise test: 'she started having chest pains in the second stage of the Bruce protocol. There was ST depression of 2.5 mm in V1 to V4. This is a positive exercise test'.

What is the next step in the management of this lady?

Your answer was correct

- A Bypass surgery
- B Angiogram +/- angioplasty
- C Technetium scan
- D Dobutamine stress echocardiography
- E Cardiac MRI

Explanation



- B Angiogram +/- angioplasty

This lady has early onset of angina and ischaemic ECG changes that are associated with an adverse prognosis and more severe coronary artery disease in the context of an ETT. ETTs are not recommended by NICE because of the possibility of missing a diagnosis of significant coronary artery stenosis, and inherent risks of the test in patients with severe disease, although the positive test this time prompts an angiogram to determine the extent of her coronary atherosclerosis.

- A Bypass surgery

Bypass surgery may be required, although further evaluation with angiography is required first.

- C Technetium scan

Technetium scanning is of value in detecting an area of myocardial ischaemia, although an angiogram would still be required to determine the most appropriate intervention with respect to treatment.

D Dobutamine stress echocardiography

Dobutamine stress echocardiography is useful to identify abnormal ventricular wall motion, but again would not identify the best mode of intervention.

E Cardiac MRI

Cardiac MRI may be useful where there is a delay or the patient cannot undergo invasive angiography, although the advantage of the invasive procedure is that progression to stenting can be an option.

9490

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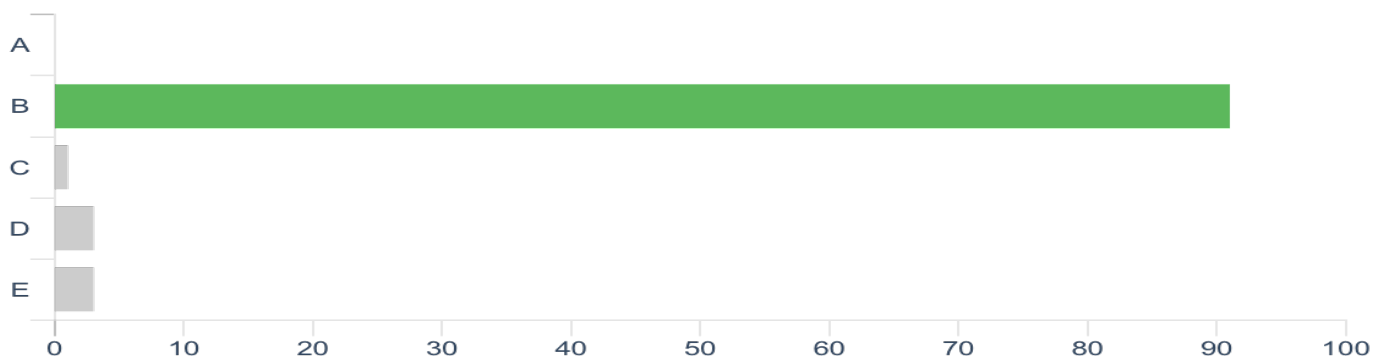
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Responses Correct:

25

Responses Incorrect:	106
Responses Total:	131
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External Links

NICE Pathways. Chest Pain Overview

pathways.nice.org.uk/pathways/acute-coronary-syndromes#path=view%3A/pathways/acute-coronary-syndromes/early-m...

(<http://pathways.nice.org.uk/pathways/acute-coronary-syndromes#path=view%3A/pathways/acute-coronary-syndromes/early-management-of-unstable-angina-and-nstemi.xml&content=view-node%3Anodes-person-at-intermediate-high-or-highest-risk>)

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis

Links to NICE guidelines/CKS



Q132

A 48-year-old man is referred to the Cardiology Clinic with a six month history of palpitations. He describes palpitations every other day, lasting for up to a minute at a time. The palpitations are not associated with shortness of breath, chest pain or dizziness/loss of consciousness, and there is no obvious precipitating factor. They are not impacting on his quality of life, but he has attended for review following encouragement from his family. His past medical history is unremarkable and he is not on any medication.

On examination, he is comfortable, with a blood pressure (BP) of 132/72 mmHg and a pulse of 66 beats per minute (bpm). Cardiovascular, respiratory, abdominal, and central nervous systems (CNS) are all normal.

Investigations reveal the following:

Investigation	Result
Electrocardiogram (ECG)	Sinus rhythm
Chest X-ray (CXR)	Normal
Full blood count (FBC), Urea and electrolytes (U&Es), Liver function tests (LFTs), Thyroid function tests (TFTs), lipid profile and ECHO	All within normal range
24 hour ECG tape	Sinus rhythm throughout; one episode of premature ventricular ectopics (PVEs) comprising 5 PVEs within 1 min

What is the most appropriate management option?

Your answer was incorrect

- A Angiography
- B Start bisoprolol
- C Start verapamil
- D Start amiodarone
- E Reassure

Explanation



E Reassure

With normal echo and 24 h tape, it is unlikely that there is anything sinister going on in this man. PVEs may be considered significant if they fall within any of the following categories:

- Occurring frequently (10 or more beats/hour, or 6 or more beats/min)
- PVE in bigeminal rhythm
- PVE in short runs of ventricular tachycardia
- PVE exhibiting R-on-T phenomenon
- PVE associated with serious organic heart disease such as in the context of MI, and left ventricular decompensation
- PVE associated with significant symptomatology such as syncope.

The symptoms in this young man are not troublesome and he will only need reassurance. Should the PVEs become symptomatically significant, or increase in frequency, a trial of suppression with beta-blocker therapy or rate-limiting calcium channel blocker could be considered.

B Start bisoprolol

Beta-blockers can be used for rate control of arrhythmias such as atrial fibrillation, but there is no indication of such an arrhythmia in this case, making beta-blockers an inappropriate choice.

A Angiography

He does not describe any anginal features, and there is no suggestion from his history, investigations or examination of coronary artery disease.

C Start verapamil

Rate-limiting calcium channel blockers such as verapamil can be used to slow ventricular rate in cases of supraventricular tachycardia (though they are not first-line agents for this indication). However, in this case there is no evidence of such an arrhythmia, making calcium channel blockers an inappropriate choice.

D Start amiodarone

Amiodarone would be appropriate to gain control of arrhythmias such as paroxysmal supraventricular, nodal and ventricular tachycardias, atrial fibrillation/flutter, VF and arrhythmia associated with WPW. There is no suggestion of arrhythmia here, making

amiodarone an unsuitable choice.

9495

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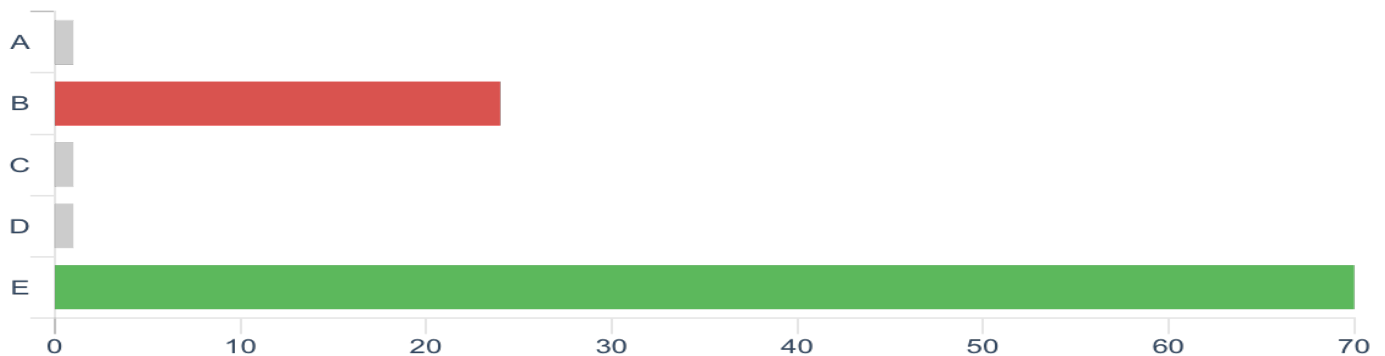
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External Links

Frequent ventricular extrasystoles: significance, prognosis and treatment

[escardio.org/Journals/E-Journal-of-Cardiology-Practice/Volume-9/Frequent-ventricular-extrasystoles-significance-progno...](https://www.escardio.org/Journals/E-Journal-of-Cardiology-Practice/Volume-9/Frequent-ventricular-extrasystoles-significance-progno...)
(<https://www.escardio.org/Journals/E-Journal-of-Cardiology-Practice/Volume-9/Frequent-ventricular-extrasystoles-significance-prognosis-and-treatment>)



Q133

A 68-year-old year woman comes to the Cardiology Clinic for follow up. She suffered an inferior STEMI some six weeks ago and was stented. Here current medications are 80 mg atorvastatin, 75 mg aspirin and 2.5 mg bisoprolol.

She read an article on the Internet that vitamin E was good for people who have had a previous heart attack and would like your opinion on it.

How would you advise this patient regarding vitamin E?

Your answer was incorrect

- A She should start taking 400 U/day of vitamin E
- B She should start taking 400 U of vitamin E weekly
- C There is no evidence that it is beneficial
- D It reduces the incidence of strokes
- E It is only beneficial post MI in patient with diabetes

Explanation



- C There is no evidence that it is beneficial

The Heart Outcomes Prevention Evaluation (HOPE) study was a large randomised trial of ramipril and vitamin E in patients at high risk of cardiovascular events. This study showed no significant differences in the numbers of myocardial infarction, stroke or cardiovascular death between the vitamin E group and the placebo group. The HOPE-TOO was an extension of the same study and still showed no significant differences between the vitamin E group and the placebo group.

- D It reduces the incidence of strokes

Vitamin E has no impact on risk of ischaemic stroke, although it may increase the risk of haemorrhagic stroke.

A She should start taking 400 U/day of vitamin E

A study has suggested that consumption of more than 60U/day may increase the risk of haemorrhagic stroke. As such 400 U/day, given the lack of impact on ischaemic events, has no role as a therapy.

B She should start taking 400 U of vitamin E weekly

This is a dose of less than 60U/day, thought to be the threshold for pharmaceutical supplementation. It's therefore unlikely to have a positive or negative benefit.

E It is only beneficial post MI in patient with diabetes

Large CV outcome studies in patients with diabetes have shown no positive impact of vitamin E in preventing ischaemic events.

9496

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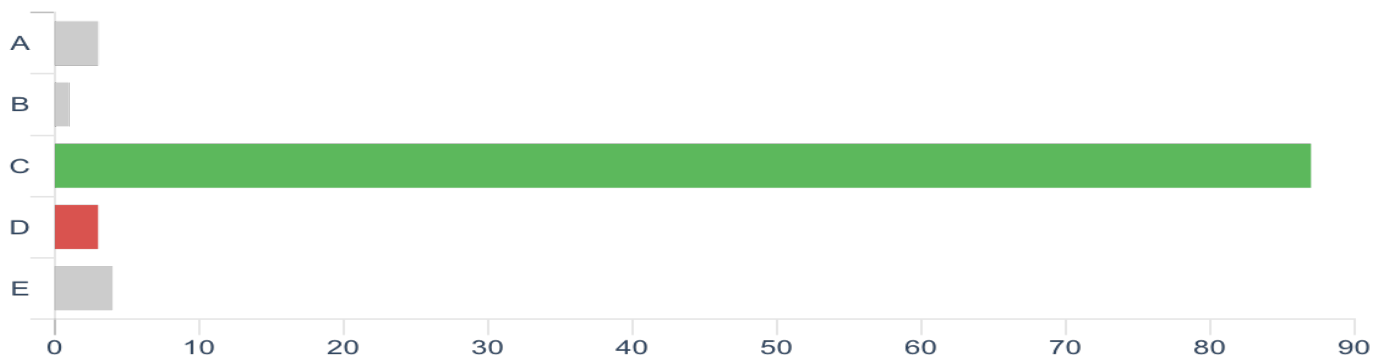
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Expanded Explanation

Overview

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Links to NICE guidelines/CKS



Q134

A 19-year-old football player has been referred to the Emergency Department (ED) following a pre-season medical. He had spent the morning training, and was subsequently undergoing a series of tests, including an electrocardiogram (ECG). When the ECG was undertaken, it showed ST segment elevation in the anterior chest leads and he was quickly referred to the ED.

On examination in the ED, he is comfortable but anxious at rest. He has no chest pain during or after exercise, no shortness of breath and no dizziness/loss of consciousness. His past medical history is unremarkable and he is not on any medication. His physical examination is entirely normal.

Investigations reveal the following:

Investigation	Result
Chest X-ray (CXR)	Normal
ECG	Sinus rhythm, with 2 mm concave ST elevation in V ₂ -V ₅ . J point notching is seen, with peaked T waves

What is the most likely diagnosis?

Your answer was incorrect

- A Wolff-Parkinson-White syndrome
- B Early repolarisation
- C Acute myocardial infarction
- D Pericarditis
- E Pulmonary embolism

Explanation



- B Early repolarisation

There exists a benign but often alarming electrocardiographic entity that presents with ST segment elevation. It is known as the early repolarisation variant and expresses as an early uptake of the ST segment before the descending limb of the R wave has reached the baseline. Features of early repolarization variant are:

- Classically the ST segment elevation during early exercise returns to normal as heart rate increases further
- It is common in black males
- Clinical evaluation is entirely normal
- ST elevation is usually seen in the precordial leads.

A Wolff-Parkinson-White syndrome

Wolff-Parkinson-White syndrome is associated with an accessory conduction pathway between the atrium and ventricle. ECG features include a short PR interval, a delta wave (slurred upstroke of the QRS complex) and a broad QRS complex. The morphology of the delta wave is suggestive of the location of the accessory pathway.

C Acute myocardial infarction

The history given is not typical for acute myocardial infarction, in that there is no chest pain or associated autonomic features. The patient also has no risk factors for ACS. The ECG features seen are more in keeping with benign early repolarisation than acute MI, and there is no evidence of reciprocal ECG changes to support this diagnosis.

D Pericarditis

There is no history of chest pain given by the patient, nor prodromal features such as viral illness. The changes here are localised to the precordial leads, where changes in pericarditis are often more generalised in nature. Additionally, the presence of J-point notching and prominent T waves is more suggestive of benign early repolarisation than pericarditis.

E Pulmonary embolism

The most common ECG change seen in cases of acute pulmonary embolus is sinus tachycardia. There may also be the presence of a large S wave in Lead 1, with a Q wave and T wave inversion in lead 3 ('S₁Q₃T₃'), indicative of right heart strain. There are also no symptoms such as dyspnoea or acute chest pain, or risk factors such as immobility to support this diagnosis.

9498

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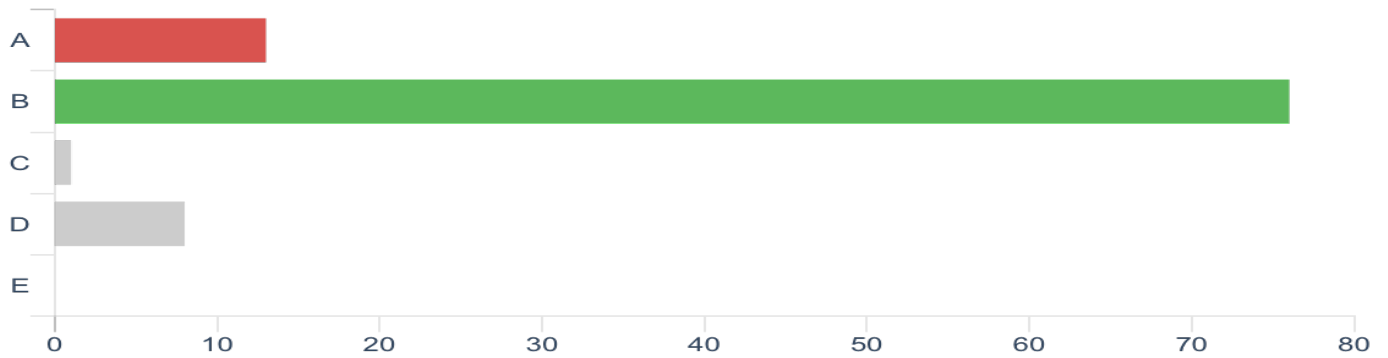
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Q135

A 45-year-old woman of no fixed abode is brought to the Emergency Department (ED) by the police. She was found lying on a bench at the railway station. She is a poor historian and has only complained of several episodes of loose bowel motions and vomiting. She denies any other symptoms.

On examination, she is dehydrated, with a blood pressure (BP) of 100/55 mmHg and her pulse is 104 beats per minute (bpm). There are no cardiac murmurs and her chest is clear. She has slight abdominal tenderness on deep palpation but no organomegaly. There are no gross neurological abnormalities.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	158 g/l	115-155 g/l
White cell count (WCC)	$11.0 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$210 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	136 mmol/l	135-145 mmol/l
Potassium (K^+)	2.4 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	131 μ mol/l	50-120 mol/l
Mean corpuscular volume (MCV)	88.6 fl	80-100 fl
Urea	9.7 mmol/l	2.5-6.5 mmol/l
Magnesium (Mg^{2+})	0.71 mmol/l	0.75-1.00 mmol/l
Chest X-ray (CXR)	Normal	
Electrocardiogram (ECG)	Sinus rhythm with features suggestive of severe hypokalaemia	

Which of the following ECG changes is indicative of severe hypokalaemia?

Your answer was correct

A Delta waves

- B Short QT interval
- C U waves
- D Tall, tented T waves
- E Long ST segment

Explanation



- C U waves

This patient is clearly dehydrated and hypokalaemic. The significance of the hypokalaemia is reflected in the prominence of U waves on the ECG. The U wave is produced by slow and late repolarisation of the intraventricular Purkinje system and follows the T wave. It is usually best seen in leads V_4 - V_6 .

The causes of prominent U waves are:

- Hypokalaemia
- Cardiovascular drugs, e.g. digitalis, quinidine, amiodarone
- Psychotropic drugs, e.g. phenothiazines, tricyclic antidepressants.

Other ECG changes seen in hypokalaemia may include:

- ST depression
- Small T waves
- Large P waves
- PR prolongation
- QRS prolongation
- T wave inversion
- Ectopic beats.

Hypokalaemia has the potential to produce arrhythmias such as atrial fibrillation/flutter, ventricular fibrillation, ventricular tachycardia, and torsades.

- A Delta waves

Delta waves are associated with Wolff-Parkinson-White syndrome.

- B Short QT interval

Short QT interval is associated with hypercalcaemia.

D Tall, tented T waves

Tall, tented T waves are associated with hyperkalaemia. Hypokalaemia is associated with small T waves.

E Long ST segment

Long ST segment is associated with hypocalcaemia. In severe hypokalaemia there may be ST segment depression.

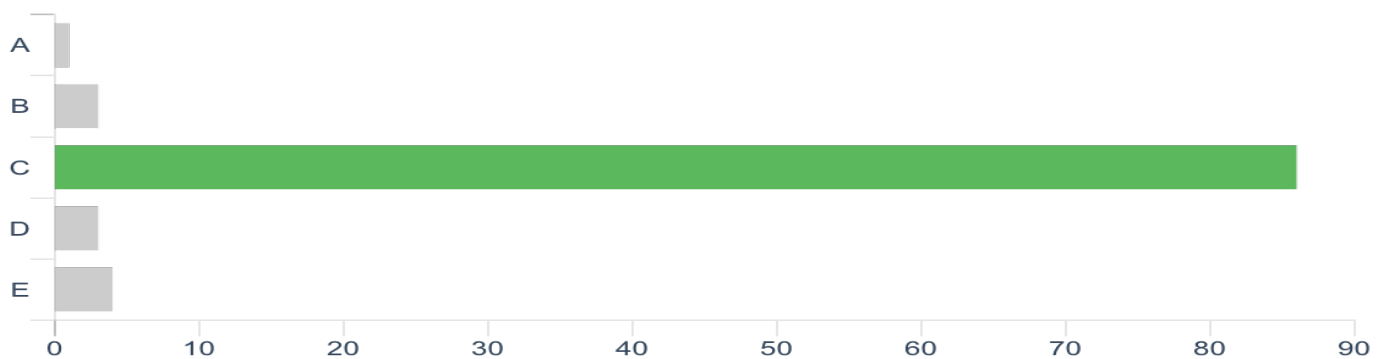
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Responses Incorrect:	109
Responses Total:	135

Responses - % Correct:

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Q136

A 47-year-old man is referred to the Emergency Department (ED) by his General Practitioner (GP) as a result of very high blood pressure. He complains of a severe headache and has vomited. His GP was investigating hypertension. He is not on any medications.

On examination, he has mild dyspnoea with a blood pressure (BP) of 200/105 mmHg. His pulse is 90 beats per minute (bpm). His jugular venous pressure (JVP) is not raised. His first and second heart sounds are heard and there are no murmurs. There are bibasal crackles consistent with hypertensive left ventricular failure.

His other systems are entirely normal. The following results are obtained:

Investigation	Result
Chest X-ray (CXR)	Normal
Electrocardiogram (ECG)	Sinus rhythm
Fundoscopy	Grade 2 hypertensive retinopathy
Full blood count (FBC), Urea and electrolytes (U&Es), Liver function tests (LFTs), urinalysis and lipid profile	Are within the normal range

What is the best initial step in managing this patient's blood pressure?

Your answer was incorrect

- A IV sodium nitroprusside
- B Sublingual nifedipine
- C Oral atenolol
- D Oral captopril
- E Reassurance and monitoring

Explanation



A IV sodium nitroprusside

This man has markedly elevated blood pressure and evidence of decompensation with evidence of LVF. IV sodium nitroprusside titrated for gradual BP reduction is an ideal choice for intervention. It leads to significant vasodilatation and will not only reduce blood pressure but will have a positive impact on the mild LVF seen here.

D Oral captopril

Like nifedipine, oral captopril has a relatively short half-life, nitroprusside as a titratable infusion is therefore the better option.

B Sublingual nifedipine

Sublingual nifedipine can reduce BP rapidly, although it has a short half-life, which can lead to rapid rebound in blood pressure. For this reason nitroprusside, which can be delivered as a continuous infusion, is preferred.

C Oral atenolol

Although atenolol will reduce blood pressure, it has a long half-life and may exacerbate cardiac failure; as such other interventions are preferred.

E Reassurance and monitoring

This patient is at risk of worsening left ventricular failure and / or an acute stroke due to his hypertension. Reassurance alone is therefore inappropriate.

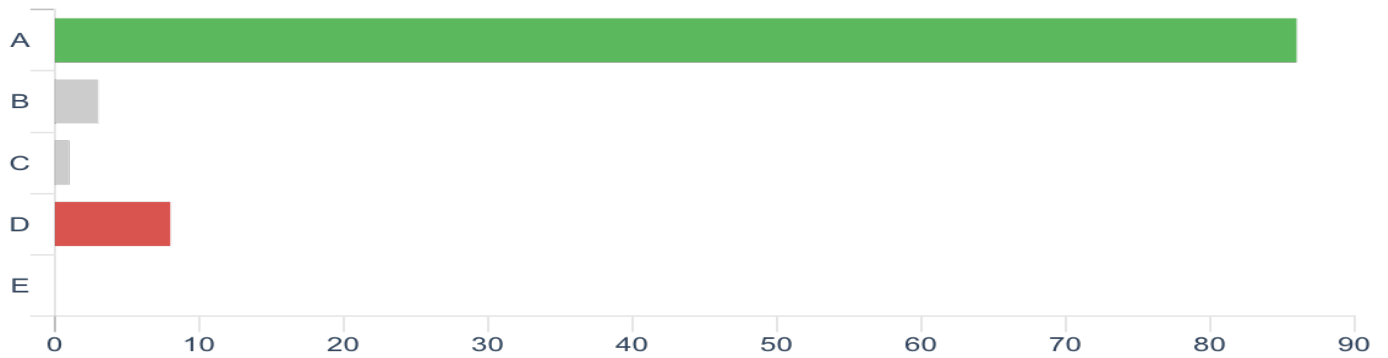
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Expanded Explanation

Overview

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Q137

A 21-year-old medical student is admitted by ambulance to the Emergency Department (ED). He was found by a passer-by in a state of undress and was unresponsive.

On admission to the ED he has a Glasgow Coma Score (GCS) of 4, with unresponsive dilated pupils. His core temperature is measured at 28 °C, and re-warming is commenced. Some 10 minutes after admission to the department he develops ventricular fibrillation.

Which of the following fits best with the treatment of pulseless ventricular arrhythmia in this case?

Your answer was correct

- A Amiodarone is likely to be effective
- B Lignocaine is likely to be effective
- C Repeated defibrillation is likely to be required
- D Prolonged cardiopulmonary resuscitation is likely to be required
- E Defibrillation at voltages higher than 360 V is recommended

Explanation



- D Prolonged cardiopulmonary resuscitation is likely to be required

At core temperatures of less than 30 °C, treatment of ventricular arrhythmia with medical therapy is largely ineffective, and electrical cardioversion is less effective than in normothermic patients. For this reason, a prolonged period of CPR may be required until core temperature is above 30 °C. Defibrillation should be limited to three shocks, and drugs should be withheld at temperatures below 30°C. Between 30–35 °C, the intervals between drug doses should be doubled when compared with normothermia intervals. Where available, for a long period of cardiac arrest, cardiopulmonary bypass may be effective, although practically this is possible in only a handful of centres within the UK.

- A Amiodarone is likely to be effective

In hypothermic arrest, drugs are less effective - metabolism is slowed and there is the possibility of accumulation to toxic levels - and prolonged resuscitation with re-warming is the management of choice.

B Lignocaine is likely to be effective

In hypothermic arrest, drugs are less effective - metabolism is slowed and there is the possibility of accumulation to toxic levels - and prolonged resuscitation with re-warming is the management of choice.

C Repeated defibrillation is likely to be required

Defibrillation is less effective in hypothermia. For ventricular fibrillation/ventricular tachycardia (VF/VT), defibrillation can be tried up to three times but should then not be tried until the temperature reaches 30°C.

E Defibrillation at voltages higher than 360 V is recommended

Defibrillation is less effective in cases of hypothermia - re-warming and prolonged CPR is the management of choice. Defibrillation can be tried if VF/VT is present, but should be performed as per standard life support guidelines and not at an increased voltage.

18525

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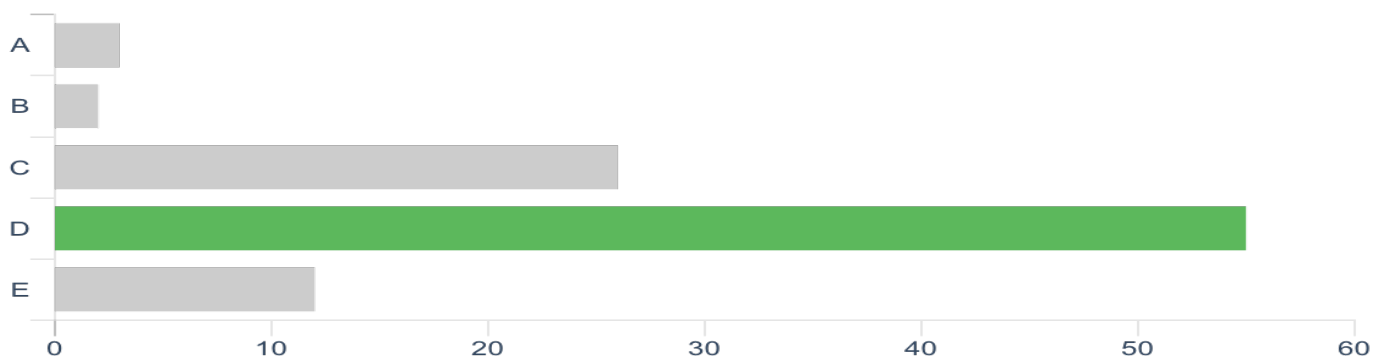
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External Links

RCEM Learning. Cardiac arrest in Special Circumstances: Hypothermic Cardiac Arrest

rcemlearning.co.uk/references/cardiac-arrest-in-special-circumstances-hypothermic-cardiac-arrest/#management

(<http://www.rcemlearning.co.uk/references/cardiac-arrest-in-special-circumstances-hypothermic-cardiac-arrest/#management>)

Resuscitation Council UK. Prehospital Resuscitation

[resus.org.uk/resuscitation-guidelines/prehospital-resuscitation/](https://www.resus.org.uk/resuscitation-guidelines/prehospital-resuscitation/)

(<https://www.resus.org.uk/resuscitation-guidelines/prehospital-resuscitation/>)



Q138

You are called to a ongoing cardiac arrest on the Cardiac Unit. A 58-year-old man was admitted two days ago with an anterior myocardial infarction (MI). The nurses inform you that he was making a reasonable recovery until the onset of chest pain 30 minutes ago.

As the Ward Doctor was reviewing him, he went into ventricular fibrillation. You give him an initial cycle of one shock at 360 J followed by 2 minutes of cardiopulmonary resuscitation (CPR), and he becomes asystolic. Blood gases taken peri-arrest reveal a pH of 6.9 and a potassium of 4.9 mmol/l. Adrenaline 1 mg intravenous (IV) is given.

Which of the following is the optimal next step in his management?

Your answer was incorrect

- A Give sodium bicarbonate 8.4% IV
- B Give sodium bicarbonate 1.2% IV
- C Continue CPR
- D Give amiodarone 300mg IV
- E Give IV fluids

Explanation



- C Continue CPR

This man is now in asystole. The non-shockable algorithm of the ALS guidelines should therefore be followed. This emphasises high-quality CPR with adjunctive adrenaline.

- B Give sodium bicarbonate 1.2% IV

The use of sodium bicarbonate is no longer recommended as part of the ALS algorithm drawn up by the UK resuscitation council. It may, however, still be considered in cases of profound hyperkalaemia or where there is overdose of tricyclic antidepressants.

- A Give sodium bicarbonate 8.4% IV

The use of sodium bicarbonate is no longer recommended as part of the ALS algorithm drawn up by the UK resuscitation council. It may, however, still be considered in cases of profound hyperkalaemia or where there is overdose of tricyclic antidepressants.

D Give amiodarone 300mg IV

This man is in asystole, and the non-shockable algorithm should be followed. There is no place for amiodarone in this context.

E Give IV fluids

Where there is suspicion of hypovolaemia, e.g. after massive blood loss due to trauma, then IV fluids may be of value, but there is no suggestion that this is the case here.

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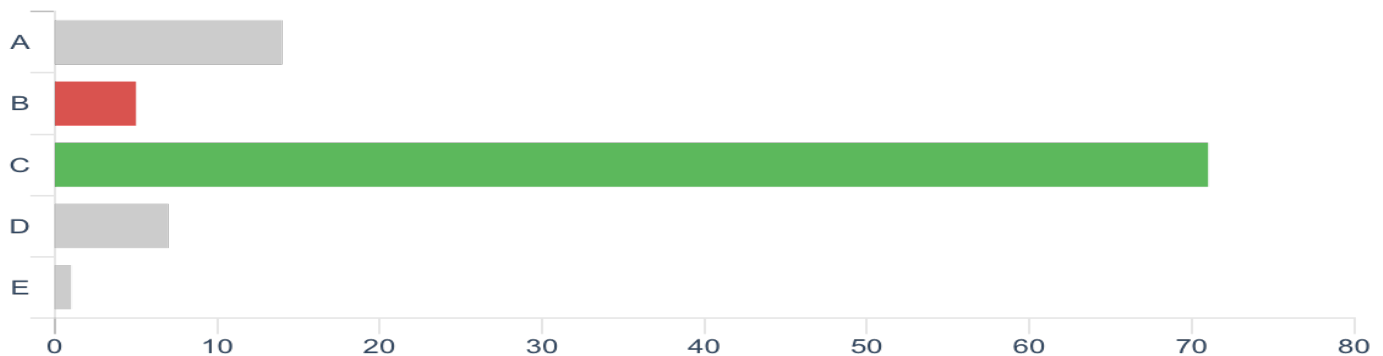
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External Links

Resuscitation Council UK. Resuscitation Guidelines; Adult Advanced Life Support.

[resus.org.uk/resuscitation-guidelines/adult-advanced-life-support/](https://www.resus.org.uk/resuscitation-guidelines/adult-advanced-life-support/)

(<https://www.resus.org.uk/resuscitation-guidelines/adult-advanced-life-support/>)

Use of Sodium Bicarbonate in Cardiac Arrest: Current Guidelines and Literature Review

[ncbi.nlm.nih.gov/pmc/articles/PMC4780490/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4780490/)

(<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4780490/>)



Q139

A 28-year-old intravenous (IV) heroin abuser is admitted to the Emergency Department (ED). He has been suffering from fevers for the past few days and is feeling very unwell. There is a history of a flu-like illness which resolved about a week ago. On further questioning he admits to problems finding an injecting site and has recently taken to using groin vessels.

On examination, he looks emaciated, with a body mass index (BMI) of 16 kg/m². Cardiovascular examination reveals a murmur consistent with pulmonary regurgitation. Respiratory examination suggested pockets of infection consistent with pneumonia.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	10.1 g/dl	13.5-17.5 g/dl
Mean corpuscular volume (MCV)	97 fl	80-100 fl
White cell count (WCC)	$11.2 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Neutrophils	$8.2 \times 10^9/l$	$2.5-7.58 \times 10^9/l$
Sodium (Na ⁺)	135 mmol/l	135-145 mmol/l
Potassium (K ⁺)	5.4 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	185 µmol/l	50-120 µmol/l
Urea	10.1 mmol/l	2.5-6.5 mmol/l
Erythrocyte sedimentation rate (ESR)	87 mm/hour	1-20 mm/hour
Chest X-ray (CXR)	Multiple areas of patchy consolidation consistent with pneumonia with abscess formation	

Which of the following is the most likely diagnosis in this case?

Your answer was incorrect

- A *Klebsiella pneumoniae*
- B *Streptococcus pneumoniae* pneumonia

- C *Streptococcus bovis* endocarditis
- D *Staphylococcus aureus* endocarditis
- E *Pseudomonas* endocarditis

Explanation



- D *Staphylococcus aureus* endocarditis

The most likely diagnosis is *S. aureus* endocarditis. This man is an IV drug abuser, with evidence of poor injection technique and right-sided valvular disease. Often right-sided endocarditis leads to septic emboli distributed via the pulmonary vasculature, and the chest X-ray findings would be consistent with this. In contrast, left-sided endocarditis is more commonly associated with embolic phenomena involving the periphery, such as the toes or even with emboli affecting the renal or cerebral vasculature. Diagnosis is based on the collection of multiple blood cultures (at least three), and imaging of affected valves via echocardiography. Choice of antibiotics depends upon local policy, but a regime suitably targeted against *S. aureus* would be appropriate in this case.

- B *Streptococcus pneumoniae* pneumonia

The presence of abscesses makes this a less likely diagnosis, and it does not explain the patient's murmur.

- A *Klebsiella* pneumonia

This condition is most commonly seen in those with underlying conditions such as alcoholism, diabetes or COPD. It is associated with sputum production, which features haemoptysis more commonly than other bacterial pneumonias. CXR changes are most commonly seen in the upper lobes.

- C *Streptococcus bovis* endocarditis

This organism is most commonly isolated in patients with colon cancer.

- E *Pseudomonas* endocarditis

Pseudomonas is most commonly seen in those with pre-existing conditions such as cystic fibrosis, and as a hospital-acquired pathogen. It is uncommon in those who were previously healthy. *Pseudomonas* infection is also associated with a characteristic skin lesion (ecthyma gangrenosum). It presents acutely and usually requires surgical treatment.

18528

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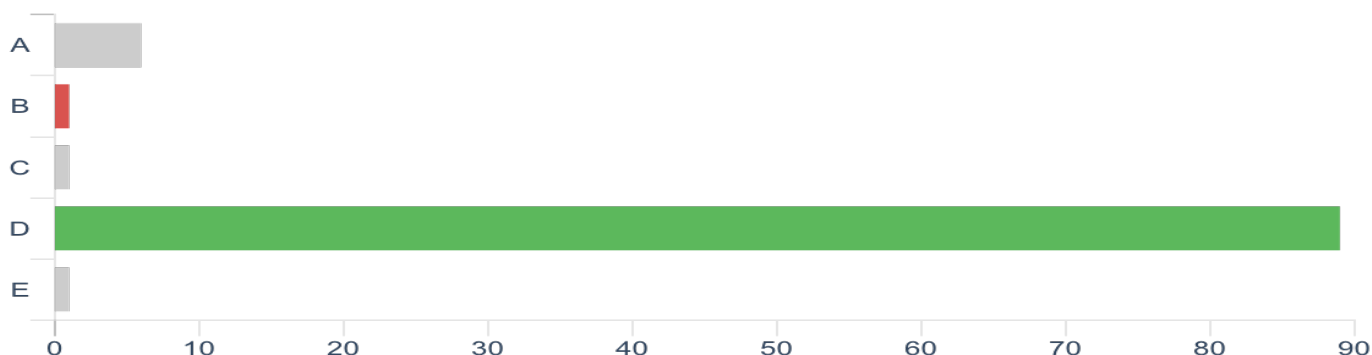
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Expanded Explanation

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Q140

A 57-year-old man presents to the Emergency Department (ED) complaining of a headache. On examination, his blood pressure (BP) is noted to be 210/100 mmHg.

His past history of note includes asthma, for which he takes a salmeterol/fluticasone combination inhaler and, apart from this, he has attended the General Practitioner (GP) only infrequently.

A detailed examination reveals grade 3 hypertensive retinopathy, no focal neurological deficit, and no BP difference between arms. There are no heart murmurs. You elect to admit him for commencement of anti-hypertensive therapy.

Which of the following would be the most appropriate initial agent to trial him on?

Your answer was incorrect

- A IV labetalol
- B Oral metoprolol
- C Oral isosorbide dinitrate
- D Oral doxazosin
- E Oral calcium channel blocker

Explanation



- E Oral calcium channel blocker

Unfortunately, severe hypertension presenting acutely with headache $\pm$ other symptoms is an area that is poorly served by clinical trials. Most studies are inadequately powered to deliver a definitive result as to which class of therapy is most appropriate, and there are no trials that adequately compare the superiority of intravenous (iv) versus oral therapy. In this case, the aim should be to reduce blood pressure by around 25% over the first hour.

- D Oral doxazosin

This is usually considered a third or fourth-line intervention for hypertension, and is therefore not useful here versus other first-line interventions such amlodipine.

A IV labetalol

Given this patient's history of asthma, labetalol is best avoided given that alternatives exist.

B Oral metoprolol

Metoprolol is longer acting, more difficult to titrate and runs the risk of worsening asthma. As such it should be avoided here.

C Oral isosorbide dinitrate

Isosorbide dinitrate has limited effectiveness in the management of hypertension, and is more useful as an intervention for angina.

18530

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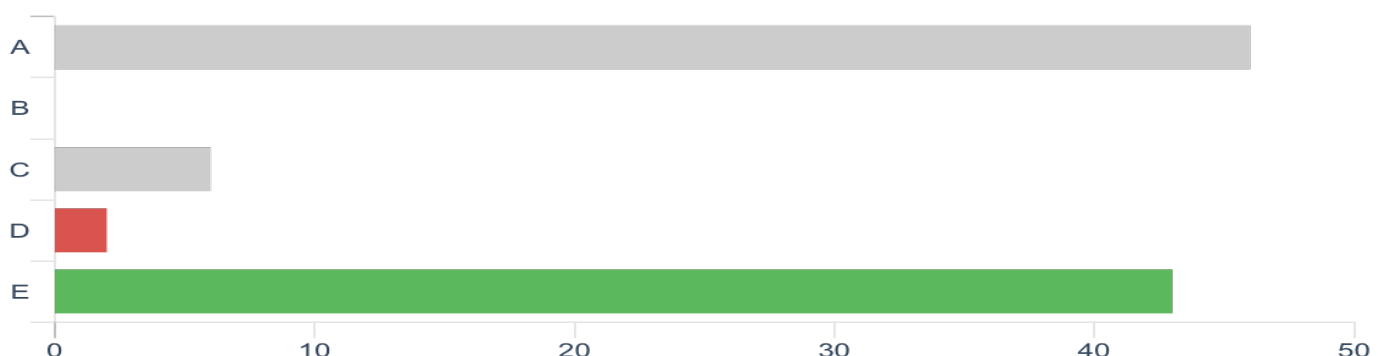
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Expanded Explanation

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Q141

A 40-year-old man presents to the Cardiology Clinic for advice. He works as a solicitor, keeps fit, is of normal weight and is a non-smoker. He is worried because his father and brother both died of myocardial infarction (MI) during their early forties.

On examination, he is of normal weight with a body mass index (BMI) of 24 kg/m² and has a blood pressure (BP) is 135/78 mmHg.

Fasting bloods reveal the following:

Investigation	Result	Normal value
Low-density lipoprotein (LDL) cholesterol	6.0 mmol/l	< 3.5 mmol/l
Triglycerides	3.3 mmol/l	< 1.5 mmol/l
High-density lipoprotein (HDL) cholesterol	0.8 mmol/l	> 1.0 mmol/l
Glucose	4.1 mmol/l	3.5–5.5 mmol/l
Thyroid stimulating hormone (TSH)	0.5 µU/l	0.17–3.2 µU/l

What is the most appropriate action in this case?

Your answer was incorrect

- A Commence fenofibrate therapy
- B Reassure this gentleman that his cardiovascular risk is low and discharge him
- C Advise him to diet and reduce his fat intake
- D Start atorvastatin
- E Start ezetimibe

Explanation



- D Start atorvastatin

This man is likely to have familial combined hyperlipidaemia, present in around 1/250 individuals and associated with premature cardiovascular disease. The most common type of familial dyslipidaemia, it may be responsible for up to 10% of cases of premature cardiovascular disease. It is characterised by increased LDL and triglyceride levels, often accompanied by low HDL levels. A statin will reduce the risk of cardiovascular disease events and is the first-choice drug for primary and secondary prevention of cardiovascular disease.

C Advise him to diet and reduce his fat intake

Given that he already lives a healthy lifestyle, dietary modification is unlikely to significantly impact on his lipid parameters.

A Commence fenofibrate therapy

Fenofibrate may be added to statin therapy if triglycerides remain high even after the LDL cholesterol concentration has been reduced adequately.

B Reassure this gentleman that his cardiovascular risk is low and discharge him

His blood tests show evidence of increased LDL and triglyceride levels, which puts him at increased risk of cardiovascular events.

E Start ezetimibe

Ezetimibe as a monotherapy is recommended as an option for the treatment of primary hypercholesterolaemia in adults in whom initial statin therapy is contraindicated or not tolerated. Ezetimibe in combination with a statin is recommended in primary hypercholesterolaemia when serum total or LDL cholesterol concentration is not adequately controlled with the maximum tolerated dose of statin and a change to an alternative statin is being considered.

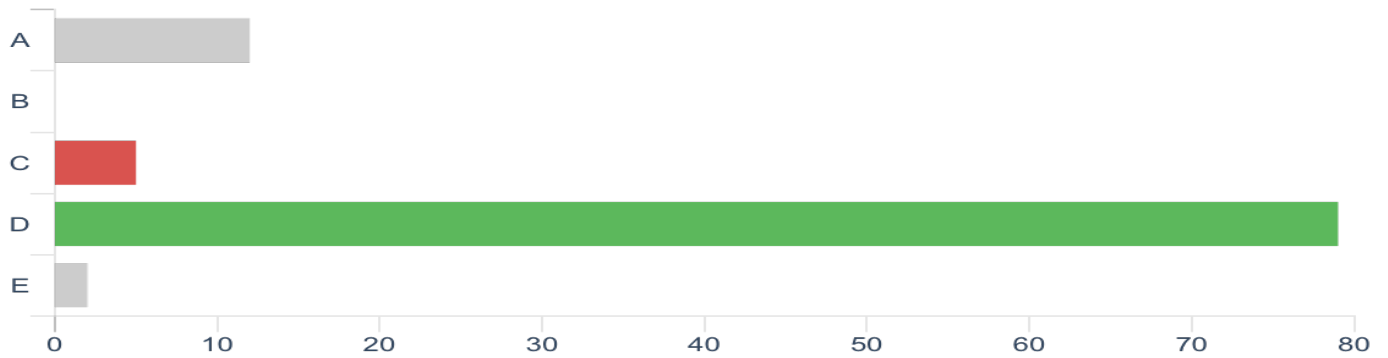
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Responses Total:	141
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Expanded Explanation

Overview

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Links to NICE guidelines/CKS



Q142

A 64-year-old man with a long history of ischaemic heart disease (IHD) and cardiac failure is reviewed in the Cardiology Clinic. He unfortunately still has symptoms of shortness of breath on exercise and is dyspnoeic at night, despite being managed with ramipril 10 mg daily, carvedilol 12.5 mg twice daily, digoxin 125 mcg daily, spironolactone 25 mg daily and furosemide 80 mg daily.

On examination, his blood pressure (BP) is 104/60 mmHg. His pulse is 50 beats per minute (bpm), and his chest is clear.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	13.2 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$4.8 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$304 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	139 mmol/l	135–145 mmol/l
Potassium (K^+)	4.9 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	175 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Electrocardiogram (ECG)	Sinus rhythm, QRS widening (155ms)	
Ejection fraction	28%	
pO_2	9 kPa	10.5–13.5 kPa

Which of the following is the most appropriate management for him based on the available information?

Your answer was incorrect

- A Offer morphine to relieve his shortness of breath
- B Start home oxygen therapy
- C Increase his furosemide to 160mg daily
- D Add metolazone to his regime

E Consider cardiac resynchronisation therapy

Explanation



E Consider cardiac resynchronisation therapy

According to current guidelines, this patient fits the drug therapy, ECG and echocardiographic criteria for cardiac resynchronisation therapy. This is usually with permanent dual-chamber pacing, although certain patients at high risk of ventricular arrhythmias and cardiac arrest may receive an implantable cardioverter defibrillator instead.

C Increase his furosemide to 160mg daily

We are not given evidence of fluid overload, and it is worth noting that this gentleman's creatinine is raised at 175. SIGN are clear that the diuretic dose chosen or reached should eliminate ankle or pulmonary oedema without dehydrating the patient and placing them at risk of renal dysfunction or hypotension.

A Offer morphine to relieve his shortness of breath

While morphine can be considered as an adjunctive/palliative therapy for patients with heart failure, it is not the most appropriate option in this case as the patient meets the criteria for CRT implantation.

B Start home oxygen therapy

We are told his PaO_2 is 9, which is above the current threshold for consideration of instituting home oxygen therapy.

D Add metolazone to his regime

We are not given evidence of fluid overload, and this gentleman is already taking two diuretic agents. ESC guidance states that a mineralocorticoid antagonist (MRA), i.e. spironolactone/eplerenone, is always preferred.

18632

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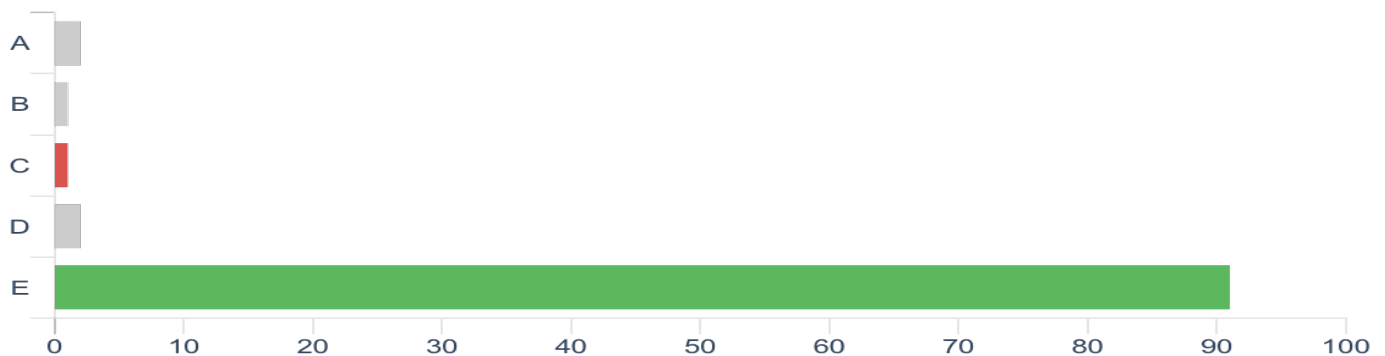
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External Links

European Society of Cardiology - Acute and Chronic Heart Failure[escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-and-Chronic-Heart-Failure](https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-and-Chronic-Heart-Failure)<https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-and-Chronic-Heart-Failure>**SIGN. Chronic Heart Failure**[sign.ac.uk/pdf/SIGN147.pdf](http://www.sign.ac.uk/pdf/SIGN147.pdf)<http://www.sign.ac.uk/pdf/SIGN147.pdf>

Expanded Explanation

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Q143

A 76-year-old man with a history of chronic asthma managed with high-dose seretide comes to the Emergency Department (ED) complaining of palpitations. He has felt very faint, with shortness of breath for the past 30 minutes. Two further episodes occur during his time in the ED, documented as fast atrial fibrillation (AF).

On examination, his blood pressure (BP) is 135/80 mmHg. His pulse is 80 beats per minute (bpm) and regular. An electrocardiogram (ECG) at that time reveals sinus rhythm with evidence of lateral ST depression.

Which of the following is the most appropriate treatment for him to control his ventricular rate?

Your answer was incorrect

- A Bisoprolol
- B Amiodarone
- C Ivabradine
- D Verapamil
- E Adenosine

Explanation



- D Verapamil

Verapamil is a non-dihydropyridine calcium antagonist which is an appropriate choice to obtain long-term ventricular rate control.

- C Ivabradine

This is a 'funny channel' blocker used in the management of angina and heart failure. It has been used off-licence in treatment of atrial fibrillation but is not recommended under current guidelines (which in fact state that use of ivabradine has been associated with increased rates of atrial fibrillation).

A Bisoprolol

Beta blockers should be used with caution in patients with asthma, and this is therefore not the most appropriate option for this patient.

B Amiodarone

Amiodarone, while a highly effective anti-arrhythmic agent, is limited by long-term systemic side effects, and current guidelines recommend use of other anti-arrhythmic agents as first line before the introduction of amiodarone.

E Adenosine

Adenosine is a short-acting agent which serves to cause a transient AV block. It can be useful in terminating transient tachy-arrhythmias, and in the diagnosis of the underlying rhythm in cases of SVT of uncertain aetiology. It would not be the most appropriate choice as prophylactic agent here.

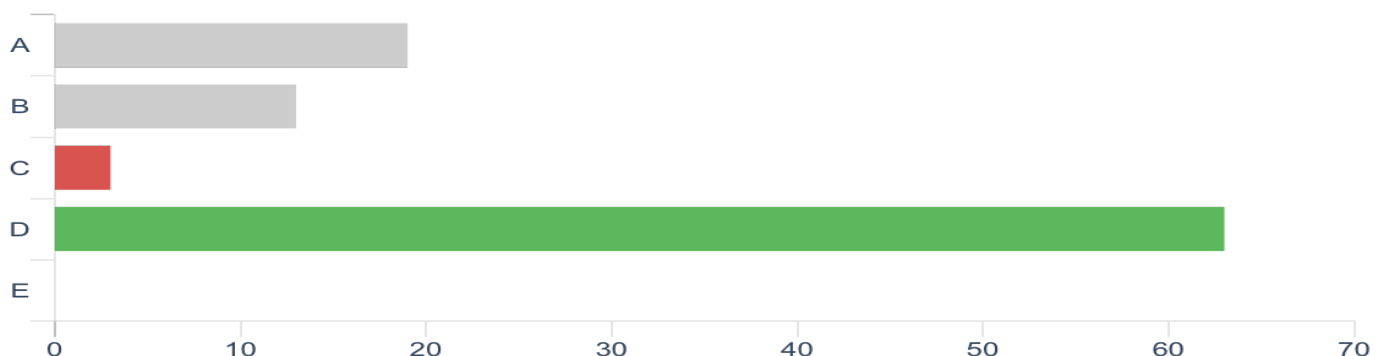
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Responses Incorrect:	116
Responses Total:	143
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External Links

2016 ESC guidelines for the management of atrial fibrillation

academic.oup.com/eurheartj/article/37/38/2893/2334964/2016-ESC-Guidelines-for-the-management-of-atrial-fibrillation
(<https://academic.oup.com/eurheartj/article/37/38/2893/2334964/2016-ESC-Guidelines-for-the-management-of-atrial-fibrillation>)

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Q144

A 60-year-old man presents to the Emergency Department (ED) with a history of headaches and palpitations. He has mild bilateral ankle swelling. Three weeks previously he was diagnosed by his General Practitioner (GP) as having hypertension and started on a new medication for this according to current guidelines.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	12.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$5.0 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$220 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	140 mmol/l	135-145 mmol/l
Potassium (K^+)	4.5 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	102 μ mol/l	50-120 μ mol/l

Given his new symptoms, which of the following is the most likely medication that he was commenced on?

Your answer was incorrect

- A Atenolol
- B Prazosin
- C Amlodipine
- D Bendroflumethiazide
- E Ramipril

Explanation



- C Amlodipine

Amlodipine is a calcium antagonist, and is a first-line agent for the treatment of hypertension in this age group (>55 years). It is also most likely to cause ankle swelling, therefore making it the most probable agent here.

An ACE inhibitor is recommended as first-line treatment of hypertension in patients under 55 years; for patients >55 years, or for black patients of any age, a calcium antagonist should be chosen as a first step.

D Bendroflumethiazide

This is a thiazide diuretic and is not a first-line anti-hypertensive choice. NICE recommend that a thiazide-like diuretic, such as chlortalidone or indapamide, should be given in preference to a conventional thiazide diuretic such as bendroflumethiazide or hydrochlorothiazide. While CCB is the first-line recommendation, if there is intolerance to CCB or evidence or risk of heart failure, then a thiazide-like diuretic would be a suitable first-line choice.

A Atenolol

Beta-blockers are not a preferred initial therapy for hypertension, though they may be considered in younger people such as women of child-bearing age. Beta-blockers are also strongly recommended in the treatment of hypertension in those with recent MI, and preferred in patients with other IHD.

B Prazosin

This is an alpha-blocker used in the management of BPH, and in combination with other drugs in the treatment of resistant hypertension. It is not recommended as a first line anti-hypertensive agent.

E Ramipril

This is an ACE inhibitor and would be a suitable choice as first-line agent for those under 55 years of age. As this patient is 60, current guidelines recommend use of a calcium channel blocker as first line.

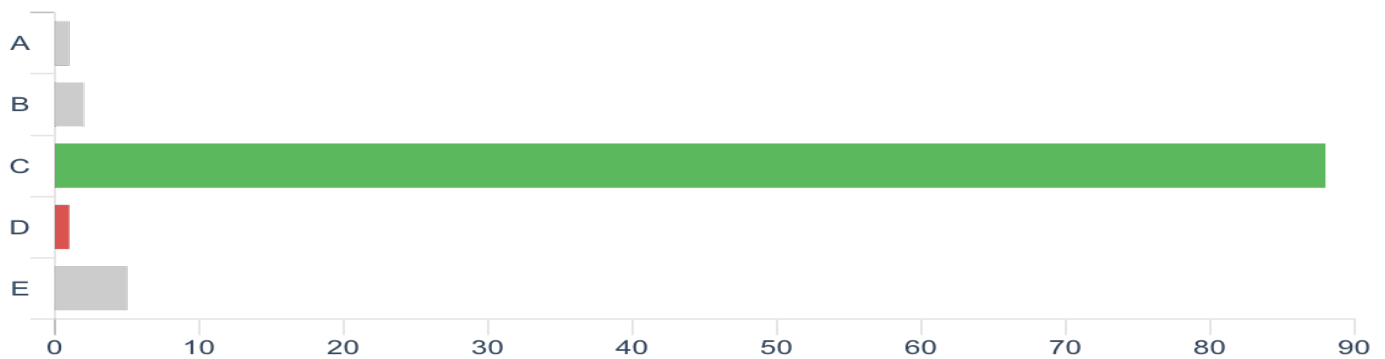
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External Links

ESC guidelines on the management of Arterial Hypertension[escardio.org/Guidelines/Clinical-Practice-Guidelines/Arterial-Hypertension-Management-of](https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Arterial-Hypertension-Management-of)

(https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Arterial-Hypertension-Management-of)

Hypertension and heart failure[evidence.nhs.uk/formulary/bnf/current/2-cardiovascular-system/25-hypertension-and-heart-failure](https://www.evidence.nhs.uk/formulary/bnf/current/2-cardiovascular-system/25-hypertension-and-heart-failure)

(https://www.evidence.nhs.uk/formulary/bnf/current/2-cardiovascular-system/25-hypertension-and-heart-failure)

Expanded Explanation

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Q145

A 17-year-old man who has had limited interaction with medical services attends the Emergency Department (ED) because he feels tired, lethargic, and short of breath. You understand that his mother removed him from the hospital soon after the birth and he did not receive a full paediatric pre-discharge examination. You understand too that he has had no formal medical care and has spent the past few years travelling around the UK and Ireland.

On examination, he looks thin and tired. His right arm blood pressure (BP) is 145/92 mmHg. There is a late systolic murmur which appears loudest over the thoracic spine. He has bilateral basal crackles consistent with heart failure, and mild pitting ankle oedema. A plain chest radiograph appears to show evidence of notching of the posterior ribs.

Which of the following is the most likely diagnosis?

Your answer was correct

- A Hypertrophic obstructive cardiomyopathy
- B Mitral regurgitation
- C Coarctation of the aorta
- D Ostium secundum atrial septal defect
- E Aortic stenosis

Explanation



- C Coarctation of the aorta

Whilst the classical sign of coarctation of the aorta is said to be radio-femoral delay, or differential blood pressures, we are not given this information here. Hence we have to make our diagnosis on the fairly limited information given. We are told that he is a traveller, which opens up a number of options with respect to congenital heart disease diagnoses, given that his mother did not wait for a paediatric check on the child and he has not used health services since. We are told that there is a late systolic murmur, loudest over the thoracic spine, and this is indeed a characteristic feature of coarctation of the aorta. Scalloping of the posterior ribs on CXR is another feature of long-standing coarctation. Echocardiography, coupled with magnetic resonance angiography, would be appropriate radiological investigations.

A Hypertrophic obstructive cardiomyopathy

Signs would typically include large a waves in the JVP, a double apex impulse, loud S4, the presence of S3 and a late systolic murmur due to outflow tract obstruction ($\pm$ mitral regurgitation), which increases in intensity with valsalva.

B Mitral regurgitation

This would classically produce a 'blowing' pansystolic murmur, often with a reduced or absent S1, heard loudest at the apex with radiation to the axilla. It may be associated with signs such as atrial fibrillation and ventricular hypertrophy.

D Ostium secundum atrial septal defect

Patients are often asymptomatic during early life and present in their 3rd or 4th decade. It is associated with right ventricular heave, a murmur loudest in the pulmonic area (which is usually a flow murmur related to excess volume over a normal pulmonary valve), and a split S2.

E Aortic stenosis

This would classically produce an ejection systolic murmur heard loudest in the aortic area with radiation to the carotids. There may be associated signs such as a 'heaving' apex beat, slow rising pulse or the presence of an S4.

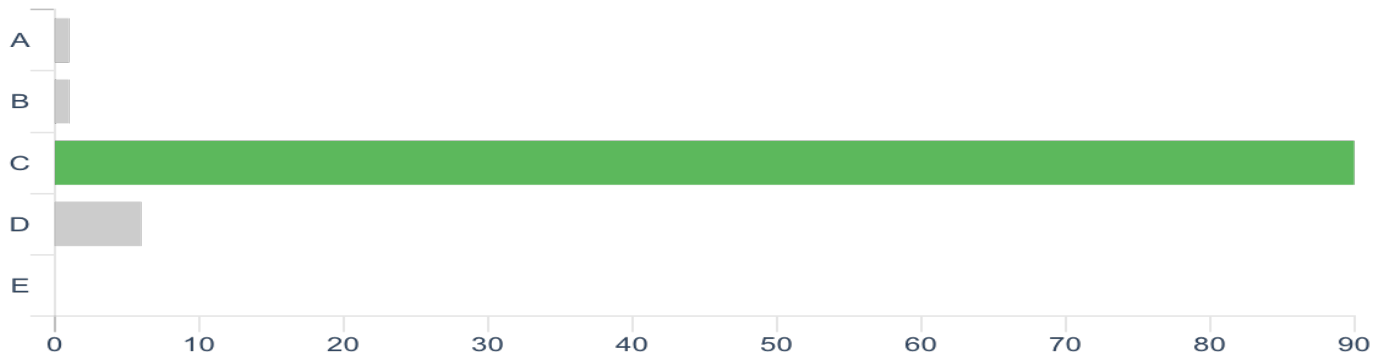
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Q146

A 40-year-old man is admitted to the Emergency Department (ED) with an episode of cardiac chest pain lasting 40 minutes, which resolved just before admission. He has a history of coarctation of the aorta, which was repaired several years ago. He has been well since this time, taking minimal medication for the treatment of hypertension.

On examination, he is haemodynamically stable with a blood pressure (BP) of 115/70 mmHg and a pulse of 75 beats per minute (bpm).

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	12.1 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$5.0 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$230 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	139 mmol/l	135–145 mmol/l
Potassium (K^+)	4.5 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	120 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Electrocardiogram (ECG)	No acute changes	
Chest X-ray (CXR)	unremarkable	

Which of the following is the most appropriate initial course of action?

Your answer was correct

- A Trans-oesophageal echocardiogram
- B 3 h high-sensitivity troponin
- C Discharge
- D Exercise tolerance test
- E CT Thorax

Explanation



B 3 h high-sensitivity troponin

Due predominantly to changes in blood flow after coarctation repair, patients may suffer accelerated coronary artery disease quite late after surgery. As such, given that the pain has now gone and the ECG shows no acute changes, this patient should at least be observed until a 3 h troponin is available. Other possibilities include late presenting re-coarctation; as such, if the troponin is normal, this patient may well progress to angiography anyway.

A Trans-oesophageal echocardiogram

While it may prove appropriate to perform a TOE later in this patient's work-up, it would not be the most appropriate initial test and may not be required if a TTE were to prove diagnostic.

C Discharge

This patient has presented with acute chest pain in the context of previous surgery. Despite the resolution of his symptoms, it would be appropriate to undertake a period of investigation and perform a troponin.

D Exercise tolerance test

While it may prove appropriate to perform an ETT later in the course of this patient's work-up, it would not prove the most valuable initial test.

E CT Thorax

While it may prove appropriate to perform a CT thorax to rule out re-coarctation, it would seem prudent to await a troponin prior to consideration of further imaging. There is no suggestion from this patient's history of dissection, etc, that would warrant urgent imaging.

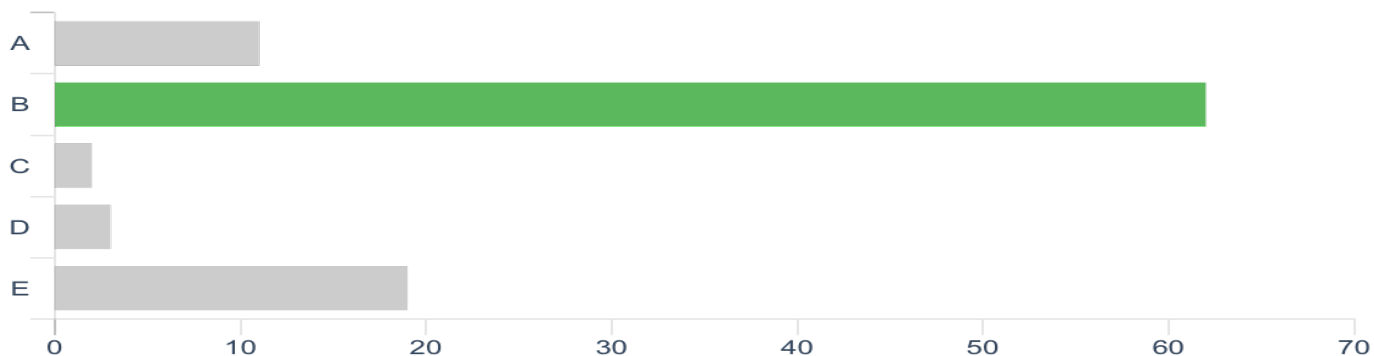
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Q147

A 36-year-old woman presents to her 34-week midwife visit complaining of a severe headache and worsening indigestion. She has been relatively well during her pregnancy; her blood pressure (BP) at booking was 115/72 mmHg.

On review on this occasion, her BP is elevated at 145/92 mmHg.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	11.0 g/dl	11.5–15.5 g/dl
White cell count (WCC)	$5.4 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$234 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	140 mmol/l	135–145 mmol/l
Potassium (K^+)	5.0 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	115 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Urine analysis	Protein ++	

Which of the following is the most appropriate course of action to control her blood pressure?

Your answer was incorrect

- A Methyldopa and outpatient review
- B Nifedipine and outpatient review
- C Admit for IV labetalol
- D Ramipril and outpatient review
- E Valsartan and outpatient review

Explanation



C Admit for IV labetalol

This woman has clinical symptoms and signs consistent with pre-eclampsia and, as such, IV labetalol is the only appropriate option from those given here. Usual dose is via a bolus and then 1 mg/kg/h. Of course, the only way to resolve the pre-eclampsia is to consider delivering the baby, and that would be the next course of action. Magnesium sulphate is the intervention of choice in eclampsia to manage both hypertension and risk of seizures.

D Ramipril and outpatient review

ACE inhibitor use in pregnancy is associated with increased risk of renal and skeletal abnormalities in the fetus.

A Methyldopa and outpatient review

Oral methyldopa is an alternative for controlling gestational hypertension when oral labetalol is unsuitable.

B Nifedipine and outpatient review

Nifedipine, like methyldopa, is recommended as an alternative to labetalol for patients who cannot tolerate it.

E Valsartan and outpatient review

Like ACE inhibitors, ARBs are contra-indicated for use in pregnancy.

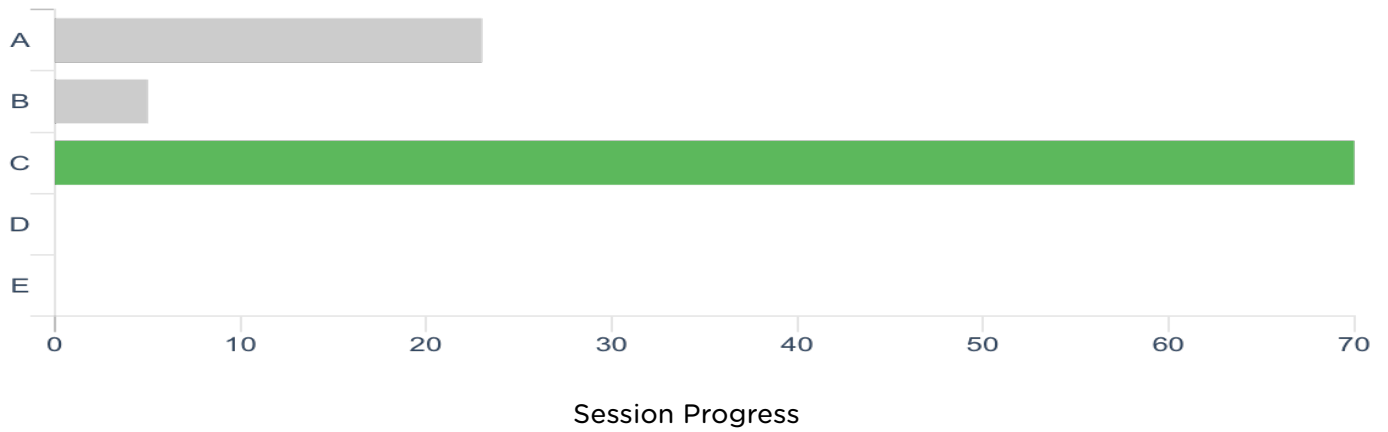
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Q148

A 71-year-old man is admitted to the Emergency Department (ED) with cardiac failure. He suffered a myocardial infarction (MI) six weeks earlier and his current medication includes ramipril 10 mg daily, aspirin 75 mg and atorvastatin 40 mg daily. His other past medical history of note includes severe chronic obstructive pulmonary disease (COPD) and chronic renal impairment.

On examination, he appears lucid, although he is extremely short of breath and wants to discuss his resuscitation status.

Which of the following would have the most impact on the decision regarding a DNACPR order in this case?

Your answer was incorrect

- A Age
- B Co-morbidities
- C Patient's wish to be resuscitated no matter what
- D The patient's family's wishes
- E The views of his power of attorney

Explanation



- B Co-morbidities

Whilst selected elderly patients may do as well as younger patients post-resuscitation, those with co-morbidities have a survival to hospital discharge of only around 5%. The key is in open discussion with the patient and their family, in order to reach a shared decision. This is emphasised by the recent court cases of Tracey vs Cambridge University Hospitals NHSFT [2014] and Winspear v City Hospitals Sunderland NHSFT [2015].

- D The patient's family's wishes

While it is, of course, vitally important to take into consideration the views of the patient's family (and particularly where these differ from those of the patient, careful discussion is key), if it is felt that resuscitation would be futile on clinical grounds, or not in your patient's best interests, there is no obligation to offer it.

A Age

While it can be considered as part of the decision-making process, the BMA/RCN/Resus Council Guidance is clear that "blanket policies that deny CPR or apply CPR to groups of people, for example to all patients above or below a certain age, are unethical and probably unlawful. It is important to consider the patient as a whole and not make decisions solely based on factors such as age.

C Patient's wish to be resuscitated no matter what

While it is, of course, vitally important to take into consideration the views of the patient, if it is felt that resuscitation would be futile on clinical grounds, or not in your patient's best interests, there is no obligation on the treating team to offer it.

E The views of his power of attorney

We are told that this patient is lucid and keen to discuss his resuscitation status. We are not given any indication that he lacks capacity, which is the point at which a power of attorney would take effect. However, it remains important that the views of those close to the patient are sought and considered in the decision-making process.

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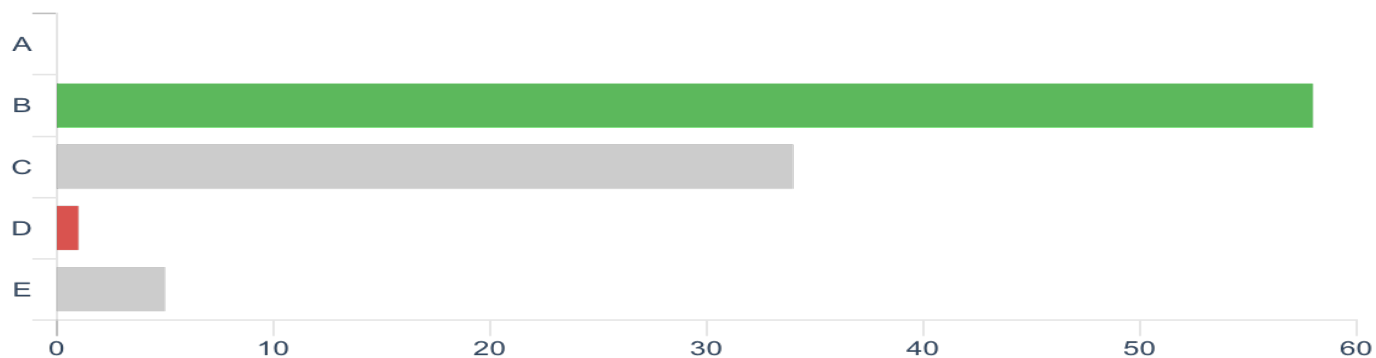
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External Links

Discussing resuscitation decisions

[gmc-uk.org/guidance/28734.asp](http://www.gmc-uk.org/guidance/28734.asp)

(<http://www.gmc-uk.org/guidance/28734.asp>)

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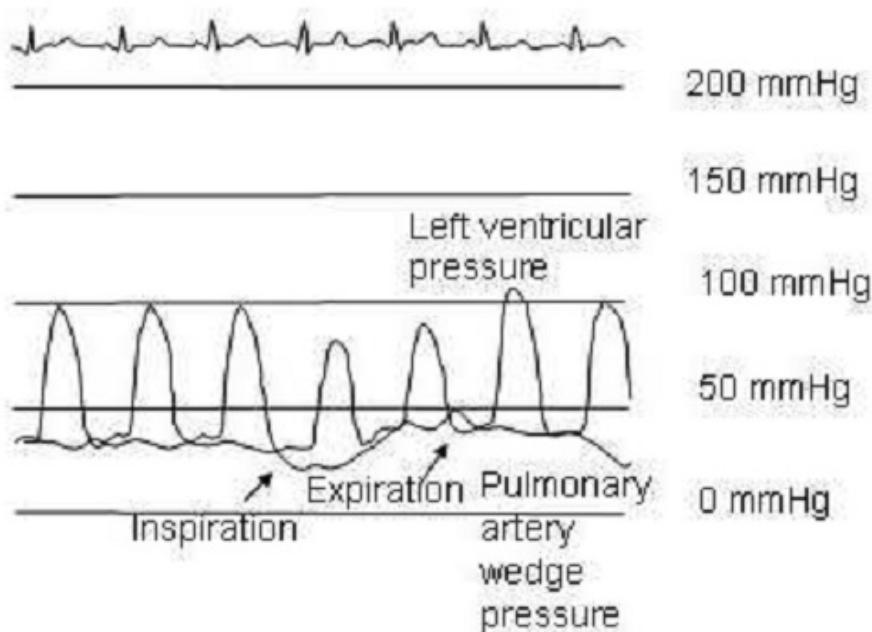
Q149

A 52-year-old woman who has received chemotherapy and radiotherapy for previous Hodgkin's lymphoma 20 years ago presents to the Cardiology Clinic complaining of shortness of breath, feeling faint, and gradually increasing ankle swelling.

On examination, she looks short of breath, her systolic blood pressure (BP) is 100 mmHg, but there is a decrease of 20 mmHg on inspiration.

An electrocardiogram (ECG) reveals low voltage sinus tachycardia.

Cardiac catheterisation reveals the following:



Which of the following is the most likely diagnosis?

Your answer was incorrect

- A Primary cardiac lymphoma
- B Myocarditis
- C Dilated cardiomyopathy
- D Pericardial effusion

E Hypertrophic obstructive cardiomyopathy (HOCM)

Explanation



D Pericardial effusion

This patient has pulsus paradoxus, a clinical sign in which there is a fall in systolic blood pressure > 10 mmHg on inspiration. This sign is indicative of a number of clinical conditions including pericardial effusion, and constrictive pericarditis. The small amplitude QRS complexes reported in the ECG makes a pericardial effusion significantly more likely. The history of lymphoma with radiotherapy hints to an underlying cause of inflammatory pericarditis leading to the effusion. This is a recognised late complication of midline radiotherapy.

E Hypertrophic obstructive cardiomyopathy (HOCM)

HOCM is a cause of left ventricular hypertrophy and not a cause of pulsus paradoxicus.

A Primary cardiac lymphoma

Primary cardiac lymphomas are rare and make up only 0.5% of all lymphomas. Secondary cardiac involvement from lymphoma is more common and can result in pericardial tamponade. However, secondary cardiac involvement is more common in non-Hodgkin's lymphoma.

Reference:

McDonnell et al. Involvement of the heart by malignant lymphoma: a clinicopathologic study. *Cancer*. 1982;49:944-51.

B Myocarditis

The primary aetiology for myocarditis in western Europe is viral infection (eg adenovirus, coxsackie virus), although worldwide Chagas' disease is the most common cause. Anthracycline chemotherapy is a recognised cause; however, these agents are more commonly applied to the treatment of non-Hodgkin's lymphoma. Myocarditis is unlikely in this situation as it primarily presents with chest pain (which is not reported here). Additionally, unless a pericardial effusion develops, it should not result in pulsus paradoxus.

C Dilated cardiomyopathy

An important complication to be aware of when using anthracycline chemotherapy agents, this leads to signs and symptoms of heart failure (as reported here). However, it is more commonly used in non-Hodgkin's lymphoma and typically presents much earlier following the

chemotherapy regimen (usually within a year).

21011

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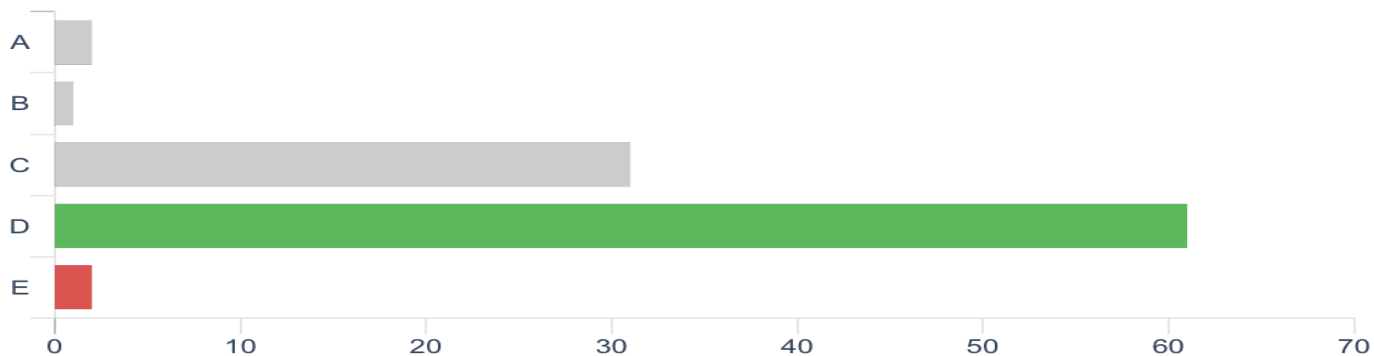
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Q150

A 60-year-old man with heart failure comes to the Cardiology Clinic for review. His current medication includes furosemide 80 mg one a day, spironolactone 50 mg once a day, bisoprolol 5 mg once a day and ramipril 10 mg once a day. He has had increased shortness of breath over the past three months and is now housebound, only able to live downstairs and move from room to room.

On examination, his blood pressure (BP) is 100/70 mmHg, while his pulse is 55 beats per minute (bpm). He has late inspiratory crackles in both lung fields on auscultation, and bilateral swollen ankles. A transthoracic echocardiogram (ECHO) shows a left ventricular ejection of 30%.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	11.4 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$5.0 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$130 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	139 mmol/l	135–145 mmol/l
Potassium (K^+)	4.9 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	155 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Electrocardiogram (ECG)	Sinus rhythm, with QRS 160 ms	
Chest X-ray (CXR)	Evidence of bilateral pulmonary oedema, cardiomegaly	
Ejection fraction	30%	

Which of the following is the most appropriate intervention to improve mortality?

Your answer was incorrect

- A Implantation of an implantable cardioverter defibrillator (ICD)
- B Implantation of a single chamber pacemaker
- C Initiate low-dose digoxin

- D Implantation of a cardiac re-synchronisation therapy (CRT) device
- E Increase furosemide dose

Explanation



- D Implantation of a cardiac re-synchronisation therapy (CRT) device

This patient has developed significant heart failure and appears to be on maximum medical therapy at present. His mild bradycardia limits his ability to tolerate up-titration of his beta-blockade. The presence of a broad LBBB picture on his ECG suggests that ventricular contraction is likely to be uncoordinated. In such patients, implantation of a cardiac re-synchronisation (CRT) device will improve mortality and has been shown to improve symptoms (judged by NYHA class). See Table 1 for full recommendations.

Table 1: Options for implantation of ICD or CRT devices in patients with heart failure and left ventricular dysfunction with a left ventricular ejection fraction of $\leq 35\%$. NYHA – New York Heart Association Class of heart failure symptoms. CRT-D – cardiac resynchronisation therapy device with defibrillator capability. CRT-P – cardiac resynchronisation therapy device with pacemaker capability only. ICD – implantable cardioverter defibrillator. *Suggested by presence of positive family history of long-QT syndrome hypertrophic cardiomyopathy, Brugada syndrome or arrhythmogenic right ventricular cardiomyopathy. Adapted from National Institute for Health and Care Excellence TA314 – Implantable cardioverter defibrillators and cardiac resynchronisation therapy for arrhythmias and heart failure.

	NYHA Class			
QRS duration	I	II	III	IV
<120 ms	ICD if high risk of sudden cardiac death*			ICD and CRT not clinically indicated
120-149 ms (no LBBB)	ICD			CRT-P
120-149 ms (LBBB)	ICD	CRT-D	CRT-P or CRT-D	
≥150 ms (±LBBB)	CRT-D			

Cleland JGF et al. The effect of cardiac resynchronization on morbidity and mortality in heart failure. *N Engl J Med*. 2005;352:1539-49.

National Institute for Health and Care Excellence TA314 – Implantable cardioverter defibrillators and cardiac resynchronisation therapy for arrhythmias and heart failure. June 2014

B Implantation of a single chamber pacemaker

This patient has a mild bradycardia with no indication of heart block on ECG. As such, there does not appear to be an indication for pacemaker implantation. Furthermore, single-lead ventricular pacing in this patient may exacerbate the ventricular dis-synchrony which may in turn worsen their heart failure.

A Implantation of an implantable cardioverter defibrillator (ICD)

Patients with significant heart failure are at risk of developing clinically significant ventricular arrhythmias and associated sudden cardiac death. However, ICD therapy alone (compared with defibrillation capability built into a CRT device) is recommended only for patients with heart failure who do not have findings suggestive of significant cardiac dis-synchrony. Full details of patients recommended for ICD vs CRT therapy are detailed in Table 1.

National Institute for Health and Care Excellence TA314 – Implantable cardioverter defibrillators and cardiac resynchronisation therapy for arrhythmias and heart failure. June 2014.

C Initiate low-dose digoxin

Digoxin has been shown to reduce hospitalisation when given for heart failure; however, the DIG trial did not demonstrate any benefit in all-cause mortality, and a meta-analysis of digoxin in heart failure has suggested an increase in mortality. Further, digoxin's mode of action is through competitive binding with K^+ ions and the Na^+/K^+ ATPase pump can inhibit AV-node depolarisation, which would worsen this patient's mild bradycardia.

E Increase furosemide dose

Furosemide and other loop-diuretics have not been shown to have any significant benefit in mortality for patients with heart failure. This contrasts with potassium-sparing diuretics (such as spironolactone), which do have a mortality benefit when added to beta-blockers and ACE inhibitors in the management of chronic heart failure. Furthermore, in the case of this patient, the low systolic blood pressure would mean that the addition of significant further doses of furosemide may well be poorly tolerated.

References:

Peakcock WF, et al. Impact of intravenous loop diuretics on outcomes of patients hospitalized with acute decompensated heart failure: insights from the ADHERE registry. *Cardiology*. 2009;113:12-19.

Pitt B, et al. The effect of spironolactone on morbidity and mortality in patients with severe heart failure. *N Engl J Med*. 1999;341:709-11.

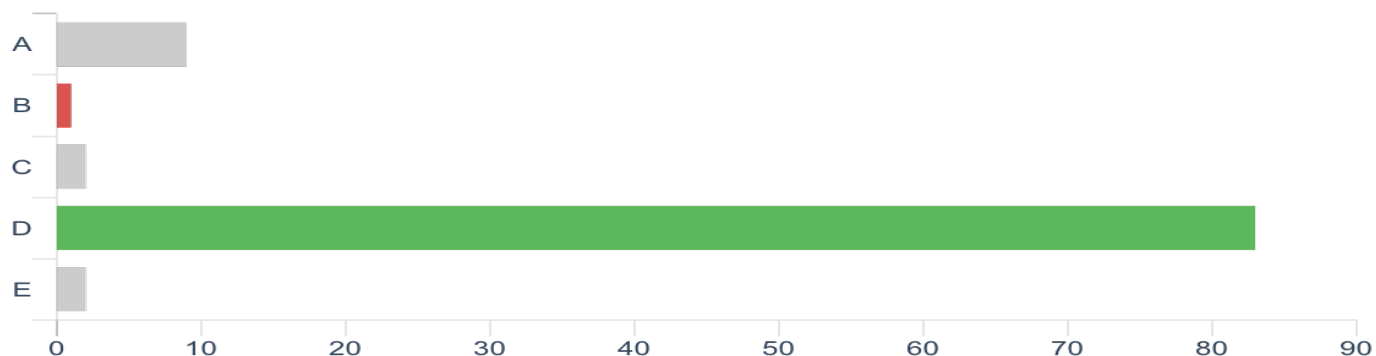
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis**

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Q151

A 68-year-old woman presents to the Emergency Department (ED) after a collapse in the local supermarket. Apparently she had attended a few months earlier with a similar episode. She suffered an inferior myocardial infarction (MI) seven years ago but was otherwise relatively well. Other past history of note includes the development of paroxysmal atrial fibrillation (AF) three years earlier. Her medication includes ramipril 10 mg once a day, aspirin 75 mg once a day, indapamide 1.5 mg once a day, bisoprolol 2.5 mg once a day and atorvastatin 10 mg at night. She also takes ranitidine for indigestion.

On examination in the ED, she looks relatively well. Her pulse is 62 beats per minute (bpm) and regular, while her blood pressure (BP) is 115/72 mmHg.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	12.1 g/dl	11.5-15.5 g/dl
White cell count (WCC)	$5.6 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$156 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	140 mmol/l	135-145 mmol/l
Potassium (K^+)	5.0 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	120 μ mol/l	50-120 μ mol/l

An electrocardiogram (ECG) shows second-degree heart block.

A 24 hour ECG tape while on the ward shows two episodes of complete heart block, both occurring at night, the longest episode lasting 8 seconds.

Which of the following is the most appropriate intervention?

Your answer was incorrect

- A Stop bisoprolol and discharge
- B Single chamber pacemaker
- C Dual chamber pacemaker
- D Stop bisoprolol and observe as an inpatient

E Stop ranitidine and discharge

Explanation



C Dual chamber pacemaker

This patient presents with two episodes of collapse associated with second-degree heart block with periods of complete heart block. Although cessation of her beta-blocker may have some benefit to her symptoms it is unlikely to completely resolve her clinical situation. As such, implantation of a pacemaker is required. Given that her atrial fibrillation is paroxysmal, she is likely to benefit from a dual-chamber pacemaker.

D Stop bisoprolol and observe as an inpatient

As with Option A, stopping the low dose of bisoprolol is unlikely to completely resolve her symptoms or ECG findings. Although observing this patient rather than discharging immediately may be of some benefit, these should be considered for a dual-chamber pacemaker in the first instance.

A Stop bisoprolol and discharge

The use of bisoprolol in this patient may have exacerbated her underlying cardiac rhythm. However, stopping this therapy is unlikely to resolve her rhythm abnormalities or symptoms completely. Additionally, bisoprolol has a positive mortality benefit following this patient's myocardial infarction and should be continued if possible. Given repeated episodes of collapse and positive findings on her 24 h tape, this option would be insufficient.

B Single chamber pacemaker

This patient does require implantation of a pacemaker given her symptoms and ECG findings. However, a dual-chamber pacemaker allows for both atrial and ventricular pacing. In patients that have organised atrial activity this is beneficial. If her atrial fibrillation was long-standing, persistent or permanent in nature, then a single-chamber device could be considered.

E Stop ranitidine and discharge

Ranitidine has been shown to induce bradycardia in some patients, and case reports of syncope induced by ranitidine have been published. However, given the history of an inferior myocardial infarction (which is most likely to damage the AV node), it is unlikely that the use of ranitidine is primarily responsible for the recurrent collapses in this lady.

References:

Camarri E, et al. Ranitidine induced bradycardia. *Lancet*. 1982;320:160.

Radhamanohar M. Syncope caused by ranitidine-induced increase in A-V block. *Postgrad Med J.* 1993;69:500.

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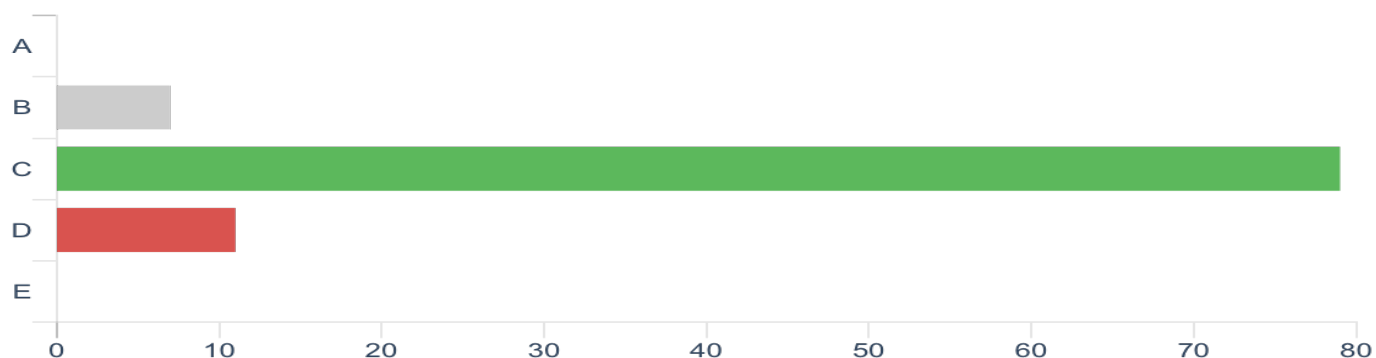
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Responses Total:	151
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Q152

A 59-year-old man presents to the Emergency Department (ED) with central crushing chest pain radiating to both arms. He is sweaty and vomiting. He has a past history of hypertension, for which he takes ramipril 10 mg daily. He smokes 20 cigarettes per day.

On examination, his blood pressure (BP) is 110/70 mmHg, while his pulse is 62 beats per minute (bpm). He has clinical evidence of pulmonary oedema.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	13.1 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$5.0 \times 10^9/\text{l}$	$4.0\text{--}11.0 \times 10^9/\text{l}$
Platelets (PLT)	$199 \times 10^9/\text{l}$	$150\text{--}400 \times 10^9/\text{l}$
Sodium (Na^+)	139 mmol/l	135–145 mmol/l
Potassium (K^+)	4.9 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	120 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Electrocardiogram (ECG)	Widespread ST elevation	

He undergoes stenting of the left anterior descending (LAD) artery and is recovering on the Coronary Care Unit (CCU) when you are asked to see him by the nurses. There is persistent slowing of his pulse to 40 bpm and his BP is 80/40 mmHg. A repeat ECG demonstrates complete heart block and resolved ST elevation. You give him atropine 3 mg, but it makes little difference.

Which of the following is the most appropriate intervention?

Your answer was incorrect

- A External pacing
- B Further atropine 1 mg
- C Adrenaline
- D Isoprenaline

E Temporary pacing wire

Explanation



E Temporary pacing wire

Unfortunately in this case there is a significant likelihood of permanent complete heart block. Whereas in the context of inferior MI, heart block may just be indicative of temporary ischaemia and may thus resolve after supportive management and revascularisation, in anterior MI it is indicative of extensive infarction. Therefore rather than attempting external pacing it is most appropriate to manage him with a temporary pacing wire, which may need to be converted to permanent pacing after a few days.

C Adrenaline

This patient is demonstrating haemodynamic instability and has failed to respond to medical management with atropine. Definitive management is insertion of a temporary pacing wire.

A External pacing

External pacing is less reliable than transvenous pacing and is uncomfortable for the patient. It can be used as an emergency temporising measure but, in this case, where transvenous pacing is available, this represents a more suitable management option.

B Further atropine 1 mg

Current Resuscitation Council brady-arrhythmia guidelines recommend atropine to a maximum of 3 mg. As he has not responded to this dose and he is demonstrating haemodynamic instability, further doses of atropine would not represent appropriate management.

D Isoprenaline

This patient is demonstrating haemodynamic instability and has failed to respond to medical management with atropine. Definitive management is the insertion of a temporary pacing wire. Also note that, while representing a suitable stabilising agent in the management of complete heart block, recent myocardial infarction is a contraindication to the use of isoprenaline.

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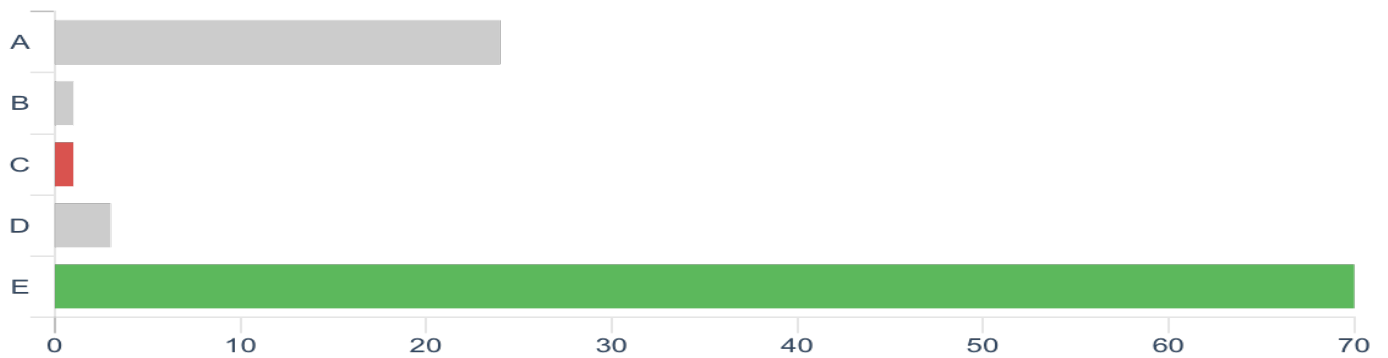
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Responses Total:	152
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Expanded Explanation

Overview

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Q153

A 72-year-old woman, who has known biventricular failure and left atrial dilatation on electrocardiogram (ECG), chronic obstructive pulmonary disease (COPD) and peripheral vascular disease (PVD) is admitted to the Emergency Department (ED) in fast atrial fibrillation (AF) with a ventricular rate of 154 beats per minute (bpm). She has become acutely short of breath over the past 48 hours. In view of low chances of successful chemical cardioversion you elect to begin treatment with digoxin. You load her with 500 µgrams digoxin intravenously (IV) and then a further 250 µgrams over a six hour period.

On examination, her blood pressure (BP) is 132/72 mmHg, while her pulse is 128 bpm and she feels well. There are crackles to the mid zones on auscultation of her chest.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	12.8 g/dl	11.5–15.5 g/dl
White cell count (WCC)	$4.9 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$206 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na ⁺)	141 mmol/l	135–145 mmol/l
Potassium (K ⁺)	4.9 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	132 µmol/l	50–120 µmol/l

What is the most appropriate option with respect to her digoxin dosing?

Your answer was correct

- A Stop the digoxin and commence metoprolol
- B Initiate digoxin 125micrograms PO OD
- C Give a further loading dose of digoxin 250 micrograms IV
- D Add amiodarone 200 mg TDS to the regimen
- E Give a further loading dose of digoxin 500 micrograms IV

Explanation



C Give a further loading dose of digoxin 250 micrograms IV

Digoxin helps control ventricular rate in atrial fibrillation through competitive blockade of the K^+ site on the Na^+/K^+ ATPase. This slows conduction through the AV node. Digoxin has a high volume of distribution and long half-life (36-48 h), which means that loading doses are required to allow the drug to reach a steady-state concentration more quickly. Although this patient has symptomatically improved, her heart rate remains elevated and a further loading dose of digoxin is required.

A Stop the digoxin and commence metoprolol

Metoprolol is a beta-blocker which can be used for rate control of atrial fibrillation in some patients. This patient has a background of COPD; the use of a beta-blocker in this group may exacerbate her COPD and reduce the effectiveness of salbutamol reliever inhalers. Metoprolol is a beta-1 selective antagonist and has a quite low incidence of causing bronchospasm. However, given this patient also has heart failure, digoxin probably is a better choice - especially since she has already been started on it. The dose should be optimised prior to changing therapy.

B Initiate digoxin 125micrograms PO OD

Digoxin has a high volume of distribution and a long half-life (36-48 h). In this patient the half-life is likely to be further elongated due to her renal dysfunction. If initiated on a maintenance dose of digoxin at this point, it will take several days to reach a steady state. Digoxin dose should be titrated to heart rate in atrial fibrillation; this patient's heart rate remains elevated and it is likely that the plasma concentration of digoxin remains insufficient. As such, a further loading dose is required.

D Add amiodarone 200 mg TDS to the regimen

The main role of amiodarone in the management of atrial fibrillation is through chemical cardioversion to sinus rhythm. This is unlikely to occur in a patient with significant left atrial dilatation. Furthermore, the use of amiodarone in conjunction with digoxin can increase the plasma levels of digoxin (by impairing renal digoxin clearance), which will already be elevated in this patient with reduced renal function.

E Give a further loading dose of digoxin 500 micrograms IV

A further loading dose of digoxin is required. Digoxin is almost exclusively renally cleared; as a result, this patient's renal impairment will significantly alter the half-life of this medication. Given the significant benefit the patient has already obtained from the current doses and the narrow therapeutic range of digoxin, the use of a 250 microgram loading dose is the more appropriate option.

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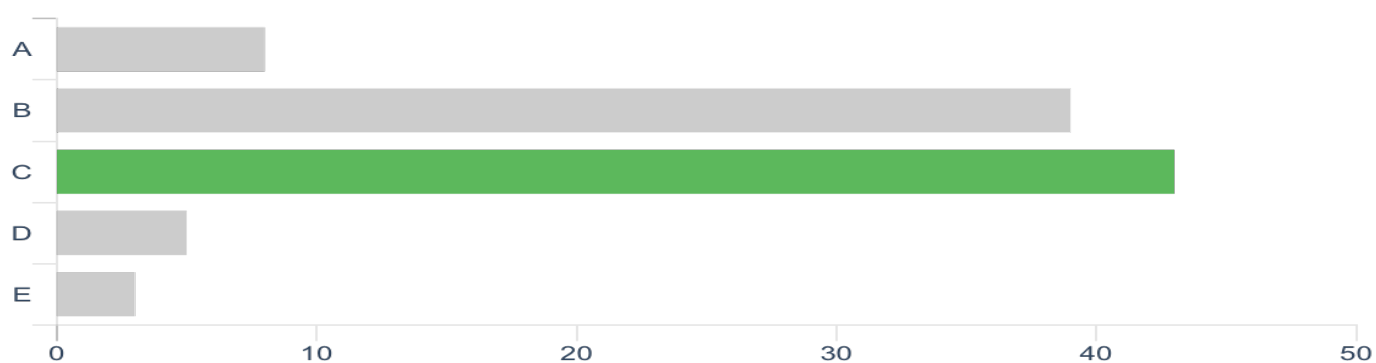
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Expanded Explanation

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Q154

A 38-year-old woman who is 30 weeks pregnant is admitted to the Emergency Department (ED) with central crushing chest pain, sweating and vomiting of three hours duration. She smoked 20 cigarettes per day prior to her pregnancy, and has continued to smoke 10 cigarettes per day since becoming pregnant. Her father suffered a myocardial infarction (MI) at the age of 48.

On examination, she has a blood pressure (BP) of 100/50 mmHg, looks pale and sweaty. Her pulse is 60 beats per minute (bpm) and regular and she is not in cardiac failure. During the examination, she suffers a ventricular fibrillation (VF) arrest which responds to one direct current (DC) shock.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	11.0 g/dl	11.5–15.5 g/dl
White cell count (WCC)	$5.9 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$179 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	139 mmol/l	135–145 mmol/l
Potassium (K^+)	4.2 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	95 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Electrocardiogram (ECG)	Anterior ST elevation consistent with STEMI	

Which of the following is the most appropriate management for her?

Your answer was incorrect

- A Angioplasty
- B Low molecular weight (LMW) heparin
- C Recombinant tissue plasminogen activator (rTPA)
- D Intravenous (iv) amiodarone
- E Tirofiban

Explanation



A Angioplasty

This patient has features which suggest the presence of an acute myocardial infarction. This is supported by her smoking history, significant family history, the nature of the pain, and ECG findings. There is limited data on the management of acute myocardial infarction; although pregnancy is associated with a 3 to 4-fold increases in the risk of pregnancy, the baseline risk remains rare. It is felt that the treatment of acute myocardial infarction should follow the usual standard of care (ie angioplasty).

Reference:

Roth A, Elkayam U. Acute myocardial infarction associated with pregnancy. J Am Coll Cardiol. 2008;52:171-180.

C Recombinant tissue plasminogen activator (rTPA)

While rTPA can be appropriate for the treatment of an acute STEMI, this is primarily limited to situations in which angioplasty is not immediately available. The placental transfer of rTPA is limited, and unlikely to affect the foetus. However, despite some evidence of favourable outcomes when thrombolysis has been used for the treatment of PEs, there have been reports of maternal haemorrhage, preterm delivery, foetal loss, and spontaneous abortion.

Reference:

Lecander I, Nilsson M, Astedt B. Depression of plasminogen activator activity during pregnancy by the placental inhibitor PAI 2. Fibrinolysis 1988;2:165-7.

Roth A, Elkayam U. Acute myocardial infarction associated with pregnancy. J Am Coll Cardiol. 2008;52:171-180.

B Low molecular weight (LMW) heparin

This treatment would be appropriate if the likely diagnosis was a pulmonary embolism (PE). Although common in pregnancy, the clinical picture does not fit this diagnosis. The patient's baseline heart rate is 60 bpm. It would be expected that the patient would be tachycardic if the PE was large enough to result in a cardiac arrest. Further, the ECG demonstrates features of a STEMI and does not indicate right ventricular strain

D Intravenous (iv) amiodarone

Amiodarone is a class III antiarrhythmic agent and may have some role in the secondary prevention of further VF arrests if an underlying cause is uncertain. However, the cause of this arrest is likely secondary to an acute myocardial infarction. Treatment of this cause should be the priority.

E Tirofiban

Tirofiban is a glycoprotein IIb/IIIa inhibitor and acts as an antiplatelet agent. Although antiplatelet agents have a role in the treatment of acute myocardial infarction as a secondary prevention agent (+/- to reduce the risk of stent thrombosis), it does not form the central component of treatment in this condition. Further, it has been shown to cross the placenta in both rats and rabbits. As such, it should be avoided in pregnancy.

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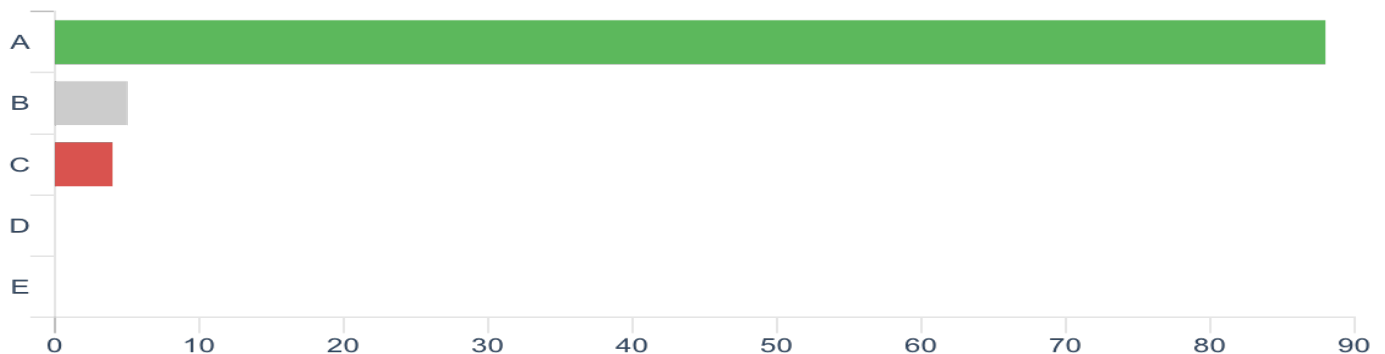
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Expanded Explanation

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Q155

A 72-year-old woman was admitted to the Emergency Department (ED) with her second fall in three months. She was discharged home, but an astute Senior House Officer (SHO) ordered a 24 hour tape as an outpatient.

You review her in the Cardiology Clinic. She has a history of hypertension which is managed with ramipril and indapamide and she reports episodes of dizziness and fast palpitations over the past few months.

On examination, she looks slim, while her blood pressure (BP) is 155/84 mmHg. Her pulse is 82 beats per minute (bpm) sinus rhythm. She is not in cardiac failure.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	12.4 g/dl	11.5–15.5 g/dl
White cell count (WCC)	$5.1 \times 10^9/\text{l}$	$4.0\text{--}11.0 \times 10^9/\text{l}$
Platelets (PLT)	$198 \times 10^9/\text{l}$	$150\text{--}400 \times 10^9/\text{l}$
Sodium (Na^+)	140 mmol/l	135–145 mmol/l
Potassium (K^+)	4.9 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	110 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Thyroid-stimulating hormone (TSH)	2.5 U/l	0.4–4.0 U/l
Resting electrocardiogram (ECG)	Sinus rhythm, no acute changes but inferior Q waves identified	
24 hour ECG tape	Short periods of paroxysmal atrial fibrillation (AF), pauses of up to four seconds	

How would you plan to initially manage the patient with respect to her rhythm disturbance?

Your answer was incorrect

- A Aspirin
- B Digoxin
- C Amiodarone
- D Bisoprolol
- E Referral for pacemaker

Explanation



- E Referral for pacemaker

This patient has atrial fibrillation (AF) with associated pauses. Pauses of up to 3 s are common, especially when spontaneously cardioverting from AF to sinus rhythm. However, pauses longer than this may suggest the presence of sinus node disease. Given her history of falls, she requires the implantation of a pacemaker. This will then allow for the use of negatively chronotropic agents (eg beta-blockers) for the treatment of her paroxysmal AF.

Further, the patient's CHA₂DS₂-VASc score is 3 and she requires anticoagulation with a vitamin-K antagonist (eg warfarin) or a non-vitamin K antagonist anticoagulant (eg dabigatran, rivaroxaban, apixaban, edoxaban).

- B Digoxin

Digoxin may be an appropriate for the rate control of atrial fibrillation. However, the presence of significant pauses on the 24-h tape suggests that the patient is at risk of developing significant heart block. Providing an agent that acts by inhibiting the depolarisation of the AV node will increase the risk of heart block in this patient. They instead require a pacemaker implanted prior to initiating any negatively chronotropic agent.

- A Aspirin

The primary issue present here is the presence of likely sinus node disease, and this need to be addressed first. Aspirin has no role in the treatment of atrial fibrillation. Although it was previously considered appropriate to reduce the risk of stroke in low-risk patients (not the case in the patient), evidence has shown that the increase in bleeding risk outweighs any stroke-reduction benefit.

C Amiodarone

Amiodarone is a class III antiarrhythmic agent. Although it can be used in select patients with atrial fibrillation, it is not a first-line agent.

D Bisoprolol

Beta-blockade is a central component of AF rate control. However, the presence of significant pauses suggest an increased risk of complete heart block. Bisoprolol will inhibit the depolarisation of the AV node and increase this risk further. Although likely to be an appropriate treatment in this patient, a pacemaker must be implanted first.

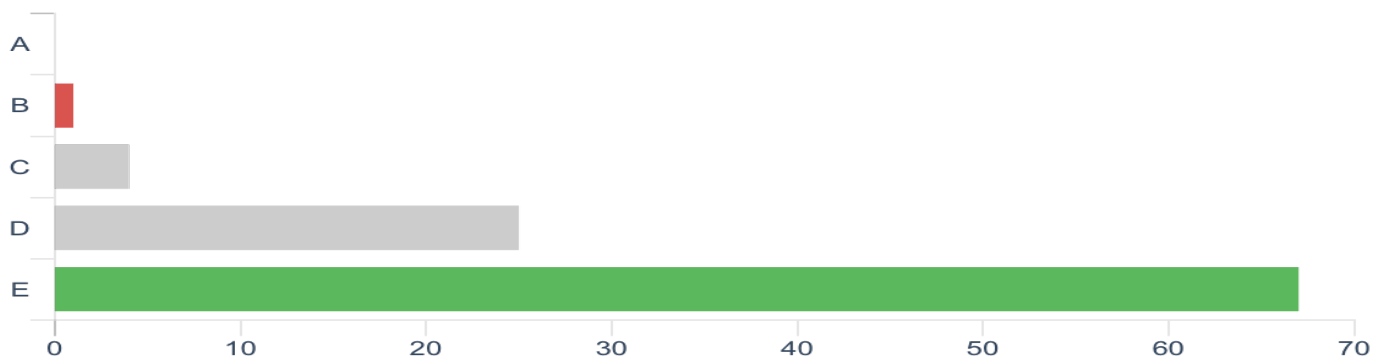
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Responses - % Correct:

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Expanded Explanation

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Q156

A 23-year-old homeless patient comes to the Emergency Department (ED). She has been feeling sick for some considerable time with fevers and rigors and has now begun to develop a rash.

On examination, she is pyrexial: her temperature is 38.1 °C. She has splinter haemorrhages on examination of her finger nails and a generalized purpuric rash. Further examination reveals injection sites on both forearms and evidence that she has tried to inject into her femoral vein.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	10.0 g/dl	11.5-15.5 g/dl
White cell count (WCC)	$12.4 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$35 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na ⁺)	139 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.5 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	152 µmol/l	50-120 µmol/l
Erythrocyte sedimentation rate (ESR)	70 mm/hour	1-20 mm/hour
Blood cultures × 3	No growth so far	
Urine	Blood positive (+ve)	
Chest X-ray (CXR)	Cavitating lesions both lower lobes	

Which of the following is the most appropriate next investigation?

Your answer was correct

- A Further blood cultures
- B CT thorax

- C Trans-thoracicechocardiogram
- D Urine cultures
- E ANA

Explanation



- C Trans-thoracicechocardiogram

The clinical situation portrayed here is that of infective endocarditis. This is supported by the raised ESR, clinical history, and splinter haemorrhages on examination. The injection marks suggest that the patient has a substance abuse problem (likely using heroin). The use of dirty needles or less clean injection sites (eg the femoral vein) increases the risk of introducing bacteria into the blood stream.

Given the history of injectable drug use and the cavitating lesions on chest X-ray, *Staphylococcus aureus* is the most likely diagnosis; blood cultures will likely confirm this. An echocardiogram is required as part of the Duke criteria (see table 1) for diagnosing endocarditis and is the most important next investigations especially as the patient likely has a right-sided valvular infection.

Major Criteria	Minor Criteria
Blood cultures positive for typical microorganisms consistent with endocarditis from two different blood cultures.	Predisposing heart condition or intravenous drug use
Evidence of endocardial involvement on echocardiogram	Temperature > 38.0 °C
	Vascular phenomena (eg septic emboli, intracranial haemorrhage, Janeway's lesions)
	Immunologic Phenomena (eg Osler's nodes, glomerulonephritis)
	Positive blood cultures which do not meet the major criterion level
	Echocardiographic evidence for endocarditis not sufficient to meet the major criterion

Table 1: Duke criteria for the diagnosis of endocarditis. For a positive diagnosis, a patient requires two major criteria, one major and three minor criteria, or five minor criteria. Adapted from: Durack DT, Lukes AS, Bright DK. New criteria for diagnosis of infective endocarditis: utilization of specific echocardiographic findings. Duke Endocarditis Service. *American Journal of Medicine*. 1994;96(3):200-9.

A Further blood cultures

Three blood cultures from different sites taken at different times are a primary investigation for infective endocarditis (the likely diagnosis in this case). However, sufficient cultures have already been taken in this case. Cultures can take a number of days to become positive and further cultures at this time are unnecessary.

B CT thorax

The cavitating lesions on chest X-ray likely represent emboli from a right sided valvular lesion. This is particularly common in *Staphylococcus aureus* endocarditis.

A CT thorax would elucidate the nature of the cavitations further, but will not help with the underlying diagnosis. A CT thorax combined with FDG-PET can be used to look for inflammation on cardiac valves if the echocardiogram is non-diagnostic.

D Urine cultures

The source of infection in this patient is likely to be endocarditis. Urine culture may be appropriate if further investigations for endocarditis are negative, but further imaging of the heart are required initially.

E ANA

This would be an important test if a diagnosis of systemic lupus erythematosus (SLE) was being considered. SLE can lead to a form of non-infective endocarditis (Libman-Sacks endocarditis). However, the history of intravenous drug use makes infective endocarditis a more likely diagnosis. As such, cardiac imaging with a trans-thoracic echocardiography is required.

21203

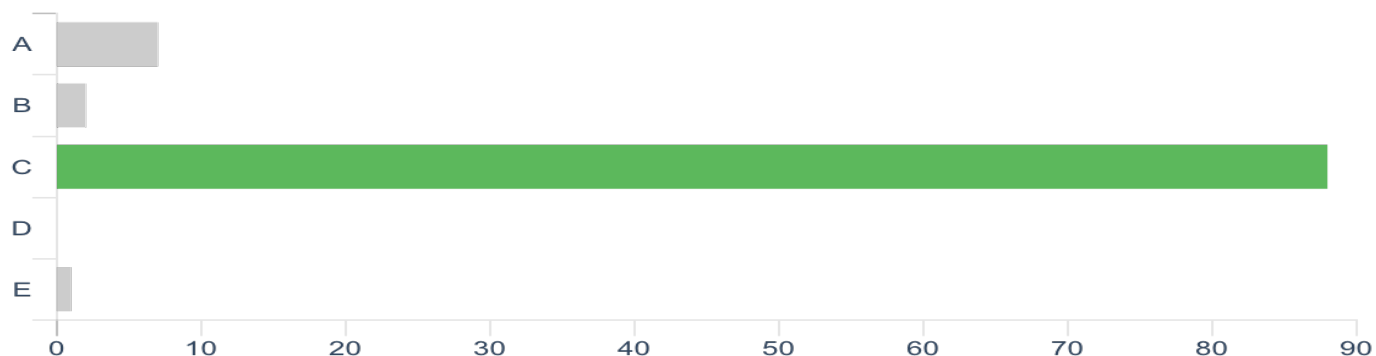
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Responses Incorrect:	125
Responses Total:	156
Responses - % Correct:	20%

Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Q157

A 32-year-old Romanian man presents to the Emergency Department (ED) complaining of shortness of breath and tiredness. He tells you that this has been increasing over the past six months. He also complains of a chronic cough.

On examination, his body mass index (BMI) is 21 kg/m² and he looks tired. His blood pressure (BP) is 110/70 mmHg and his resting pulse is 80 beats per minute (bpm). He has bilateral ankle oedema.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	10.5 g/dl	13.5–17.5 g/dl
White cell count (WCC)	11.6 × 10 ⁹ /l	4.0–11.0 × 10 ⁹ /l
Platelets (PLT)	201 × 10 ⁹ /l	150–400 × 10 ⁹ /l
Sodium (Na ⁺)	138 mmol/l	135–145 mmol/l
Potassium (K ⁺)	4.5 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	120 µmol/l	50–120 µmol/l
Electrocardiogram (ECG)	Low voltage complexes, nothing else of note	
Echocardiography (ECHO)	pericardial effusion	
Effusion fluid	Lymphocytes positive (+ve)	

Which of the following is the most likely diagnosis?

Your answer was correct

- A Autoimmune pericarditis
- B Viral pericarditis
- C Restrictive cardiomyopathy
- D Tuberculous pericarditis
- E Amyloidosis

Explanation



D Tuberculous pericarditis

Worldwide, tuberculous (TB) pericarditis is the commonest cause of constrictive pericarditis. There is a higher prevalence of TB in eastern Europe, when combined with the history of cough this is suggestive of this diagnosis. The presence of lymphocytes in the effusion fluid is further supports this diagnosis. A chest X-ray and tuberculosis cultures would be required as part of the diagnostic work-up.

A Autoimmune pericarditis

Autoimmune pericarditis is primarily a condition secondary to systemic autoimmune disease (eg systemic lupus erythematosus, rheumatoid arthritis). There are no features to suggest such a background condition in this case.

B Viral pericarditis

Although viral pericarditis can become chronic, it is normally a self-limiting condition that presents with chest pain as a primary symptom.

C Restrictive cardiomyopathy

This rare condition can lead to symptoms of heart failure which could explain the ankle oedema and chronic cough. However, it does not typically present with pericardial effusion.

E Amyloidosis

Cardiac amyloid can present with signs of heart failure. However, the echocardiogram (ECHO) would normally show significant pseudo-hypertrophy and a speckled appearance. Further, conduction deficits on the ECG are common in cardiac amyloid.

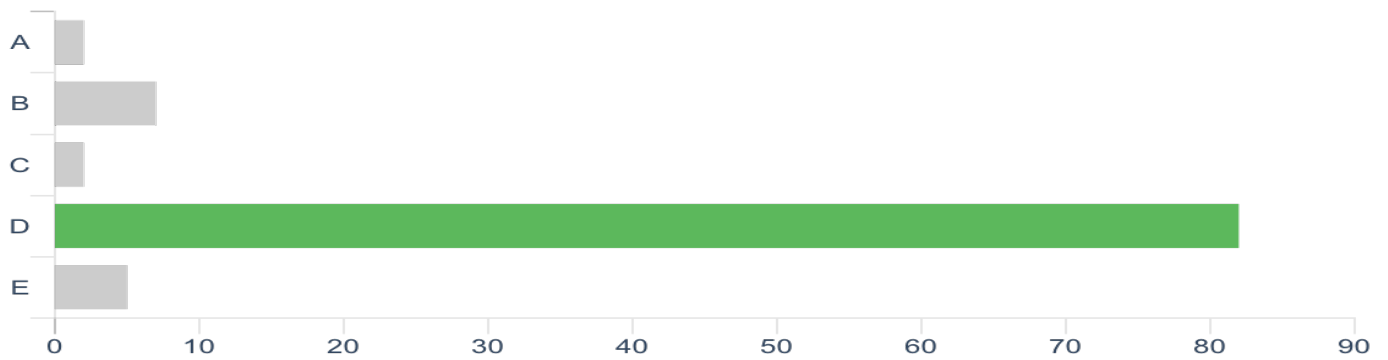
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Session Progress

Responses Correct:	32
Responses Incorrect:	125
Responses Total:	157
Responses - % Correct:	20%



Q158

A 41-year-old man is brought to the Emergency Department (ED) by ambulance with crushing central chest pain, nausea, vomiting and collapse. He smokes 20 cigarettes per day and uses daily cocaine.

On examination, his blood pressure (BP) is 180/72 mmHg, while his pulse is 95 beats per minute (bpm) and he looks very unwell. He has bilateral crackles at both lung bases.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	13.1 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$6.7 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$167 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	139 mmol/l	135–145 mmol/l
Potassium (K^+)	4.5 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	100 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Troponin	3.0 $\mu\text{g/l}$	
Electrocardiogram (ECG)	Anterior ST elevation consistent with acute myocardial infarction (MI)	
Coronary artery angiography	Left main stem, flow decreased by 85%, but no focal lesion identified	

Which of the following is the most appropriate immediate management with respect to his chest pain?

Your answer was incorrect

A Aspirin

- B Low-molecular weight (LMW) heparin
- C Angioplasty
- D Atenolol
- E GTN

Explanation



- E GTN

This case suggests a STEMI in an otherwise young and healthy patient. The use of cocaine can lead to the development of coronary vasospasm. This is suggested by the coronary angiogram which does not show a focal lesion. Intravenous (iv) GTN is the most appropriate initial management for the treatment of coronary vasospasm.

- C Angioplasty

No focal lesion was seen on angiography, as such there is no location amenable to stenting. This is a case of coronary vasospasm for which stenting is not appropriate.

- A Aspirin

Aspirin has a role in the acute treatment of acute coronary syndrome where platelet aggregation following plaque rupture plays a major pathological role. However, antiplatelet agents have no role in the treatment of coronary vasospasm, the underlying condition in this case.

- B Low-molecular weight (LMW) heparin

LMWH, primarily fondaparinux, is part of the treatment bundle for acute coronary syndrome. However, there is no evidence of acute occlusion on the angiogram. LMWH is unnecessary in coronary vasospasm.

- D Atenolol

Beta-blockade is an important element in the treatment bundle for acute coronary syndrome. In that setting it reduces the risk of post-infarct arrhythmias. However, in the case of coronary vasospasm, beta-blockade may worsen vasoconstriction and should be avoided.

21211

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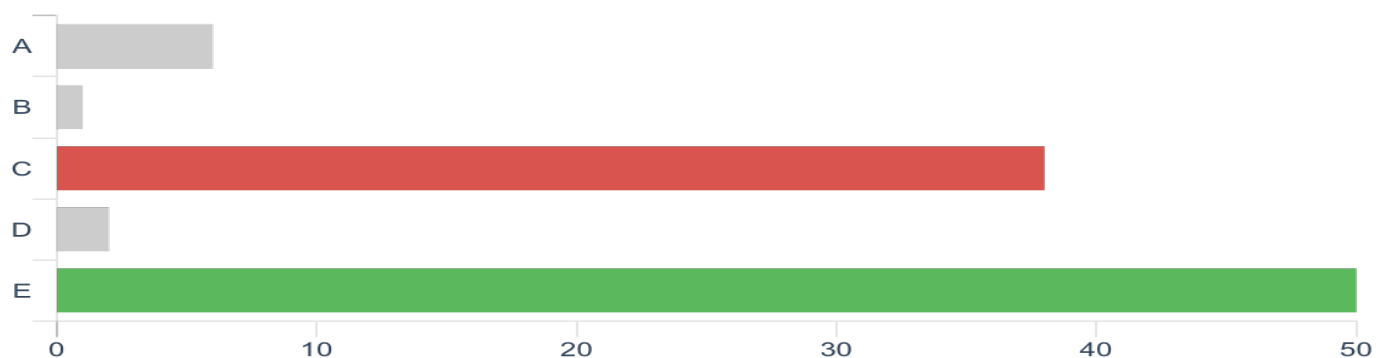
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Expanded Explanation

Overview

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Links to NICE guidelines/CKS



Q159

A 52-year-old man with a history of diabetes mellitus had a bare metal stent inserted after an inferior myocardial infarction (MI). Three months later he is admitted to the Emergency Department (ED) with a further episode of chest pain. His troponin at 12 hours is negative.

On examination, his blood pressure (BP) is 140/82 mmHg, while his pulse 72 beats per minute (bpm) and regular. He is not clinically in heart failure. An exercise test is performed, which reveals inferolateral ST depression.

Which of the following is the most likely diagnosis?

Your answer was correct

- A In-stent thrombosis
- B New coronary artery disease distal to the stent
- C Coronary artery emboli
- D In-stent re-stenosis
- E Coronary artery vasospasm

Explanation



- D In-stent re-stenosis

Bare metal stent re-stenosis occurs more commonly in patients with diabetes mellitus. Coated or drug-eluting stents are now recommended for use in patients with cardiac risk factors, such as diabetes.

Coated stents may also be associated with late re-stenosis in diabetes mellitus, particularly in the context of discontinuation of clopidogrel (in patients who are aspirin resistant). It is also advised that dual anti-platelet therapy with both aspirin and clopidogrel should be continued for at least a year after the procedure.

- A In-stent thrombosis

This is more common in diabetic patients and with bare metal stents than with coated stents. It is less common at this quite early stage post-procedure, and tends to coincide with cessation of anti-platelet medication.

B New coronary artery disease distal to the stent

This is unlikely given the short time frame, though longer term in such a patient with significant risk factors, this could become a problem. Indeed, the presence of a stent in a coronary artery may induce inflammatory changes in the vessel wall that make subsequent CABG higher risk.

C Coronary artery emboli

These are more common in atrial fibrillation. There is, in fact, a lower prevalence of classical cardiac risk factors such as hypertension, diabetes mellitus, smoking and dyslipidaemia in coronary emboli than other causes of myocardial ischaemia and infarction (see reference below).

E Coronary artery vasospasm

Also known as Prinzmetal angina, this occurs in cycles and is due to spasming contraction of coronary vessel wall smooth muscle. It causes ST elevation on ECG and may result in elevated cardiac enzymes following prolonged attacks.

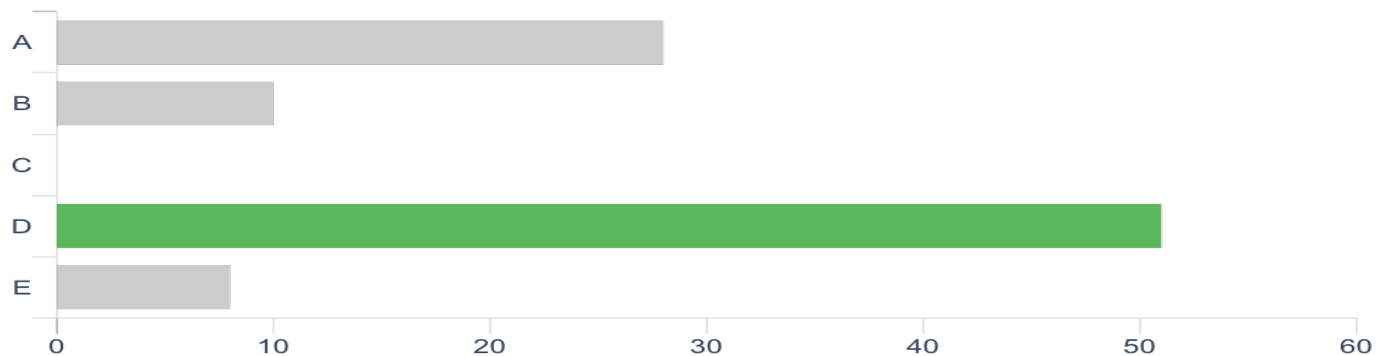
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External Links

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doi.org/10.1161/CIRCULATIONAHA.114.015134

(<https://doi.org/10.1161/CIRCULATIONAHA.114.015134>)

Expanded Explanation

Overview

Links to NICE guidelines/CKS



Q160

A 65-year-old man with a history of cigarette smoking (40 pack-years) and type II diabetes presents to the Emergency Department (ED) with pain in both calves and feet. He reports calf pain on walking to the pub over the past few months, but says that the pain became much worse a few weeks ago and is now also present at rest. He also has suffered with pins and needles in his feet for two to three years. He takes a phosphodiesterase-5 (PDE-5) inhibitor for erectile dysfunction.

On examination, his distal foot pulses are not easily palpable. His capillary return is poor in both feet and there is an absence of hair. His arches have dropped and his feet show evidence of bony deformity. There is an ulcer on his right great toe with evidence of surrounding infection and oedema. His blood pressure (BP) is measured at 155/85 mmHg. His pulse is 75 beats per minute (bpm) and atrial fibrillation (AF) is observed.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	12.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$6.2 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$201 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	140 mmol/l	135-145 mmol/l
Potassium (K^+)	4.9 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	192 μ mol/l	50-120 μ mol/l
HbA _{1c}	77.05 mmol/mol (9.2%)	< 53 mmol/mol (< 7.0%)
ABPI	0.4 - both legs	

Which of the following is the most likely cause of his calf pain?

Your answer was incorrect

- A Diabetic neuropathy
- B Chronic arterial insufficiency
- C Mixed arterial disease and neuropathy

- D Charcot marie tooth (CMT)
- E Osteomyelitis

Explanation



- B Chronic arterial insufficiency

The patient has suffered calf claudication for many months, which has progressed to pain at rest. The ABPI has fallen into the critical zone (<0.5) - he therefore requires arterial ultrasound and an arteriogram. There may be lesions that are amenable to angioplasty at the time of angiography, otherwise he may require referral for bypass surgery.

It is also noted that his creatinine is elevated at $192 \mu\text{mol/l}$, which puts him at significantly increased risk of contrast nephropathy. It would be important to ensure the patient is adequately hydrated before the procedure to reduce this risk.

- D Charcot marie tooth (CMT)

CMT, also known as hereditary motor and sensory neuropathy, is a group of disorders characterised by genetical demyelinating peripheral neuropathy. CMT presents with progressive distal weakness and atrophy. Sensory symptoms tend to include numbness rather than such severe pain, as in this case. Physical deformities include pes cavus, hammertoes and “stork leg deformity” due to calf atrophy. These are not present in this case and the arterial insufficiency, evidence by the ABPI, is unexplained by CMT.

- A Diabetic neuropathy

Although there is evidence of peripheral neuropathy with paraesthesia in the feet, ulcers and fallen arches, this is unlikely to be the cause of the pattern of pain described here.

- C Mixed arterial disease and neuropathy

Although an accurate diagnosis for the overall condition of this patient, it is the chronic arterial insufficiency that accounts for the presentation of claudication progressing to chronic pain.

- E Osteomyelitis

This patient is at high risk of osteomyelitis due to impaired sensation, impaired healing and the presence of infection around the ulcer. The normal white cell count (WCC) reduces the likelihood of this diagnosis, although in chronic infection inflammatory markers may not be

elevated. An MRI scan of the foot would be needed to diagnose osteomyelitis of this patient's toe.

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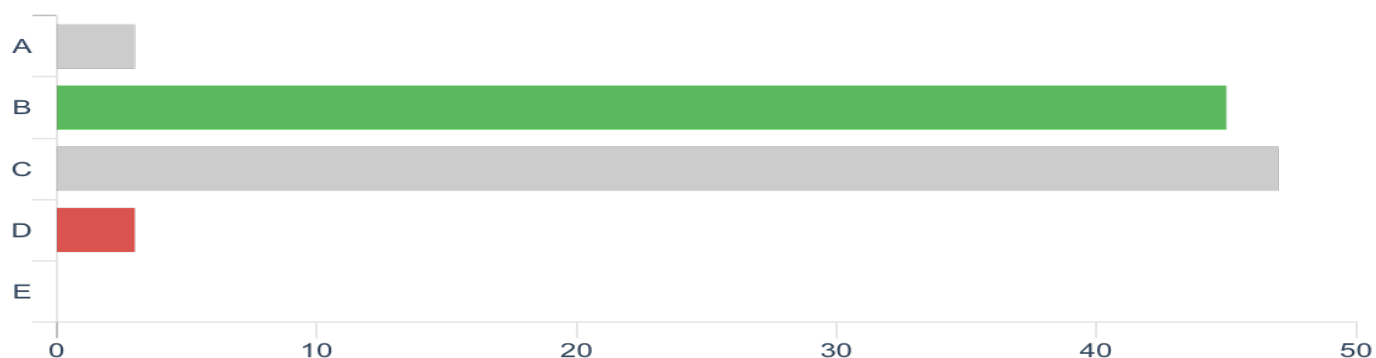
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Expanded Explanation

Overview

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Links to NICE guidelines/CKS



Q161

A 62-year-old man presents to the Cardiology Clinic with fatigue. He reports periods in the day when he feels absolutely washed out. He tries to keep himself fit, walking several miles every day, but is finding it virtually impossible to keep up his usual exercise schedule. He denies loss of consciousness or dizziness. Medication of note includes amlodipine and indapamide for hypertension.

On examination, his blood pressure (BP) is 125/75 mmHg, while his pulse 75 beats per minute (bpm) and regular. Cardiovascular and respiratory examination is unremarkable.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	12.3 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$5.4 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$205 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	140 mmol/l	135-145 mmol/l
Potassium (K^+)	4.8 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	110 μ mol/l	50-120 μ mol/l
72 hour electrocardiogram (ECG)	Three periods of complete heart block, each occurring while asleep, with pauses lasting for 3 seconds or longer, one as long as 5 seconds	

Which of the following is the most appropriate intervention?

Your answer was correct

- A Stop amlodipine
- B Arrange review in 6 months time
- C Admit for permanent pacing

- D Start midodrine
- E Stop indapamide

Explanation



- C Admit for permanent pacing

Although this patient has not yet had a syncopal episode, he has significant pauses lasting for greater than 3 s associated with episodes of complete heart block. Therefore the most appropriate management is permanent pacing.

- A Stop amlodipine

Calcium channel blockers may be associated with complete heart block, but this is more likely with non-dihydropyridine agents such as verapamil and diltiazem. Therefore stopping amlodipine is unlikely to resolve the problem.

- B Arrange review in 6 months time

No intervention would leave this patient with a life-threatening arrhythmia and potential for sudden cardiac death.

- D Start midodrine

This is an α_1 agonist used in the treatment of orthostatic hypotension. There would be no indication for its use in this scenario.

- E Stop indapamide

This medication may be associated with hyponatraemia and the consequent symptoms, but is not known to cause heart block.

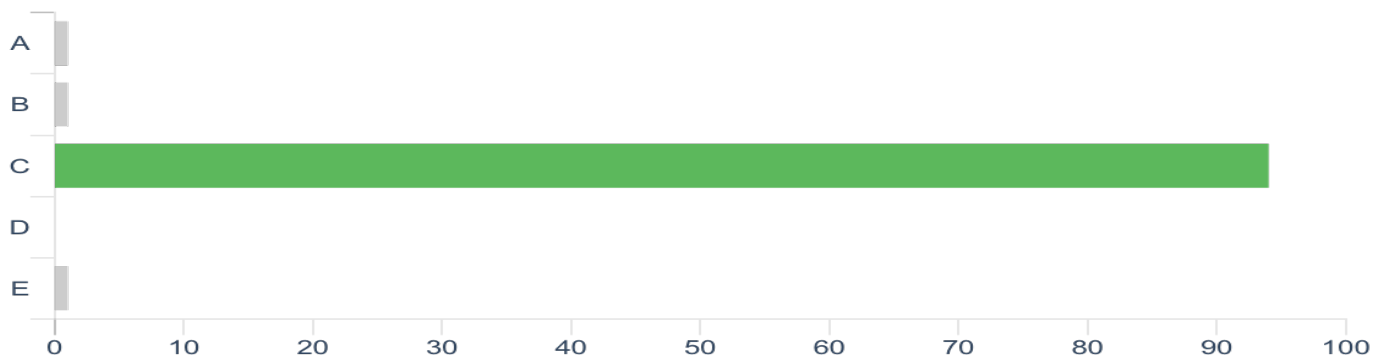
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Q162

A 72-year-old man comes to the Cardiology Clinic for review. He has severe biventricular failure and is taking ramipril 10 mg, furosemide 160 mg, spironolactone 25 mg, digoxin 62.5 µg and bisoprolol 10 mg.

On examination, he looks a little dry. His blood pressure (BP) is 110/72 mmHg when lying and 95/65 mmHg on standing. There is no peripheral oedema and no crackles on auscultation of the chest.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	12.1 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$5.0 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$208 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na ⁺)	140 mmol/l	135–145 mmol/l
Potassium (K ⁺)	5.6 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	210 µmol/l (165 at last clinic appointment)	50–120 µmol/l
Urea	13.1 mmol/l	2.5–6.5 mmol/l

Which of the following agents should be reduced in dose or discontinued?

Your answer was correct

- A Ramipril
- B Furosemide and spironolactone
- C Spironolactone
- D Digoxin
- E Bisoprolol

Explanation



B Furosemide and spironolactone

This patient's renal function has deteriorated since his last clinic appointment, with rising urea and creatinine suggesting pre-kidney disease. Given there are no clinical signs of heart failure, the most sensible first modification to this patient's medications would be to reduce the dose of furosemide and withhold spironolactone until the potassium falls. After reducing the dose it is important to monitor U&Es regularly. His potassium is elevated at 5.6 mmol, but this might be expected to fall as the pre-kidney disease resolves.

A Ramipril

This is an ACE inhibitor known to improve mortality in heart failure. It can be implicated in the development of kidney disease, and U&E should be monitored throughout its use. In this case however, with only mildly elevated potassium it's prudent to stop the diuretics first.

C Spironolactone

Reducing spironolactone alone is unlikely to resolve the pre-kidney disease, and potassium may therefore remain elevated. It's important therefore to withhold both diuretics.

D Digoxin

Digoxin levels may increase in the presence of kidney disease, and therefore it would be important to monitor for signs of toxicity, or indeed digoxin levels. With mild kidney disease, the dose is unlikely to require changing and digoxin is not implicated in the development of kidney disease. It is used in heart failure because it improves symptoms and prevents hospital admissions.

E Bisoprolol

This provides control of heart rate and prevents arrhythmias in heart failure. It also conveys some survival benefit and improves symptoms. Dose should be reduced when eGFR <20 ml/min.

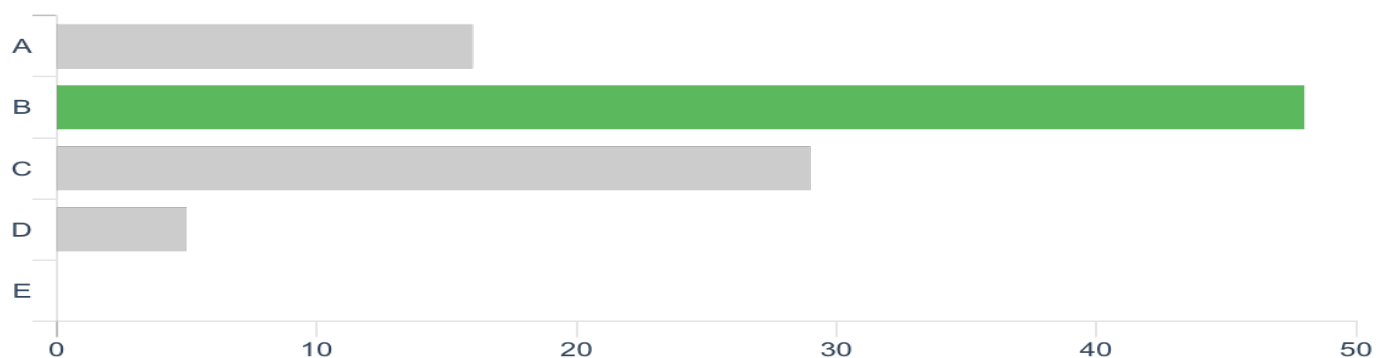
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Responses Incorrect:	127
Responses Total:	162
Responses - % Correct:	22%

Expanded Explanation

Overview

Clinical Presentation

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Q163

A 63-year-old woman with congestive cardiac failure comes to the Cardiology Clinic for review. She has had two previous myocardial infarctions (MI). Her regular medications include ramipril 10 mg, furosemide 80 mg, bisoprolol 10 mg, digoxin 125 µg and spironolactone 25 mg.

On examination, her blood pressure (BP) is 142/82 mmHg, while her pulse is 80 beats per minute (bpm) and regular. She has bibasal crackles consistent with left ventricular failure and bilateral pitting oedema of the ankles.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	11.9 g/dl	11.5–15.5 g/dl
White cell count (WCC)	$5.4 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$210 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na ⁺)	140 mmol/l	135–145 mmol/l
Potassium (K ⁺)	4.9 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	135 µmol/l	50–120 µmol/l

Which of the following is the most appropriate management for her?

Your answer was incorrect

- A Reduce bisoprolol
- B Increase spironolactone
- C Increase furosemide
- D Increase digoxin
- E Increase bisoprolol

Explanation



C Increase furosemide

This patient is relatively hypertensive, with evidence of decompensated heart failure and fluid overload. The most appropriate initial management is to increase in her diuretic therapy and relieve the symptoms of fluid overload – pulmonary and peripheral oedema.

D Increase digoxin

This may be considered over the longer term, but there is no indication to do so in this situation. It would not change her current symptoms, which are related to fluid overload. Digoxin improves symptoms although it has no impact on mortality in heart failure. The recommended dose for this indication is 125-250 micrograms per day.

A Reduce bisoprolol

This is unlikely to be of any benefit as her symptoms are not related to beta-blockade. Bisoprolol is used as an adjunct in heart failure, with doses starting at 1.25 mg per day, titrated up to 10 mg per day over several weeks.

B Increase spironolactone

Spironolactone is associated with an increased risk of hyperkalaemia. While spironolactone in combination with an ACE inhibitor or ARB has been shown to improve mortality in heart failure, this effect is not dose dependent - studies suggest that increasing the dose of spironolactone above the minimum does not improve outcome.

E Increase bisoprolol

This is not advised as the patient is already on the maximum dose recommended in heart failure.

It is worth noting the elevated creatinine. Many of the drugs used in heart failure cause kidney disease or need dose adjustment in the presence thereof. If making any alterations to this lady's medications, renal function should be monitored regularly.

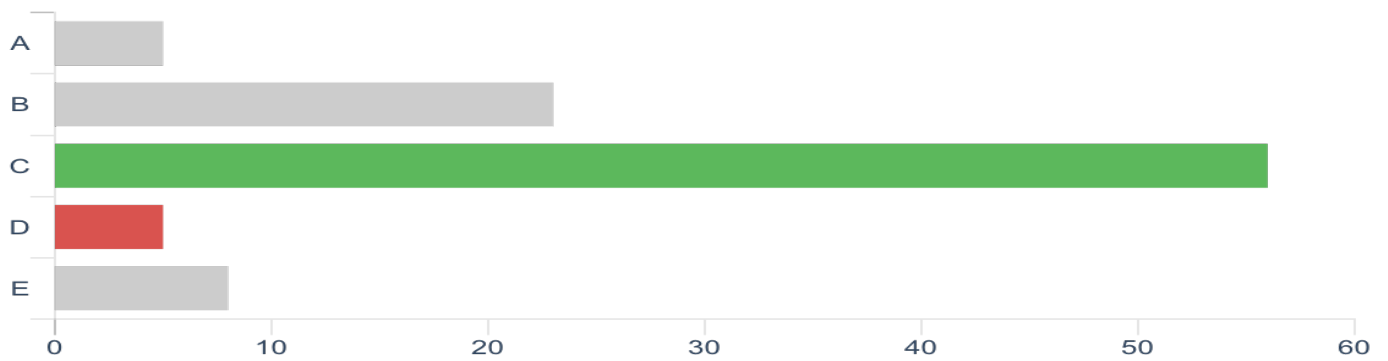
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Responses Total:	163
Responses - % Correct:	21%

Expanded Explanation

Overview

Clinical Presentation

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Q164

A 73-year-old woman comes for review in the Cardiology Clinic with her husband. He is very worried because she passed out after getting out of her chair to go to the toilet. He reports that she went pale and then collapsed, hitting her head on the floor. She had around 20-30 seconds of twitching and was incontinent of urine. She has a history of hypertension for which she takes ramipril 5 mg daily.

On examination, her blood pressure (BP) in the clinic is 155/90 mmHg; otherwise cardiovascular examination is unremarkable. Neurological examination is entirely normal.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	13.1 g/dl	11.5-15.5 g/dl
White cell count (WCC)	$5.4 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$201 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	140 mmol/l	135-145 mmol/l
Potassium (K^+)	4.4 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	130 μ mol/l	50-120 μ mol/l
Resting electrocardiogram (ECG)	Old inferior infarct, otherwise normal	
Chest X-ray (CXR)	Slight cardiomegaly but nothing else of note	

Which of the following investigations is most likely to reveal the underlying cause of her collapse?

Your answer was correct

- A 72 h ECG monitoring
- B Tilt table test
- C CT head

- D 24 h BP recording
- E EEG

Explanation



- B Tilt table test

The history here is typical of orthostatic hypotension. The twitching and incontinence witnessed by her husband are most likely related to the syncopal event, rather than a primary neurological problem. The tilt table allows for very accurate measurement of pulse and blood pressure moving from a supine to a standing position. Tilt table testing may reveal bradycardic or hypotensive carotid body syndrome, which can then be managed with appropriate intervention.

- A 72 h ECG monitoring

This is used to investigate cardiac arrhythmias, which may present with syncope similar to that described above. It does not provide any information about blood pressure, which is key to identifying the cause of this lady's postural symptoms.

- C CT head

It would be tempting to perform a CT scan of this lady's head given the history of head injury and preceding loss of consciousness, with some features suggestive of seizure activity. In this case it would not play any diagnostic role.

- D 24 h BP recording

This is usually used in the diagnosis of hypertension, where recordings in the GP surgery or clinic are variable and unreliable. It may well identify this lady's postural drop, but would not be the most efficient way to do this.

- E EEG

This is used to diagnose epilepsy. The clinical scenario described here does not suggest that this lady is having seizures.

21427

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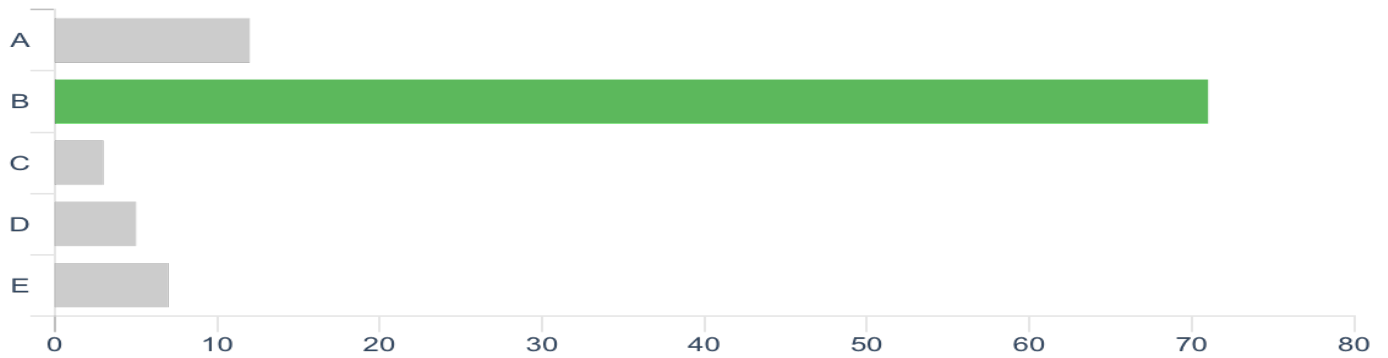
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Q165

A 54-year-old man is referred by his General Practitioner (GP) for routine cardioversion after a new diagnosis of atrial fibrillation (AF). He has not required rate control.

At presentation, his heart rate is 75 beats per minute (bpm) and he demonstrates AF. His blood pressure (BP) is 142/82 mmHg. There are no signs of cardiac failure or respiratory tract infection (RTI).

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	12.9 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$7.2 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$288 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	141 mmol/l	135–145 mmol/l
Potassium (K^+)	4.2 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	130 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Thyroid stimulating hormone (TSH)	3.1 $\mu\text{U/l}$	0.17–3.2 $\mu\text{U/l}$
Echocardiogram (ECHO)	Normal left atrial size, no significant valvular disease	

Cardioversion is scheduled for 1 month's time. How should his anticoagulation best be managed?

Your answer was incorrect

- A Aspirin and clopidogrel 6 weeks pre- and until 1 month after the procedure
- B Low-molecular weight heparin for 72 h pre- and then 48 h post- the procedure
- C Low-molecular weight heparin while being warfarinised, then continue warfarin for 6 months after the procedure
- D Low-molecular weight heparin while being warfarinised, then continue warfarin for 1 year after the procedure

- E Low-molecular weight heparin while being warfarinised, then review need for continued anti-coagulation at 1-month post cardioversion

Explanation



- E Low-molecular weight heparin while being warfarinised, then review need for continued anti-coagulation at 1-month post cardioversion

Evidence suggests that 1/3 of patients who are successfully cardioverted to sinus rhythm revert to atrial fibrillation during the first month after cardioversion. This puts them at significant risk of thromboembolic events. This patient is in a high potential success group because of his normal echocardiogram, with normal left atrial size and lack of significant valvular disease, and absence of other cardiac risk factors.

Warfarin takes several days to reach therapeutic levels, so he will need initial treatment with LMWH until this is achieved. He can then be maintained on warfarin until review at 1 month, when his anti-coagulation can be reassessed. If he is still in sinus rhythm and has no further symptoms of palpitations, anticoagulation can be discontinued.

- A Aspirin and clopidogrel 6 weeks pre- and until 1 month after the procedure

Dual antiplatelet therapy (aspirin and clopidogrel) is not indicated for management of AF. It is used as secondary prevention in CVD following MI, CVE and angina.

- B Low-molecular weight heparin for 72 h pre- and then 48 h post- the procedure

The short duration of treatment with this option, just 72 h pre- and 48 h post-procedure, would not be adequate given the high risk of developing a clot pending cardioversion. It would also make cardioversion in one month's time unsafe, as clots may have formed in the left atrium during the period of AF, which can dislodge at cardioversion causing CVE.

- C Low-molecular weight heparin while being warfarinised, then continue warfarin for 6 months after the procedure

Longer-term anticoagulation even after successful cardioversion is indicated for higher-risk patients. The decision is based on patient factors and CHA₂DS₂-VASc score.

- D Low-molecular weight heparin while being warfarinised, then continue warfarin for 1 year after the procedure

Longer-term anticoagulation even after successful cardioversion is indicated for higher-risk patients. The decision is based on patient factors and CHA₂DS₂-VASc score.

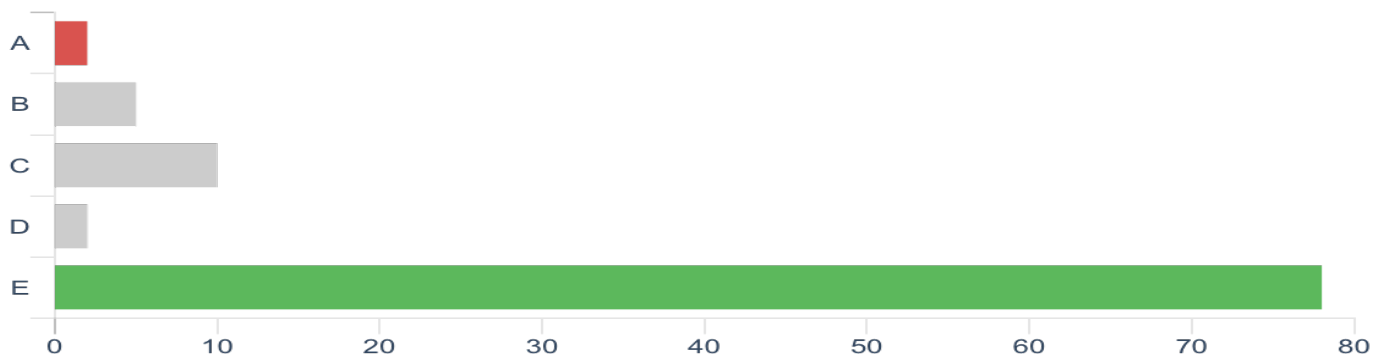
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Expanded Explanation

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Q166

A 72-year-old man attends his General Practitioner (GP) about one week after right hemicolectomy for colonic carcinoma, feeling generally unwell. He has been suffering from sweats, particularly at night, and is feeling increasingly lethargic.

On examination, he has pyrexia (37.8°C) and a pan-systolic murmur.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	10.3 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$12.1 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$145 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na ⁺)	139 mmol/l	135–145 mmol/l
Potassium (K ⁺)	4.5 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	180 µmol/l	50–120 µmol/l
Erythrocyte sedimentation rate (ESR)	77 mm/hour	1–20 mm/hour
Trans-oesophageal echocardiography (ECHO)	Mitral valve vegetations	

Which of the following is the most likely responsible organism?

Your answer was incorrect

- A *Bacteroides fragilis*
- B *Staphylococcus aureus*
- C *Staphylococcus epidermidis*
- D *Streptococcus viridans*
- E *Pseudomonas*

Explanation



A *Bacteroides fragilis*

Endocarditis is a rare complication of colonic resection, which occurs due to mobilisation of gut bacteria and their entry into the bloodstream. Passage of bacteria to the heart occurs via venous drainage, so valve lesions tend to be right-sided. Vegetations may also occur on the left side of the heart, as seen here, and in this case mitral valve lesions have led to mitral regurgitation.

In the context of endocarditis following bowel resection, *Bacteroides* is the most likely organism of those listed, though *S. bovis* is also seen. The incidence of postoperative endocarditis is very low because of the use of peri-operative broad-spectrum antibiotics (usually a cephalosporin in combination with metronidazole). Management in this case is metronidazole.

D *Streptococcus viridans*

This organism is present in the mouth and is the reason that the presence of valvular heart disease may be relevant in dental procedures. It is more commonly associated with community-acquired infection. It commonly presents as subacute disease.

B *Staphylococcus aureus*

This species is overall the most common cause of infective endocarditis, and around one third of *Staph. aureus* bacteraemia cases result in endocarditis, the majority of cases occur in structurally normal valves. The main risk factors are intravascular lines, IV drug abuse, alcoholism, cancer and chronic diseases such as diabetes or long-term steroid use. Is therefore more often associated with healthcare-acquired disease.

C *Staphylococcus epidermidis*

This tends to present as subacute disease. Although it can cause native valve disease, it is most associated with early prosthetic valve endocarditis.

E *Pseudomonas*

This is a bacterium that may contaminate recreational drugs, and it is therefore associated with IV drug abuse. It has a high morbidity and mortality and high rate of relapse.

21520

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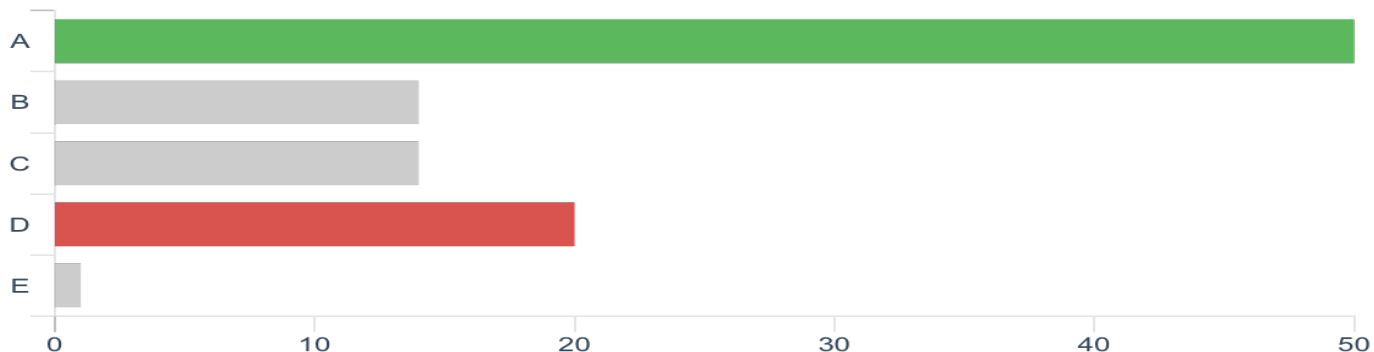
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Expanded Explanation

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Q167

A 57-year-old man presents to his General Practitioner (GP) with tiredness. He had a prosthetic aortic valve replacement six months ago. The procedure itself was uneventful, but he now feels increasingly tired and lethargic. He takes warfarin and a recent international normalised ratio (INR) result was 3.0.

On examination, he looks pale. His blood pressure (BP) is 105/70 mmHg, while his pulse is 90 beats per minute (bpm). On auscultation the prosthetic valve is easily audible. There are bilateral coarse crackles at both lung bases consistent with mild LVF.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	9.7 g/dl	13.5–17.5 g/dl
Mean corpuscular volume (MCV)	105 fl, reticulocytosis, decreased haptoglobins	80–100 fl
White cell count (WCC)	$5.0 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$155 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	139 mmol/l	135–145 mmol/l
Potassium (K^+)	5.0 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	120 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Erythrocyte sedimentation rate (ESR)	15 mm/hour	0–10 mm in the 1 st hour
Albumin	39 g/l	35–55 g/l
Alanine aminotransferase (ALT)	45 U/l	5–30 U/l
Bilirubin	86 $\mu\text{mol/l}$	1–22 $\mu\text{mol/l}$

Which of the following is the most likely diagnosis?

Your answer was incorrect

- A Subacute bacterial endocarditis
- B Gastrointestinal haemorrhage
- C Valve haemolysis

- D Liver abscess
- E Warfarin-related haemolytic anaemia

Explanation



- C Valve haemolysis

Valve haemolysis is associated with prosthetic valve replacement. It occurs because of mechanical destruction of red cells and leads to anaemia, with increased reticulocyte count and decreased haptoglobins. The bilirubin elevation is likely to be due to a rise in unconjugated bilirubin because of haemolysis.

- B Gastrointestinal haemorrhage

This should be suspected in any patient presenting with occult anaemia, including in this case. However, blood loss tends to cause a microcytic anaemia and haptoglobins would be normal.

- A Subacute bacterial endocarditis

This can present with fatigue, but there tend to be other features such as fever, new or changing heart murmur, weight loss and vascular and immunologic phenomena. Staphylococci and bacteria of the HACEK group (*Haemophilus*, *Actinobacillus*, *Cardiobacterium*, *Eikenella* and *Kingella*) are more common causative organisms in prosthetic valve endocarditis than native valve.

- D Liver abscess

This condition presents with fever, right upper quadrant pain, anorexia and malaise. There are variable changes in liver function tests, with hypoalbuminaemia and elevated alkaline phosphatase being the most typical.

- E Warfarin-related haemolytic anaemia

Warfarin is not known to cause a haemolytic anaemia, though may be associated with occult blood loss and consequent anaemia.

21521

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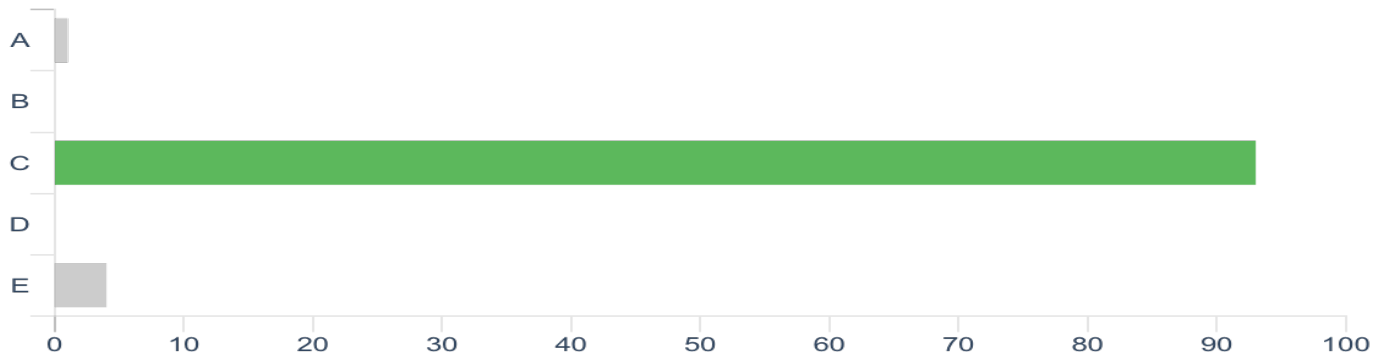
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Q168

A 73-year-old woman attends the Emergency Department (ED) after an incident in which she felt dizzy and fell over while at the supermarket. This is her first such episode, which she describes as acute in onset with rapid resolution; there was no associated chest pain. She has a past history of myocardial infarction (MI) some 20 years ago, and hypertension. Her current medication includes atorvastatin 10 mg, ramipril 10 mg and aspirin 75 mg.

On examination, her blood pressure (BP) is 105/72 mmHg, while her pulse is 56 beats per minute (bpm) and regular. She has no heart murmurs and is not in cardiac failure.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	11.9 g/dl	11.5–15.5 g/dl
White cell count (WCC)	$4.3 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$212 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	139 mmol/l	135–145 mmol/l
Potassium (K^+)	5.0 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	171 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Electrocardiogram (ECG)	Bifascicular block, sinus bradycardia	
24 hour ECG	Episodes of 4 second pause, single short run of NSVT, paroxysms of atrial fibrillation (AF)	

Which of the following is the most appropriate next management step for this patient?

Your answer was incorrect

- A Implantable cardioverter/defibrillator
- B Permanent pacemaker
- C Load with digoxin
- D Load with amiodarone

E Sotalol

Explanation



B Permanent pacemaker

Bifascicular block and history of pauses on 24 h tape indicate the need for permanent pacemaker insertion. Current ESC guidelines on pacing state: 'Pacing is indicated in patients affected by sinus node disease who have the documentation of symptomatic bradycardia due to sinus arrest or sinus- atrial block' as a class I recommendation.

The VT may be related to the pauses (ventricular escape occurs, and ischaemia in a susceptible patient may lead to a run of VT), and should be reassessed after pacemaker insertion has occurred.

D Load with amiodarone

While loading with amiodarone would be an appropriate option for control of atrial fibrillation or ventricular tachycardia, in this case it would have the potential to worsen her pauses and is therefore not the most suitable choice.

A Implantable cardioverter/defibrillator

Implantable cardioverter/defibrillator would not address her pauses or bifascicular block, and is therefore not the most appropriate management option here.

C Load with digoxin

While loading with digoxin would be an appropriate choice for control of atrial fibrillation, in this case it would have the potential to worsen her pauses and is therefore not the most suitable choice.

E Sotalol

While beta blockers may be an appropriate option for atrial fibrillation, sotalol would not represent a first-choice agent; in any case, here it would have the potential to worsen her pauses and is therefore not the most suitable choice.

21523

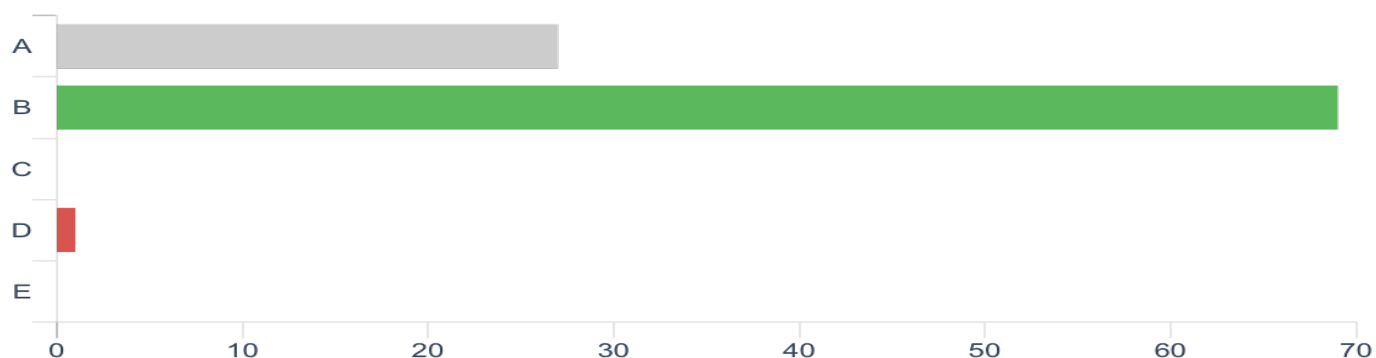
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External Links

ESC Clinical Practice Guidelines[escardio.org/Guidelines/Clinical-Practice-Guidelines/Cardiac-Pacing-and-Cardiac-Resynchronization-Therapy](https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Cardiac-Pacing-and-Cardiac-Resynchronization-Therapy)[\(https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Cardiac-Pacing-and-Cardiac-Resynchronization-Therapy\)](https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Cardiac-Pacing-and-Cardiac-Resynchronization-Therapy)

Q169

A 38-year-old man presents to the Emergency Department (ED) with his girlfriend. He has had rapid palpitations that began some six to eight hours after a heavy alcohol binge.

Past medical history of note includes recently diagnosed hypertension, for which he takes 5 mg ramipril. He works as a builder, often having to lift heavy pallets of brick.

On examination, he is in atrial fibrillation (AF), with a blood pressure (BP) of 120/70 mmHg and a pulse of 130 bpm. He has no heart murmurs and is not in heart failure.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	12.9 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$5.0 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$299 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na)	140 mmol/l	135–145 mmol/l
Potassium (K)	4.1 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	110 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Electrocardiogram (ECG)	Fast AF with otherwise unremarkable findings	
Chest X-ray (CXR)	No acute changes	

Which of the following is the most appropriate treatment?

Your answer was incorrect

- A Amiodarone
- B Adenosine
- C Flecainide
- D Vagal manoeuvres
- E Digoxin

Explanation



C Flecainide

Flecainide is a class Ic anti-arrhythmic agent used to prevent and treat tachyarrhythmias. However, study results have shown that it should not be used in patients with a previous history of ischaemic or structural heart disease, as it may lead to increased mortality rates. Where structural heart disease exists, cardioversion may be the better option.

E Digoxin

Digoxin can be used to achieve rate control in non-paroxysmal AF. Given the acute nature and reversible cause associated with this patient's AF, medical cardioversion with flecainide is preferable.

A Amiodarone

There is no suggestion of structural heart disease here, and the most likely cause of his presentation with fast AF is his alcoholic binge. Amiodarone and flecainide are all potential options for rhythm control, although, out of these, flecainide is associated with the highest percentage chance of conversion to sinus rhythm. Amiodarone is often used when prior drugs have been ineffective or when other drugs are contraindicated.

B Adenosine

Intravenous (IV) administration of adenosine causes transient heart block in the atrioventricular (AV) node. Treatment with adenosine is not indicated in the treatment of AF but is instead used for the rapid reversion to sinus rhythm in patients with paroxysmal supraventricular tachycardia.

D Vagal manoeuvres

Vagal manoeuvres, such as that of Valsalva, are used against spontaneous supraventricular tachycardias where they are efficacious in terminating about one-quarter of cases. Such manoeuvres may also be used to temporarily slow AF. However, the conversion of AF to sinus rhythm is usually not achieved with vagal manoeuvres. Thus, AF is classically treated with medications or electrical cardioversion.

30939

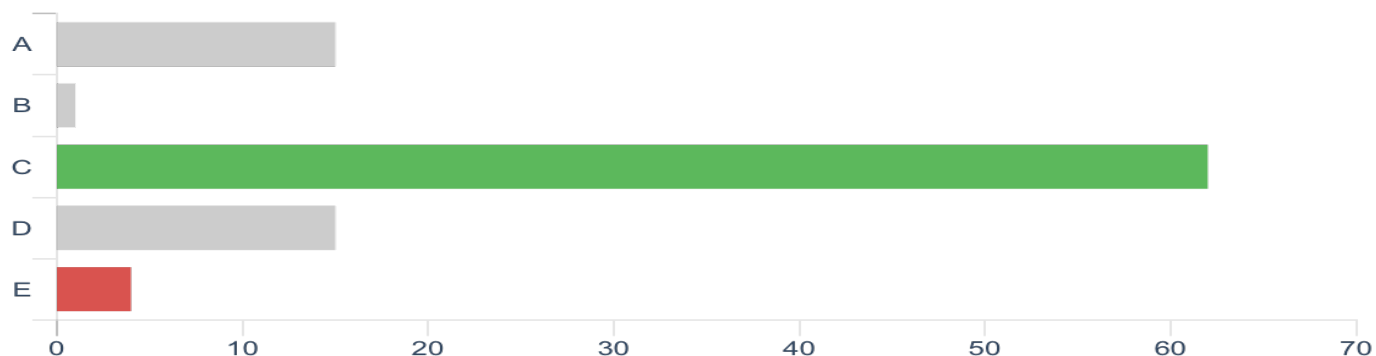
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 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**



Q170

A 76-year-old man with a long-standing history of hypertension is referred to the Cardiology Department with a six month history of worsening shortness of breath on exertion and peripheral oedema. He is now unable to walk more than 20 yards without getting breathless. He finds it very uncomfortable to lie flat at night and over the last month there were a couple of nights when he woke up trying to catch his breath. He is currently on furosemide 40 mg twice a day and ramipril 5 mg once a day.

On examination in the clinic, his blood pressure (BP) is 145/90 mmHg, while his pulse is 85 beats per minute (bpm) and regular. His heart sounds are normal on auscultation, and there are bi-basal crackles on auscultation of his chest. His jugular venous pulse (JVP) is seen at 4 cm and there is pitting oedema bilaterally to mid calves.

An electrocardiogram (ECG) shows sinus rhythm with left ventricular hypertrophy.

A chest X-ray (CXR) confirms an enlarged cardiac shadow with evidence of left ventricular failure. A previous echocardiogram (ECHO) from two months ago reveals an ejection fraction of 32%.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	10.2 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$6.3 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$198 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	132 mmol/l	135-145 mmol/l
Potassium (K^+)	3.5 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	101 μ mol/l	50-120 μ mol/l
Urea	6.0 mmol/l	2.5-6.5 mmol/l

Which of the following measures is the most important step in this case?

Your answer was incorrect

- A Increase furosemide
- B Add bisoprolol

- C Add digoxin
- D Add metolazone
- E Add spironolactone

Explanation



- E Add spironolactone

This patient has New York Heart Association III congestive cardiac failure and a poor prognostic outcome. Spironolactone combines a diuretic effect with prognostic benefit for major adverse cardiovascular events (MACE) outcomes and heart failure, as seen in the RALEs study (see weblink below). In this case it will help raise the patient's potassium and, with peripheral oedema and an elevated JVP, it is the intervention of choice.

- C Add digoxin

Digoxin is a last resort in patients with no evidence of atrial fibrillation; in patients with heart failure there is a hint from meta-analysis that it may actually increase mortality.

- A Increase furosemide

Increasing furosemide is less favoured versus spironolactone, because it doesn't confer a prognostic benefit and may actually lower potassium into the hypokalaemic range in this setting.

- B Add bisoprolol

Bisoprolol is associated with symptomatic and prognostic benefit in NYHA III heart failure, although it should be initiated when the patient is in stable fluid balance rather than the situation seen here.

- D Add metolazone

Metolazone can be used in patients with severe fluid overload who have 'maxed-out' on loop diuretic. It may, however, be associated with significant electrolyte abnormalities including hypokalaemia and hyponatraemia, and is therefore not the first option here. Where it is used, daily monitoring with urea and electrolytes is advised.

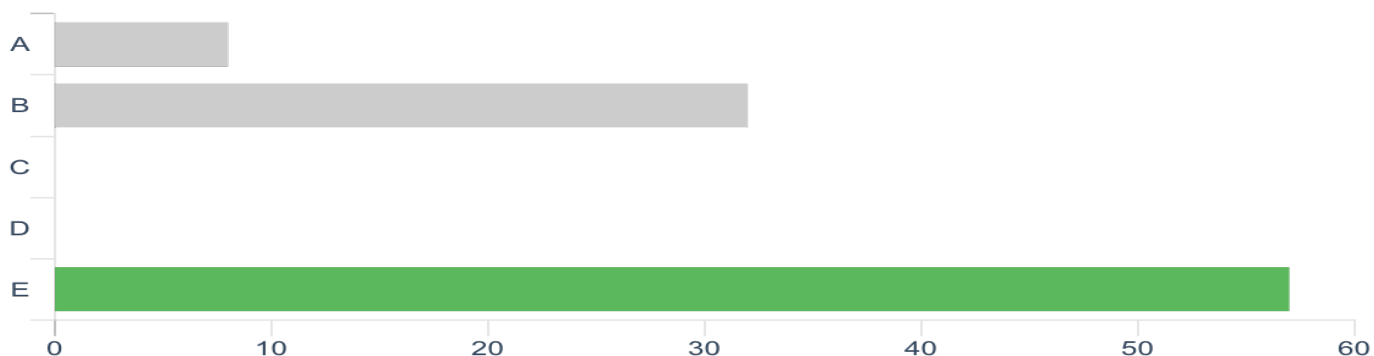
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Expanded Explanation

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Q171

A 70-year-old known diabetic is referred to the Rapid Access Clinic (RAC) by his General Practitioner (GP) as a result of a three month history of intermittent palpitations. He describes these as fast and irregular and of sudden onset and termination. He has felt quite light-headed on a couple of occasions during these palpitations, but denies any chest pain or shortness of breath. The GP mentions in the referral letter that he has a borderline high blood pressure (BP) and was recently started on ramipril.

On examination, his pulse is 72 beats per minute (bpm) and his BP is 145/95 mmHg. Otherwise, investigations are unremarkable.

A routine electrocardiogram (ECG) shows sinus rhythm with left ventricular hypertrophy.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	13.1 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$5.6 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$253 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	136 mmol/l	135–145 mmol/l
Potassium (K^+)	4.8 mmol/l	3.5–5.0 mmol/l
Urea	5.0 mmol/l	2.5–6.5 mmol/l
Creatinine (Cr)	99 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Thyroid stimulating hormone (TSH)	3 $\mu\text{U/l}$	0.17–3.2 $\mu\text{U/l}$

A 24 hour ECG reveals episodes of paroxysmal atrial fibrillation (PAF). An echocardiogram (ECHO) shows concentric hypertrophy with mild impairment of left ventricular function, dilated left atrium and no significant valvular pathology.

Which one of the following would be the intervention of choice?

Your answer was incorrect

- A Flecainide
- B Bisoprolol
- C Digoxin

D Amiodarone

E Verapamil

Explanation



B Bisoprolol

A beta-blocker can limit the episodes of PAF and achieve rate control during the episodes, as well as being beneficial for blood pressure control and left ventricular impairment, and is the treatment of choice if there are no contraindications. It is recommended by NICE guidance.

C Digoxin

Digoxin does not maintain sinus rhythm in paroxysmal atrial fibrillation, and doesn't confer prognostic benefit in IHD. As such, it doesn't have a role here.

A Flecainide

Flecainide is contraindicated in patients with structural abnormalities and at high risk of ischaemic heart disease, and is therefore not an option. It is usually considered only in younger patients with no evidence of IHD and acute-onset AF.

D Amiodarone

Amiodarone isn't indicated here for long-term use because of its adverse event profile, including photosensitisation, lung fibrosis and thyroid function test abnormalities.

E Verapamil

Verapamil is a second-choice option for rate control of AF if other options such as bisoprolol are unsuitable or contraindicated.

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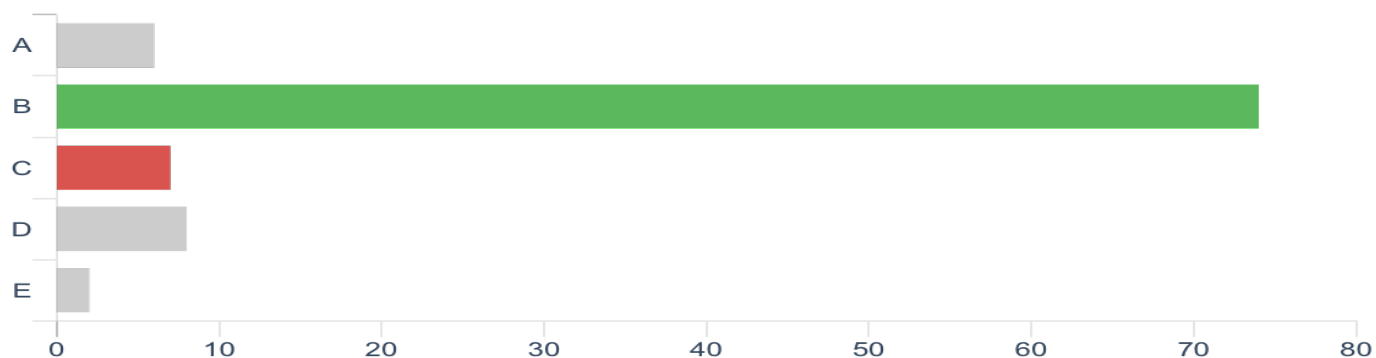
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External Links

NICE. CG180 Atrial fibrillation: management

[nice.org.uk/guidance/cg180](https://www.nice.org.uk/guidance/cg180)

(<https://www.nice.org.uk/guidance/cg180>)

Expanded Explanation

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Q172

A 24-year-old man, previously fit and well, is admitted to the Emergency Department (ED) under the care of the Orthopaedic Team following a road traffic accident (RTA). He was riding his motorbike when he was hit by a car, where he sustained a comminuted open fracture of his left tibia and fibula. He undergoes an open reduction and fixation operation and is returned to the ward.

A week later he is found to be pyrexial, with a temperature of 38.9°C. He is tachycardic, with a pulse of 130 beats per minute (bpm). His blood pressure is 100/60 mmHg. There are splinter haemorrhages on two of his fingernails. There is a systolic murmur on auscultation of his chest. His chest is clear on auscultation.

A bedside urine dipstick is positive for blood, protein and leucocytes. His serum creatinine (Cr) level is 125 µmol/l.

Blood cultures grow staphylococcus aureus.

Given the likely cause of his fever, which of the following is the most appropriate treatment in this case?

Your answer was incorrect

- A IV benzylpenicillin and gentamicin
- B IV cefuroxime and metronidazole
- C IV vancomycin
- D IV flucloxacillin
- E IV clarithromycin

Explanation



- D IV flucloxacillin

This patient has clinical features consistent with a diagnosis of infective endocarditis. After at least three sets of blood cultures have been taken from three different sites, blind treatment should be instigated pending results. The treatment is targeted at the most likely suspected organism. In this case the most likely pathogen is *Staphylococcus* because of his extensive

trauma, and initial treatment should involve flucloxacillin. Studies suggest that gentamicin adds little to efficacy and worsens the potential AE profile of therapy, and thus it isn't recommended here.

B IV cefuroxime and metronidazole

Cefuroxime and metronidazole is a usual intervention for infection related to surgery, not for subacute bacterial endocarditis.

A IV benzylpenicillin and gentamicin

Benzylpenicillin, is the initial empirical therapy for native valve endocarditis where there is little evidence to support staphylococcal infection. The features here point towards Staphylococcal infection as the most likely underlying cause.

C IV vancomycin

Vancomycin is usually reserved for endocarditis related to MRSA rather than the likely diagnosis here, which is methicillin-sensitive staphylococcal endocarditis.

E IV clarithromycin

IV clarithromycin is considered an option for treating staphylococcal endocarditis in patients with penicillin allergy.

32275

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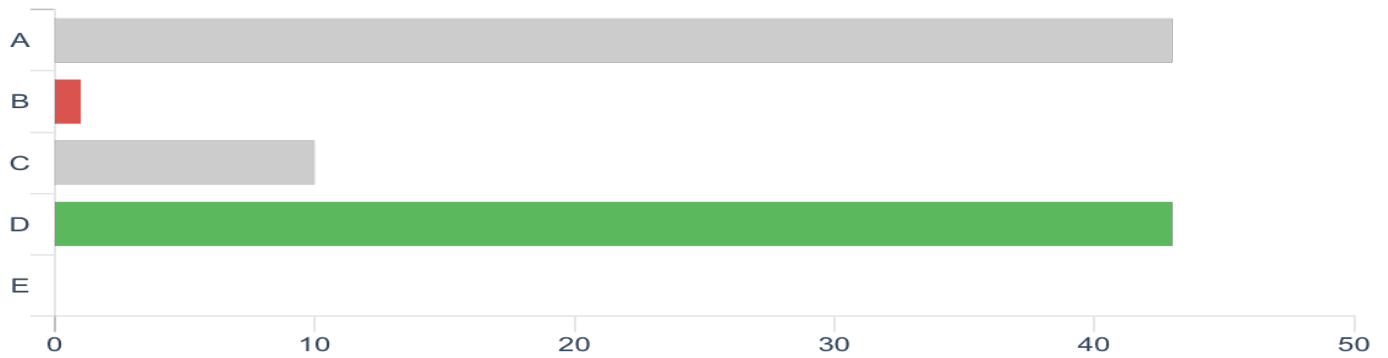
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Responses Correct:	36
Responses Incorrect:	136
Responses Total:	172
Responses - % Correct:	21%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q173

An 83-year-old man is seen in the Cardiology Department for pre-syncopal episodes. He describes a couple of events when he felt that he was going to faint and had to sit down. There were no precipitating factors on either of these episodes. There was no associated chest pain or palpitations. In his everyday life he has very good exercise tolerance with no symptoms of chest pain on exertion, shortness of breath on exertion, orthopnoea or paroxysmal nocturnal dyspnoea.

He has a past medical history of hypertension for which he was prescribed bendroflumethiazide 2.5 mg once a day. There is no history of ischaemic heart disease or valvular heart disease.

On examination he is comfortable, with a blood pressure (BP) of 138/86 mmHg and a heart rate of 76 beats per minute (bpm), which is irregular. His heart sounds are normal and his chest is clear.

An electrocardiogram (ECG) performed shows sinus rhythm with occasional ventricular ectopics. The patient has 24 hour ECG monitoring as an outpatient.

Which one of the following findings would be an indication for permanent pacemaker implantation?

Your answer was incorrect

- A Frequent ventricular ectopics (around 50 per hour)
- B Sinus pauses of >3.0 s
- C Intermittent Wenckebach phenomenon
- D Paroxysmal atrial fibrillation
- E Non-sustained VT

Explanation



- B Sinus pauses of >3.0 s

Indications for permanent pacemaker implantation include third-degree heart block, symptomatic second-degree block, asymptomatic type II second-degree block and pauses of more than 3.0 s.

A Frequent ventricular ectopics (around 50 per hour)

Single ventricular ectopics are not an indication for neither a permanent pacemaker nor an implantable defibrillator. They are most likely to be a normal phenomenon.

C Intermittent Wenckebach phenomenon

Mobitz type 1 heart block associated with the Wenckebach phenomenon is not associated with progression to complete heart block.

D Paroxysmal atrial fibrillation

PAF is an indication for bisoprolol under current NICE guidance, rather than a pacemaker.

E Non-sustained VT

Ventricular tachycardia (VT) may be an indication for an ICD in the context of a previous myocardial infarction (MI), particularly in the setting of a reduced ejection fraction. The MADIT trial showed a 54% reduction of death in patients following MI with left ventricular ejection fraction (LVEF) < 35% and sustained VT on monitoring or inducible on electrophysiological studies. The AVID trial showed a 31% death reduction in patients with resuscitated VT or ventricular fibrillation (VF). Current indications for automatic implantable cardioverter-defibrillator (AICD) include cardiac arrest due to VF or VT (though not due to a reversible cause), spontaneous sustained VT, unexplained syncope with VT inducible at EPS and non-sustained VT with prior MI.

32277

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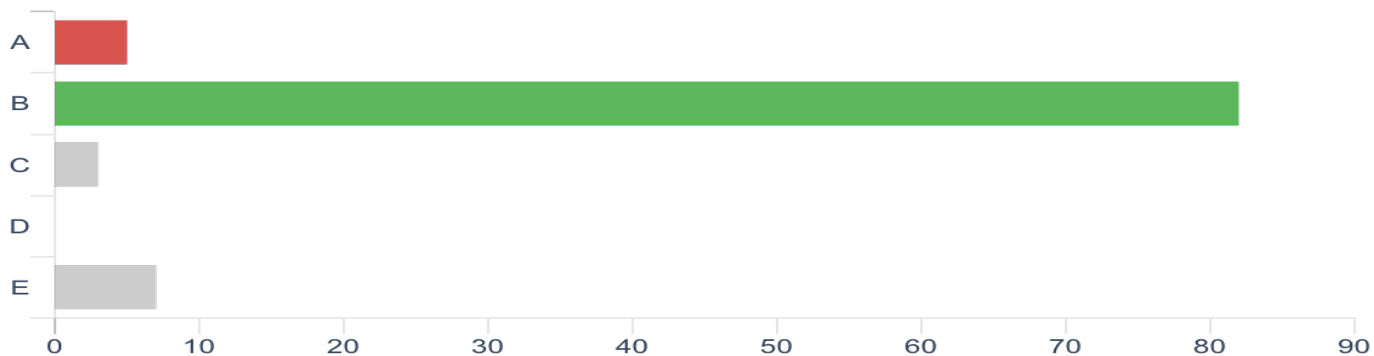
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Responses Correct:	36
Responses Incorrect:	137
Responses Total:	173
Responses - % Correct:	21%

External Links

NICE. Pacemakers

[nice.org.uk/guidance/ipg626](https://www.nice.org.uk/guidance/ipg626)

(<https://www.nice.org.uk/guidance/ipg626>)



Q174

A 43-year-old man presents to the Emergency Department (ED) with a one hour history of central crushing chest pain radiating to his left arm. This has started suddenly and has been building up in intensity. He has been feeling very nauseous and sweaty and is starting to get short of breath. There is no past medical history. He smokes 30 cigarettes a day and drinks about 25 units of alcohol per week.

On examination, he is in pain. His blood pressure (BP) is 165/95 mmHg, while his pulse is 120 beats per minute (bpm) and regular. He has saturations of 95% on room air. His heart sounds are normal and there are bi-basal crackles on auscultation of his chest.

A 12-lead electrocardiogram (ECG) shows ST elevation of 4 mm in leads V2-V5.

A portable chest X-ray (CXR) shows evidence of left ventricular failure (LVF).

Which one of the following measures would offer the greatest prognostic benefit in this patient in the immediate period on admission to hospital?

Your answer was incorrect

- A Abciximab
- B Thrombolysis with tPA
- C Immediate primary angioplasty
- D Atenolol 25 mg
- E Ramipril 2.5mg

Explanation



- C Immediate primary angioplasty

The patient has an acute anterior myocardial infarction (MI) leading to acute left ventricular failure (LVF). Aspirin 300 mg and clopidogrel 600 mg stat and immediate primary angioplasty, if the option is available, are the measures that offer the greatest prognostic benefit in the early hours.

- B Thrombolysis with tPA

If in a setting where primary angioplasty is not an option, thrombolytic therapy should be instigated as early as possible, although in all but the remotest parts of the UK, PCI is feasible.

A Abciximab

Abciximab, a 2b3a platelet inhibitor, may be useful in the management of acute MI where patients are undergoing PCI. It is not recommended in advance of PCI because given early it isn't associated with improved outcomes versus a delayed approach, and may lead to further bleeding if given early.

D Atenolol 25 mg

Atenolol reduces myocardial oxygen demand and is of prognostic value in acute MI, although given early it may lead to haemodynamic instability.

E Ramipril 2.5mg

Like atenolol, ACE inhibitors do infer prognostic benefit post MI, although they are usually instituted during the first 24 h after admission rather than immediately following.

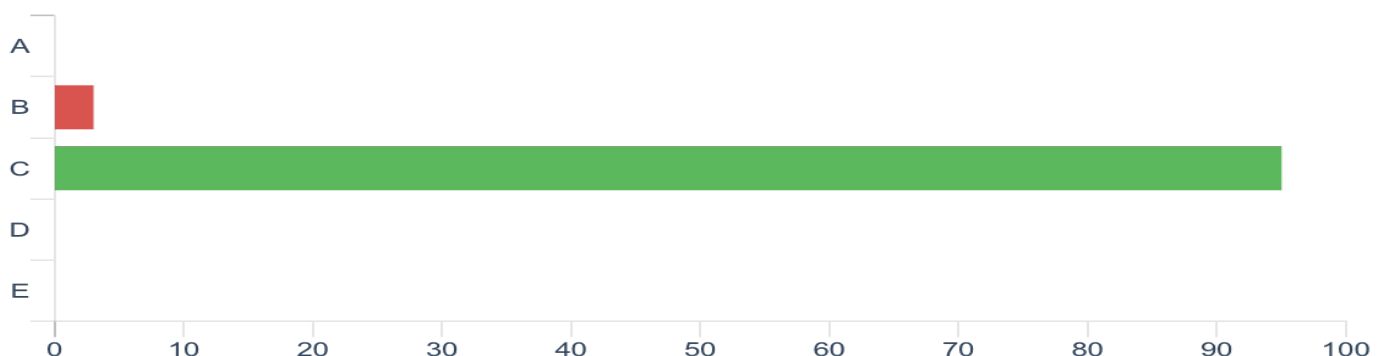
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Responses Correct:	36
Responses Incorrect:	138
Responses Total:	174
Responses - % Correct:	21%

 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q175

A 19-year-old woman presents to the Emergency Department (ED) with exertional breathlessness and palpitations.

On examination, there are giant v waves on inspection of her jugular venous pulse (JVP) and a left parasternal heave on palpation of her chest. There is a systolic murmur on auscultation and mild pitting oedema of both ankles.

She undergoes an echocardiogram (ECHO) that confirms the presence of elevated right-sided pressures with tricuspid regurgitation.

She undergoes a left and right heart catheter, which reveals the following:

Sample site	Oxygen saturations (%)
Inferior vena cava	62
Superior vena cava	58
Right atrium	80
Right ventricle	78
Pulmonary artery	78
Arterial saturation	97

Given these data, which is the likeliest diagnosis?

Your answer was incorrect

- A Patent ductus arteriosus
- B Primary pulmonary hypertension
- C Patent foramen ovale
- D Mitral stenosis
- E Chronic pulmonary thromboembolism

Explanation



C Patent foramen ovale

The oxygen saturation data show a step-up in the saturations between the vena cava and the right atrium. This signifies the existence of a left-to-right shunting of oxygenated blood at the level of the atrium. This could be a result of an atrial septal defect (ASD) or a patent foramen ovale (PFO). PFOs are relatively common in younger patients. Autopsy studies have shown a prevalence of up to 30%. Opinion is divided on whether ASD represents an increased risk of stroke secondary to a paradoxical embolus. The presence of ASD is also thought to be associated with the development of migraine in some patients.

B Primary pulmonary hypertension

Primary pulmonary hypertension isn't associated with a shunt at the level of the atria, although it is associated with right-sided cardiac failure.

A Patent ductus arteriosus

A patent ductus is associated with a systolic machinery murmur, and the cardiac catheterisation confirms that the shunt is at the level of the atrium.

D Mitral stenosis

Mitral stenosis is associated with a diastolic murmur; tricuspid regurgitation is associated with a systolic murmur. It is also not associated with the atrial shunt seen here.

E Chronic pulmonary thromboembolism

In chronic PE, pulmonary hypertension would be expected although an atrial shunt would not be seen.

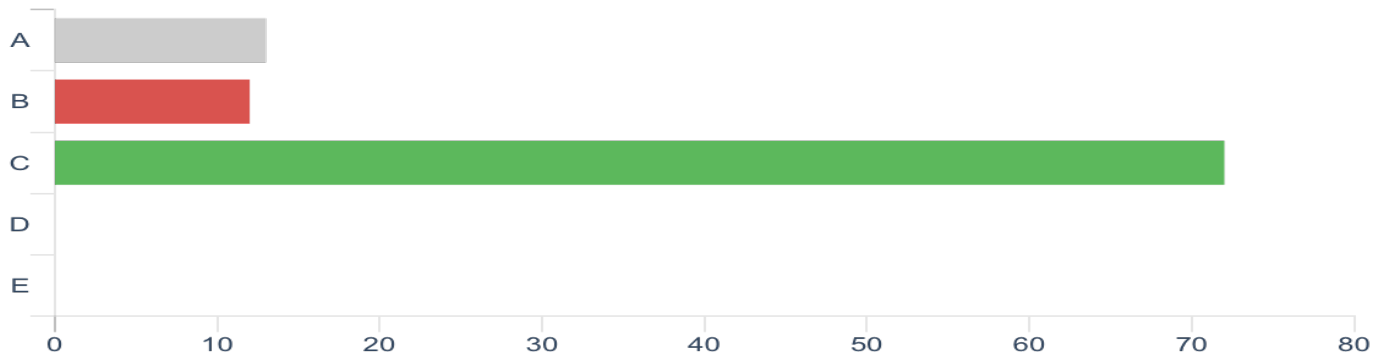
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Responses Correct:	36
Responses Incorrect:	139
Responses Total:	175
Responses - % Correct:	21%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q176

A 78-year-old man attends the Emergency Department (ED) complaining of palpitations. He describes these as fast and regular, and of sudden onset and termination. He describes a particularly bad episode when he almost lost consciousness. He knows he is on warfarin 'to thin the blood' but is unsure about the rest of his medications. He says that in the past he has suffered from an irregular heartbeat, and that he has recently been prescribed a course of antibiotics for a chest infection. He is allergic to penicillin, smokes 10 cigarettes a day and drinks very occasionally. He denies any recent alcohol binges.

On examination, he appears comfortable, with a pulse of 85 beats per minute (bpm). His blood pressure (BP) is 144/89 mmHg. His heart sounds are normal and his chest is clear.

A 12-lead electrocardiogram (ECG) shows sinus rhythm with normal QRS complexes. The PR interval is 0.16 seconds and the QTc interval is 0.52 seconds.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	14.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$9.6 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$253 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	138 mmol/l	135-145 mmol/l
Potassium (K^+)	4.2 mmol/l	3.5-5.0 mmol/l
Urea	4.7 mmol/l	2.5-6.5 mmol/l
Creatinine (Cr)	103 μ mol/l	50-120 μ mol/l
Thyroid stimulating hormone (TSH)	3 mU/l	0.17-3.2 μ U/l

Which one of the following is most likely to account for the ECG findings in this case?

Your answer was incorrect

- A Amoxicillin
- B Ciprofloxacin
- C Doxycycline

D Erythromycin

E Cephalexin

Explanation



D Erythromycin

This gentleman has QT prolongation and he is at risk of atypical ventricular tachycardia (VT) (torsades de pointes). Although there are some rare congenital causes of long-QT syndrome, these are unlikely to present so late in life and it is most likely that this is iatrogenic in origin. Out of the antibiotics described, erythromycin is recognised to result in long-QT syndrome. Other drugs causing a long QT include anti-arrhythmics (amiodarone, procainamide, disopyramide, quinidine, sotalol and bretylium), psychotropics (phenothiazines, tricyclic antidepressants, lithium and haloperidol), quinine, tacrolimus and cisapride.

C Doxycycline

Doxycycline is not associated with rhythm disorders. It is associated with gastro-oesophageal reflux, which can lead to tolerability issues for some patients.

A Amoxicillin

Amoxicillin is not associated with cardiovascular adverse events and, given this patient's penicillin allergy, would not have been prescribed.

B Ciprofloxacin

From the cardiovascular point of view, the main concern with respect to ciprofloxacin use in the frail elderly is its interference with theophylline metabolism that can precipitate potentially life-threatening hypokalaemia.

E Cephalexin

Cefalexin is well tolerated and is not associated with increased risk of cardiac rhythm disorders.

32280

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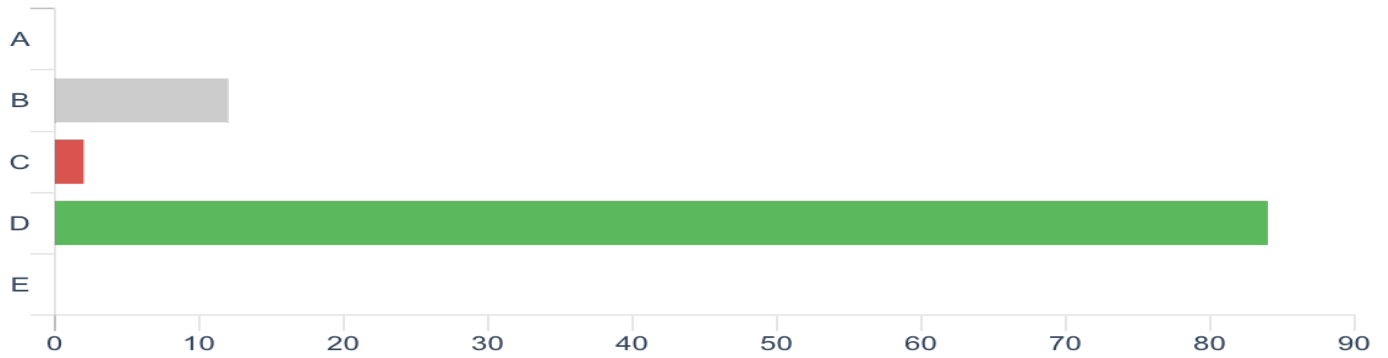
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Responses Correct:	36
Responses Incorrect:	140
Responses Total:	176
Responses - % Correct:	20%



Q177

A 74-year-old hypertensive man is referred by his General Practitioner (GP) to the Cardiology Department with a diastolic murmur that was picked up incidentally during one of his regular reviews. He denies any symptoms of angina, shortness of breath or palpitations. He is on bendroflumethazide and ramipril for his hypertension, but no other medications. There is no past medical history of note.

On examination, he is comfortable at rest with a blood pressure (BP) of 149/65 mmHg and a pulse of 85 beats per minute (bpm). He has a heaving precordium on palpation and there is a diastolic murmur at the left sternal edge which is present for half of diastole.

An electrocardiogram (ECG) shows sinus rhythm with left ventricular hypertrophy (LVH).

An echocardiogram (ECHO) shows a dimensionally normal left ventricle with good function. There is moderate aortic regurgitation and no other significant valve pathology.

Which one of the following should form part of this patient's management?

Your answer was incorrect

- A Coronary angiography
- B Annual echocardiographic follow-up
- C Beta-blocker therapy
- D Antibiotic prophylaxis advice
- E Outpatient 24 h ECG

Explanation



- B Annual echocardiographic follow-up

This patient has asymptomatic moderate aortic regurgitation (AR) with no signs of left ventricular failure, and therefore does not have any indications for surgery at this time. Patients with AR require regular echocardiographic follow-up to assess the state of the left ventricle, as symptoms develop quite late in the course of the disease. Elective valve replacement is indicated in patients who develop limiting symptoms, and in asymptomatic

patients with evidence of progressive LV dilatation on echocardiography. Emergency valve replacement should be considered in patients with severe acute AR usually due to endocarditis.

D Antibiotic prophylaxis advice

Patients with acquired valvular heart disease are at increased risk of developing infective endocarditis (IE) and, previously, these patients were given antibiotic prophylaxis before dental and certain non-dental procedures, such procedures involving the upper and lower gastrointestinal tract. However, antibiotic prophylaxis is no longer recommended by NICE, and therefore advice on antibiotic prophylaxis would not be appropriate. However, advice on good oral hygiene and the symptoms that may indicate infective endocarditis would be.

A Coronary angiography

In the context of valvular disease, coronary angiography is indicated for the detection of associated coronary artery disease when surgery is planned. It may not be indicated before surgery in young patients with no atherosclerotic risk factors, or in rare circumstances when the risk of doing coronary angiography outweighs benefit. This patient has asymptomatic moderate aortic regurgitation (AR) with no signs of left ventricular failure, and therefore surgery is not indicated at this time. Coronary angiography would, therefore, not be appropriate.

C Beta-blocker therapy

This patient has asymptomatic moderate aortic regurgitation (AR) with no signs of left ventricular failure. Beta-blockade may significantly impact cardiac function, and so angiotensin-converting enzyme (ACE) inhibitors are preferable, as there is some evidence to suggest that these prevent left ventricular (LV) dilatation in the longer term.

E Outpatient 24 h ECG

This patient has asymptomatic moderate aortic regurgitation (AR) with no signs of left ventricular failure. An outpatient 24 h ECG is not indicated in this patient. However, an ECG would have been carried out, initially, alongside a clinical examination of the patient.

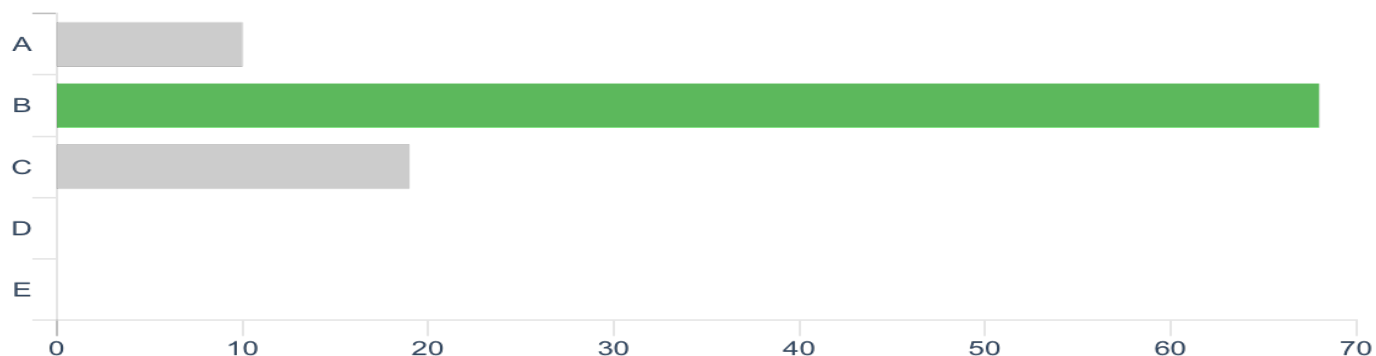
32281

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Difficulty: Easy

Peer Responses %



Session Progress

Responses Correct:	36
Responses Incorrect:	141
Responses Total:	177
Responses - % Correct:	20%

External Links

NICE. Management of heart disease

[nice.org.uk/guidance/gid-ng10122/documents/consultation-comments-and-responses](https://www.nice.org.uk/guidance/gid-ng10122/documents/consultation-comments-and-responses)

(<https://www.nice.org.uk/guidance/gid-ng10122/documents/consultation-comments-and-responses>)



Q178

A 48-year-old man presents to the Emergency Department (ED) with general malaise and ankle swelling. On close questioning he describes a decrease in his exercise tolerance over the last few months because of increasing breathlessness. He also describes a cough that is productive of clear sputum. There is no history of chest pains. He has no past medical history of note. He smokes 10 cigarettes a day and drinks 40 units of alcohol per week.

On examination, he is comfortable at rest, with a blood pressure of 155/98 mmHg and a pulse of 90 beats per minute (bpm) and regular. His jugular venous pressure (JVP) is raised and there is bipedal oedema. There is a pan-systolic murmur on auscultation of his heart and bi-basal crackles on auscultation of his chest.

A chest X-ray (CXR) shows an enlarged heart with evidence of fluid overload.

An electrocardiogram (ECG) shows borderline left bundle branch block.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	16.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$6.6 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$273 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135-145 mmol/l
Potassium (K^+)	4.8 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	89 μ mol/l	50-120 μ mol/l
Mean corpuscular volume (MCV)	98 fl	80-100 fl
Urea	6.0 mmol/l	2.5-6.5 mmol/l
Thyroid stimulating hormone (TSH)	3 μ U/l	0.17-3.2 μ U/l
Albumin	36 g/l	35-55 g/l
Alanine aminotransferase (ALT)	30 U/l	5-30 U/l
aspartate aminotransferase (AST)	65 U/l	10-40 U/l
γ -glutamyl transferase (GGT)	100 U/l	5-30 U/l

An echocardiogram (ECHO) shows a dilated left ventricle, with moderate global impairment of function and an ejection fraction of 40%. There is mild to moderate mitral regurgitation which is deemed to be functional.

Which of the following would be of most value impacting on his long term prognosis?

Your answer was incorrect

- A Viral serology
- B Beta-blocker therapy
- C Angiotensin converting enzyme inhibitor therapy
- D Alcohol cessation
- E Diuretic therapy

Explanation



- D Alcohol cessation

This patient has symptoms and signs of heart failure and the most likely cause in this case is one of dilated cardiomyopathy secondary to alcohol abuse. Abstinence from alcohol is paramount in arresting the progress of the condition, and if he doesn't stop drinking, despite receiving medication for heart failure, he will continue to experience significant symptoms.

- C Angiotensin converting enzyme inhibitor therapy

This patient has symptoms and signs of heart failure. The most likely cause in this case is one of dilated cardiomyopathy secondary to alcohol abuse. Angiotensin-converting enzyme (ACE) inhibitors reduce mortality and morbidity in heart failure and are therefore recommended in patients, unless contraindicated or not tolerated. However, given the aetiology, if he doesn't stop drinking he will continue to experience significant symptoms, and therefore this is not the most appropriate answer.

- A Viral serology

This patient has symptoms and signs of heart failure and the most likely cause in this case is dilated cardiomyopathy secondary to alcohol abuse. Viral serology has a very low diagnostic yield and would not affect the advice to discontinue with alcohol consumption.

- B Beta-blocker therapy

This patient has symptoms and signs of heart failure and the most likely cause in this case is dilated cardiomyopathy secondary to alcohol abuse. Beta-blockers reduce mortality and morbidity in symptomatic heart failure and should be started alongside an angiotensin-converting enzyme (ACE) inhibitor. However, given the aetiology, if he doesn't stop drinking he will continue to experience significant symptoms, and therefore this is not the most appropriate answer.

E Diuretic therapy

This patient has symptoms and signs of heart failure and the most likely cause in this case is one of dilated cardiomyopathy secondary to alcohol abuse. Diuretics are recommended to reduce the signs and symptoms of congestion, but their effect on mortality and morbidity have not been studied in RCTs. This is, therefore, not the most appropriate answer. If he doesn't stop drinking, despite receiving medication, he will continue to experience significant symptoms.

32282

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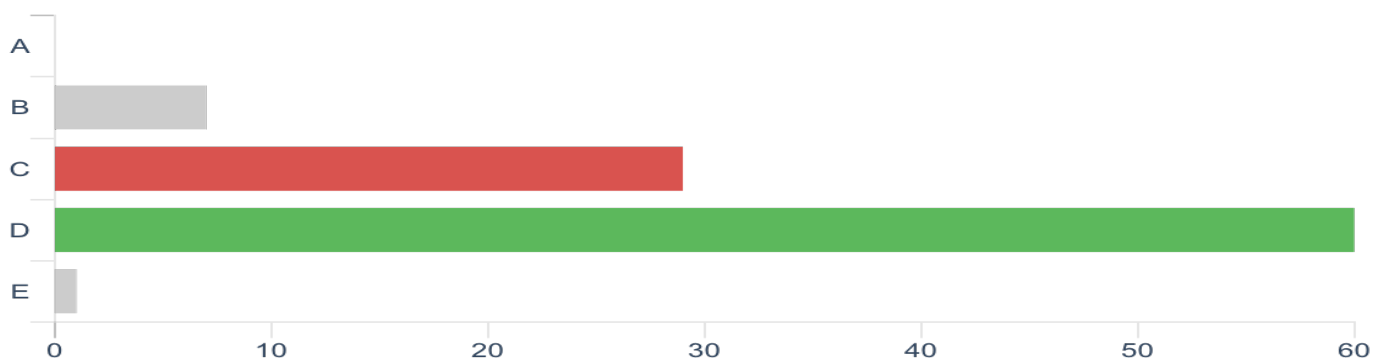
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Responses Correct:

36

Responses Incorrect:	142
Responses Total:	178
Responses - % Correct:	20%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

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Q179

A 65-year-old Jamaican woman is referred to the Cardiology Department by her General Practitioner (GP) with a history of progressive breathlessness. She has also noticed that her ankles have been swelling up recently. A trial of furosemide 40 mg once daily by her GP has not produced any noticeable results.

On examination in the clinic, she is found to have a blood pressure (BP) of 138/95 mmHg and a pulse of 85 beats per minute (bpm). Her jugular venous pressure (JVP) is elevated and there is a fourth heart sound on auscultation. There is pedal oedema bilaterally.

A chest X-ray (CXR) shows bilateral hilar lymphadenopathy with a normal-sized heart.

An echocardiogram (ECHO) is performed that shows biatrial enlargement with normal-sized ventricles and preserved left ventricular systolic function.

Which of the following investigations would be most appropriate next step in establishing the diagnosis?

Your answer was incorrect

- A Computerised tomography (CT) of the chest
- B Serum angiotensin-converting enzyme (ACE)
- C Rectal biopsy
- D Liver biopsy
- E Immunoglobulin electrophoresis

Explanation



- A Computerised tomography (CT) of the chest

This patient presents with symptoms of heart failure with preserved systolic function of the heart. This raises the possibility of restrictive cardiomyopathy leading to diastolic dysfunction. Causes of restrictive cardiomyopathy include infiltrative disease, such as amyloidosis, haemochromatosis and sarcoidosis, and post-radiation therapy fibrosis.

In the presence of hilar lymphadenopathy in a Jamaican lady, sarcoidosis is a possible underlying cause. The true incidence of cardiac involvement in sarcoidosis is unknown. Infiltrating granulomas may occur in the heart of up to 50% of patients with systemic sarcoidosis, but clinical manifestations of cardiac involvement are thought to occur in 5%. Cardiac involvement in sarcoidosis is not always associated with widespread disease but when present it indicates a poor prognosis.

A liver biopsy may be undertaken if the diagnosis of haemochromatosis is suspected. Given that in this case, sarcoidosis is a more likely diagnosis, a CT of the chest is the preferred next diagnostic step.

D Liver biopsy

This patient presents with symptoms of heart failure with preserved systolic function of the heart. This raises the possibility of restrictive cardiomyopathy leading to diastolic dysfunction. Secondary causes of restrictive cardiomyopathy include infiltrative disease, such as amyloidosis, haemochromatosis and sarcoidosis, and post-radiation therapy fibrosis. A liver biopsy may be undertaken if the diagnosis of haemochromatosis is suspected. Given that in this case, sarcoidosis is a more likely diagnosis. A CT of the chest is the preferred next diagnostic step.

B Serum angiotensin-converting enzyme (ACE)

This patient presents with symptoms of heart failure with preserved systolic function of the heart. This raises the possibility of restrictive cardiomyopathy leading to diastolic dysfunction. Causes of restrictive cardiomyopathy include infiltrative disease, such as amyloidosis, haemochromatosis and sarcoidosis, and post radiation therapy fibrosis. The ACE level is elevated in 75% of untreated patients with sarcoidosis. However, serum ACE has limited utility as a diagnostic test, due to poor sensitivity (false negative results) and insufficient specificity (almost a 10% rate of false positive results).

C Rectal biopsy

This patient presents with symptoms of heart failure with preserved systolic function of the heart. This raises the possibility of restrictive cardiomyopathy leading to diastolic dysfunction. Secondary causes of restrictive cardiomyopathy include infiltrative disease, such as amyloidosis, haemochromatosis and sarcoidosis, and post-radiation therapy fibrosis.

E Immunoglobulin electrophoresis

This patient presents with symptoms of heart failure with preserved systolic function of the heart. This raises the possibility of restrictive cardiomyopathy leading to diastolic dysfunction. Secondary causes of restrictive cardiomyopathy include infiltrative disease, such as amyloidosis, haemochromatosis and sarcoidosis, and post-radiation therapy fibrosis.

32283

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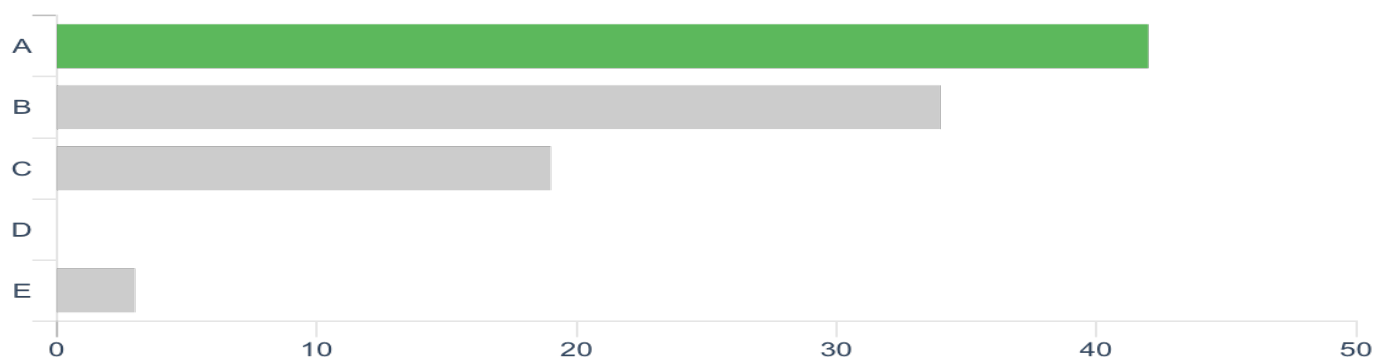
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Difficulty: Difficult

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Responses Correct:	36
Responses Incorrect:	143
Responses Total:	179
Responses - % Correct:	20%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q180

A 64-year-old woman is referred to the Cardiology Clinic by her General Practitioner (GP) for review. She has felt 'washed-out' over the past few weeks and has suffered a number of fevers and chills. She has a past medical history of Sydenham's chorea, and a dental extraction was carried out around two months ago.

On examination, she demonstrates the murmur of mitral regurgitation. She has peripheral splinter haemorrhages. Blood cultures are taken.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	9.0 g/l	11.5–15.5 g/dl
Mean corpuscular volume (MCV)	92.0 fl	80–100 fl
White cell count (WCC)	$12.5 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Neutrophils	$10.5 \times 10^9/l$	$2.5\text{--}7.58 \times 10^9/l$
Platelets (PLT)	$190 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Erythrocyte sedimentation rate (ESR)	95 mm/hour	1–20 mm/hour

Which one of the following stems represents the best choice for initial management?

Your answer was incorrect

- A IV corticosteroids
- B IV benzylpenicillin
- C Check autoimmune profile
- D Endoscopy to investigate anaemia
- E Commence ferrous sulphate

Explanation



B IV benzylpenicillin

This patient has a history of Sydenham's chorea, a condition associated with rheumatic fever, and a recent history of dental extraction. It is likely that there has been some long-standing damage to the valve as a result of the rheumatic fever, and that the dental extraction has introduced infection resulting in endocarditis. The history of fever and malaise, normochromic, normocytic anaemia and markedly raised erythrocyte sedimentation rate (ESR) associated with the murmur of mitral regurgitation and splinter haemorrhages (signifying immune complex deposition) points towards a diagnosis of endocarditis. The key to establishing a microbiological diagnosis is the taking of multiple sets of blood cultures from multiple sites. Empirical antibiotic therapy should be started as soon as possible, even before echocardiography if there is any delay in performing this, in the face of such strong evidence pointing to the diagnosis. The most likely infective agent in this case would be *Streptococcus viridans*. Combination therapy with benzylpenicillin and gentamicin was the previous intervention of choice, although modern thinking is that gentamicin adds little in terms of efficacy at the expense of increased therapy related adverse events.

E Commence ferrous sulphate

The anaemia is as a result of endocarditis, not iron deficiency, ferrous sulphate is therefore not of value here.

A IV corticosteroids

Corticosteroids may accelerate progression of endocarditis; they are therefore an inappropriate option here.

C Check autoimmune profile

Anti-nuclear antibodies may be elevated in rheumatic fever, although they wouldn't confirm or refute the diagnosis of subacute bacterial endocarditis.

D Endoscopy to investigate anaemia

This patient has a normochromic normocytic anaemia, not consistent with iron deficiency anaemia.

32285

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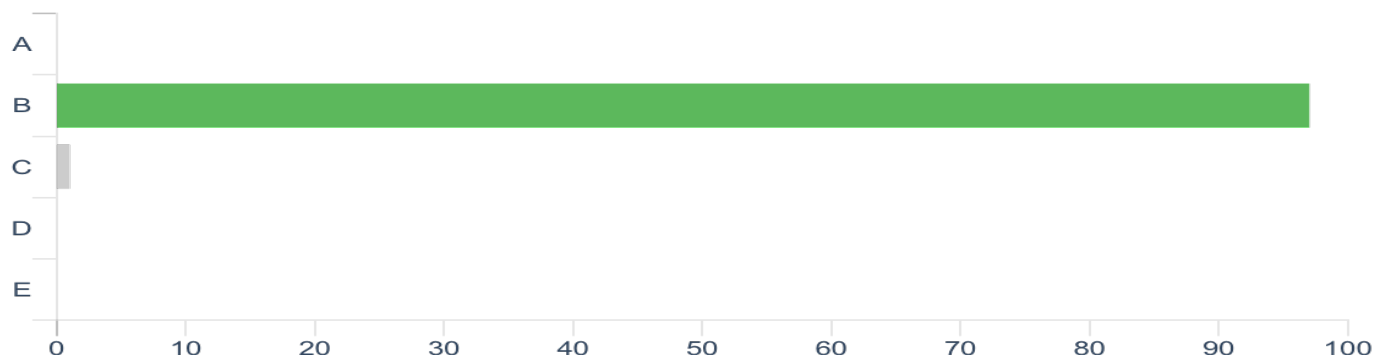
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

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Prognosis



Q181

A 32-year-old man is admitted to the Emergency Department (ED) following a cardiac arrest. A automatic defibrillator was used on the scene of the incident, and this shocked him from ventricular fibrillation into sinus rhythm. He denies chest pain prior to the event, has an unremarkable past medical history and documented normal glucose, blood pressure (BP) and cholesterol at his General Practitioner (GP) surgery. He is a non-smoker.

On examination in the ED, his Glasgow Coma Scale score is 13. His BP is 120/80 mmHg and he is now in sinus rhythm.

An electrocardiogram (ECG) reveals right bundle-branch block and ST elevation in the right precordial leads.

Which one of the following would be the most appropriate treatment option in this case?

Your answer was correct

- A Amiodarone
- B Verapamil
- C Implantable cardioverter defibrillator
- D Long-term anticoagulation
- E Atenolol

Explanation



- C Implantable cardioverter defibrillator

Right bundle-branch block and ST elevation in the right precordial leads associated with ventricular fibrillation and sudden death is characteristic of Brugada syndrome. Prognosis of patients is related to history of previous syncope and inducibility of arrhythmias during ventricular stimulation. An implantable defibrillator is the treatment of choice in these patients, although a subset of patients may also be considered for therapy with quinidine, particularly those who present with 'VF storm', with multiple firings of their defibrillator in one day.

A Amiodarone

Amiodarone is not effective in the management of arrhythmia associated with Brugada syndrome. It may be of value in patients with VT related to ischaemic cardiomyopathy with decreased LV function.

B Verapamil

Verapamil is not of value in the management of Brugada syndrome; it is usually a treatment option for patients with paroxysmal SVT.

D Long-term anticoagulation

This patient's collapse isn't due to a thromboembolic phenomenon. Anticoagulation is therefore not of value here.

E Atenolol

Beta blockade is considered for patients with long-QT syndrome to reduce the risk of ventricular tachycardia.

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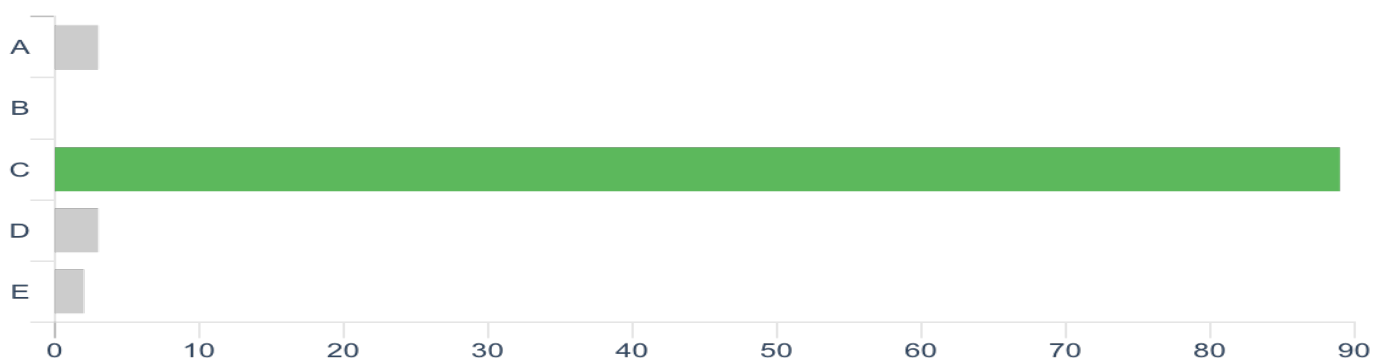
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Responses Incorrect:	144
Responses Total:	181
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Q182

A 62-year-old woman is admitted to the Emergency Department (ED) suffering from extreme headache, nausea, vomiting and increasing drowsiness.

On examination, her blood pressure (BP) on admission is 185/130 mmHg and she has grade IV hypertensive retinopathy. Electrolyte testing reveals a potassium level of 3.8 mmol/l, a sodium level of 134 mmol/l and a creatinine level of 158 mmol/l.

You admit her to the High-dependency unit (HDU).

Which one of the following is the most appropriate way to manage her blood pressure?

Your answer was incorrect

- A IV sodium nitroprusside
- B Oral amlodipine
- C Oral atenolol
- D Oral ramipril
- E Oral furosemide

Explanation



- A IV sodium nitroprusside

This patient has hypertensive encephalopathy with a deteriorating level of consciousness. Her condition is too severe for oral therapy and she requires IV blood pressure lowering therapy with sodium nitroprusside. The aim of treatment is to lower blood pressure to around 110-115 mmHg diastolic within 2-4 h, and nitroprusside can be titrated to target. Nitroprusside therapy may be accompanied by IV furosemide. Where there is significant neurology, CT is also an important part of the work-up. Acute blood pressure lowering may result in an extension of deficit in the event of a proven stroke. Late features of hypertensive encephalopathy may include fits and coma.

- D Oral ramipril

Oral ramipril is occasionally used as initial therapy for marked hypertension in patients with probable autosomal dominant polycystic kidney disease, although in this case with hypertensive encephalopathy, nitroprusside is more appropriate.

B Oral amlodipine

Although amlodipine may lower blood pressure, acute effects are likely to be modest and amlodipine is long-acting, meaning that it can't be easily titrated.

C Oral atenolol

Oral atenolol may precipitate cardiac failure in patients with hypertensive crisis, and it is long-acting, preventing easy titration of the dose.

E Oral furosemide

Oral furosemide is usually used as a second-line therapy in combination with nitroprusside.

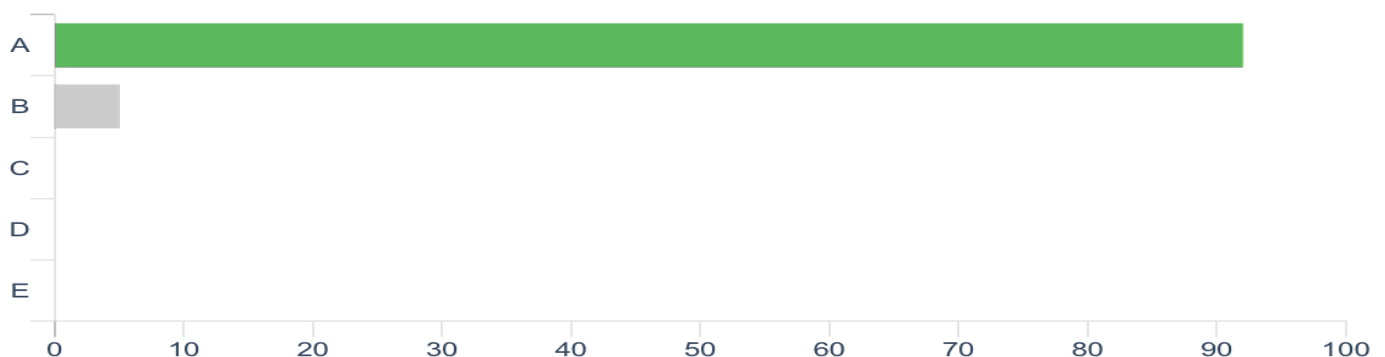
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Responses Incorrect:	145
Responses Total:	182
Responses - % Correct:	20%

 Expanded Explanation**Overview****Clinical Presentation****Diagnosis / Investigation****Management****Prognosis**

Q183

A 62-year-old heavy smoker presents to the Emergency Department (ED) with a history of very severe central chest pain radiating to the back. His past medical history of note includes hypertension controlled with ramipril and atenolol, and a transient ischaemic attack some six months earlier.

On examination, he has a difference in blood pressure (BP) of 35/10 mmHg between his two arms. There are signs of aortic regurgitation and a pericardial friction rub. An electrocardiogram (ECG) reveals evidence of inferior ST elevation and atrial fibrillation (AF), with a ventricular rate of 90 beats per minute (bpm). His BP is 125/75 mmHg.

Which one of the following options represents optimal initial management of this case?

Your answer was incorrect

- A IV thrombolysis
- B Beta-blockade
- C Low-molecular weight heparin
- D Aspirin
- E ACE inhibition

Explanation



- B Beta-blockade

The clinical signs in this patient point towards a diagnosis of aortic dissection. It is likely that the electrocardiogram signs of inferior myocardial infarction are due to the dissection having compromised the right coronary artery ostium. Key management considerations are reduction of blood pressure (with IV β -blockade) and pain relief. Contrast computed tomography (CT) scanning is necessary to assess the extent of dissection and suitability for surgery, and early consultation with a cardiothoracic surgeon is advised. Mortality for untreated aortic dissection is 25–30% at 24 h and 65–70% at 2 weeks; dissections confined to the descending aorta are associated with better survival (80%).

C Low-molecular weight heparin

Anti-coagulation is not appropriate until a dissection has been ruled out by CT.

A IV thrombolysis

Given the difference in blood pressure between the arms, and the fact the pain radiates to the back, dissection should be ruled out before considering thrombolysis or anti-coagulation.

D Aspirin

Although aspirin would be considered in the event of a myocardial infarction, it isn't appropriate here given that dissection is likely.

E ACE inhibition

In dissection blood pressure can be labile, and there is a risk of decreased renal perfusion. As such, although ACE inhibition may be appropriate over the long term, it isn't usually started in the acute period after diagnosis.

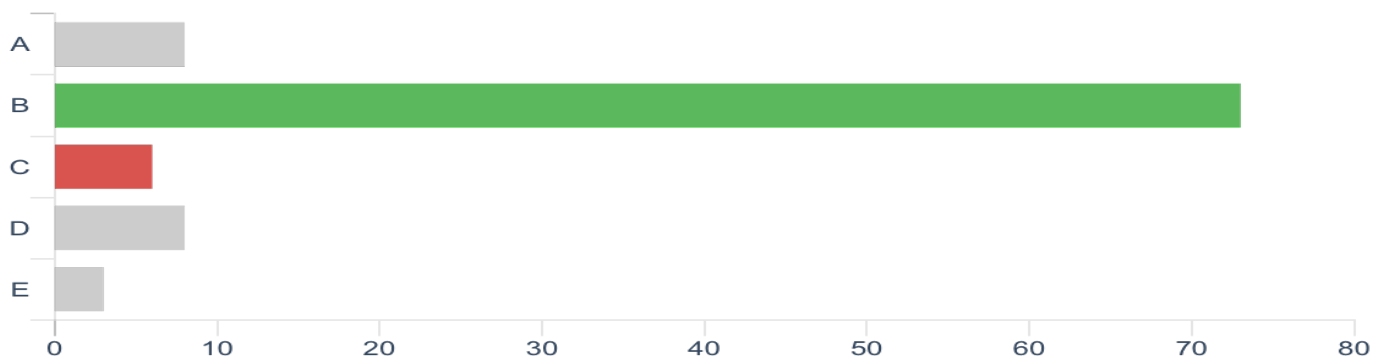
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

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Links to NICE guidelines/CKS



Q184

A 58-year-old man is brought into the Emergency Department (ED) of a University Hospital with a history of central crushing chest pain associated with weakness and diaphoresis.

He has no history of ischaemic heart disease (IHD) but has a left carotid endarterectomy 10 months ago after an ischaemic stroke, from which he has almost fully recovered. He smokes 20 cigarettes per day. The patient was administered oxygen, aspirin and sublingual nitroglycerine (GTN) spray in the ambulance but has persistent pain.

On examination, his pulse is 120 beats per minute (bpm), while his blood pressure (BP) is 140/90 mmHg. Examination of the chest does not reveal any abnormalities. His oxygen saturation is measured at 93%. A 12-lead electrocardiogram (ECG) reveals sinus tachycardia and ST-segment elevation suggestive of ischaemia in leads I, aVL, V5 and V6. There is no history of haemorrhagic stroke, active internal bleeding, suspected aortic dissection, active peptic ulcer disease, or major surgery within the past three weeks. Nor is there indication of recent trauma.

It is now one hour since the onset of symptoms. You plan to take the patient to the Cardiac Catheter Lab for angioplasty. He has been treated with heparin and morphine and given aspirin by the paramedic crew.

Which one of the following treatments is likely to have the greatest impact on prognosis whilst awaiting transfer to the catheter lab?

Your answer was incorrect

- A Reperfusion therapy with a thrombolytic agent
- B Intravenous beta-blocker
- C ACE inhibitor
- D Ticagrelor
- E IV GTN

Explanation



- D Ticagrelor

Ticagrelor studies have demonstrated that in dual anti-platelet therapy for patients with STEMI it is associated with reduced risk of further MI or stent thrombosis compared to clopidogrel as the alternative. The PLATO study trialed a dose of 90 mg ticagrelor.

C ACE inhibitor

For similar reasons to avoiding IV beta-blockers, ACE inhibitors are avoided in the acute period after an infarct.

A Reperfusion therapy with a thrombolytic agent

It's clear from modern clinical practice that stenting is preferred to thrombolysis, and hence thrombolysis before PCI is not appropriate.

B Intravenous beta-blocker

Blood pressure may be unstable in the context of acute ischaemia; IV beta blockade is therefore not an intervention of choice in this situation.

E IV GTN

Although GTN may relieve ischaemia and lead to peripheral vasodilatation, resulting in symptom relief, it has less of an impact on prognosis than dual anti-platelet therapy.

32293

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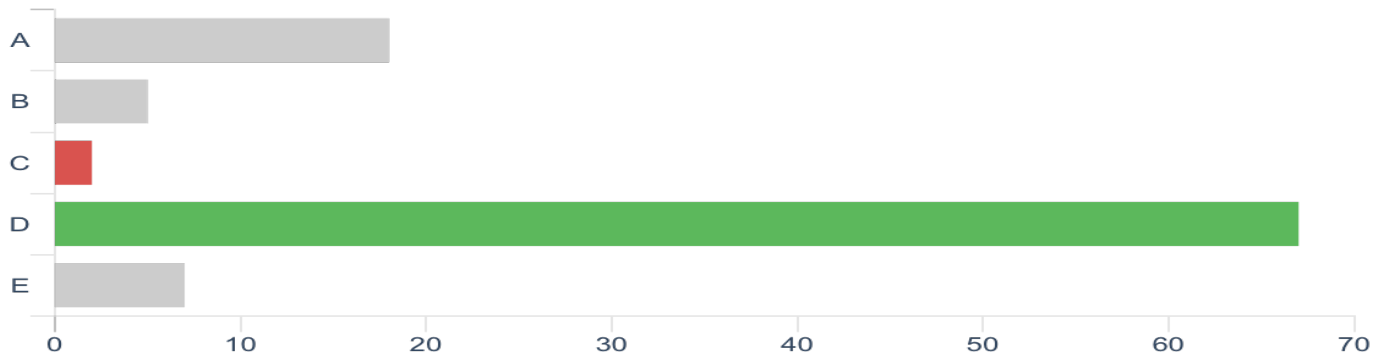
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Expanded Explanation

Overview

Clinical Presentation

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Links to NICE guidelines/CKS



Q185

A 55-year-old man presents to the Emergency Department (ED) with acute onset of crushing retrosternal chest pain that started three hours ago and has become much worse in the last 30 minutes. Other than hypertension, he has no past medical history of note.

On examination, he has a pulse of 40 beats per minute (bpm). His blood pressure (BP) is 104/63 mmHg. Jugular venous pulsation (JVP) is seen up to 3 cm above the sternal notch and the chest is clear to auscultation.

An electrocardiogram (ECG) shows narrow QRS complexes with 2 mm ST segment elevation in leads II, III and aVF, as well as complete heart block (CHB). He is given aspirin and clopidogrel.

Which of the following is the most appropriate way to manage this patient?

Your answer was incorrect

- A IV streptokinase
- B IV Reteplase
- C Subcutaneous fondaparinux
- D Temporary transvenous pacemaker
- E Urgent PCI

Explanation



- E Urgent PCI

Conduction abnormalities are common in patients with inferior myocardial infarction (MI), as the right coronary artery (RCA) supplies the sinoatrial (SA) node (60% of people), atrioventricular (AV) node (90% of people) and His bundle. Complete heart block (CHB) in association with inferior MI is often associated with narrow complex escape rhythm, rarely progresses to asystole, and usually resolves within one week. If escape rhythm is more than 40 beats/min with normal blood pressure, treatment is not required. Urgent PCI is the best option, as reperfusion of the RCA is likely to restore AV node function.

- C Subcutaneous fondaparinux

Fondaparinux is the anticoagulant of choice for NSTEMI, which is ruled out by the inferior lead ST elevation seen here.

A IV streptokinase

IV streptokinase is of course now superseded by PCI and by TPA where PCI is not available or is inappropriate. It is still used in the treatment of complicated empyema, where any abscess might be multi-loculated.

B IV Reteplase

TPA is only considered an option for patients where PCI is either inappropriate or unavailable.

D Temporary transvenous pacemaker

Given this patient's systolic blood pressure is above 100 mmHg and pulse is 40, there is no indication at this stage to introduce a temporary pacemaker. It's better to progress directly to PCI.

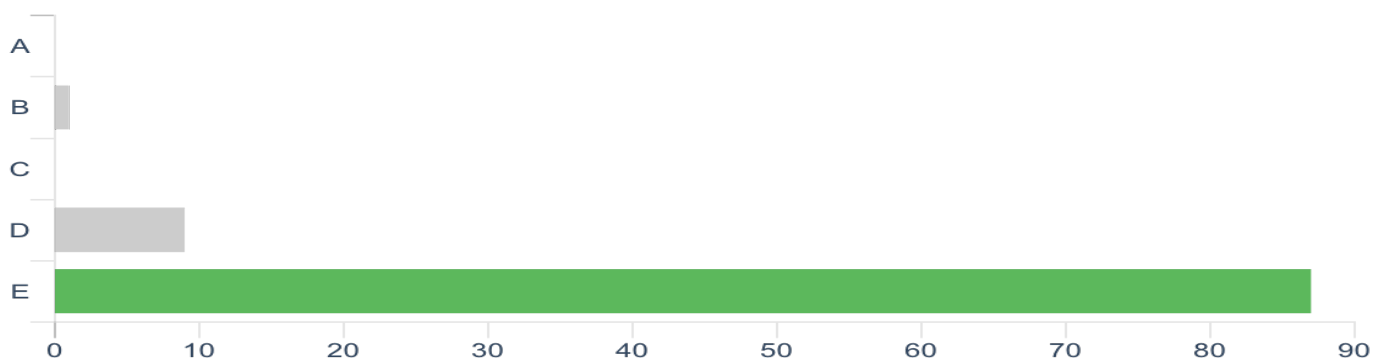
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Responses Total:	185
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 Expanded Explanation**Overview****Links to NICE guidelines/CKS**

Q186

A 48-year-old man is admitted to the Coronary Care Unit (CCU) post-percutaneous coronary intervention (PCI), having had acute onset retrosternal chest pain some two hours earlier.

On examination, he is initially stable, with a pulse of 67 beats per minute (bpm) sinus rhythm and a blood pressure (BP) of 125/70 mmHg. Six hours after arrival, the nurse in charge calls you because an electrocardiogram (ECG) monitor shows frequent premature ventricular contractions (PVCs). The patient is comfortably lying in the bed, and is asymptomatic. His BP is 105/65 mmHg, while his pulse is 69 bpm, his jugular venous pulse (JVP) is 2 cm above the sternal notch, and the chest is clear to auscultation. As you examine him, you notice frequent PVCs and a run of ventricular tachycardia (VT) lasting 5 seconds. The nurse tells you that he had a similar run of VT few minutes ago.

Which of the following steps is most appropriate at this stage?

Your answer was incorrect

- A IV lignocaine
- B IV Amiodarone
- C IV Procainamide
- D Observation
- E Check potassium and magnesium levels

Explanation



- E Check potassium and magnesium levels

Premature ventricular contractions (PVCs) and non-sustained ventricular tachycardia (NSVT) are common in the early post-myocardial infarction (MI) period. NSVT is defined as three or more consecutive beats at a rate >100 beats/min that last less than 30 s. If these do not cause any haemodynamic compromise, treatment is not needed.

Hypokalaemia increases the incidence of NSVT as well as VT and ventricular fibrillation (VF), and hence it is prudent to check serum potassium (K^+) levels early. During the GISSI-2 trial it was observed that a serum K^+ level of <3.6 mmol/l was associated with a twofold increased

risk of VF. Therefore serum K^+ should be maintained >4 mmol/l by oral or intravenous (IV) supplementation in patients with acute MI.

Concomitant magnesium (Mg^{2+}) deficiency is present in many patients with hypokalaemia and also makes correction of hypokalaemia difficult. Hence serum Mg^{2+} levels should also be checked and maintained >1 mmol/l.

C IV Procainamide

It was thought that there was little practical difference between amiodarone and procainamide for the treatment of VT, although recent RCT evidence supports a superior efficacy profile for procainamide in the event that an anti-arrhythmic is required.

A IV lignocaine

Anti-arrhythmic therapy might be considered if NSVT causes haemodynamic compromise or becomes sustained VT. Lignocaine can be significantly negatively inotropic, and hence it isn't a first-choice option here.

B IV Amiodarone

IV amiodarone is a first-choice antiarrhythmic, although the first step in this case is to check potassium and magnesium levels and correct them as needed.

D Observation

Hypokalaemia and hypomagnesaemia are both associated with significant risk of VF, and hence leaving levels unchecked is not an option.

32296

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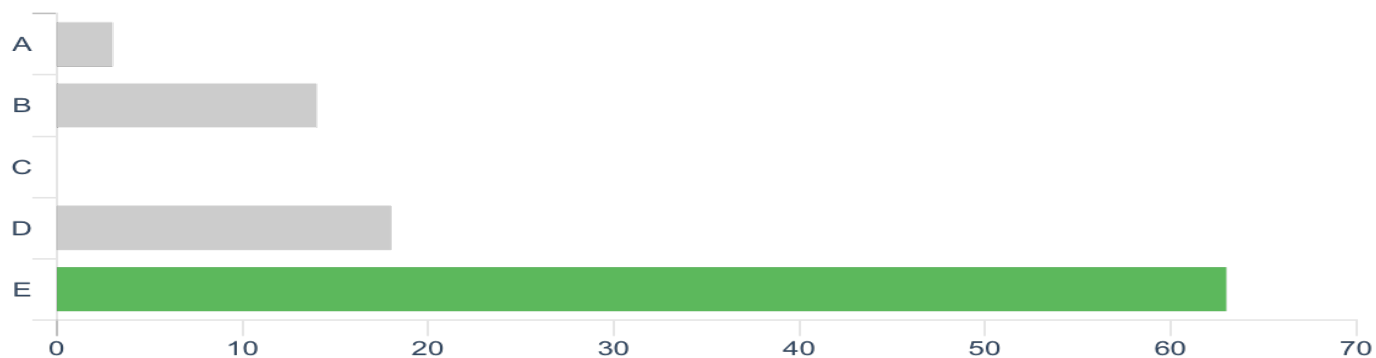
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(<https://academic.oup.com/eurheartj/article/38/17/1329/3056919/Randomized-comparison-of-intravenous-procainamide>)

Expanded Explanation

Overview

Links to NICE guidelines/CKS



Q187

A 45-year-old man is admitted to the Coronary Care Unit (CCU) with a history of retrosternal chest pain of one hour duration associated with sweating and nausea.

On examination, his initial electrocardiogram (ECG) shows ST segment elevation in inferior leads. His blood pressure (BP) is 110/60 mmHg, while his pulse is 60 beats per minute (bpm). His respiratory rate of 18 breaths per minute. His chest and cardiac examination is unremarkable. He undergoes urgent percutaneous-coronary intervention (PCI) with angioplasty and stenting of the right coronary artery (RCA).

After three hours his BP is recorded as 85/55 mmHg while his pulse is 88 bpm. He shows low-volume peripheral pulses, jugular venous distension, normal first and second heart sounds, and a pansystolic murmur best heard at the left sternal edge. The lung fields are clear to auscultation.

Which of the following is the most useful next investigation for this patient?

Your answer was incorrect

- A CT pulmonary angiogram
- B Ventilation/perfusion scan
- C Swan-Ganz catheterisation
- D Echocardiography
- E Repeat troponin

Explanation



- D Echocardiography

Inferior wall myocardial infarction (MI) is associated in one third of cases with right ventricular myocardial infarction (RVMI). RVMI leads to reduced right ventricle compliance and stroke volume, which in turn leads to reduced left ventricle filling and low cardiac output. VSD or acute mitral regurgitation may lead to a pansystolic murmur, and an echocardiogram will inform most quickly as to the underlying diagnosis. The murmur is most likely to be a function of tricuspid regurgitation secondary to a hypokinetic dilated right ventricle. The most likely diagnosis here is acute tricuspid regurgitation due to right ventricular dilatation.

C Swan-Ganz catheterisation

Swan-Ganz catheterisation may be useful in predicting requirements for fluid replacement and guiding any use of inotropes, although in the first instance an ECHO is more important to confirm the underlying diagnosis.

A CT pulmonary angiogram

Pulmonary embolism (PE) can also have similar physical findings: jugular venous distension, hypotension and clear lung fields. A PE might be seen in the setting of an acute MI, but would be more usual during the recovery period, particularly when patients take a few days to mobilise.

B Ventilation/perfusion scan

There is a very low probability of a PE occurring in the setting of an acute MI, and these symptoms are more likely to be due to a right ventricular infarct.

E Repeat troponin

Troponin is still likely to be rising as a result of the original MI, and won't inform on management here.

Patients typically present with hypotension, jugular venous distension and clear lung fields in the setting of an inferior or inferoposterior MI, as is the case in this patient. These findings can mimic cardiac tamponade. An echocardiography will be useful in excluding tamponade and will also aid in diagnosis by demonstrating right ventricular dysfunction and dilatation. It has an added advantage of assessing left ventricular ejection fraction.

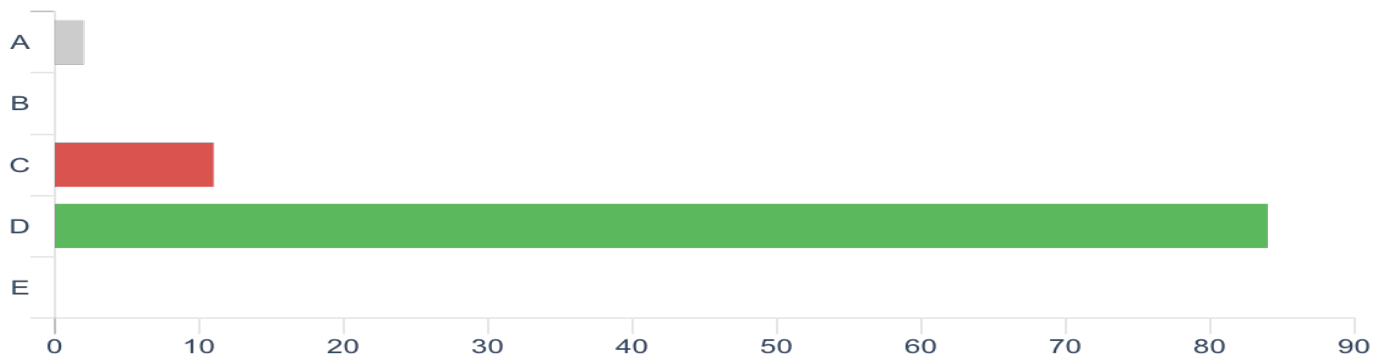
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Responses Total:	187
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Expanded Explanation

Overview

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Differential Diagnosis

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Links to NICE guidelines/CKS



Q188

A 68-year-old man presents to the Emergency Department (ED) with a history of retrosternal chest pain that started suddenly six hours ago, which radiated to his left arm and lasted for 30 minutes. About 20 min ago the pain started again. He was diagnosed with hypercholesterolaemia two years earlier, and is taking atorvastatin 40 mg/day.

On examination, his pulse is 52 beats per minute (bpm), while his blood pressure (BP) is 105/55 mmHg. His respiratory rate is 22 breaths per minute. There is no jugular venous distension (JVD), while his heart sounds are normal and his chest is clear to auscultation.

An electrocardiogram (ECG) reveals 1.5 mm ST segment depression in lateral leads. The patient is administered chewable aspirin 300 mg, sublingual nitroglycerine, morphine and fondaparinux. His troponin is significantly elevated.

Which additional medication should be administered to this patient?

Your answer was incorrect

- A Atenolol
- B Ticagrelor
- C Alteplase
- D Abciximab
- E Dobutamine

Explanation



- B Ticagrelor

This patient has non-ST segment elevation myocardial infarction (NSTEMI). Pharmacotherapy for NSTEMI includes antiplatelet therapy in the form of aspirin and Ticagrelor, fondaparinux and other agents such as beta-blockers, GTN and angiotensin-converting enzyme inhibitors. However, beta-blockade, nitrates and ACE inhibitors are contraindicated if there is significant hypotension.

- D Abciximab

Abciximab is a IIb/IIIa platelet inhibitor, and is usually considered in patients with a STEMI where PCI is planned.

A Atenolol

Although introducing atenolol is associated with positive CV outcomes post MI, in this situation with hypotension and relative bradycardia it may lead to significant cardiovascular instability.

C Alteplase

Thrombolysis isn't indicated in the treatment of NSTEMI; in STEMI, PCI is the preferred intervention.

E Dobutamine

Dobutamine is an inotrope. Inotropes are used with caution in the acute MI setting because of the risk that they may actually worsen myocardial ischaemia with only a limited effect on blood pressure.

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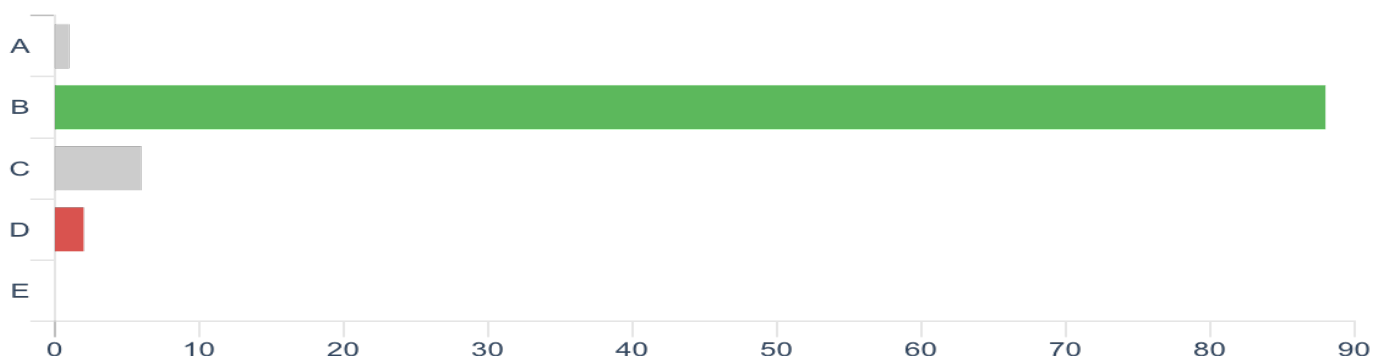
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Responses Incorrect:	151
Responses Total:	188
Responses - % Correct:	20%

 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q189

A 68-year-old man is admitted to the Emergency Department (ED) following an acute onset of substernal chest pain. An electrocardiogram (ECG) reveals acute inferior myocardial infarction (MI). He undergoes primary angioplasty and stenting to the right coronary artery and makes an uneventful recovery. He is discharged home on aspirin 75 mg per day, atenolol 50 mg per day, pravastatin 20 mg per day, enalapril 10 mg twice daily and clopidogrel 75 mg per day. He presents two weeks later again with substernal chest pain. The pain is sharp, radiates to the left trapezius ridge and left lower chest and increases with respiration.

On examination, his pulse is 75 beats per minute (bpm). His blood pressure (BP) is 110/60 mmHg, while his respiratory rate is 22 breaths per minute. His temperature is 38.5 °C. There is no jugular venous distension (JVD), his heart sounds are normal, and a friction rub is heard at the left anterior and posterior chest. A chest X-ray (CXR) reveals cardiomegaly, small left pleural effusion and few infiltrates at the left lower zone.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	13.8 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$15 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$187 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Erythrocyte sedimentation rate (ESR)	55 mm/hour	1–20 mm/hour
Troponin	< 0.05 ng/ml	< 0.1 ng/ml
Urea & other electrolytes (U&Es)	Normal	

Which one of the following is the most appropriate way to treat this patient?

Your answer was correct

- A IV antibiotics
- B Aspirin 650 mg QDS
- C Prednisolone 60 mg/day
- D S/c low-molecular weight (LMW) heparin

E Indometacin 100 mg BD

Explanation



B Aspirin 650 mg QDS

This patient's clinical presentation is suggestive of Dressler syndrome, which usually occurs 1-8 weeks after myocardial infarction. Patients present with malaise, fever, pericardial pain, elevated ESR and sometimes may also have pleuritis and pneumonitis. It has been postulated that the syndrome results from release of cardiac antigens which then stimulate antibody production. The immune complexes are then deposited in the pericardium, pleura and lung. There may be accompanying pleural and pericardial effusion and therefore echocardiography should be done.

A IV antibiotics

This patient has inflammatory rather than infective pericarditis, and thus antibiotics have no role in its management.

C Prednisolone 60 mg/day

Corticosteroids are not recommended in the treatment of Dressler syndrome because of the risk that they may delay myocardial healing.

D S/c low-molecular weight (LMW) heparin

The friction rub on auscultation is more consistent with pericarditis versus a pulmonary embolus, and thus LMW heparin is not required.

E Indometacin 100 mg BD

Other NSAIDs such as indomethacin may be utilised in the event that aspirin isn't tolerated.

32300

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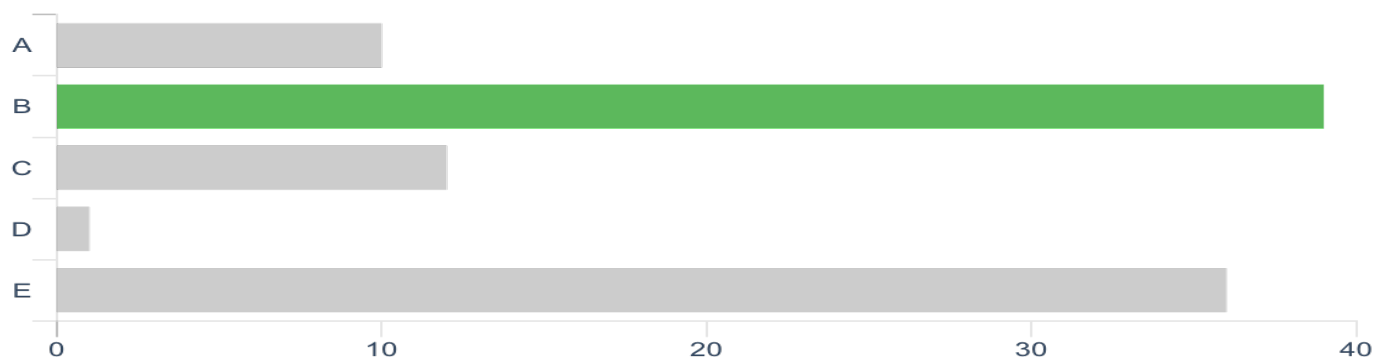
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q190

A 28-year-old man presents to the Emergency Department (ED) with a two day history of high-grade fever. He has no other symptoms. He has had insulin-dependent diabetes mellitus for the last 10 years which is well controlled on twice daily intermediate-acting insulin.

On examination, he is a sick-looking young male with a temperature of 39.5 °C. His blood pressure (BP) is 150/70 mmHg, while his pulse is 98 beats per minute (bpm). His respiratory rate is 22 breaths per minute. Examination of the skin, chest, abdomen, cardiovascular and central nervous system (CNS) is non-contributory.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	13.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$14 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$452 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na ⁺)	132 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.1 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	100 µmol/l	50-120 µmol/l
Chloride (Cl ⁻)	92 mmol/l	98-106 mmol/l
Bicarbonate (HCO ₃ ²⁻)	26 mmol/l	24-30 mmol/l
Urine dipstick	Normal	
Urine dipstick	Normal	
Electrocardiogram (ECG)	Normal	
Chest X-ray (CXR)	Normal	
Blood culture	Preliminary report shows Gram-positive cocci in clusters in both aerobic and anaerobic bottles	

Which of the following is the investigation most likely to confirm the diagnosis in this patient?

Your answer was incorrect

- A Upper GI endoscopy
- B Lumbar puncture
- C Abdominal ultrasound scan
- D CT abdomen
- E Trans-oesophageal echocardiogram (TOE)

Explanation



- E Trans-oesophageal echocardiogram (TOE)

This patient has community-acquired staphylococcal bacteraemia. Up to 20% of these patients may have infective endocarditis without any clinical stigmata of infective endocarditis. TOE is more sensitive than transthoracic (TTE), is widely available and is the investigation of choice versus TTE in those patients who are able to tolerate the procedure. The antimicrobial therapy of choice is IV flucloxacillin coupled with IV gentamicin, unless the isolate is found to be methicillin resistant.

- D CT abdomen

CT abdomen is most useful in identifying an intra-abdominal abscess, active diverticular disease or other conditions such as ischaemic bowel as causes of this patient's acute presentation, none of which are suspected here.

- A Upper GI endoscopy

Streptococcus gallolyticus is a cause of endocarditis in patients with underlying colon cancer or infection of the biliary tree. If either of these is suspected then ERCP or colonoscopy is a potentially more appropriate investigation. In the absence of any GI symptoms it wouldn't be suspected as the underlying cause of his presentation.

- B Lumbar puncture

The lack of headache or symptoms of meningism counts against CNS infection as the cause of this patient's symptoms.

- C Abdominal ultrasound scan

Abdominal ultrasound scan is a relatively insensitive method to confirm a source for any infection, given there are no symptoms of biliary tract or urinary infection.

32301

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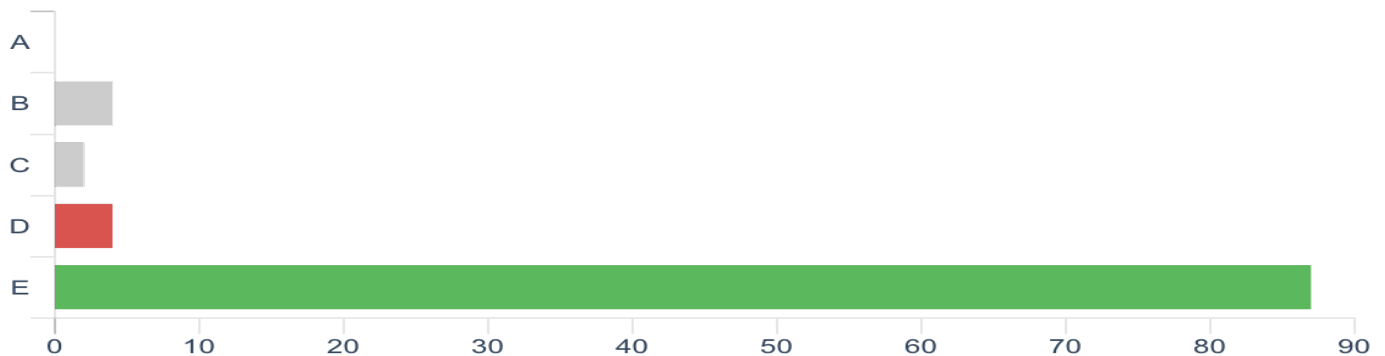
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis**

Diagnosis / Investigation

Management

Prognosis



Q191

A 68-year-old man is admitted to the Emergency Department (ED) demonstrating progressively severe shortness of breath of two days duration. He is known to have ischaemic cardiomyopathy and an ejection fraction of 30%.

On examination on arrival, his respiratory rate is 35 breaths per minute; his oxygen saturation by pulse oximetry is 81%, while a chest X-ray (CXR) shows bilateral pulmonary infiltrates and cardiomegaly. He is intubated, mechanically ventilated and started on a intravenous (IV) infusion of furosemide 6 mg per hour and nitroglycerine 25 µg per minute. Over the next three days he achieves a negative fluid balance of 3.2 litres and a CXR shows a decrease in pulmonary infiltrates. His serial cardiac enzymes are normal except for slightly elevated troponin T.

However, the next day when extubation is planned he becomes hypotensive. His blood pressure (BP) is 80/50 mmHg and the infiltrates on CXR worsen. You note that his bloods that morning have revealed a c-reactive protein (CRP) of 189 mg/l, and neutrophils are above the upper limit or normal.

A Swan-Ganz catheterisation is performed and reveals the following:

Investigation	Result
Pulmonary capillary wedge pressure (PCWP)	8 mmHg
Cardiac output	5 l/min
Cardiac index	3 l/min/m ²
Systemic vascular resistance (SVR)	650 dynes s/cm ⁻⁵ (700-1100)

Furosemide and nitrates are stopped but blood pressure fails to improve.

Which of the following is the most appropriate next step in the management of this patient?

Your answer was incorrect

- A Haemodialysis
- B Normal saline 500 ml IV bolus
- C IV Dobutamine infusion
- D IV Dopamine infusion

E Left ventricular assist device (LVAD)

Explanation



B Normal saline 500 ml IV bolus

The haemodynamic parameters in this patient - low systemic vascular resistance and normal cardiac index and cardiac output - are suggestive of septic shock. This is probably secondary to ventilator-associated pneumonia. It occurs 48-72 h after admission, and worsening pulmonary infiltrates despite negative fluid balance are suggestive of chest infection. Appropriate management is fluid resuscitation to achieve optimal left heart filling pressure, and IV antibiotics.

C IV Dobutamine infusion

Inotropes are generally avoided if possible in patients with ischaemic cardiomyopathy because of the risk of worsening LV function as a result of negatively impacting on ischaemia.

A Haemodialysis

Haemodialysis would be considered in the event that renal function deteriorated despite optimal fluid management and IV antibiotic therapy.

D IV Dopamine infusion

Renal-dose dopamine was commonly used to manage acute renal impairment associated with sepsis, although controlled trials suggest it has limited efficacy. In this situation fluid replacement and IV antibiotics are more appropriate first steps.

E Left ventricular assist device (LVAD)

An LVAD might be considered once fluid replacement and IV antibiotic therapy have been optimised, in the event that blood pressure and urine output are both suboptimal.

32302

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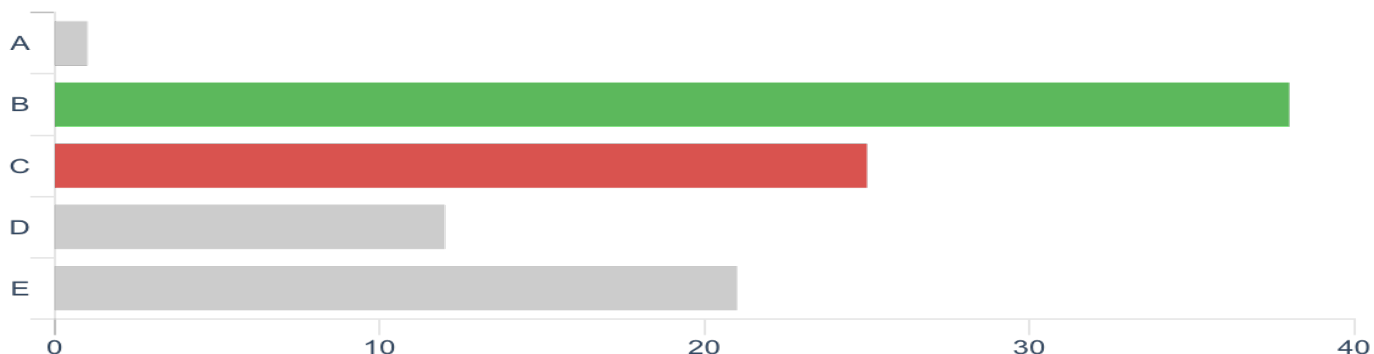
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Responses Correct:	38
Responses Incorrect:	153
Responses Total:	191
Responses - % Correct:	20%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q192

A 38-year-old man arrives at the Emergency Department (ED) reporting that he had been feeling unwell for one week with rhinorrhoea, dry cough, generalised myalgia, and a low-grade fever.

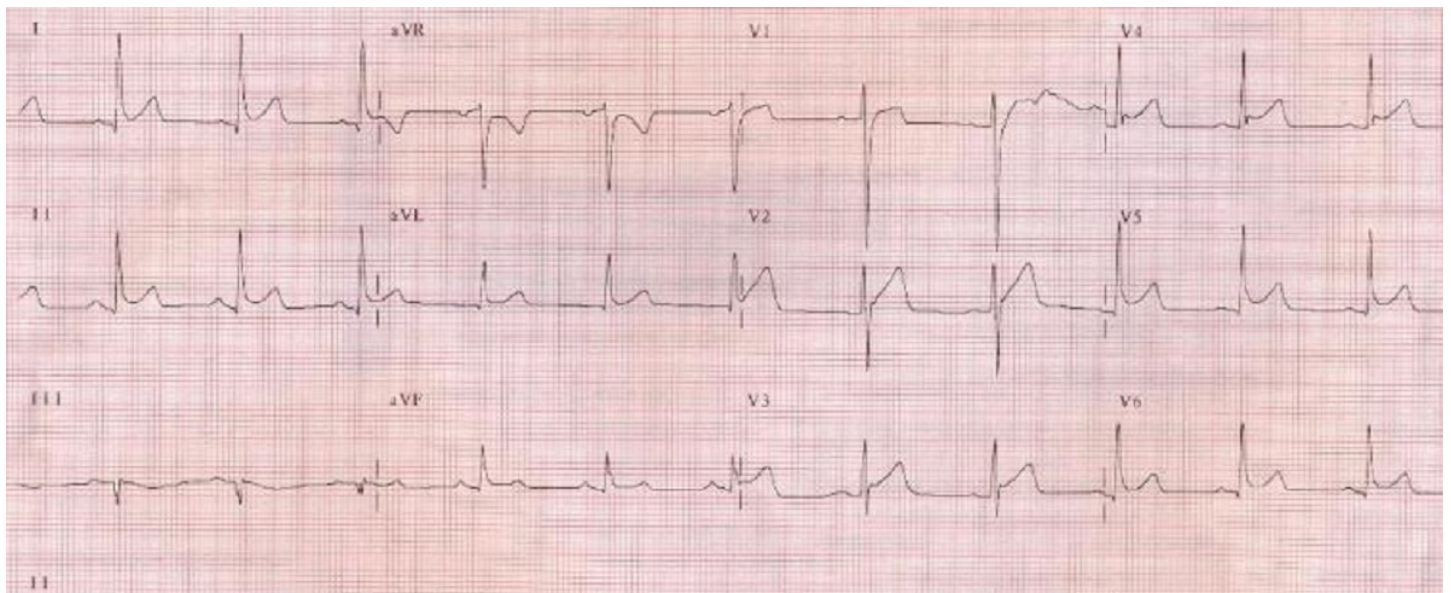
For the past 8 hours he has experienced substernal chest pain that is sharp and increases with respiration, and is slightly relieved when he leans forward. There is no radiation, sweating, palpitations or shortness of breath. He has no past medical history of note.

On examination, he is a well-built young male who is not in any distress. His pulse is 68 beats per minute (bpm), while his blood pressure (BP) is 144/84 mmHg and his respiratory rate 14 breaths per minute. There is a pericardial friction rub best heard at the left sternal edge. The rest of the examination is unremarkable.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	16.0 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$7.8 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$550 \times 10^9/l$	$150-400 \times 10^9/l$
Erythrocyte sedimentation rate (ESR)	32 mm/hour	1-20 mm/hour

An electrocardiogram (ECG) that is performed is shown below:



Which one of the following ECG features is most helpful in establishing the diagnosis of acute pericarditis?

Your answer was incorrect

- A T wave inversion in aVR
- B Normal QRS axis
- C PR segment depression in lead II and elevation in aVR
- D Early transition of R waves in chest leads
- E RS pattern in lead V1

Explanation



- C PR segment depression in lead II and elevation in aVR

The clinical features and electrocardiogram (ECG) in this patient are consistent with a diagnosis of acute pericarditis. The electrocardiographic differential diagnosis of acute pericarditis is myocardial infarction and early repolarisation abnormality. It can be differentiated from myocardial infarction by concavity of ST segment elevation and localisation of ST segment elevation to infarct-related artery and, given his age and prodromal symptoms, pericarditis is the more likely cause. However, these two ECG features do not differentiate acute pericarditis and early repolarisation abnormality. The two most helpful differentiating features are PR segment depression, which is usually best seen in lead II and V6, and PR segment elevation in aVR. This results from injury current that is directed towards aVR. An ST/T ratio greater 0.25 or a T-wave amplitude of less than or equal to 3 mm also has high positive and negative predictive value in diagnosis of acute pericarditis.

- D Early transition of R waves in chest leads

Early transition of R waves may be seen in some normal individuals, and hence it isn't a useful marker of pericarditis.

- A T wave inversion in aVR

The T wave is normally inverted in aVR in adults, and hence it isn't a useful differentiator towards pericarditis.

- B Normal QRS axis

Although constrictive pericarditis is associated with right axis deviation, a normal QRS axis doesn't rule pericarditis in or out.

E RS pattern in lead V1

An RSR pattern in lead V1 is indicative of right bundle branch block, which may or may not be associated with acute pericarditis.

32304

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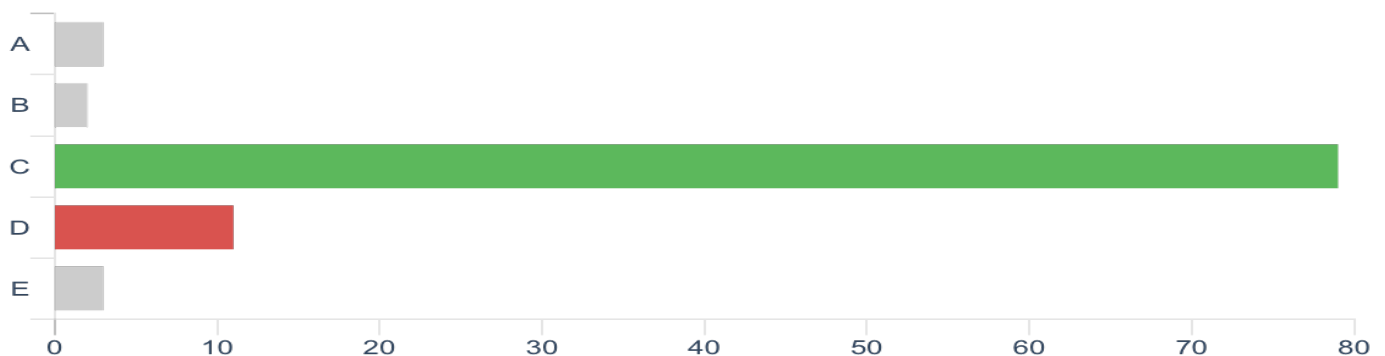
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Responses Total:	192
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Q193

A 26-year-old man is admitted to the Emergency Department (ED) with acute cardiac failure. He has been previously fit and well - his past medical history is unremarkable. He presented with three-day history of central chest pain, fever and shortness of breath. Initially he had generalised muscle pains; he then developed chest pain and a cough productive of yellowish sputum. The chest pain radiated to his back and the shortness of breath was progressive. When he presented, he could not complete a sentence in one breath because of breathlessness.

On examination, he is dyspnoeic, febrile and sweaty, with a pulse > 100 beats per minute (bpm). His respiratory rate is 32 breaths per minute, while his blood pressure (BP) is 81/43 mmHg. His jugular venous pressure (JVP) is slightly raised at 4 cm. First, second and a third heart sounds were heard producing a gallop rhythm. Respiratory examination revealed widespread crackles and scattered rhonchi bilaterally.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	15.8 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$18 \times 10^9/l$ (lymphocytosis)	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$210 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	136 mmol/l	135-145 mmol/l
Potassium (K^+)	4.1 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	131 μ mol/l	50-120 μ mol/l
Bicarbonate (HCO_3^{2-})	23.4 mmol/l	24-30 mmol/l
Mean corpuscular volume (MCV)	88.6 fl	80-100 fl
Urea	9.7 mmol/l	2.5-6.5 mmol/l
Magnesium (Mg^{2+})	0.81 mmol/l	0.75 -1.00 mmol/l
Troponin T	12.4 units	< 0.01 units
Electrocardiogram (ECG)	Sinus rhythm with a right bundle branch block at a rate of 123/min	
Chest X-ray (CXR)	Enlarged globular heart with evidence of pulmonary oedema	
	A small pericardial effusion with a	

Echocardiogram (ECHO)	normal left ventricular size but very poor global left ventricular function; the ejection fraction was 25%	
Pulmonary capillary wedge pressure (PCWP)	21 mmHg	

Blood gases on 100% oxygen reveal the following:

Investigation	Result	Normal values
pH	7.5	7.35–7.45
pO ₂	15.10 kPa	10.5–13.5 kPa
pCO ₂	3.43 kPa	4.6–6.0 kPa

He is given diamorphine, pain relief, and catheterised.

Which of the following interventions would you immediately commence in addition in this patient?

Your answer was incorrect

- A Intravenous gelofusin
- B Inotropic support
- C DC cardioversion
- D Thrombolysis
- E Potassium and magnesium replacement

Explanation



- B Inotropic support

This patient, with a likely diagnosis of acute viral myocarditis, is in cardiogenic shock. In this case with a PCWP >15 mmHg, inotropic support is the most appropriate next step. If PCWP <15 mmHg, then cautious intravenous (IV) fluids (colloids) should be given in 100–200 ml. A small amount of diamorphine is beneficial as it vasodilates and reduces anxiety. Early cardiology consultation is advised. Left ventricular assist devices are also recognised to improve outcomes in this situation.

C DC cardioversion

This patient is tachycardic due to her cardiac failure rather than to a rhythm disturbance requiring cardioversion.

A Intravenous gelofusin

This patient's PCWP is already above 15 mmhg, and hence further fluid loading is not appropriate.

D Thrombolysis

Although this patient is in hypotensive cardiac failure, there is no indication that this is ischaemic in origin and hence thrombolysis isn't required.

E Potassium and magnesium replacement

Both magnesium and potassium are within the normal range, and hence replacement is not required in this situation.

32305

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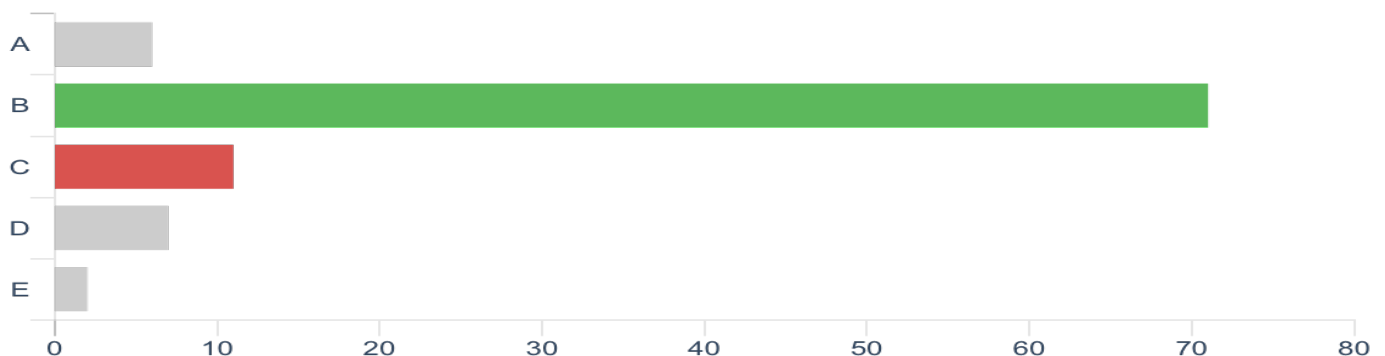
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q194

A 71-year-old woman is admitted to the Emergency Department (ED) with severe central chest pain. The chest pain has been there for 40 minutes and is also felt in the arms and jaw. There is associated shortness in breath. Her past medical history includes hypertension, osteoarthritis, and diet-controlled diabetes mellitus. She is on the following medications: bendrofluazide 2.5 mg once a day, amlodipine 10 mg once a day and paracetamol 500 mg. She occasionally drinks alcohol and has smoked since she was 16 years of age (about 10 cigarettes/day).

On examination, she is distressed, with a blood pressure (BP) of 90/45 mmHg. Her pulse is 38 beats per minute (bpm) and regular. Her jugular venous pressure (JVP) is raised to 7 cm with intermittent cannon waves. Her heart sounds are heard with a variable first heart sound. Her respiratory rate is 26 breaths per minute and her chest is clinically clear.

Blood gases on 60% oxygen reveal the following:

Investigation	Result	Normal value
pH	7.45	7.35–7.45
pO ₂	15.10 kPa	10.5–13.5 kPa
pCO ₂	3.77 kPa	4.6–6.0 kPa

Investigations reveal the following:

Investigation	Result	Normal value
Bicarbonate (HCO ₃ ²⁻)	22.4 mmol/l	24–30 mmol/l
Haemoglobin (Hb)	15.8 g/dl	11.5–15.5 g/dl
Mean corpuscular volume (MCV)	88.6 fl	80–100 fl
Platelets (PLT)	250 × 10 ⁹ /l	150–400 × 10 ⁹ /l
White cell count (WCC)	13.1 × 10 ⁹ /l	4.0–11.0 × 10 ⁹ /l
Sodium (Na ⁺)	136 mmol/l	135–145 mmol/l
Potassium (K ⁺)	4.1 mmol/l	3.5–5.0 mmol/l
Urea	7.7 mmol/l	2.5–6.5 mmol/l
Creatinine (Cr)	121 µmol/l	50–120 µmol/l
Magnesium (Mg ²⁺)	0.81 mmol/l	0.75 –1.00 mmol/l
Electrocardiogram	More than 2 mm of ST elevation in	

(ECG)	II, III, aVF and ST depression in V1-V3, complete heart block	
Chest X-ray (CXR)	Normal	

You instigate a fluid bolus.

Which of the following other treatments would you plan for next?

Your answer was incorrect

- A Nitrate infusion
- B Thrombolysis
- C PCI
- D Transvenous Pacing
- E IV furosemide

Explanation



- C PCI

This patient has right ventricular infarction and complete heart block. Right ventricular (RV) infarction results in elevated right-sided pressures and low left-sided pressures. Nitrates and diuretics should be avoided as they reduce preload and can worsen hypotension. The aim is to maintain a high right ventricular preload by an initial fluid bolus. This patient has complete heart block, although this should resolve once revascularisation is achieved via PCI. If not, then temporary venous pacing would be a logical addition to therapy.

- B Thrombolysis

PCI has superior outcomes to thrombolysis in this situation and is therefore the preferred option.

- A Nitrate infusion

Nitrate infusion can further reduce preload and drive significant hypotension, and thus it should be avoided here.

D Transvenous Pacing

Heart block often resolves in right ventricular infarction after the acute ischaemia is relieved, and hence pacing may not be required.

E IV furosemide

In this situation diuretics may reduce right ventricular filling pressure and further exacerbate hypotension.

32306

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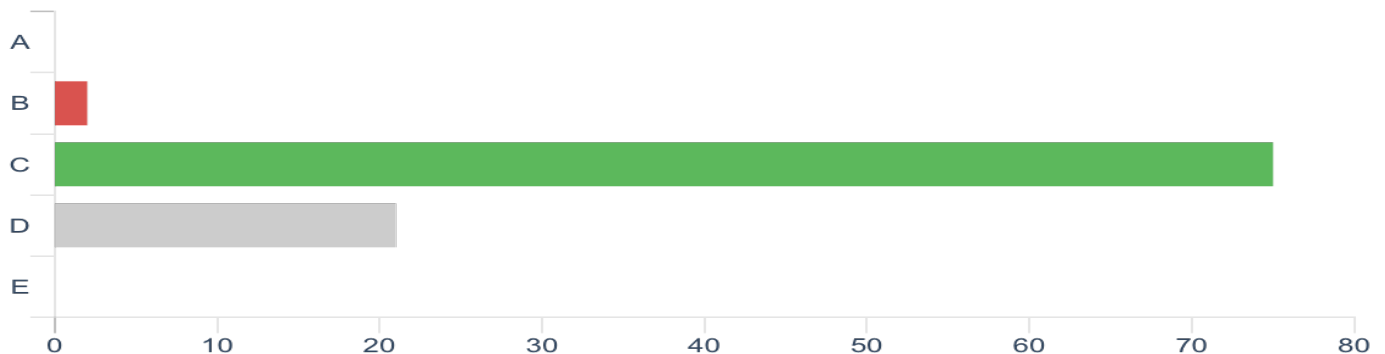
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Q195

A 69-year-old man is admitted to the Emergency Department (ED) with a sudden onset of palpitations. The palpitations started three hours ago, and are associated with shortness of breath, light-headedness and chest discomfort. He has had two similar episodes of palpitations in the last two months that have lasted only a few seconds. He had never sought any medical advice on these previous palpitations. His past medical history is unremarkable and he is not on any medication.

On examination, he is dyspnoeic, with a blood pressure (BP) of 112/64 mmHg. His pulse is > 180 beats per minute (bpm), while his respiratory rate is 28 breaths per minute. His oxygen saturation on air is 90%, and his chest is clinically clear. His jugular venous pressure (JVP) is not raised. First and second heart sounds are heard but you cannot appreciate whether there is any murmur.

An electrocardiogram (ECG) shows a heart rate of 188 bpm with a narrow QRS complex. A chest X-ray (CXR) is normal.

The patient is placed on a monitor and given rapid intravenous (IV) 6 mg of adenosine, but his heart rate only slows down to 176 bpm. The patient is then given 12 mg of adenosine and his heart rate slows to 110 bpm to reveal the underlying atrial fibrillation (AF). He is also given oxygen and low-molecular weight heparin (LMWH).

An electrocardiogram (ECG) shows a heart rate of 110 bpm and AF.

Which of the following interventions would you immediately start for this patient?

Your answer was incorrect

- A DC cardioversion
- B Loading dose of IV 0.75–1 mg digoxin in 50 ml saline over 1–2 h
- C Glycoprotein IIb/IIIa inhibitor
- D IV amiodarone
- E Angiotensin-converting enzyme (ACE) inhibitor

Explanation



- D IV amiodarone

This patient has atrial fibrillation, which given the history is probably of relatively acute onset. The immediate need would be to try and manage chemical cardioversion, in which case IV amiodarone is an obvious choice. Digoxin would not encourage reversion to sinus rhythm so would not be the first choice here. The likely outcome is the patient reverting back to sinus rhythm within hours. If the patient does not revert back to sinus rhythm, formal anticoagulation would need to be instituted. He would also need to be investigated for the cause of the atrial fibrillation. Electrical cardioversion may be an option acutely if he becomes significantly compromised with respect to his BP, or considered at a later date as an elective procedure post oral anticoagulation.

E Angiotensin-converting enzyme (ACE) inhibitor

ACE inhibition may precipitate worsening hypertension and won't impact on this patient's ventricular rate.

A DC cardioversion

This patient has a well-maintained blood pressure; chemical cardioversion is therefore the preferred option.

B Loading dose of IV 0.75–1 mg digoxin in 50 ml saline over 1–2 h

In this situation with a relatively short duration of AF, it is reasonable to try and attain sinus rhythm with amiodarone.

C Glycoprotein IIb/IIIa inhibitor

Platelet inhibition isn't the most important next step, control of the patient's atrial fibrillation is. In the event there is a strong suspicion of ACS, then the first-line interventions are high-dose aspirin, clopidogrel and fondaparinux.

32307

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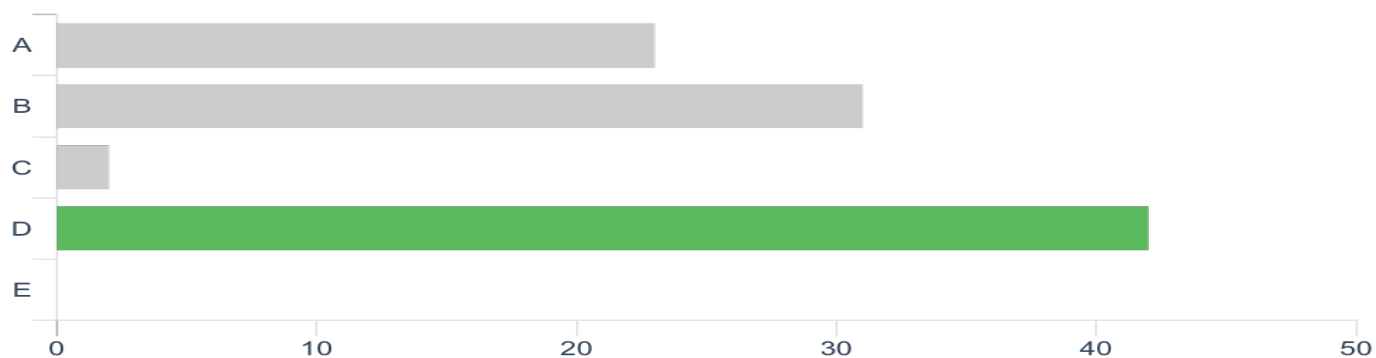
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 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q196

A 69-year-old man presents to the Emergency Department (ED) of a District General Hospital (DGH) with central chest pain. The hospital does not have an on-site acute angiography service. The pains started when he was walking uphill from the park to his house. The pains were very severe and radiated to his neck, jaw and left arm. The severe pains lasted for about an hour and this was five hours ago. He had never experienced such severe pains before and thought he was going to die. He still has some dull chest pains but these are not very severe. He felt nauseated but did not vomit. In the past, he has occasionally had some chest tightness, which came on with strenuous exertion, and he had managed very well by avoiding activities that brought the pain on. He is not on any medication.

On examination, he is alert and distressed. His blood pressure (BP) is 110/84 mmHg and his pulse is 76 bpm and regular. His first and second heart sounds are heard and there are no murmurs. His chest is clinically clear.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	16.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$13.2 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$256 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	136 mmol/l	135-145 mmol/l
Potassium (K^+)	4.2 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	176 μ mol/l	50-120 μ mol/l
Mean corpuscular volume (MCV)	82 fl	80-100 fl
Urea	7.4 mmol/l	2.5-6.5 mmol/l
Troponin T	Awaited	
Electrocardiogram (ECG)	Normal sinus rhythm, inferior ST depression	
Chest X-ray (CXR)	Unremarkable	
O ₂ saturation	96% on air	

You give him diamorphine, fondaparinux and aspirin.

Which one of the following additional medications would you immediately start this patient on?

Your answer was incorrect

- A TPA
- B Tirofiban
- C Atorvastatin
- D Bisoprolol
- E Ticagrelor

Explanation



- E Ticagrelor

This gentleman has chest pain which is suspicious for ischaemic cardiac pain, but his ECG only shows inferior ST depression. The nature of his pain and ECG changes mean that it is prudent to manage him with fondaparinux, aspirin and ticagrelor until a troponin level is obtained. The upper limit of normal for troponin has recently been lowered, and with the success of angioplasty and aggressive preventative pharmacotherapy, the threshold for intervention in coronary disease has generally been lowered over the past few years. Of course if his cholesterol is elevated, statin therapy is highly likely to be instigated.

- B Tirofiban

Tirofiban is a IIb/IIIa platelet inhibitor and is indicated for use in NSTEMI, although use of IIb/IIIa inhibitors has largely been superseded by high-dose P2Y₁₂ inhibitors such as ticagrelor in combination with aspirin.

- A TPA

TPA isn't indicated as there is no evidence yet of a STEMI; in any case, PCS is preferred to thrombolysis for the treatment of STEMI.

- C Atorvastatin

Of course statins are indicated in this patient population, although the most important intervention early in treatment is the move to dual anti-platelet therapy.

- D Bisoprolol

Beta blockade is useful in reducing myocardial oxygen demand and does impact on CV outcomes in this population, although immediate initiation of therapy isn't essential.

32309

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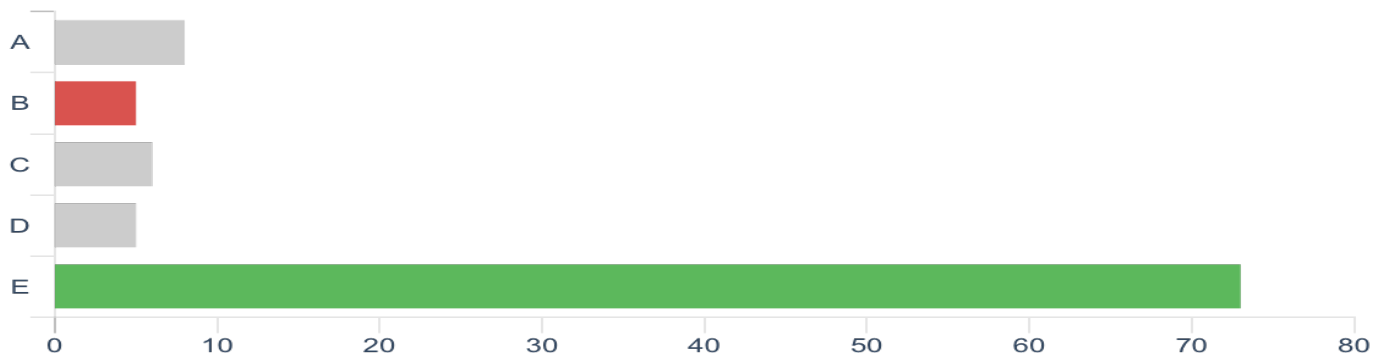
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis

Links to NICE guidelines/CKS



Q197

A 69-year-old man presents to the Emergency Department (ED) with central chest pain. The pains started when he was walking uphill from the park to his house. The pains were very severe and radiated to his neck, jaw and left arm. The severe pains lasted for about an hour and this was 12 hours ago. He had never experienced such severe pains before and thought he was going to die. He still has some residual dull chest ache. He felt nauseated but did not vomit. In the past, he has occasionally had some chest tightness that came on with strenuous exertion and he had managed very well by avoiding activities that brought the pain on. He is not on any medication.

On examination, he is alert but distressed. His blood pressure (BP) is 106/60 mmHg, while his pulse is 51 beats per minute (bpm) and regular. First and second heart sounds are heard and there are no murmurs. His chest is clinically clear.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	16.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$13.2 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$256 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	136 mmol/l	135-145 mmol/l
Potassium (K^+)	4.2 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	132 μ mol/l	50-120 μ mol/l
Mean corpuscular volume (MCV)	82 fl	80-100 fl
Urea	7.4 mmol/l	2.5-6.5 mmol/l
Hs-troponin	2 x upper limit of normal	
Electrocardiogram (ECG)	Normal sinus rhythm with ST depression of 1 mm in leads II, III and aVF	
Chest X-ray (CXR)	Unremarkable	
O ₂ saturation	95% on air	

Which of the following is the most appropriate treatment?

Your answer was correct



- A Beta blockade and early outpatient angiography
- B Clopidogrel, aspirin, low molecular weight heparin and inpatient stress-test
- C Ticagrelor, aspirin, heparin and Inpatient angiography
- D Beta blockade and oral nitrate
- E Aspirin, low-molecular weight heparin and tirofiban

Explanation



- C Ticagrelor, aspirin, heparin and Inpatient angiography

This gentleman is high risk; his symptoms, ECG changes and investigations are consistent with an NSTEMI. In this case he may well be considered for inpatient angiography. Ticagrelor and aspirin are now the treatments of choice in conjunction with fondaparinux.

- A Beta blockade and early outpatient angiography

This patient is at very high risk of a STEMI, and thus beta blockade alone and outpatient angiography is inappropriate.

- B Clopidogrel, aspirin, low molecular weight heparin and inpatient stress-test

Stress testing is discouraged according to NICE guidance, as it may either precipitate ischaemia or generate a false-negative result.

- D Beta blockade and oral nitrate

Although beta blockade will have positive effects on reducing myocardial oxygen demand, the risk of STEMI in the short term will remain significant.

- E Aspirin, low-molecular weight heparin and tirofiban

The use of IIbIIIa inhibitors has been largely superseded by ticagrelor and aspirin in conjunction with fondaparinux.

32311

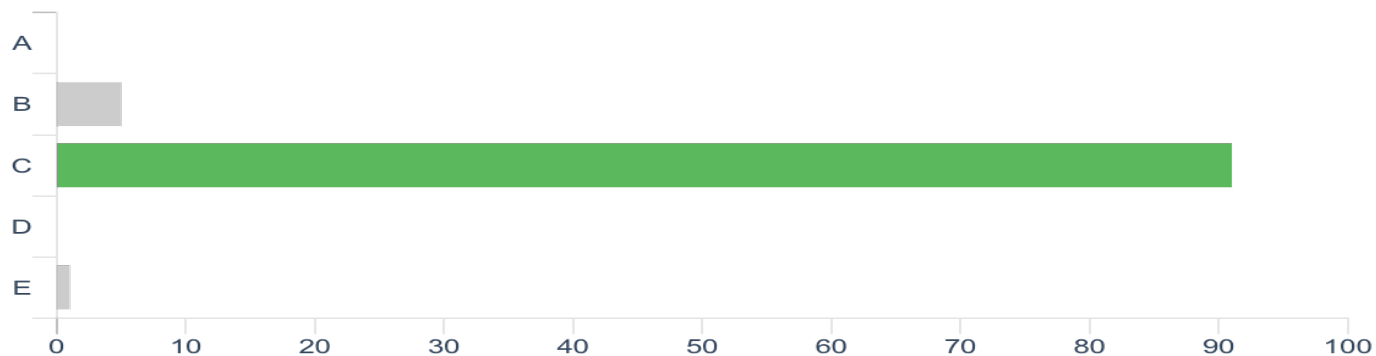
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NICE. Unstable angina and NSTEMI[nice.org.uk/guidance/CG94](https://www.nice.org.uk/guidance/CG94)[\(https://www.nice.org.uk/guidance/CG94\)](https://www.nice.org.uk/guidance/CG94)

Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis**

Diagnosis / Investigation

Management

Prognosis

Links to NICE guidelines/CKS



Q198

A 26-year-old woman comes to the Cardiology Clinic having been referred by her General Practitioner (GP). She has suffered from progressive shortness of breath for eight months. She is really worried now because even minimal exertion is making her breathless. She has no palpitations, cough or chest pains. Her past medical history is unremarkable and she takes no medication. She has been seeing her GP over the last two to three months but he could not detect any abnormality. Her full blood count (FBC), urea and electrolytes (U&Es), liver function tests (LFTs) and chest X-ray (CXR) were all reported as normal.

On examination, her blood pressure (BP) is 125/60 mmHg. Her pulse is 86 beats per minute (bpm) and regular. Her jugular venous pressure (JVP) is raised to 5 cm, there is a parasternal heave and apex beat is in the 5th intercostals space at the mid-clavicular line. She has an increased pulmonary component of second heart sound and tricuspid regurgitation. FBC, LFTs and blood biochemistry are within the normal range.

A CXR shows enlarged central pulmonary arteries and clear lung fields. An electrocardiogram (ECG) shows right axis deviation, tall R waves in V1-V2 and right ventricular strain pattern.

An echocardiogram (ECHO) demonstrates tricuspid regurgitation, right ventricular enlargement, a reduction in left ventricular cavity size and abnormal septal configuration consistent with right ventricular pressure overload.

There is a positive response to acute vasodilator testing.

Which one of the following medications is appropriate first-line therapy in the treatment of this condition?

Your answer was incorrect

- A Calcium channel blockers
- B Beta-blockers
- C Hydralazine
- D Prostacyclin
- E Angiotensin-converting enzyme (ACE) inhibitors

Explanation



A Calcium channel blockers

The above young lady presents with the classical signs and symptoms of primary pulmonary hypertension (PPH). Obesity, portal hypertension, anorexigens, HIV and systemic hypertension have all been implicated in the development of PPH. Whilst only 10-15% of patients appear to have a pulmonary vascular tree responsive to calcium antagonism, these agents still constitute the initial therapy of choice according to guidelines, but only in those patients who show a response to vasodilator testing. Options for later-stage disease include endothelin receptor antagonists (which may be associated with peripheral oedema and hepatotoxicity); PDE-5 inhibitors such as sildenafil; and prostacyclin, which has been shown when given in infusion to impact on both quality of life and survival time.

B Beta-blockers

Beta blockade has no impact on outcomes in primary pulmonary hypertension, and it should therefore be avoided here.

C Hydralazine

Hydralazine is an option for treating patients with left ventricular dysfunction where ACE inhibitors are neither tolerated nor contraindicated.

D Prostacyclin

Prostacyclin is an option for later-stage primary pulmonary hypertension and can be used in combination with endothelin receptor antagonists and PDE-5 inhibitors.

E Angiotensin-converting enzyme (ACE) inhibitors

ACE inhibitors have a primary role in the treatment of left ventricular dysfunction.

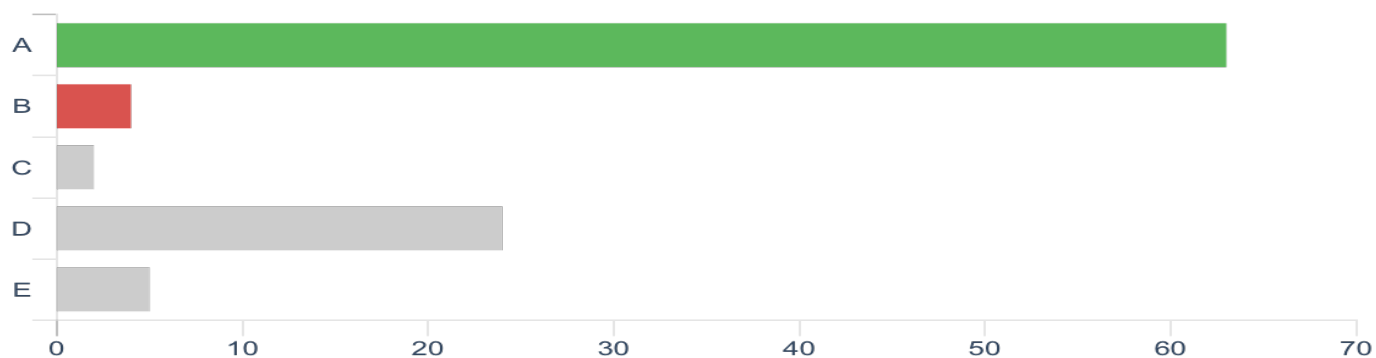
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Q199

A 21-year-old man attends his General Practitioner (GP) complaining that he feels unwell. His symptoms began within the past two to three weeks, and include tiredness and fatigue, fever, loss of appetite and weight loss, and general aches and pains over his body. He had delayed coming to see his GP since he thought it was a flu-like illness but his symptoms have been getting worse. He is otherwise medically fit and is not on any medication. He denies being a smoker and does not drink but does not give a forthright answer to a question about recreational drug use. The GP examines the patient thoroughly and notes a temperature of 38 °C, tachycardia and the presence of a previously unrecorded cardiac murmur. A diagnosis of endocarditis is suspected and the GP immediately sets about obtaining the first set of blood cultures.

Which one of the following clinical features/investigations would most add credence to the suspected diagnosis?

Your answer was incorrect

- A Recent dental extraction
- B Normal ESR
- C Microscopic haematuria
- D Subconjunctival haemorrhages
- E Palmar erythema

Explanation



- C Microscopic haematuria

Most patients with endocarditis have evidence of vasculitis, strongly associated with microscopic haematuria. Other vasculitic features include splinter haemorrhages, Osler's nodes (finger/toe pulp infarcts) and Janeway lesions (palmar/plantar macules). Patients may also be clubbed.

- D Subconjunctival haemorrhages

Subconjunctival haemorrhages may occur for a number of reasons, including severe coughing, head injury and uncontrolled hypertension.

A Recent dental extraction

Dental extraction is common, and the vast majority of procedures are carried out with no sequelae. Risk of infection after dental extraction is increased in patients with a history of valvular disease.

B Normal ESR

Marked elevation in ESR is the norm for patients with bacterial endocarditis.

E Palmar erythema

Palmar erythema is associated with liver failure rather than with bacterial endocarditis.

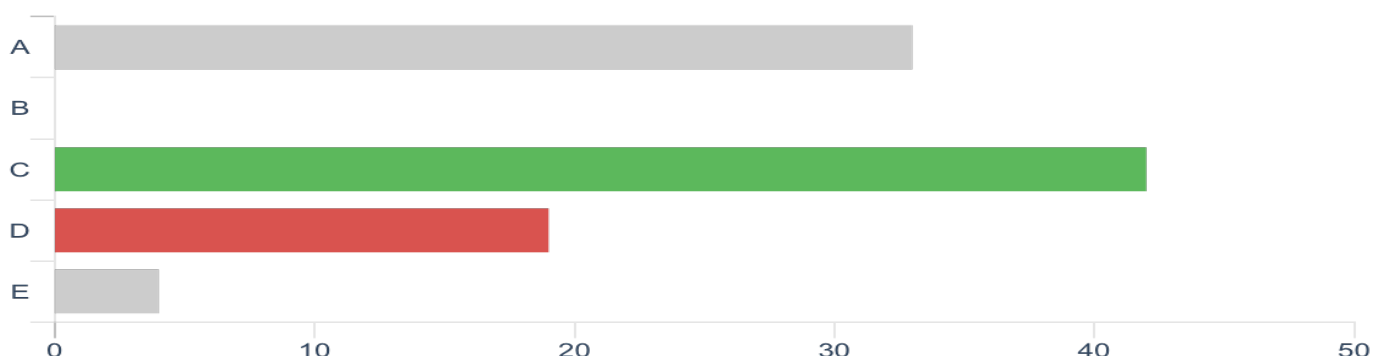
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Responses Correct:	39
Responses Incorrect:	160
Responses Total:	199
Responses - % Correct:	20%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q200

You are a Cardiology Senior House Officer (SHO) in the Outpatient Department. A 66-year-old woman comes for her annual review. She had a mechanical valve replacement four years ago for severe aortic stenosis (AS). She has been well until three weeks ago. Her present complaint is that of weight loss, poor appetite and breathlessness. She reports that the symptoms started after she attended a general surgical appointment for rectal bleeding.

On examination, she is thin with conjunctival pallor. There is evidence of splinter haemorrhages on both hands. A metallic valve click is not audible at the bedside and on auscultation of the heart sounds, a normal first sound is heard with a soft metallic second sound. There is an ejection systolic murmur at the second right intercostal space and right sternal edge. There is also an early diastolic murmur at the lower left sternal edge accentuated by forced expiration.

You arrange urgent admission for this lady with a diagnosis of infective endocarditis on the metallic valve prosthesis. A trans-oesophageal echocardiogram is awaited.

Which of the following investigations is most important in guiding further management of the infective endocarditis?

Your answer was incorrect

- A Urinalysis
- B Blood cultures
- C 12-lead ECG
- D Urgent abdominal ultrasound
- E Urgent colonoscopy

Explanation



- B Blood cultures

This lady is unwell with prosthetic valve endocarditis, as evident by the examination findings mentioned in the question stem. While all the above tests are reasonable, the question is for the investigation most important in guiding further management.

Blood cultures is the correct answer because these will enable antibiotic therapy to be targeted within 48 h of starting treatment. Because bacteraemia may be periodic, blood cultures should be taken from separate sites, ideally 1 h apart if possible.

C 12-lead ECG

First-degree heart block, if new, might suggest aortic root abscess with AV nodal injury. While this information will certainly help us gauge the severity of the infection, it will not guide our choice of antibiotics.

A Urinalysis

This will help to confirm the diagnosis in mind but not alter the management plan.

D Urgent abdominal ultrasound

It may help to detect evidence of septic emboli, for example splenic infarction, it will not indicate the organism responsible for targeted treatment.

E Urgent colonoscopy

Intra-abdominal pathology, including colonic carcinoma, is a possible source of infecting organisms in this case, namely *Streptococcus gallolyticus* (formerly *S. bovis*). However, blood cultures would be the way to confirm the infecting organism in question.

32315

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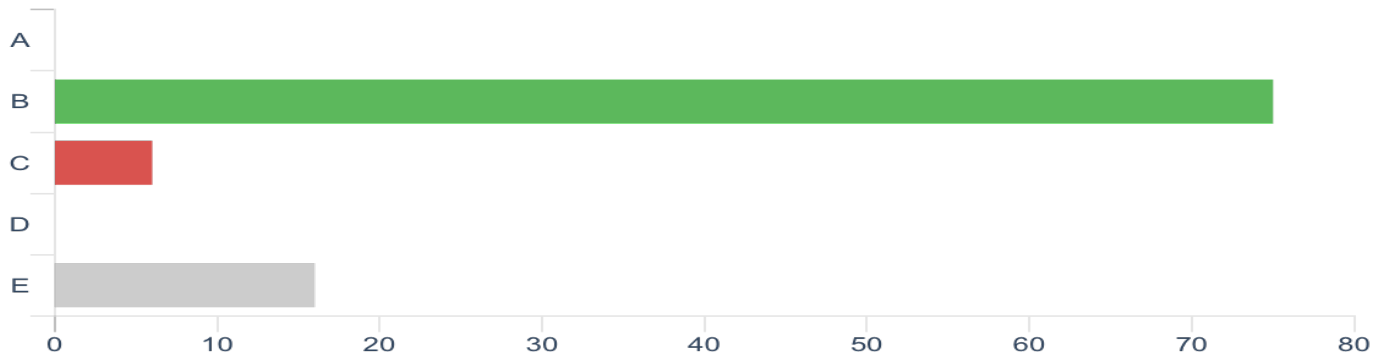
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

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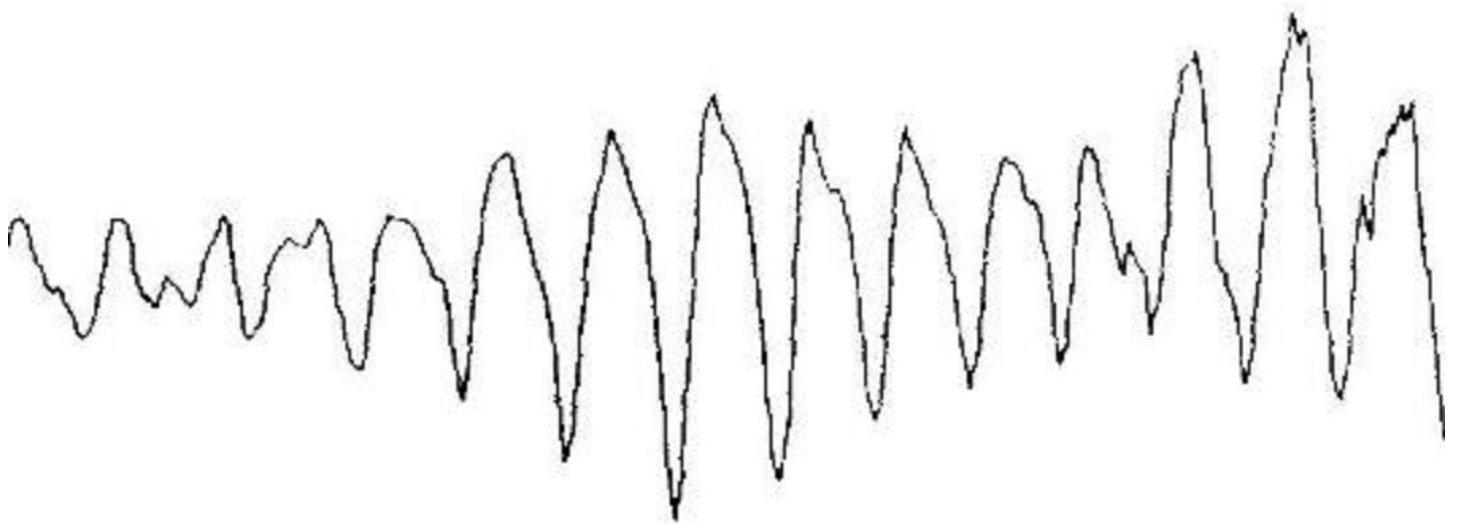


Q201

You are a Core Medical Trainee (CMT) at a District General Hospital (DGH). You are on call as the middle grade cover because the Registrar has gone home sick. You are called to the resuscitation department to see a 71-year-old man who collapsed at home. His wife called the ambulance, but on arrival of the ambulance crew the patient was alert; she has not travelled to the hospital with her husband. The paramedics report the initial rhythm strip showed sinus rhythm. The patient denies any chest pain and does not remember any prodromal symptoms preceding the collapse. There is no past medical history of note.

On examination, his blood pressure (BP) is 150/85 mmHg. His heart rate is 75 beats per minute (bpm) and regular. His temperature is 36.6 °C. His oxygen saturations are 99% on 10 litres per minute. His Glasgow Coma Score is 15; there are no tongue abrasions or evidence of urinary incontinence. The cardiovascular, respiratory and neurological examination is unremarkable.

He has been having recurrent episodes of arrhythmia in the department, and a rhythm strip is shown below.



What is the most appropriate treatment for his rhythm disturbance?

Your answer was incorrect

- A IV potassium replacement
- B IV magnesium infusion
- C IV amiodarone 300mg followed by maintenance infusion

- D IV adenosine bolus
- E IV flecainide infusion

Explanation



- B IV magnesium infusion

This ECG demonstrates torsades de pointes. A prolonged episode that results in cardiovascular instability should be treated with DC cardioversion. Pharmacotherapy for polymorphic ventricular tachycardia is magnesium, which decreases calcium influx, reducing the amplitude of the VT and helping terminate runs of torsades. It is effective even when serum magnesium is normal. Overdrive pacing or isoprenaline (to reduce the QT interval once the torsades has been corrected) can also be used to prevent relapse. Common drugs that prolong the QT interval and can potentially cause torsades – e.g. erythromycin, carbamazepine, ketoconazole and tricyclic antidepressants – should be avoided. Amiodarone, quinidine and flecainide are recognised as worsening the arrhythmia, and adenosine is ineffective in terminating it. A collateral drug history is important as he may well have been exposed to agents that lead to long QT syndrome or those that cause hypomagnesaemia.

- A IV potassium replacement

Potassium levels should be measured, and replaced if low, but routine potassium replacement does not represent the most appropriate management of TdP.

- C IV amiodarone 300mg followed by maintenance infusion

Amiodarone can cause QT prolongation and is therefore an inappropriate choice in the treatment of TdP. Resuscitation Council guidelines regarding the management of TdP state: 'Do not give amiodarone for definite torsade de pointes'.

- D IV adenosine bolus

Adenosine depresses AV node and sinus node activity. If the arrhythmia is not due to re-entry involving the AV node or sinus node (e.g. atrial flutter, AF, atrial or ventricular tachycardias), adenosine will not terminate the arrhythmia. Thus, adenosine is an inappropriate choice in this case.

- E IV flecainide infusion

Procainamide can cause QT prolongation and should be avoided in patients with pre-existing QT prolongation and TdP.

32316

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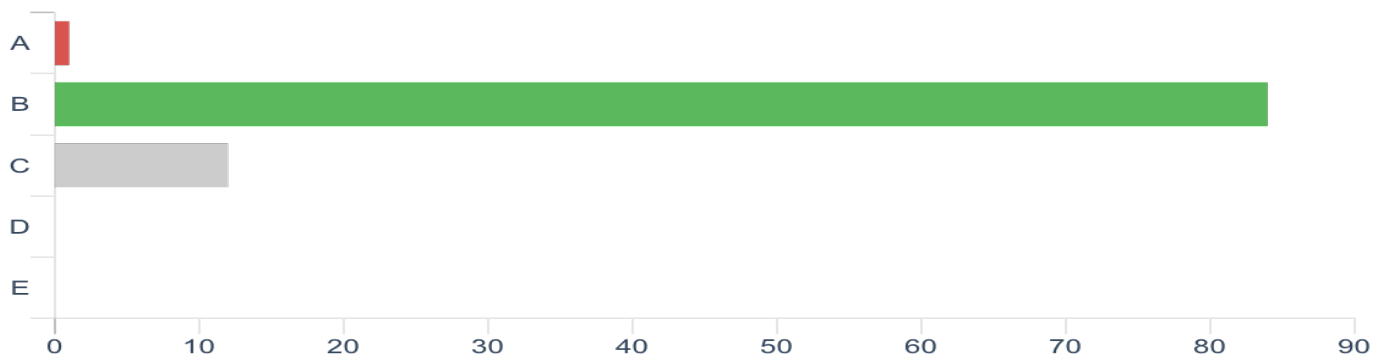
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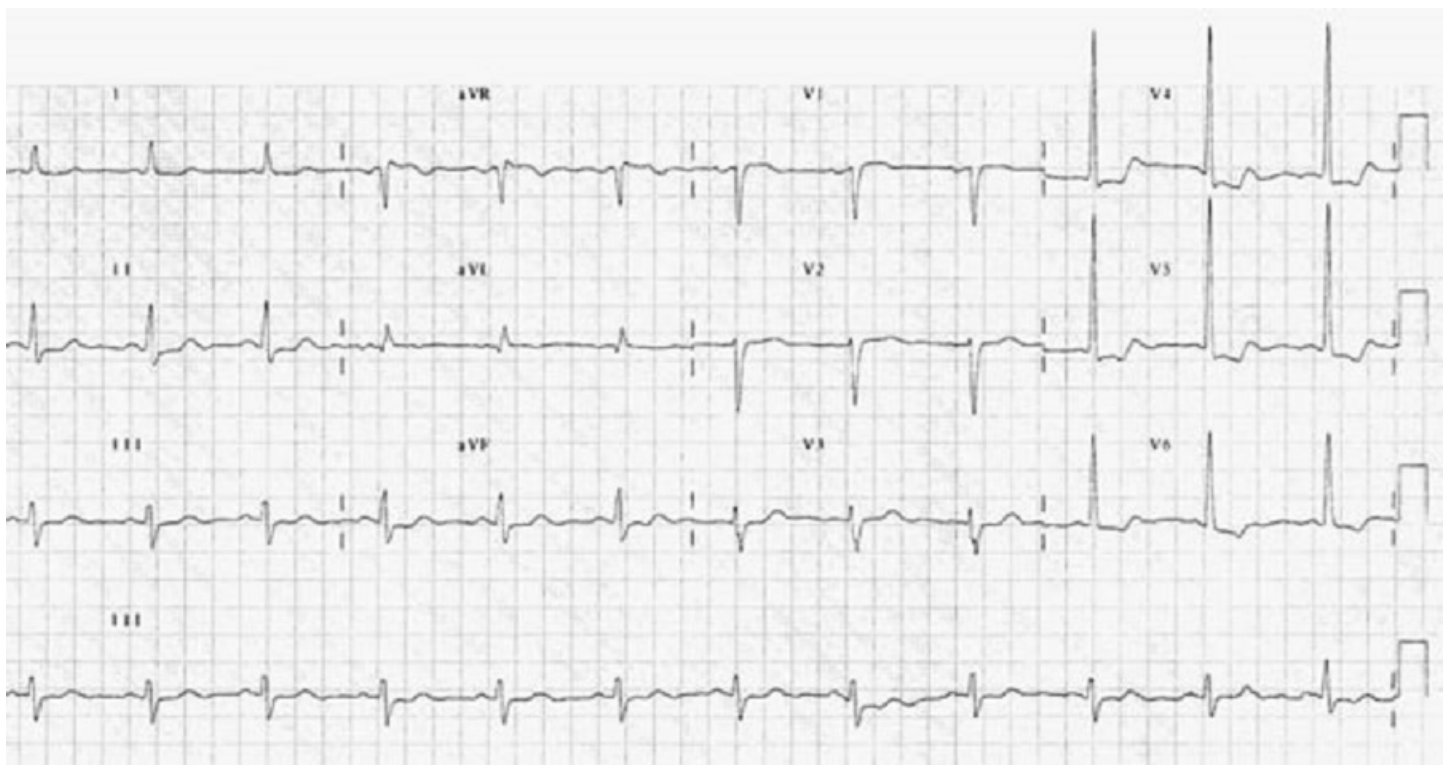
Responses Correct:	39
Responses Incorrect:	162
Responses Total:	201
Responses - % Correct:	19%



Q202

You are a General Medical Senior House Officer (GMSHO). A 45-year old African-Caribbean woman has been referred to you by her General Practitioner (GP) after attending a Well-Woman Clinic. Her GP is worried she may be hypertensive.

On examination, two blood pressure (BP) readings taken from her right and left arm are, respectively, 160/95 and 170/90 mmHg. The patient is well and asymptomatic. Apparently you understand that one of her relatives had trouble with a thyroid cancer at a relatively young age, but there is no other significant medical history. Her electrocardiogram (ECG) is shown below. Her full blood count (FBC) and renal function are within the normal ranges.



What is the optimal initial management for her hypertension?

Your answer was correct

- A Ramipril
- B Indapamide
- C Amlodipine
- D Bisoprolol

E Doxazosin

Explanation



C Amlodipine

Current NICE guidelines recommend using a calcium-channel blocker (CCB) to people aged over 55 years or to patients of African or Caribbean family origin of any age. The preference of CCB over an ACE inhibitor in this group of patients is as explained below.

As this woman has hypertension with evidence of end-organ damage, as indicated by left ventricular hypertrophy with lateral strain, medical therapy should be started. Concurrent premorbid risk factors should be assessed and treated, including hypercholesterolaemia and diabetes if identified. If possible the type of thyroid cancer suffered by her relative should be identified, as a medullary carcinoma is suggestive of MEN-2 and may lower the threshold for screening your patient for a pheochromocytoma.

If a CCB is not suitable, for example because of oedema or intolerance, or if there is evidence of heart failure or a high risk of heart failure, offer a thiazide-like diuretic.

A Ramipril

Patients with hypertension aged under 55 years (except patients of African-Caribbean ethnicity) should be offered treatment with an angiotensin-converting enzyme (ACE) inhibitor or a low-cost angiotensin-II receptor blocker (ARB). If an ACE inhibitor is prescribed and is not tolerated (for example, because of cough), a low-cost ARB should be offered. ACE inhibitors are less effective in patients of African-Caribbean ethnicity due their generally lower circulating blood levels of ACE.

B Indapamide

Diuretics can be added as additional therapy for better control of hypertension. If diuretic treatment is to be initiated or changed, offer a thiazide-like diuretic, such as chlortalidone (12.5–25.0 mg once daily) or indapamide (1.5 mg modified-release once daily or 2.5 mg once daily) in preference to a conventional thiazide diuretic such as bendroflumethiazide or hydrochlorothiazide.

D Bisoprolol

Beta blockers are not a preferred initial therapy for hypertension. However, beta blockers may be considered in younger patients, particularly those with an intolerance or contraindication to ACE inhibitors and angiotensin II receptor antagonists, women of child-bearing potential or patients with evidence of increased sympathetic drive.

E Doxazosin

Alpha blockers can be added as an adjunct therapy in cases of resistant hypertension, usually after the patient has already been established on the other treatments listed above.

For guidance regarding the diagnosis and management of hypertension in adults, please refer to NICE guideline 127.

32317

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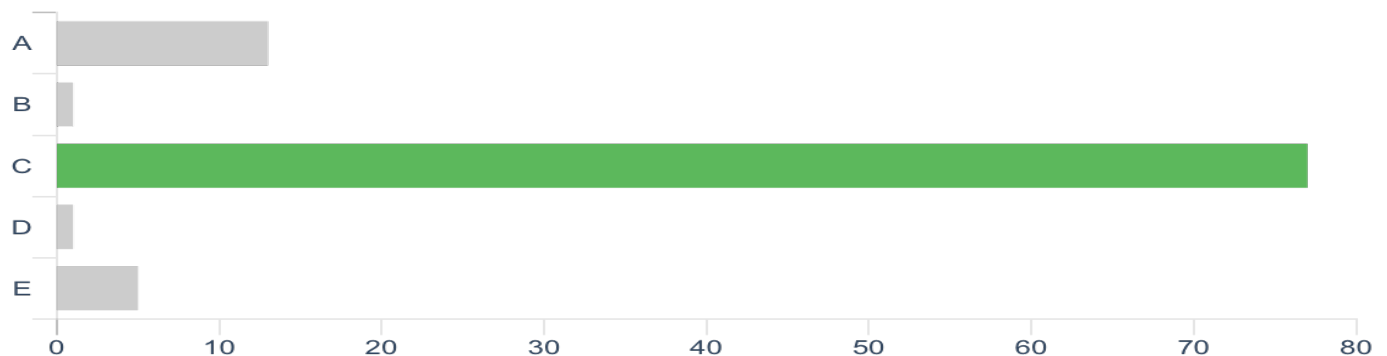
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Responses Total:	202
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External Links

Hypertension in adults: diagnosis and management[nice.org.uk/guidance/cg127](http://www.nice.org.uk/guidance/cg127)[\(http://www.nice.org.uk/guidance/cg127\)](http://www.nice.org.uk/guidance/cg127) **Expanded Explanation****Overview****Clinical Presentation****Diagnosis / Investigation****Management****Prognosis**

Q203

You are the on-call Cardiology Senior House Officer (SHO) at a Tertiary Centre. You are asked to see a 72-year-old man, known to have mild aortic stenosis (AS), admitted to the Surgical High Dependency Unit after having had a total left knee replacement under general anaesthetic. The procedure went well and as planned but unfortunately, in recovery an hour ago, the patient's heart rate was noted to jump to 165 beats per minute (bpm). The ward Foundation (F1) Doctor has bleeped you seeking advice.

When you arrive the patient's observations reveal the following:

A respiratory rate of 25 breaths per minute, while his saturations on air are 98%. His blood pressure (BP) is 75/40 mmHg, while his pulse is 165 bpm. His temperature is 36.5 °C. The F1 has given the patient 1 litre of Hartmann's solution over the last hour with no change in the patient's blood pressure. An electrocardiogram (ECG) shows atrial fibrillation (AF) with left ventricular hypertrophy meeting voltage criteria and global ischaemic changes.

The patient is alert and appears anxious and complains of vague discomfort in the chest that began roughly half an hour ago. His capillary blood glucose measurement is normal.

Which of the following is the most appropriate next option for the management of this patient?

Your answer was incorrect

- A Rapid bolus of 6 mg IV adenosine
- B Single oral dose of 5 mg bisoprolol
- C Commence rapid loading of digoxin
- D Commence 300 mg loading dose of IV amiodarone
- E Arrange for synchronised DC cardioversion

Explanation



- E Arrange for synchronised DC cardioversion

This patient has developed a tachycardia with features of compromise, as evidenced by his low blood pressure (shock), ischaemic changes on ECG and new onset of chest pain. Other features of compromise include syncope/ loss of consciousness and signs of acute heart

failure.

In an unstable patient, the appropriate next step is DC cardioversion to restore a stable sinus rhythm. This should reverse the hypotension and rate-related ECG changes/chest pain. This should of course be done with the airway support of our anaesthetic colleagues if possible. The main risk of attempting cardioversion of any form is the risk of thromboembolic stroke. It is generally accepted that the first 24 h from the onset of atrial fibrillation is the 'safe window' for attempting cardioversion. In this case we have a clear time of onset.

C Commence rapid loading of digoxin

The emphasis here is that the patient has features of compromise and requires immediate cardioversion. If the patient had a reduced but borderline blood pressure with no other features of compromise, and was out with the 24-hour window for cardioversion, digoxin could be used with the intention of rate-control without causing hypotension.

A Rapid bolus of 6 mg IV adenosine

The patient is compromised and needs immediate cardioversion to a stable rhythm. Furthermore, adenosine has no role in the management of atrial fibrillation. It might be considered as a treatment while setting up for DC cardioversion in patients with supraventricular tachycardias like AVRT or AVNRT.

B Single oral dose of 5 mg bisoprolol

While this might have been an option if the patient was stable, this is a dangerous option in this case as it will likely drop his blood pressure further.

D Commence 300 mg loading dose of IV amiodarone

Amiodarone is the choice for chemical cardioversion but is incorrect in this case as it will likely take longer to achieve cardioversion, with the added side-effect of further lowering the patient's blood pressure during this time.

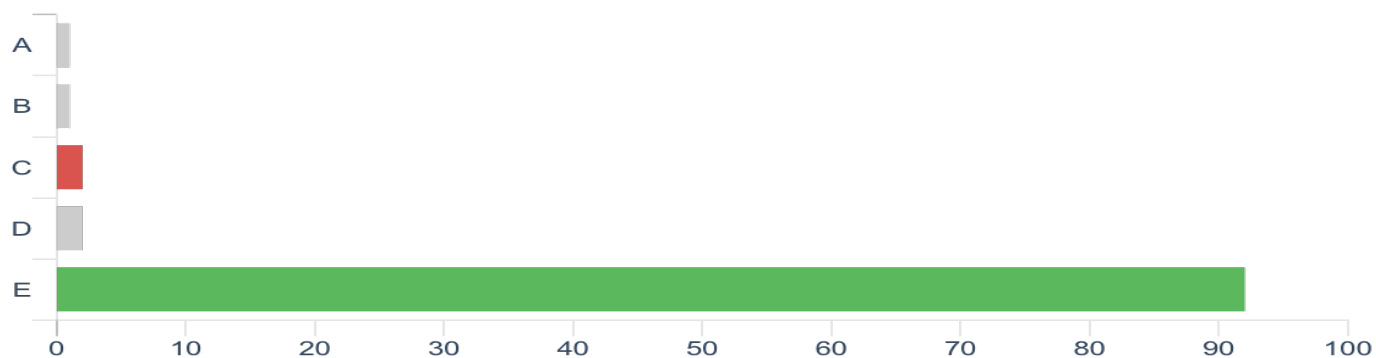
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Responses Total:	203
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q204

A 70 year-old man with known type II diabetes is referred to the Cardiology Clinic by his General Practitioner (GP) with a three-month history of intermittent palpitations. He describes these as fast and irregular and of sudden onset and termination. He has felt quite light-headed on a couple of occasions during these palpitations but denies any chest pain or shortness of breath. The GP mentions in the referral letter that he has a borderline high blood pressure (BP) and was recently started on ramipril. There is no other past medical history of note.

On examination, he has a BP of 145/95 mmHg, but is otherwise unremarkable. A routine electrocardiogram (ECG) shows sinus rhythm with left ventricular hypertrophy.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	13.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$5.6 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$253 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	136 mmol/l	135-145 mmol/l
Potassium (K^+)	4.8 mmol/l	3.5-5.0 mmol/l
Urea	5.0 mmol/l	2.5-6.5 mmol/l
Creatinine (Cr)	99 μ mol/l	50-120 μ mol/l
Thyroid stimulating hormone (TSH)	3 μ U/l	0.17-3.2 μ U/l

A 24 hour ambulatory ECG test reveals episodes of paroxysmal atrial fibrillation (AF). An echocardiogram (ECHO) shows concentric hypertrophy with mild to moderate impairment of left ventricular systolic function, normal atria and no significant valvular pathology.

Which one of the following would be the treatment of choice for his AF?

Your answer was incorrect

- A Flecainide
- B Bisoprolol
- C Digoxin

- D Amiodarone
- E Verapamil

Explanation



- B Bisoprolol

This is the first-line treatment for patients with paroxysmal atrial fibrillation. It can limit the episodes of paroxysmal AF, aid rate control during the episodes and is beneficial for this gentleman's left ventricular systolic impairment and hypertension. With regard to anticoagulation, the risk of stroke from atrial fibrillation is calculated using the CHA2DS2-VASc score. A score of 0 is considered 'low' risk and may not require anticoagulation; a score of 1 is 'low-moderate' risk and anticoagulation should be considered; a score of 2 or greater is 'moderate-high' risk and the patient should be anticoagulated assuming no contraindications.

- C Digoxin

Digoxin does not reduce the risk of onset of atrial fibrillation and therefore does not have a role in paroxysmal AF.

- A Flecainide

Flecainide is contraindicated in patients with structural heart abnormalities or at risk of ischaemic heart disease.

- D Amiodarone

While effective, this should be reserved for refractory cases due to its extensive side effect profile.

- E Verapamil

Bisoprolol is the first-line option and also has the added virtue of evidence-based benefit in patients with left ventricular systolic dysfunction. However, this might be an option for acute rate control in a patient without signs of heart failure in whom a beta blocker is contraindicated - for example a patient with asthma.

32320

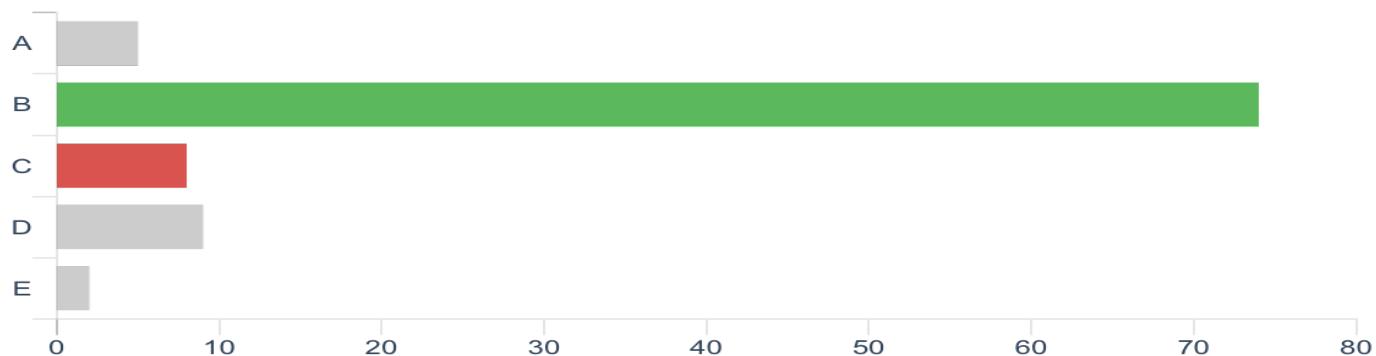
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Responses Incorrect:	164
Responses Total:	204
Responses - % Correct:	20%

Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**



Q205

A 75-year-old man is brought to the Emergency Department (ED) in a collapsed state. He had collapsed in a department store while doing some shopping with his wife. He received three direct current (DC) shocks on his way to the hospital in the ambulance.

On a quick look through his notes, he has a past medical history of psychotic depression for which he is on quetiapine and amitriptyline. He was admitted last week for the treatment of a lower respiratory tract infection (RTI) and was commenced on clarithromycin. His admission electrocardiogram (ECG) at the time showed a sinus rhythm of 84 beats per minute (bpm), normal axis, and a QTc of 460 milliseconds.

On examination, now he 'does not feel right'. He has a blood pressure (BP) of 102/60 mmHg. His pulse is > 120 beats per minute (bpm) and he has an oxygen saturation of 93% on 35% oxygen. An ECG reveals polymorphic VT.

Arterial blood gas analysis reveals that he is hypokalaemic.

Which of the following interventions would you immediately consider in this patient?

Your answer was incorrect

- A Amiodarone infusion
- B Magnesium sulphate and potassium infusion
- C IV sotalol
- D IV flecainide
- E Repeat DC cardioversion

Explanation



- B Magnesium sulphate and potassium infusion

This is the first-line treatment for torsades de pointes. Polymorphic VT is a form of ventricular tachycardia with wide QRS complexes of multiple morphologies seen on ECG. There are changing R-R intervals as well as axis of the QRS complexes. The key distinction to be made here is the difference between a diagnosis of torsades de pointes versus other forms of polymorphic VT. Not all polymorphic VT is torsades. The key is in the history. Torsades de

pointes is a polymorphic VT in the context of a prolonged QT interval. First-line treatment would entail IV magnesium and correction of any electrolyte abnormalities. Other forms of polymorphic VT secondary to scar tissue after myocardial infarction would NOT respond to the same treatment and would likely require electrical or chemical cardioversion. Other therapies include overdrive pacing and isoproterenol infusion.

In this case the patient has a history of prolonged QTc with predisposing drugs, and was recently given an antibiotic known to further prolong the QT interval. This has likely precipitated his presentation with torsades de pointes. It is important to avoid drugs that further prolong the QTc.

E Repeat DC cardioversion

This would only be correct if the patient showed clear signs of cardiovascular compromise, for example with hypotension or complaints of new ischaemic-sounding chest pain.

A Amiodarone infusion

This is not an option for the treatment of torsades de pointes and can potentially worsen the situation via its QT-prolongation effects.

C IV sotalol

Sotalol prolongs the QT interval and has no role in the treatment of torsades.

D IV flecainide

Class IC antiarrhythmics like flecainide prolong the QT interval and might exacerbate Torsades.

32322

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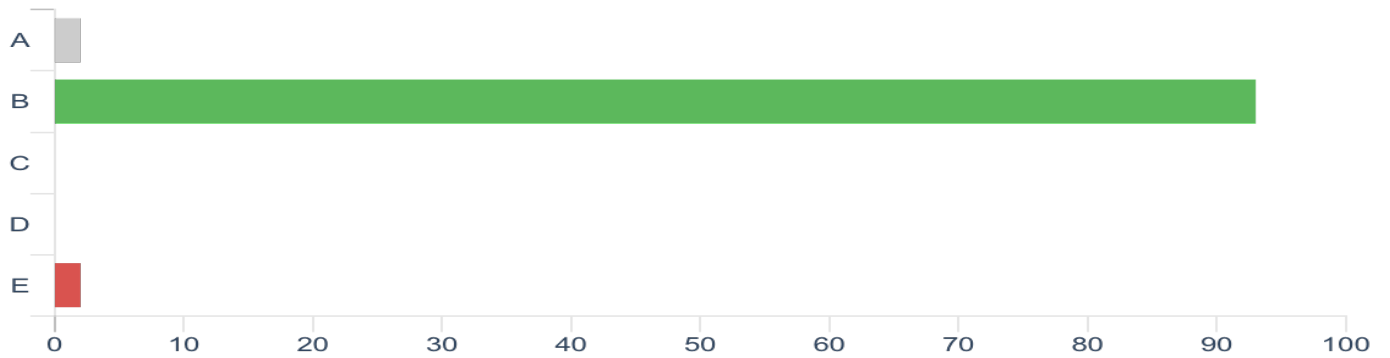
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Q206

A 51-year-old man is referred to the Cardiology Clinic with palpitations. The palpitations have occurred over a period of six months. He gets palpitations every other day and they last for up to a minute. The palpitations are not associated with shortness of breath, chest pain or dizziness and there is no obvious precipitating factor. His past medical history is unremarkable and he is not on any medication.

On examination, he is comfortable, with a blood pressure (BP) of 132/72 mmHg and a pulse of 66 beats per minute (bpm). An apex beat is in the 5th intercostal space in the mid-clavicular line and the jugular venous pressure (JVP) is not raised. First and second heart sounds are heard, and there is a mid-systolic click with a late systolic murmur of grade 2/6 radiating to the axilla. Respiration, abdominal and central nervous systems are all normal.

Investigations reveal the following:

Investigation	Result
Electrocardiogram (ECG)	Sinus rhythm
Chest X-ray (CXR)	Normal
Full blood count (FBC), Urea and electrolytes (U&Es), Liver function tests (LFTs), Thyroid function tests (TFTs) and lipid profile	Are within the normal range
24 hour ECG tape	Sinus rhythm throughout except four separate episodes of premature ventricular ectopics (PVEs). These episodes comprised 4-9 PVEs/minute
Echocardiogram (ECHO)	Normal left ventricular function (LVF) with an ejection fraction of 74%. There is mitral valve prolapse (MVP) with mild to moderate mitral regurgitation

Which one of the following is the most appropriate initial intervention in this patient?

Your answer was correct

- A Mitral valve replacement
- B Mitral valvuloplasty

- C Bisoprolol
- D Coronary angiogram
- E Amiodarone

Explanation



- C Bisoprolol

Bisoprolol is used for the suppression of ectopy. Mitral valve prolapse (MVP) affects about 5% of the general population and is more common in females. This man has mild to moderate mitral regurgitation on examination, and investigations are otherwise all normal apart from some PVEs on the 24 h tape. Crucially, his ejection fraction is normal.

Beta blockade is the initial treatment of choice for palpitations precipitated by PVEs. These work by reducing the occurrence and symptoms of the PVEs.

- A Mitral valve replacement

Mitral valve replacement is only indicated in severe mitral regurgitation or if there are signs of concomitant LV compromise (reduced ejection fraction or new dilatation of the LV). This patient will need follow-up in clinic with repeat echocardiograms to monitor progression.

- B Mitral valvuloplasty

This is a treatment for mitral stenosis and might worsen mitral regurgitation.

- D Coronary angiogram

This patient has no regional wall-motion abnormality or history to suggest significant ischaemic heart disease. Coronary angiogram is therefore not indicated. However, if in the future a surgical mitral valve replacement were indicated, coronary angiogram would be part of the pre-op work-up for potential concomitant coronary artery bypass grafting.

- E Amiodarone

Amiodarone is effective in suppressing ectopy but is only indicated if this is associated with significant haemodynamic compromise. We also need to consider the risk of substantial side effects with long-term amiodarone. Beta blockade is therefore the initial treatment of choice.

32323

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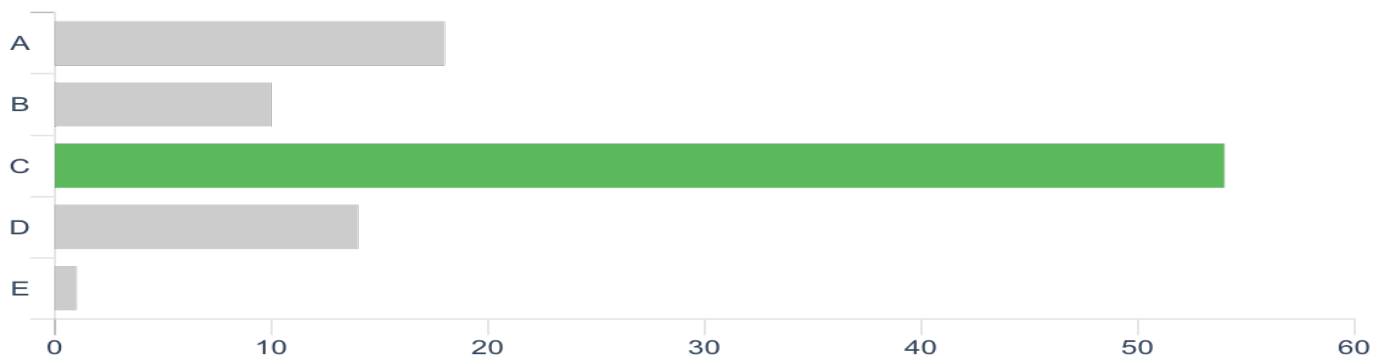
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Q207

A 71-year-old woman is brought to the Emergency Department (ED) by an ambulance as a result of altering consciousness. Her husband provides a history, stating that she had 'not been herself' that morning. She had complained of a headache and some blurred vision earlier before she stopped communicating and her right arm started shaking uncontrollably. She has osteoarthritis for which she takes ibuprofen 200 mg.

On examination, she is drowsy, with a Glasgow Coma Scale of 13. Her blood pressure (BP) is 220/115 mmHg, while her pulse is 81 beats per minute (bpm) and regular. Her respiratory rate is 20 breaths per minute and her chest is clinically clear. Her jugular venous pulse (JVP) is just visible; first and second heart sounds are heard with no added murmurs. There is no focal neurology.

Investigations reveal the following:

Investigation	Result
Electrocardiogram (ECG)	Sinus rhythm with left ventricular strain pattern
Chest X-ray (CXR)	Cardiomegaly
Fundoscopy	Papilloedema
Full blood count (FBC), Urea and electrolytes (U&Es), Liver function tests (LFTs), Thyroid function tests (TFTs), urinalysis and lipid profile	Are within the normal range
Computed tomography (CT) brain	Normal

Which one of the following interventions would you immediately start for this patient?

Your answer was incorrect

- A Sodium nitroprusside
- B Nifedipine
- C Methyldopa
- D Clonidine

E Ramipril

Explanation



A Sodium nitroprusside

This patient mostly likely has hypertensive encephalopathy. Usually this is of gradual onset and may present with headache, nausea, vomiting, confusion and hypertensive retinopathy. The lack of focal neurology and normal CT head is reassuring with respect to ruling out a cerebral infarct and, more importantly, any haemorrhage/space-occupying lesion. The goal of therapy is to reduce the mean arterial pressure by approximately 25% over the first 24-48 h. An intra-arterial line can be helpful for continuous BP monitoring.

Sodium nitroprusside is a popular first-line agent for treating malignant hypertension and is given by continuous infusion. Its short-acting nature allows almost minute-by-minute titration according to response. Another popular first-line agent is IV labetalol, which is a combined alpha and beta receptor-blocker. It has the added benefit of easy IV to oral transition.

D Clonidine

While this is an effective antihypertensive agent, it is not the first-line treatment for hypertensive emergencies. Its use is also associated with the risk of worsening ischaemia, as well as rebound hypertension upon withdrawal of the medication.

B Nifedipine

Other forms of IV calcium channel blockers (like nicardipine or diltiazem) are sometimes considered as alternatives if the first-line options are unsuitable.

C Methyldopa

Again this is not first-line therapy but could be considered in pregnancy along with hydralazine if other treatments like labetalol are ineffective. There is, however, a risk of worsening ischaemia.

E Ramipril

This is one of the first-line drugs for chronic, 'non-urgent' hypertension as per national guidelines. It is important to recognise the severity and urgency of the hypertension in this case and to treat it differently.

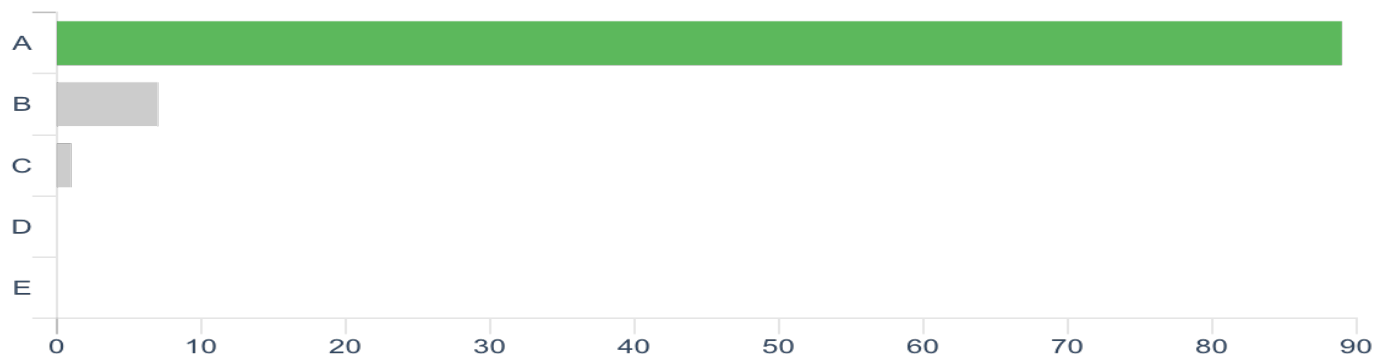
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Responses Incorrect:	166
Responses Total:	207
Responses - % Correct:	20%

Expanded Explanation

Overview

Clinical Presentation

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Q208

A 26-year-old man is admitted to the Emergency Department (ED) with worsening shortness of breath. Previously fit and well, his past medical history is unremarkable. He gives a three-day history of central chest pain, fever and shortness of breath. Initially he had generalised muscle pains; he then developed chest pain and a cough productive of yellowish sputum. The chest pain radiated to his back and the shortness of breath was progressive. At presentation, he could not complete a sentence in one breath because of breathlessness. Clinically he was in severe acute decompensated heart failure with pulmonary oedema.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	15.8 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$18 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$210 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	136 mmol/l	135-145 mmol/l
Potassium (K^+)	4.1 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	131 μ mol/l	50-120 μ mol/l
Mean corpuscular volume (MCV)	88.6 fl	80-100 fl
Urea	9.7 mmol/l	2.5-6.5 mmol/l
Magnesium (Mg^{2+})	0.61 mmol/l	0.75 -1.00 mmol/l
Hs-troponin	> 10,000 units	< 35
Electrocardiogram (ECG)	Sinus rhythm with a right bundle branch block at a rate of 130 per minute	
Chest X-ray (CXR)	Enlarged, globular heart with evidence of pulmonary oedema	

The patient was stabilised with oxygen therapy, intravenous (IV) diuretics and a brief period of continuous positive airway pressure (CPAP) and inotropic therapy in the Coronary Care Unit (CCU). A bedside trans-thoracic echocardiogram (ECHO) was performed which showed a small pericardial effusion with normal left ventricular size but very poor global left ventricular function. The ejection fraction was 15%.

His unsupported blood pressure (BP) is now 112/69 mmHg, with an NYHA symptom class of III-IV. There is still evidence of peripheral and some pulmonary oedema which is gradually improving on the ongoing IV furosemide therapy.

What is the most appropriate next step in this patient's management?

Your answer was incorrect

- A Refer for coronary angiography
- B Start low-dose beta-blocker
- C Start nitrate therapy
- D Refer for assessment of cardiac transplantation
- E Start low-dose ACE inhibitor

Explanation



- E Start low-dose ACE inhibitor

This patient presented with cardiogenic shock probably secondary to acute viral myocarditis suspected from prodrome and development of CHF in young patient without a history of congenital heart disease. The management is focused on best supportive care while instituting evidence-based therapy to assist recovery of left ventricular function. Diuretic therapy should be continued to achieve euvolaemia, and serial echocardiograms performed to monitor progress.

- D Refer for assessment of cardiac transplantation

This might be considered if the patient deteriorates despite best supportive care. Reintroduction of inotropic support, intra-aortic balloon pump insertion or use of left ventricular assist devices might be considered while awaiting cardiac transplantation.

- A Refer for coronary angiography

This young patient with no prior cardiac history is unlikely to have significant coronary artery disease leading to his presentation. This might be considered if the patient were older with more in the history to suggest concomitant ischaemic heart disease, but even then would only be considered when the patient is more clinically stable.

B Start low-dose beta-blocker

While beta-blockers are evidenced-based treatments for heart failure, we would not want to introduce this while the patient has ongoing symptoms of acute decompensated heart failure. This can be introduced at a later stage when the patient is stable.

C Start nitrate therapy

This is a useful adjunct to temporarily “offload” patients with acute decompensated heart failure in addition to standard diuretic and supportive therapy. There are ongoing symptoms of heart failure but the patient is currently improving with diuretics and will now require therapies to help with the recovery of his ventricular function.

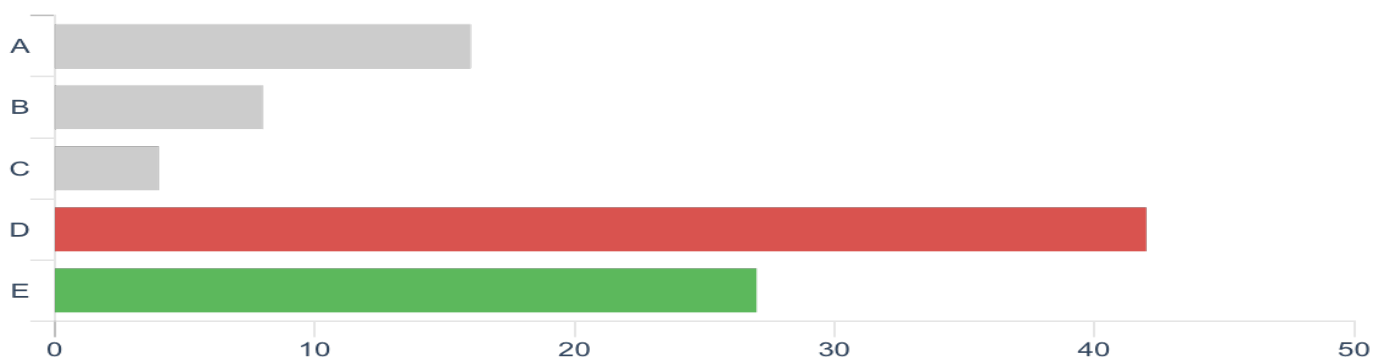
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Responses - % Correct:

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Expanded Explanation

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Q209

A 75-year-old man is referred to the Musculoskeletal Department for total hip replacement. He has a history of hypertension and angina and suffered a myocardial infarction (MI) eight years ago. Current medication include atenolol 50 mg daily, ramipril 10 mg daily, aspirin 75 mg daily, atorvastatin 20 mg daily and isosorbide dinitrate 60 mg. His blood pressure (BP) at the preoperative assessment was 160/80 mmHg, but he maintains that his readings with the General Practitioner (GP) have been normal. He last had an exercise test three years ago and managed eight minutes with no significant electrocardiogram (ECG) changes.

Which of the following investigations in addition to standard physical assessment would be most appropriate for the preoperative assessment of this patient?

Your answer was incorrect

- A Repeat exercise ECG test
- B Stress echocardiogram (Dobutamine)
- C Nuclear myocardial perfusion scan
- D Lung function testing
- E Cardiac MRI

Explanation



- B Stress echocardiogram (Dobutamine)

This is a common referral for cardiology clinics. It is important to have a good basic assessment of this patient's cardiac function to help shed light on his perioperative risk. This will all have an effect on potential haemodynamic changes during the surgery, as well as for any potential complications during the post-op period.

This option is will give us a wealth of information including the LV function, any existing regional wall-motion abnormalities and any significant valvular disease.

- D Lung function testing

This patient has no history of lung disease, as such it's very unlikely lung function testing will be of value here.

A Repeat exercise ECG test

Given this patient's hip is failing and needs to be replaced it's highly unlikely that he will be able to comply with an exercise test..

C Nuclear myocardial perfusion scan

Nuclear myocardial perfusion scan is used as an investigation for coronary artery disease in some centres, either to diagnose the presence of atherosclerosis (which we already know is present in this patient) or assess coronary flow reserve.

E Cardiac MRI

Cardiac MRI is commonly used in the assessment of new cardiac disease for which the aetiology is not immediately clear (for example young patients with new severe heart failure), or for objective assessment of myocardial status and disease.

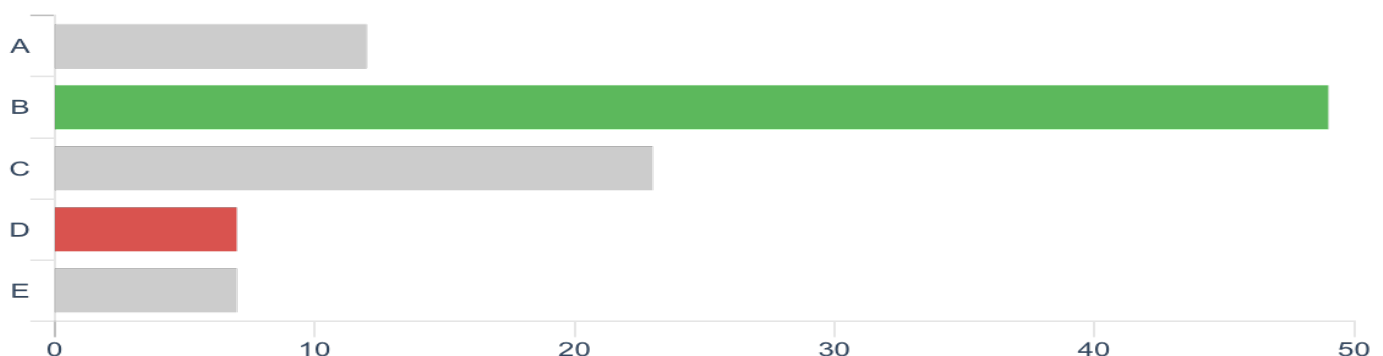
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 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q210

A 35-year-old woman, who recently arrived in the UK from Mali, presents with shortness of breath on exertion, and fatigue.

On examination, she is neither cyanosed nor clubbed, and is afebrile. There is a right precordial heave, a wide split second heart sound and a pulmonary flow murmur. Her lung fields are clear. A chest X-ray (CXR) shows cardiomegaly with prominent pulmonary arteries. An electrocardiogram (ECG) shows sinus rhythm and partial right-bundle branch block (RBBB). Routine full blood count (FBC), liver function tests (LFTs) and urea and electrolytes (U&Es) are unremarkable. Transoesophageal echocardiography (ECHO) is arranged.

Which of the following investigations would be most useful in deciding the next management step?

Your answer was incorrect

- A V/Q scan
- B Right heart catheterization
- C Arterial blood gas
- D Pulmonary function testing
- E High-resolution CT thorax

Explanation



- B Right heart catheterization

Patients arriving from developing countries may have undiagnosed pathology, including conditions not commonly encountered in the United Kingdom. Her rather non-specific symptoms are compatible with cardiac or pulmonary disease. The physical signs are in keeping with right-sided cardiac volume overload or pulmonary hypertension. However, in pulmonary hypertension due to pulmonary disease or multiple pulmonary emboli, the pulmonary arteries are characteristically normal or pruned. The presence of a wide (often fixed) split second sound, right bundle branch block and prominent pulmonary vasculature are suggestive of an atrial septal defect. The absence of a temperature or murmurs makes tricuspid endocarditis a less likely diagnosis.

Transthoracic echocardiography may confirm an enlarged right ventricle, but the atrial septum is often difficult to visualise and for this reason trans-oesophageal echocardiography is usually more helpful. Right heart catheterisation will allow quantification of the degree of shunting and an assessment of whether the defect is suitable for closure. In this case, however, the clinical evidence of marked pulmonary hypertension suggests that it may be too late for this patient.

C Arterial blood gas

While it may provide information about oxygenation, it would not be the most useful investigation in reaching a firm diagnosis or advising the next step in definitive management.

A V/Q scan

This would be used to examine for the presence of pulmonary emboli, which would be a less likely diagnosis here. Additionally, in the absence of contra-indications such as pregnancy or allergy to contrast media, a CTPA would be the preferred diagnostic test for PE.

D Pulmonary function testing

While this might provide information regarding the presence (or not) of a restrictive or obstructive lung defect, this patient's symptoms are suggestive of cardiac disease. In addition, PFT would not be able to quantify the degree of pulmonary hypertension, which is a highly desirable piece of information here.

E High-resolution CT thorax

This patient's symptoms are suggestive of an ASD, in which case a right heart catheter would provide more diagnostic and prognostic information than a CT thorax would be able to provide.

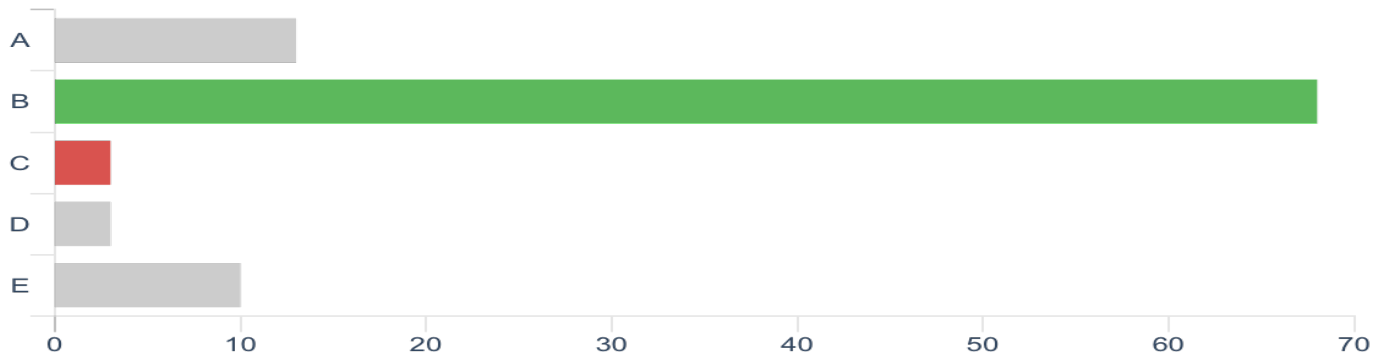
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Expanded Explanation

Overview

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Q211

A 58-year-old man presents to the Emergency Department (ED) with central crushing chest pain radiating to his left arm. He has a long history of smoking and takes ramipril, aspirin and simvastatin for hypertension and dyslipidaemia. A few minutes after admission he deteriorates, with loss of consciousness.

On examination, his blood pressure (BP) is 80/50 mmHg. An electrocardiogram (ECG) monitor shows he is in ventricular tachycardia (VT). You arrange to cardiovert him. Post-cardioversion, his BP recovers to 125/72 mmHg, and he receives aspirin and heparin.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	12.9 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$6.1 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$310 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	139 mmol/l	135–145 mmol/l
Potassium (K^+)	5.2 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	120 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Troponin	5.1 ng/ml	< 0.1 ng/ml
ECG	Inferior ST elevation, pulse 75 beats per minute	

Which one of the following represents the most appropriate management step?

Your answer was correct

- A IV streptokinase
- B IV alteplase
- C PCI
- D IV bretylium
- E IV magnesium

Explanation



C | PCI

This man has suffered an acute inferior myocardial infarction and a period of ventricular tachycardia. As such, referral for urgent PCI to relieve ischaemia is the management of choice. Given the results of recent studies, PCI is almost always preferable to thrombolysis where available.

A | IV streptokinase

Current guidelines are clear that primary PCI is the recommended reperfusion therapy over fibrinolysis if performed by an experienced team within 120 min of first medical contact. NICE guidelines state that fibrinolysis should be offered as primary treatment 'to people with acute STEMI presenting within 12 hours of onset of symptoms if primary PCI cannot be delivered within 120 minutes of the time when fibrinolysis could have been given'.

B | IV alteplase

Current guidelines are clear that primary PCI is the recommended reperfusion therapy over fibrinolysis if performed by an experienced team within 120 min of first medical contact. NICE guidelines state that fibrinolysis should be offered as primary treatment 'to people with acute STEMI presenting within 12 hours of onset of symptoms if primary PCI cannot be delivered within 120 minutes of the time when fibrinolysis could have been given'.

D | IV bretylium

Cardioversion is the management of choice for sustained VT and VF. Sustained monomorphic VT that is recurrent or refractory to direct current cardioversion should be considered to be treated with IV amiodarone in the first instance, and may be considered for treatment with IV lidocaine or sotalol (do not use IV sotalol or other beta-blockers in the context of a low ejection fraction).

E | IV magnesium

Hypomagnesaemia may worsen the propensity to develop VT; as such, if there is reasonable suspicion of hypomagnesaemia such as a history of diarrhoea, IV magnesium replacement may be considered. However, we are not given such a history here and, as such, while it may prove advantageous, provision of IV magnesium should not delay access to definitive management, in this case PCI.

32329

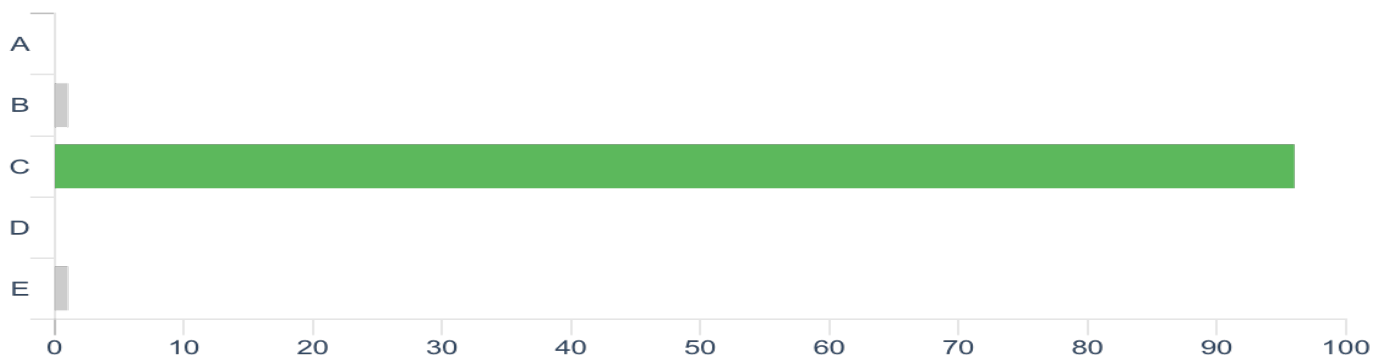
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External Links

Acute Myocardial Infarction in patients presenting with ST-segment elevation (Management of)
[escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-Myocardial-Infarction-in-patients-presenting-with-ST-segment-...](https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-Myocardial-Infarction-in-patients-presenting-with-ST-segment-elevation-Ma)
(<https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-Myocardial-Infarction-in-patients-presenting-with-ST-segment-elevation-Ma>)



Q212

A 42-year-old man with a history of asthma presents to the Emergency Department (ED) with palpitations and light-headedness. He has had two previous episodes of asthma which required admission to the Intensive Therapy Unit (ITU), and he is currently managed on salmeterol/fluticasone combination therapy 500/50 twice daily and salbutamol PRN.

On examination, he has a pulse of 160 beats per minute (bpm), with a blood pressure (BP) of 89/60 mmHg. There are bibasal crackles on auscultation of the chest. You try the Valsalva manoeuvre, which fails.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	13.4 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$5.7 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$301 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	139 mmol/l	135–145 mmol/l
Potassium (K^+)	4.9 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	100 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Electrocardiogram (ECG)	Supraventricular tachycardia, lateral ST depression	

Which one of the following is the most appropriate option in this case?

Your answer was correct

- A IV sotalol
- B IV adenosine
- C DC cardioversion
- D IV verapamil
- E IV amiodarone

Explanation



C DC cardioversion

This patient has an episode of paroxysmal SVT and is relatively decompensated, with a systolic of 89 mmHg and bilateral basal crackles. As such, electrical cardioversion is the most appropriate management option.

A IV sotalol

We are told this patient has a history of asthma, and thus beta blockade is contra-indicated here. We are also told he is relatively decompensated, and therefore electrical cardioversion is the most appropriate management strategy.

B IV adenosine

Adenosine can precipitate bronchoconstriction, and it is contra-indicated in chronic obstructive lung disease (including asthma).

D IV verapamil

This patient is decompensating, with a reduced BP and evidence of pulmonary congestion. While verapamil represents an appropriate choice for chemical cardioversion, the precarious nature of this patient's situation warrants an attempt at rapid cardioversion electrically.

E IV amiodarone

This patient is decompensating, with a reduced BP and evidence of pulmonary congestion. While IV amiodarone represents an appropriate choice for chemical cardioversion, the precarious nature of this patient's situation warrants an attempt at rapid cardioversion electrically. Alternatives to amiodarone include non-dihydropyridine calcium antagonists such as verapamil.

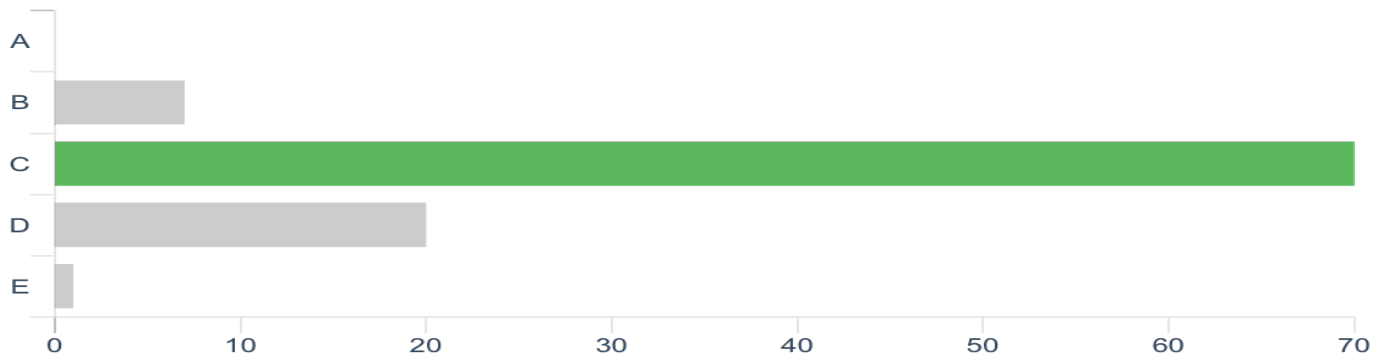
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Q213

A 54-year-old man presents to the Emergency Department (ED) with central crushing chest pain. He is a smoker of 40-50 cigarettes per day and suffers from hypertension, for which he takes ramipril 10 mg daily. He also uses aspirin 75 mg per day and atorvastatin 10 mg.

On examination, his blood pressure (BP) is 90/60 mmHg. His pulse is 105 beats per minute (bpm). He is in gross left ventricular failure (LVF) and has cool peripheries. An electrocardiogram (ECG) reveals inferior T-wave inversion.

From the options given below, which parameter fits most closely with the clinical history given?

Your answer was incorrect

- A Right atrial pressure 6 mmHg
- B Cardiac index 1.8 l/min/m²
- C Cardiac index 2.9 l/min/m²
- D Mean arterial pressure 105 mmHg
- E Ejection fraction 54%

Explanation



- B Cardiac index 1.8 l/min/m²

This man is in cardiogenic shock and it is therefore to be expected that his cardiac index would be below 2 l/min/m². Cardiac index relates cardiac output to body surface area and is calculated by CO/BSA. Normal range is approximately 2.5-4.0 l/min/m². Management in this situation would involve inotropic support with an agent such as dobutamine, and ideally mechanical support with the insertion of an intra-aortic balloon pump (IABP).

- C Cardiac index 2.9 l/min/m²

This patient is in cardiogenic shock and we would therefore expect his cardiac index to be below 2.

A Right atrial pressure 6 mmHg

We would expect there to be back pressure, consistent with his pulmonary oedema, leading to significantly elevated RAP. Six is a normal reading, and would be unexpectedly low in the case of such a patient.

D Mean arterial pressure 105 mmHg

Given that we are told his BP is 90/60, a mean arterial pressure of 105 would be impossibly high. The equation for MAP is $[SBP + (2 \times DBP)]/3$ (in this case, 70).

E Ejection fraction 54%

In the face of such a degree of cardiogenic shock, an ejection fraction of 54% would be unexpectedly high.

32331

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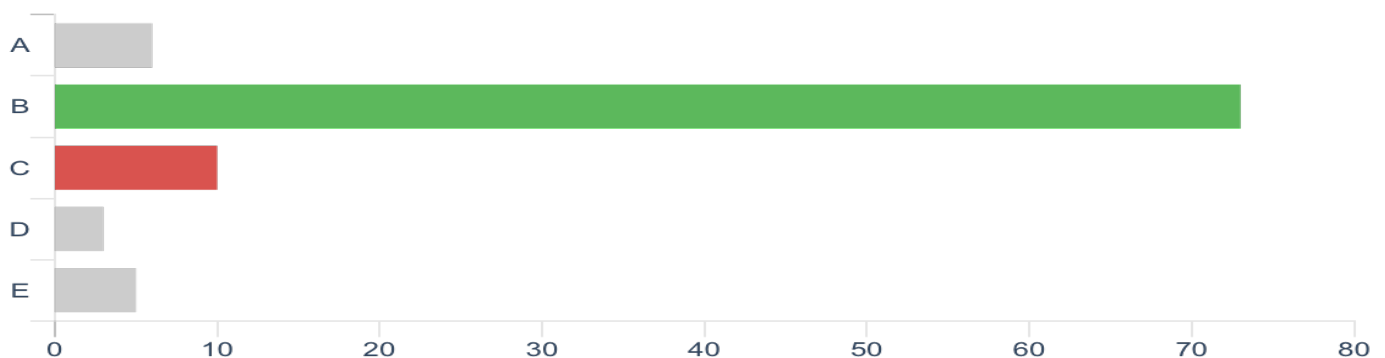
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Expanded Explanation

Overview

Clinical Presentation

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Links to NICE guidelines/CKS



Q214

A 45-year-old man, who is a known smoker, presents to the Rapid Access Clinic with a three month history of chest pains on exertion. These have been increasing in frequency over the last three weeks. He has no past medical history and is on no medications.

On examination on arrival, he has a blood pressure (BP) of 156/97 mmHg and a pulse of 89 beats per minute (bpm). Examination reveals no abnormality. A resting electrocardiogram (ECG) shows normal sinus rhythm with no evidence of left ventricular hypertrophy.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	13.6 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$4.6 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$208 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	138 mmol/l	135-145 mmol/l
Potassium (K^+)	4.9 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	83 μ mol/l	50-120 μ mol/l
Urea	5.1 mmol/l	2.5-6.5 mmol/l
Cholesterol	6.4 mmol/l	< 5.2 mmol/l
Glucose	4.8 mmol/l	3.9-7.1 mmol/l

Which one of the following is the most important intervention to perform next?

Your answer was incorrect

- A Antihypertensive therapy with an ACE inhibitor
- B Trial of GTN spray
- C Initiation of statin therapy
- D ETT
- E CT coronary angiography

Explanation



E CT coronary angiography

This patient has symptoms suggestive of ischaemic heart disease. In the context of risk factors for ischaemic heart disease (hypertension, hypercholesterolaemia, smoking), the clinical diagnosis should be confirmed in the first instance with CT coronary angiography and later with non-invasive functional imaging.. Any concomitant risk factors, such as hypertension or dyslipidaemia, should also be aggressively managed and he should be strongly encouraged to stop smoking.

D ETT

The latest NICE guidelines recommend against using exercise tolerance testing in the diagnosis of typical or atypical angina. CT coronary angiography is first line here.

A Antihypertensive therapy with an ACE inhibitor

While it is important to aggressively manage risk factors in this patient, and he should certainly be started on antihypertensive therapy, it would not aid in diagnosing the aetiology of his symptoms, and does not represent the *most* important next step.

B Trial of GTN spray

While it would prove prudent to provide a GTN spray for symptom control, doing so would not aid in the diagnosis of the underlying cause of the patient's symptoms and would not represent the *most* appropriate next step in his care.

C Initiation of statin therapy

While it is important to aggressively manage risk factors in this patient, and he would likely benefit from being started on statin therapy, it is not the *most* important next step.

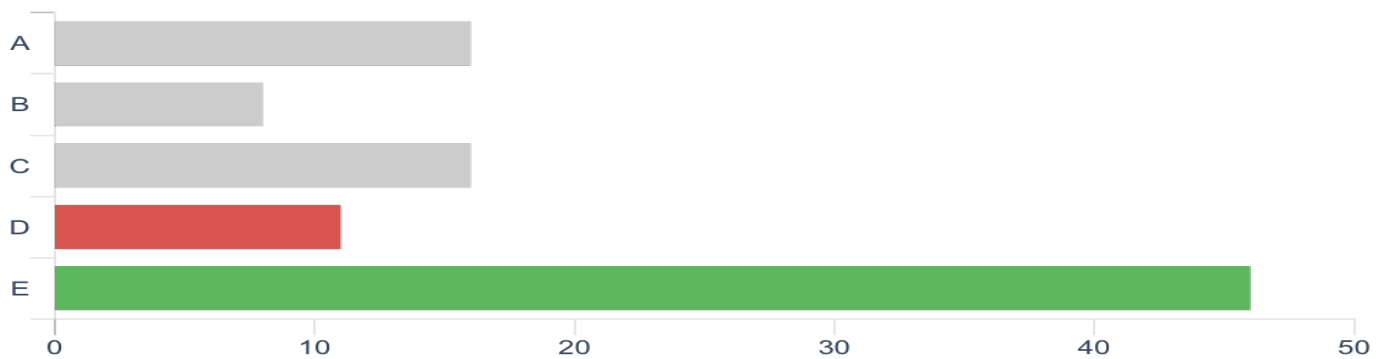
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External Links

Stable Coronary Artery Disease (Management of)

[escardio.org/Guidelines/Clinical-Practice-Guidelines/Stable-Coronary-Artery-Disease-Management-of](https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Stable-Coronary-Artery-Disease-Management-of)
(<https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Stable-Coronary-Artery-Disease-Management-of>)

NICE Pathways. Assessing and diagnosing suspected stable angina

pathways.nice.org.uk/pathways/chest-pain/assessing-and-diagnosing-suspected-stable-angina.pdf
(<https://pathways.nice.org.uk/pathways/chest-pain/assessing-and-diagnosing-suspected-stable-angina.pdf>)

Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation**

Management

Prognosis

Links to NICE guidelines/CKS



Q215

An 82-year-old man is seen in the Cardiology Clinic with a history of dizzy spells on exertion. There is no history of associated chest pain or palpitations. He describes a couple of episodes when he felt as if he was going to pass out. He has a previous history of hypertension, for which he is treated by his General Practitioner (GP) with bendrofluazide.

On examination on arrival, his blood pressure (BP) is measured at 146/86 mmHg and his pulse is 65 beats per minute (bpm). Clinical examination reveals a soft systolic murmur over the aortic area, with no radiation. A resting electrocardiogram (ECG) shows sinus rhythm with a PR interval of 0.24 milliseconds. Routine blood tests including thyroid function tests (TFTs) are normal. A 24 hour ECG tape is requested.

Which of the following results would be an indication for a permanent pacemaker?

Your answer was correct

- A PR interval 260 ms
- B Paroxysmal AF with pauses of 2 s
- C Episodes of asymptomatic Wenckebach rhythm
- D Episodes of sinus pauses lasting 2.5 s
- E Episodes of asymptomatic type 2 second-degree block

Explanation



- E Episodes of asymptomatic type 2 second-degree block

Indications for permanent pacemaker implantation include third-degree block, symptomatic Wenckebach phenomenon, asymptomatic type II second-degree block and pauses of >3.0 s. Asymptomatic Mobitz type II second-degree block is an indication because it is likely to progress to complete heart block and/or lead to episodes of syncope. Operative complications include lead displacement, haematomas, infection and, rarely, erosion of the pacemaker box through the skin. Occasionally patients may present with failure of the impulse to capture and symptomatic bradycardia. Often reprogramming alone may be adequate to prevent further problems.

A PR interval 260 ms

In the absence of haemodynamic compromise, 1st-degree heart block does not require specific intervention.

B Paroxysmal AF with pauses of 2 s

Pauses lasting 3 s or longer represent an indication for pacing.

C Episodes of asymptomatic Wenckebach rhythm

Symptomatic Wenckebach would be an indication for pacemaker insertion.

D Episodes of sinus pauses lasting 2.5 s

Pauses lasting 3 s or longer represent an indication for pacing.

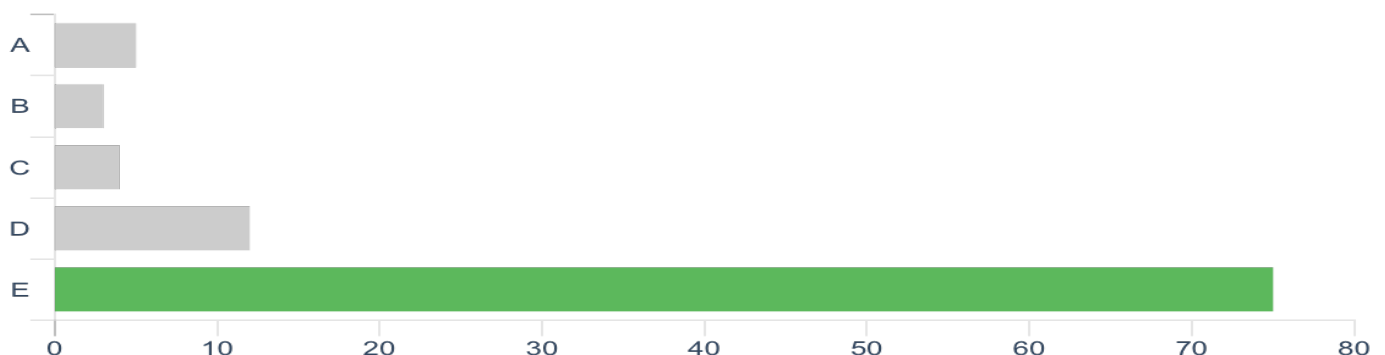
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Q216

A 59-year-old woman attends the Emergency Department (ED) complaining of severe indigestion-like pain. An electrocardiogram (ECG) shows ST elevation in the inferior leads. The patient goes for emergency percutaneous coronary intervention (PCI) and is then admitted for monitoring in the Coronary Care Unit (CCU). An hour after the PCI she is noted to have a bradycardia that does not respond to atropine. Her blood pressure (BP) is around 100 mmHg systolic.

Which one of the following would be an indication for temporary pacing wire insertion?

Your answer was incorrect

- A Ventricular rate of 43 bpm
- B Type 1, second-degree heart block
- C Frequent ventricular ectopics
- D Junctional rhythm with a QRS of 160 ms
- E First-degree heart block with a PR of 240 ms

Explanation



- D Junctional rhythm with a QRS of 160 ms

A widening QRS indicates a more extensive ischaemic territory affecting the conducting bundles. Temporary pacing wire insertion can be used as a holding measure to allow the myocardium time to recover. Bradycardias/heart block in the context of anterior myocardial infarction carry a much greater prognostic significance and are an indicator of extensive infarction.

- C Frequent ventricular ectopics

Ectopics are common following MI, and may represent reperfusion rhythm. In the absence of haemodynamic compromise, no specific intervention would be required. The CAST trial examined suppression of ventricular ectopics with class 1 anti-arrhythmics following MI, but

was stopped early due to evidence of harm.

A Ventricular rate of 43 bpm

Bradycardias are quite common in the context of inferior myocardial infarctions and they are not considered to be of any prognostic significance. This is because the right coronary artery, which is the commonest culprit artery in inferior myocardial infarctions, also gives branches to the sinoatrial (SA) and atrioventricular (AV) nodes. In the absence of haemodynamic compromise, no specific intervention would be required.

B Type 1, second-degree heart block

Asymptomatic patients with Wenckebach phenomenon do not usually require intervention, as this rhythm is at lower risk of progression to complete heart block than type 2, second-degree heart block. Symptomatic patients can be treated with atropine, and in some cases pacing.

E First-degree heart block with a PR of 240 ms

First-degree heart block does not require specific intervention apart from observation.

32335

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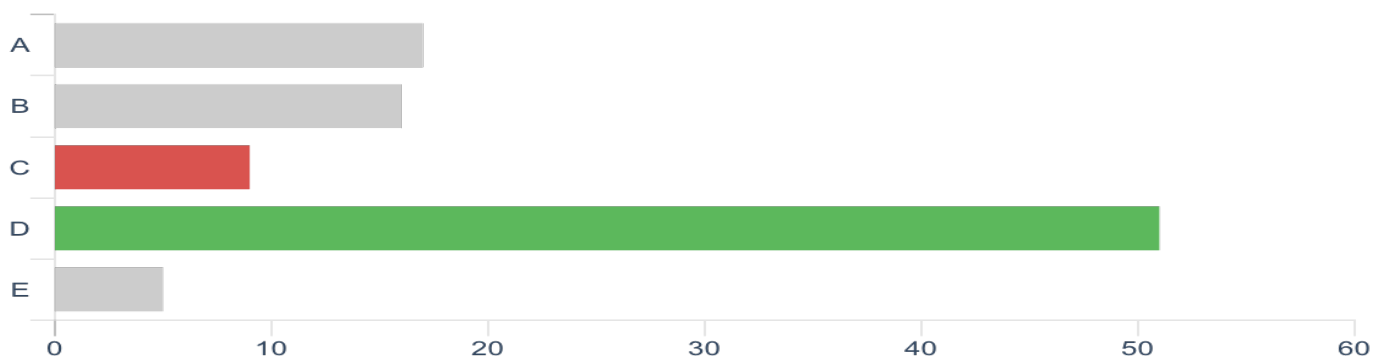
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Expanded Explanation

Overview

Clinical Presentation

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Links to NICE guidelines/CKS



Q217

A 74-year-old man presents to his General Practitioner (GP) with symptoms of breathlessness on climbing up stairs over the last six months. There is no history of chest pain or palpitations. He is known to suffer from hypertension for which he is on amlodipine 5 mg once daily. He is a smoker with a 40-pack year history and is obese, with a body mass index (BMI) of 32 kg/m².

His blood pressure (BP) in the surgery is 155/85 mmHg, while his pulse is 80 beats per minute (bpm) and regular. The GP can hear a quiet systolic murmur. His resting electrocardiogram (ECG) shows evidence of left ventricular hypertrophy. The GP refers the patient to the cardiology open-access echocardiography service.

Which of the following echo findings would most strongly point towards a non-cardiac cause of his breathlessness?

Your answer was incorrect

- A Left ventricular hypertrophy
- B Right ventricular impairment
- C Moderate aortic stenosis
- D Hypokinetic anterior wall of the left ventricle
- E Moderate mitral regurgitation

Explanation



- B Right ventricular impairment

The story is suggestive of early onset heart failure. The picture of right ventricular dysfunction should raise the possibility of an underlying respiratory pathology. In someone with a heavy smoking history, this is most likely to be chronic obstructive airways disease leading to chronic hypoxia and pulmonary hypertension; however, chronic thromboembolic disease is another possibility. If right ventricular impairment is demonstrated, given his BMI, CT pulmonary angiography (CTPA) or V/Q scan could be considered.

- C Moderate aortic stenosis

This would point towards valvular disease as a cause of his breathlessness.

A Left ventricular hypertrophy

Given his raised BP despite anti-hypertensive medication, this would suggest the possibility of uncontrolled hypertension as a potential cause of early-onset heart failure, explaining his breathlessness.

D Hypokinetic anterior wall of the left ventricle

This would suggest possible previous MI/IHD as a possible cardiac cause of his breathlessness.

E Moderate mitral regurgitation

This would point towards valvular disease as a cause of his breathlessness.

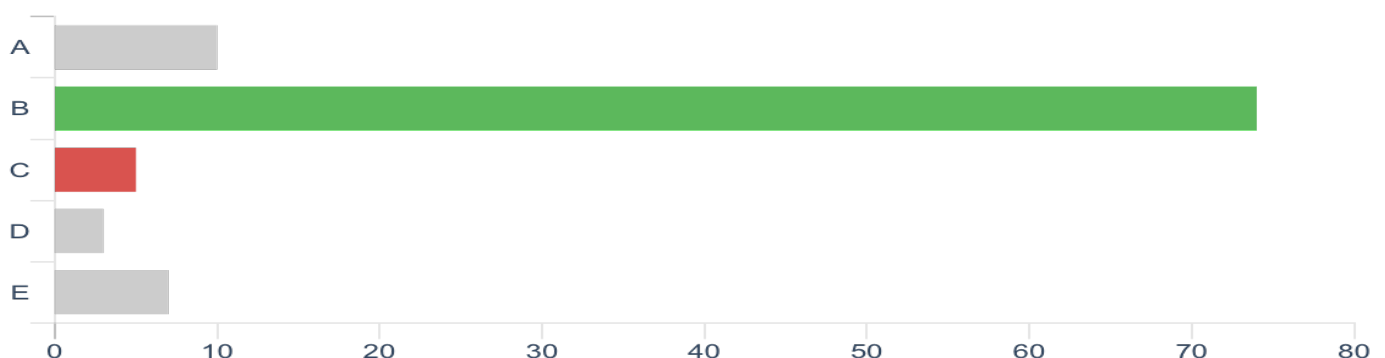
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 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Q218

A 63-year-old man presents to the Emergency Department (ED) with a three hour history of central crushing chest pain. An electrocardiogram (ECG) on arrival shows ST elevation of 3 mm in the anterior leads consistent with an anterior myocardial infarction (MI). He is sent for primary percutaneous coronary intervention (PCI) and recovers well after angioplasty and stenting, being discharged from hospital five days later.

Two months following discharge from hospital the same patient presents to hospital complaining of palpitations and dizziness. An ECG shows a broad complex tachycardia. Following emergency treatment with direct current (DC) cardioversion, an echocardiogram (ECHO) is performed that shows a hypokinetic anterior wall with an ejection fraction of 30%.

Which one of the following is the treatment of choice?

Your answer was incorrect

- A Amiodarone 200 mg tds
- B Automated ICD
- C Mexiletine 200 mg OD
- D Amiodarone 200 mg OD
- E Sotalol 80 mg OD

Explanation



- B Automated ICD

The development of late-onset ventricular tachycardia following an ischaemic event, coupled with the finding of left ventricular impairment on the echocardiogram, is an indication for the implantation of an automated defibrillator. Studies have demonstrated that this is a superior strategy with respect to survival versus long-term anti-arrhythmic therapy with an agent such as amiodarone or the other options listed. MADIT-II showed a reduction in all-cause mortality with ICD implantation vs conventional medical therapy (14.2% vs. 19.8%) in the context of post-MI patients with HFrEF. This was almost completely attributable to a reduction in sudden cardiac death (3.8% vs. 10.0%).

C Mexiletine 200 mg OD

Mexiletine is a class 1B anti-arrhythmic agent. It is no longer licensed in the UK and therefore not an appropriate choice in this case.

A Amiodarone 200 mg tds

Studies show that, in the context of ventricular tachyarrhythmias following MI in patients with decreased LV function, patients do significantly better with ICD implantation than with amiodarone.

D Amiodarone 200 mg OD

Studies show that, in the context of ventricular tachyarrhythmias following MI in patients with decreased LV function, patients do significantly better with ICD implantation than with amiodarone.

E Sotalol 80 mg OD

Studies show that in the context of VT following MI, in patients with heart failure, ICD is the management of choice

32338

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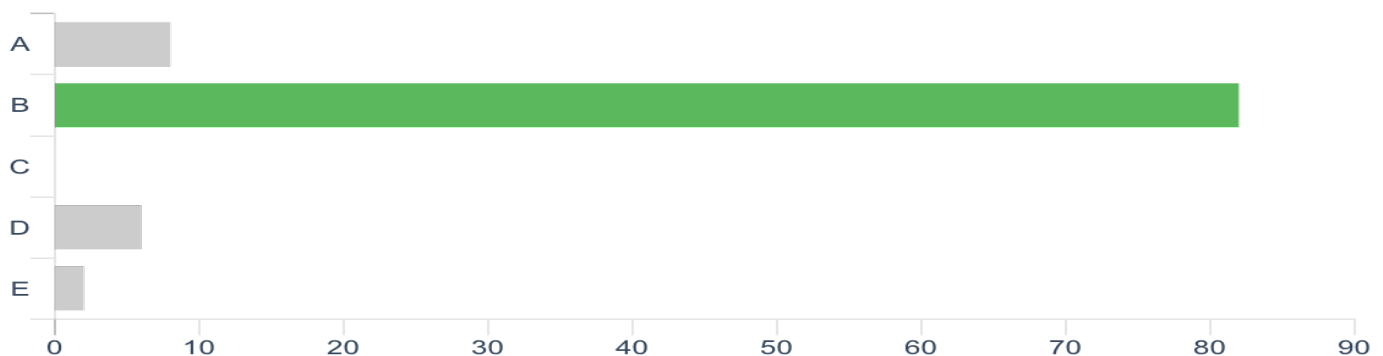
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[ncbi.nlm.nih.gov/pubmed/12039497](https://www.ncbi.nlm.nih.gov/pubmed/12039497)

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Analysis of mortality events in MADIT-II

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Q219

A 27-year-old woman who is 24 weeks into her first pregnancy is referred by her General Practitioner (GP) to the Cardiology Department complaining of palpitations. There is no past medical history of note and she is on no medications.

On examination her blood pressure (BP) is 115/82 mmHg. Her pulse is 70 beats per minute (bpm) and regular. There is a systolic murmur and a fixed splitting of the second heart sound. A 12-lead electrocardiogram (ECG) shows left-axis deviation with a right bundle branch block (RBBB). An echocardiogram (ECHO) is performed which shows an ostium primum atrial septal defect (ASD).

What is the risk, if any, to the pregnancy?

Your answer was incorrect

- A No significant increase in risk compared to the general population
- B Small risk to the mother, up to 20% risk of CHD to the fetus
- C Significant risk of maternal mortality, up to 40%
- D No significant increase in risk to the mother, up to 40% risk of CHD to the fetus
- E 10% risk of maternal mortality, no increased risk to the fetus

Explanation



- A No significant increase in risk compared to the general population

Atrial septal defects are usually well tolerated, as pulmonary hypertension is not usually present at childbearing age. However, the defect should be closed prior to subsequent pregnancies. In the presence of Eisenmenger syndrome the maternal mortality is approximately 40% and pregnancy is contraindicated, with older maternal age increasing the risk of pulmonary hypertension and Eisenmenger. Systolic flow murmurs are common in pregnancy; in the absence of structural heart disease they do not hold any prognostic significance.

- D No significant increase in risk to the mother, up to 40% risk of CHD to the fetus

Most cases of ASD are sporadic, and the risk to the foetus would not be expected to be as high as 40%.

B Small risk to the mother, up to 20% risk of CHD to the foetus

Pregnancy is tolerated well by most women with ASD. Most cases of ASD are sporadic, and the risk to the foetus would not be expected to be as high as 20%.

C Significant risk of maternal mortality, up to 40%

ASD is well tolerated in pregnancy by most women. Such a high maternal mortality (30–50% in older series and 17–33% in more recent studies) is seen in women with severe PAH, and in Eisenmenger syndrome.

E 10% risk of maternal mortality, no increased risk to the foetus

Pregnancy is tolerated well by most women with ASD.

32339

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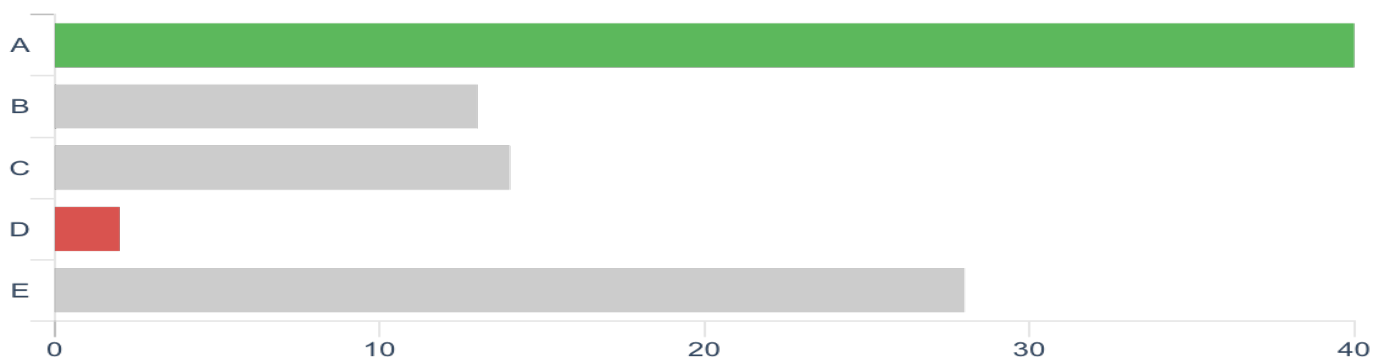
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 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Q220

A 45-year-old woman presents to the Emergency Department (ED) with breathlessness and palpitations.

On examination, there is a left parasternal heave. She has no murmurs and her chest is clear. A resting electrocardiogram (ECG) shows atrial fibrillation (AF) with right axis deviation. An echocardiogram (ECHO) confirms dilated right heart chambers.

The following data are collected during a left and right heart catheterisation study:

Sample site	Oxygen saturations (%)
Inferior vena cava	62
Superior vena cava	58
Right atrium	78
Right ventricle	79
Pulmonary artery	80
Arterial saturation	98

Which of the following is the most likely diagnosis?

Your answer was incorrect

- A Atrial septal defect
- B Ventricular septal defect
- C Patent ductus arteriosus
- D Ebstein's anomaly
- E Pulmonary stenosis

Explanation



- A Atrial septal defect

The findings of a parasternal heave on examination in combination with the right axis deviation are consistent with right ventricular volume overload. The cardiac catheterisation data show a step-up in oxygen saturations at the level of the right atrium. This signifies the presence of a left-to-right shunt at the level of the atrium, making an atrial septal defect the most likely diagnosis. The patient should be cardioverted to sinus rhythm prior to any intervention, to close the atrial septal defect. A transoesophageal echocardiogram can give sufficient anatomical data as to the size and site of the defect. It is well worth patients undergoing electrophysiological studies prior to any closure procedure. These are far easier to perform while the defect is present, as they provide an easy route into the left atrium. Any abnormal pathways predisposing to atrial flutter/fibrillation should be considered for radiofrequency ablation, which can be curative.

B Ventricular septal defect

The cardiac catheterisation data show a step-up in saturations at the level of the right atrium, making an ASD a more likely diagnosis than a VSD (in which case such a step-up would not be seen until the level of the right ventricle).

C Patent ductus arteriosus

PDA is often associated with a conspicuous apex beat due to left ventricular hypertrophy, and a continuous murmur classically described as 'machinery like'.

D Ebstein's anomaly

This is a rare congenital condition which is characterised by 'atrialisation' of the right ventricle due to apical displacement of the tricuspid valve. The first heart sound is widely split due to delayed closure of the tricuspid valve. S2 is usually normal, but may be widely split when P2 is delayed due to right bundle-branch block. A pansystolic tricuspid regurgitation murmur is also common. Patients may present with cyanosis and clubbing.

E Pulmonary stenosis

For stenosis to be sufficiently severe that a patient would present with symptoms, this would typically be associated with a loud pulmonary ejection murmur - loudest at the pulmonary area - with radiation to the posterior thorax.

32340

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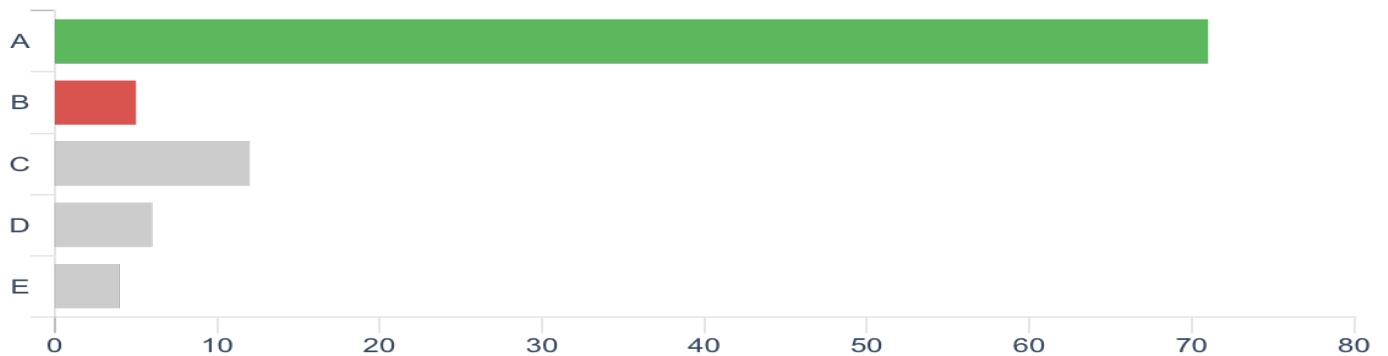
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Expanded Explanation

Overview

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Q221

A 25-year-old man presents to the Emergency Department (ED) complaining of central chest pain which is made worse by coughing and deep inspiration.

On examination, he has low-grade pyrexia at 37.9 °C. A friction rub is heard over the left sternal edge and his chest is clear. A 12-lead ECG shows widespread saddle-shaped ST changes. A chest X-ray (CXR) is unremarkable. A blood sample is sent for D-dimer analysis and is reported as negative. A bedside echocardiogram (ECHO) does not detect any significant abnormality.

What is the most likely diagnosis?

Your answer was incorrect

- A Lower respiratory tract infection
- B Myocardial infarction
- C Pulmonary embolism
- D Atypical pneumonia
- E Pericarditis

Explanation



- E Pericarditis

This patient presents with symptoms and signs consistent with a diagnosis of acute pericarditis. The diagnosis can be made based on the triad of chest pain, pericardial friction rub and ECG changes. A common complication of pericarditis is the development of pericardial effusion. This can present as breathlessness. An echocardiogram is used to confirm this and look for evidence of haemodynamic compromise. High dose aspirin or non-steroidal anti-inflammatories is the treatment of choice. A number of viruses including Coxsackie B, mumps and influenza are recognised as possible causes.

- C Pulmonary embolism

The negative D-dimer result makes this diagnosis significantly less likely than the other options here.

A Lower respiratory tract infection

Clear chest on examination, the presence of a pericardial rub and the ECG changes seen make this a less likely diagnosis than pericarditis. For an LRTI significant enough to cause symptoms, one would expect a degree of change on the CXR.

B Myocardial infarction

The pleuritic nature of his chest pain and the widespread nature of his ECG changes make this a less likely diagnosis in this case. Typically, one would expect ECG changes such as ST elevation or depression in the area served by a given coronary territory.

D Atypical pneumonia

One would expect findings on chest examination, or CXR, to support this diagnosis.

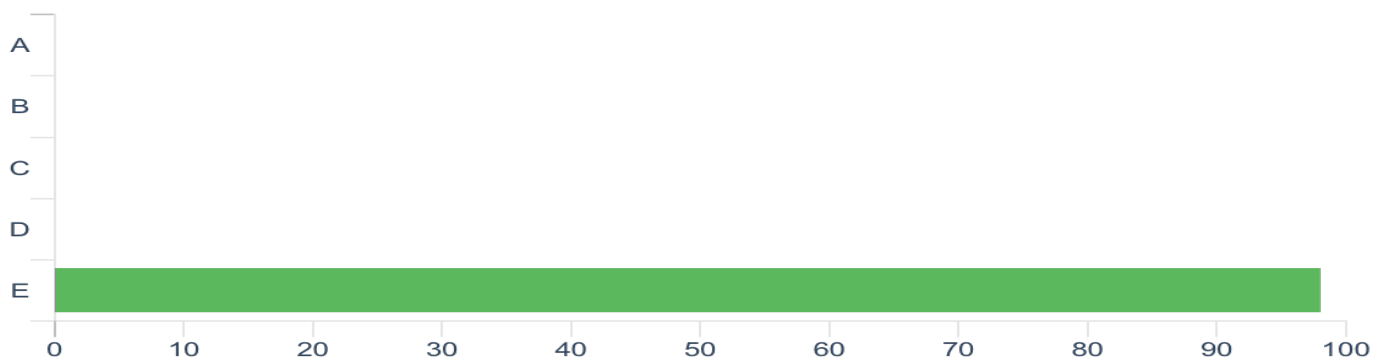
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Q222

A 73-year-old woman who is known to suffer from peptic ulcer disease (PUD) presents to the Emergency Department (ED) complaining of a six hour history of epigastric pain. She initially felt this was a bout of severe indigestion but called an ambulance after she started becoming short of breath.

On arrival in the department her blood pressure (BP) is 100/60 mmHg. Her pulse is 120 beats per minute (bpm) and she appears clammy and sweaty. Her heart sounds are normal and there are some basal crackles on auscultation of her chest. A 12-lead electrocardiogram (ECG) shows ST elevation of 1 mm in leads I and aVL, with ST depression of 2 mm and a dominant R wave in leads V1-V3. She undergoes urgent primary percutaneous coronary intervention (PCI) and makes a good initial recovery.

One week later she re-attends complaining of severe retrosternal chest pain that is worse on inspiration. On examination, she is found to have a low-grade pyrexia. There is a rub on auscultation of her chest. A 12-lead ECG shows dominant R waves in leads V1-V3. A chest X-ray (CXR) shows cardiomegaly with a small left-sided pleural effusion.

Which of the following is the most likely diagnosis?

Your answer was correct

- A Posterior myocardial infarction
- B Viral infection
- C Dressler syndrome
- D Bacterial lower respiratory tract infection
- E Pulmonary embolism

Explanation



- C Dressler syndrome

Dressler syndrome usually occurs 1–6 weeks after a myocardial infarction and is characterised by fever, pleuritis and pericarditis. It is thought to be an autoimmune reaction to myocardial antigens released after the infarction. Management is with aspirin, and corticosteroids are used in resistant cases, particularly those where pericardiocentesis has been required for

drainage of pericardial effusion; in rare cases up to 1500 ml of fluid is recognised to accumulate in the pericardial sac. Other post-MI syndromes include papillary muscle rupture, with a median time to onset of 13 h, which leads to acute mitral regurgitation, and ventricular septal defect, occurring with an incidence of 0.2% post-infarct, leading to catastrophic heart failure.

A Posterior myocardial infarction

The pleuritic nature of her chest pain, in the context of a recent MI, and the absence of dynamic ST changes on her ECG, make this a less likely diagnosis than Dressler syndrome.

B Viral infection

We are given a history of only a mild pyrexia, and in the context of a recent MI this would be a less likely diagnosis than Dressler syndrome. It is important to remember, however, that viral infections (particularly Coxsackie) can cause pericarditis.

D Bacterial lower respiratory tract infection

We are not given a significant history of respiratory symptoms such as productive cough, and the CXR was not overtly suspicious for LRTI (though in some cases of LRTI, parapneumonic effusions can be seen). Particularly in the context of recent MI, this makes LRTI a less likely diagnosis than Dressler syndrome.

E Pulmonary embolism

The presence of a rub, and a pleural effusion, in the context of a recent MI, make this a less likely diagnosis than Dressler syndrome.

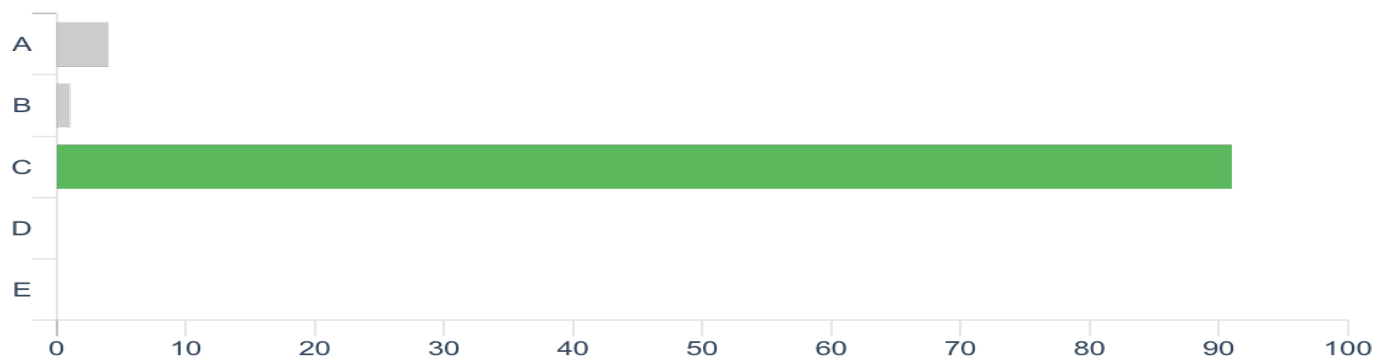
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Expanded Explanation

Overview

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Links to NICE guidelines/CKS



Q223

A 21-year-old woman presents to the Emergency Department (ED) complaining of palpitations. These started suddenly an hour ago and she describes them as fast and irregular. She has had a couple of short-lived episodes in the past but she has not sought medical advice about them.

On examination, she is found to have a blood pressure (BP) of 105/65 mmHg and a pulse of 170 beats per minute (bpm). A 12-lead ECG shows a supraventricular tachycardia with randomly changing QRS width. She is cardioverted and suspected to have Wolff -Parkinson- White syndrome.

Which of the following is the most appropriate long-term management option?

Your answer was incorrect

- A Amiodarone
- B Flecainide
- C Mexiletine
- D Bisoprolol
- E Radiofrequency ablation

Explanation



- E Radiofrequency ablation

The best long-term management option for Wolff-Parkinson-White (WPW) syndrome patients is referral for electrophysiological studies and radiofrequency ablation of the accessory pathway. This can be a curative procedure and is therefore preferable to a lifetime of anti-arrhythmic therapy. Out of the medical options given, amiodarone and flecainide have a significant body of evidence in prophylaxis against atrial fibrillation in WPW. Sotalol is another agent that prolongs myocardial refractiveness and may be used in some patients.

- D Bisoprolol

Drugs which act primarily on the AV node, such as verapamil and adenosine, should be avoided as these may lead to preferential conduction down the accessory pathway and precipitate VF.

A Amiodarone

While amiodarone is a suitable pharmacological option, radiofrequency ablation represents a potentially curative procedure and represents the best long-term management option, particularly given this patient's young age.

B Flecainide

While flecainide is a suitable pharmacological option, radiofrequency ablation offers a potentially curative procedure and represents the best long-term management option, particularly given this patient's young age.

C Mexiletine

It is a class 1b anti-arrythmic which is not currently licensed, but can be obtained from 'special-order' manufacturers and used for life-threatening ventricular arrhythmias.

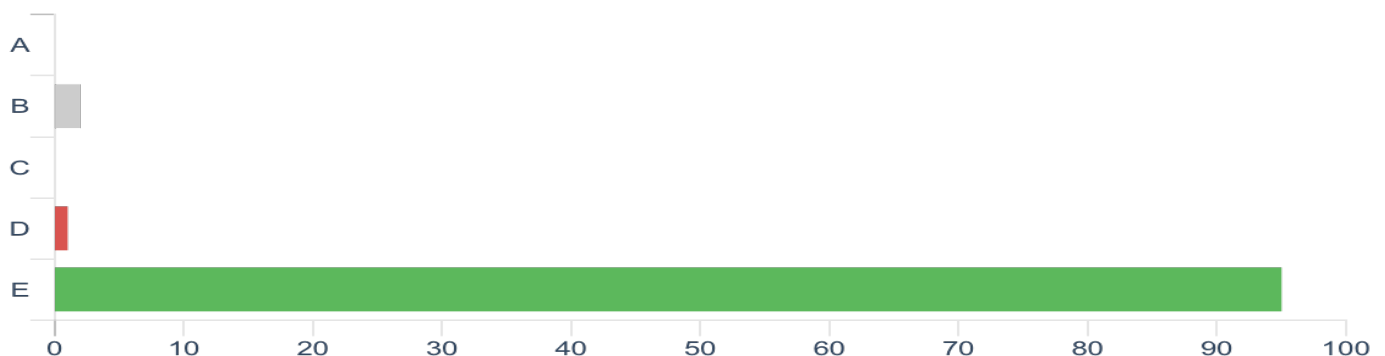
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Q224

A 46-year-old woman is diagnosed with a large left breast carcinoma. She is seen by the multidisciplinary oncology team who advocate a mastectomy with adjuvant radiotherapy and chemotherapy. A preoperative echocardiogram (ECHO) is performed and is reported as showing a good left ventricle with no significant valvular disease. The patient has a successful operation. The tumour is reported as HER2-positive, and the patient is started on a chemotherapy regime.

Two months later she complains of a gradual decrease in her exercise tolerance. On examination, there is mild bipedal oedema. Auscultation reveals inspiratory crackles at the bases of the lungs with reduced air entry on the side of the mastectomy. A chest X-ray (CXR) shows a small unilateral pleural effusion.

Which of the following is the most appropriate next step?

Your answer was incorrect

- A Therapeutic drainage of the effusion
- B Conservative management with radiographic follow-up
- C Repeat echocardiogram
- D CT chest
- E Full-body PET

Explanation



- C Repeat echocardiogram

The development of symptoms and signs of cardiac failure in an oncology patient should raise the possibility of cardiomyopathy secondary to cardiotoxic chemotherapy. A baseline echocardiogram should ideally be performed prior to embarking on any course of chemotherapy, and repeat echocardiograms are indicated if the patient develops symptoms during or after the course of chemotherapy. Herceptin in particular is recognised as being associated with cardiomyopathy. Animal studies have suggested that agonism of the Erb-B2 (HER2) receptor is protective against the development of dilated cardiomyopathy; as such, antagonism may increase the risk of developing the condition. Additionally, there can be

negative synergy between trastuzumab and other chemotherapeutic agents used to treat breast cancer, including anthracyclines such as doxorubicin, putting patients at increased risk of cardiotoxicity.

B Conservative management with radiographic follow-up

We are told that the effusion is small and unilateral. It is less likely to be responsible for this patient's symptoms than cardiac toxicity from her chemotherapy regime. It would seem prudent to actively investigate and treat this.

A Therapeutic drainage of the effusion

We are told that the effusion is small and unilateral. It is less likely to be responsible for this patient's symptoms than cardiac toxicity from her chemotherapy regime.

D CT chest

This would prove a less diagnostically useful investigation in the first instance than an echocardiogram, particularly given that there is a baseline echo with which it can be compared.

E Full-body PET

This would prove a less diagnostically useful investigation in the first instance than an echocardiogram, particularly given that there is a baseline echo with which it can be compared.

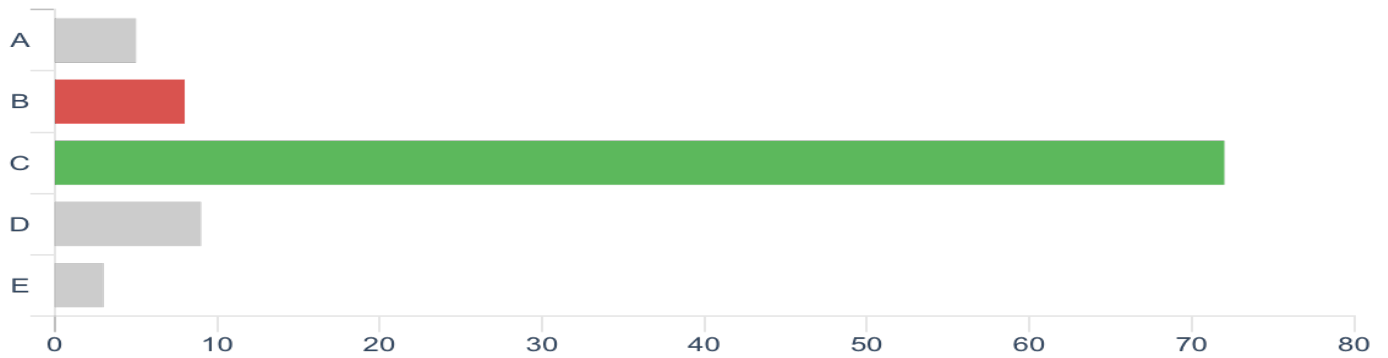
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q225

A 23-year-old woman presents to the Emergency Department (ED) with worsening shortness of breath. Her past medical history of note includes laparoscopic appendicectomy six months ago, complicated by intra-abdominal haemorrhage and admission to the intensive care unit (ICU). She has suffered multiple admissions over the past months for cardiac failure and has been noted to have pulmonary hypertension on echocardiogram (ECHO).

On examination, she is afebrile; her blood pressure (BP) is 162/90 mmHg and her pulse is 90 beats per minute (bpm). A murmur is heard over the left groin.

Investigations reveal the following:

Investigation	Result	Normal values
Right atrial pressure	15 mmHg	2-6 mmHg
Saturation	91% in IVC	
Mean pulmonary artery pressure	38 mmHg	11-17 mmHg

What is the most likely underlying cause?

Your answer was correct

- A Congenital AV malformation
- B Patent ductus arteriosus
- C ASD
- D Iatrogenic AV fistula
- E VSD

Explanation



- D Iatrogenic AV fistula

Central venous catheterisation is a rare cause of iatrogenic AV fistula. Central venous catheterisation has likely led to a fistula between the IVC and the iliac artery, with the consequence that right-sided circulatory pressures are significantly increased. The treatment of choice is stent repair of the iliac artery, which is likely to lead to resolution of her symptoms. Significantly raised right-sided cardiac pressures are also seen as a natural rather than an iatrogenic phenomenon in patients with significant arterio-venous malformations.

A Congenital AV malformation

While congenital AV malformation could lead to raised right-sided pressures, the recent onset of symptoms and history of ITU admission make iatrogenic AV fistula a more likely diagnosis.

B Patent ductus arteriosus

Patent ductus arteriosus is associated with a dilated and hypertrophied left ventricle, and classically a continuous 'machinery' murmur on auscultation, maximally beneath the left clavicle. The history of recent ITU admission and murmur over the groin make iatrogenic AV fistula a more likely diagnosis in this case.

C ASD

While ASDs can lead to pulmonary hypertension, they are commonly associated with exertional dyspnoea, recurrent chest infections and there may be a flow murmur heard across the pulmonary valve. The history of recent ITU admission and murmur over the groin make iatrogenic AV fistula a more likely diagnosis in this case.

E VSD

Depending on size, VSDs often present in childhood with dyspnoea and failure to thrive. They are associated with a pansystolic murmur at the lower left sternal border. While VSDs can be associated with pulmonary hypertension, and subsequent Eisenmenger syndrome, the history of recent ITU admission and murmur over the groin make iatrogenic AV fistula a more likely diagnosis in this case.

32345

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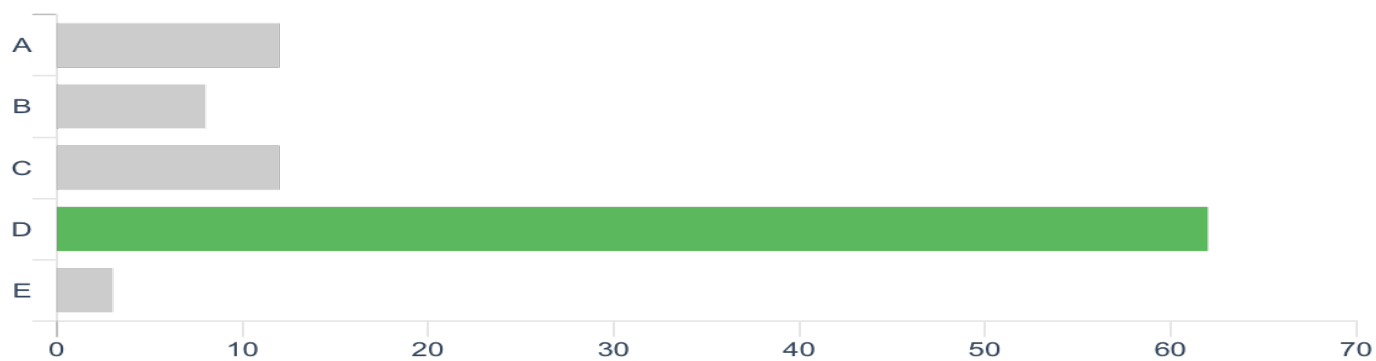
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Session Progress

Responses Correct:	46
Responses Incorrect:	179
Responses Total:	225
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Q226

A 73-year-old man presents to his General Practitioner (GP) with shortness of breath on exertion. This has been getting progressively worse over the last six months. He has found that he has to prop himself up with three pillows to go to sleep and there have been a couple of occasions when he woke up in the middle of the night with shortness of breath. He denies any history of chest pain or palpitations. There is no past medical history and he is on no medications.

On examination, his blood pressure (BP) is 168/105 mmHg and his pulse is 85 beats per minute (bpm). There is a pansystolic murmur on auscultation of his heart and bi-basal crackles on auscultation of his chest. There is bipedal oedema around his ankles.

Which of the following findings, if present, would be associated with the worst prognosis in this case?

Your answer was incorrect

- A Cardiomegaly on chest X-ray
- B Mitral regurgitation on echo
- C Ejection fraction of 50% on echo
- D Left ventricular hypertrophy on ECG
- E Serum sodium of 129 mmol/l

Explanation



- E Serum sodium of 129 mmol/l

This patient presents with symptoms and signs of congestive cardiac failure. Given the history, the most likely cause for this is left ventricular failure secondary to hypertension. Non-isotonic hyponatraemia in the context of congestive cardiac failure carries a poor prognosis as it is secondary to significant fluid overload. It was thought that specific vasopressin antagonists may offer a significant prognostic advantage in patients with heart failure and marked hyponatraemia, but the data so far have proved very disappointing.

- D Left ventricular hypertrophy on ECG

This patient is markedly hypertensive on presentation, and it could be surmised that this is long-standing and uncontrolled. In this context, LVH is not an unexpected finding.

A Cardiomegaly on chest X-ray

This patient is markedly hypertensive on presentation, and it could be surmised that this is long-standing and uncontrolled. In this context, cardiomegaly is not an unexpected finding.

B Mitral regurgitation on echo

This is the most common form of valvular heart disease in developed countries, and while it would be important to quantify and monitor, it is not the most prognostically adverse feature here.

C Ejection fraction of 50% on echo

This is at the lower end of the normal range, and would not represent the most prognostically adverse finding here.

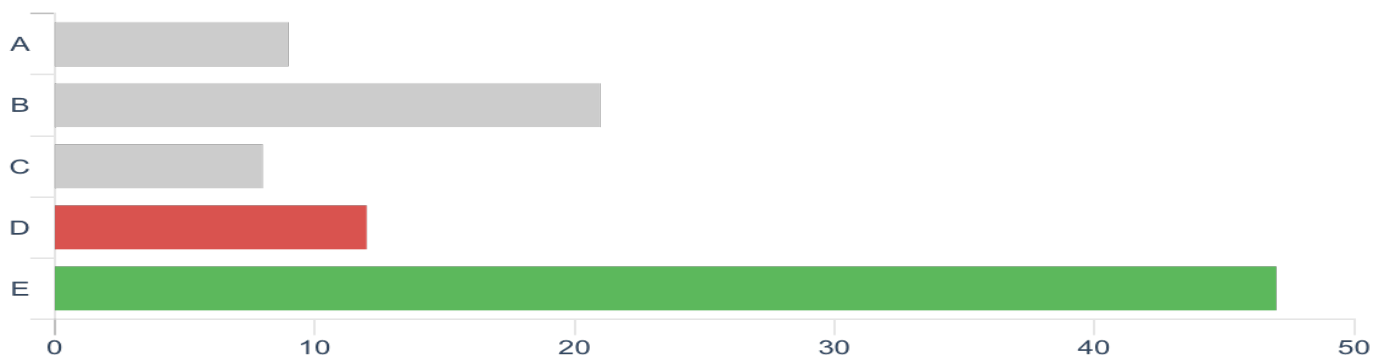
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Responses Correct:	46
Responses Incorrect:	180
Responses Total:	226
Responses - % Correct:	20%

 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Q227

A 55-year-old lorry driver presents to the Emergency Department (ED) with central chest pain. He describes this as a feeling of pressure on his chest that is building up in intensity.

On examination in the ED, he looks sweaty and clammy and he vomits once in the resuscitation area. A 12-lead electrocardiogram (ECG) shows ST elevation in the anterior leads, confirming an anterior myocardial infarction (MI). He is transferred for urgent percutaneous coronary intervention (PCI) and then moved to the Coronary Care Unit (CCU).

Which of the following rhythms on an ECG taken 2 hours post PCI would be associated with the worst prognosis?

Your answer was incorrect

- A Multiple ventricular ectopics
- B Accelerated idioventricular rhythm
- C Third-degree atrioventricular block
- D Mobitz type 1 AV block (Wenckebach phenomenon)
- E Sinus rhythm with rate 30 bpm

Explanation



- C Third-degree atrioventricular block

Complete heart block in the context of an anterior myocardial infarction signifies an extensive area of infarction and carries a high risk of in-hospital death. It is an indication for temporary pacing, and permanent pacing is almost invariably required. The CARISMA trial monitored patients with acute anterior myocardial infarction and reduced ejection fraction, and found that high-degree AV block was the strongest predictor of mortality. Note this is not the same study as the CHARISMA trial, which examined the effect of clopidogrel and aspirin in combination on cardiovascular events.

- D Mobitz type 1 AV block (Wenckebach phenomenon)

This is a relatively common rhythm abnormality following MI, occurring in up to 10% of patients, particularly in cases of inferior MI. It is usually benign, requiring only close observation to ensure that it does not progress to a higher-degree block.

A Multiple ventricular ectopics

These can be related to reperfusion and are common in the context of acute MI. The CAST trial demonstrated evidence of harm in attempting to suppress ventricular ectopics with class 1 anti-arrhythmics following MI.

B Accelerated idioventricular rhythm

This is a common rhythm abnormality following MI, occurring in 15-20% of patients. Observation is key, and no treatment is usually needed.

E Sinus rhythm with rate 30 bpm

Sinus bradycardia is relatively common following MI, and may be due to drugs, ischaemia or a vagal response. Atropine can be used for symptomatic patients, with insertion of a temporary pacing line if this proves ineffective.

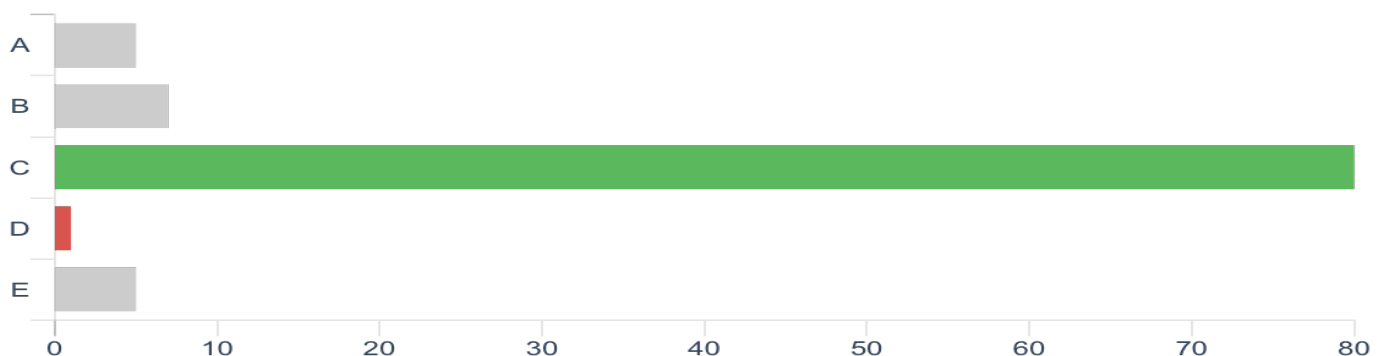
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External Links

CARISMA study

circ.ahajournals.org/content/122/13/1258.full.pdf

(<http://circ.ahajournals.org/content/122/13/1258.full.pdf>)



Q228

A 25-year-old woman who has recently arrived in the UK presents to her General Practitioner (GP) complaining of intermittent episodes of breathlessness associated with palpitations. She describes these as fast and irregular, and of sudden onset and termination. There is no associated chest pain but she has felt dizzy on a couple of occasions.

On examination, she has a blood pressure (BP) of 125/78 mmHg and a pulse of 86 beats per minute (bpm). There is a diastolic murmur over the apex of the heart and the lungs are clear. A 12-lead electrocardiogram (ECG) shows sinus rhythm with bifid P waves.

Which of the following agents is the most appropriate in this case?

Your answer was incorrect

- A Bisoprolol
- B Digoxin
- C Amiodarone
- D Flecainide
- E Mexiletine

Explanation



- A Bisoprolol

The finding of a diastolic murmur combined with the presence of a bifid P wave (P-mitrale) on the electrocardiogram (ECG) points towards the diagnosis of mitral stenosis. The episodes of palpitations most likely represent episodes of paroxysmal atrial fibrillation (AF). A beta-blocker can be used as first-line treatment to prevent atrial tachy-arrhythmias, and slow down the heart rate in sinus rhythm, thus increasing diastolic time and augmenting cardiac output. Digoxin is not particularly helpful in paroxysmal AF, and amiodarone should be reserved for resistant cases.

- E Mexiletine

It is a class 1b anti-arrhythmic, which is unlicensed in the UK but available on special order for cases of life-threatening ventricular arrhythmia.

B Digoxin

It is not an agent recommended for paroxysmal AF. There is evidence that it does not prevent paroxysmal attacks, and may even prolong attacks when they occur.

C Amiodarone

This (or dronedarone) would be indicated in cases of beta-blocker failure/resistant cases, assuming the patient meets the NICE criteria for its use.

D Flecainide

NICE guidelines state its use should be reserved for people with no evidence of structural or ischaemic heart disease. In this case bisoprolol is the preferred initial intervention, flecainide could be considered as a second line therapy.

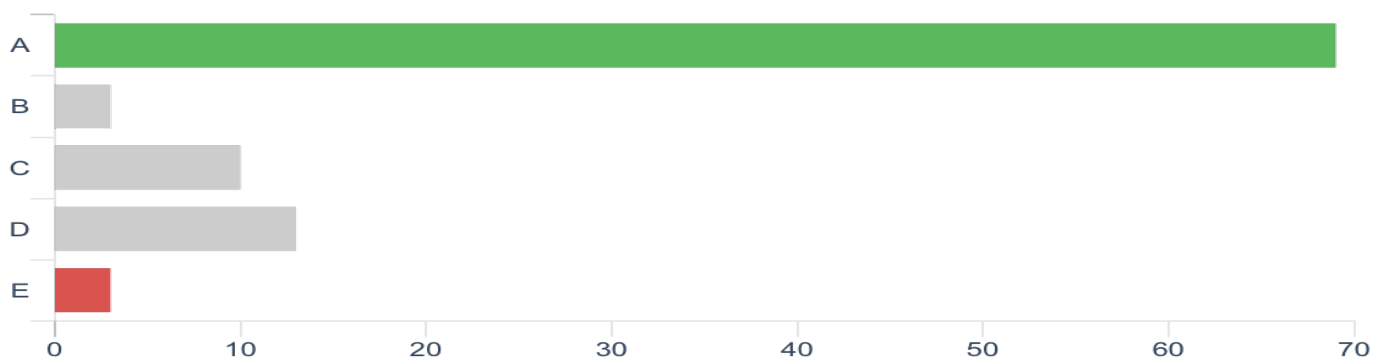
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External Links

NICE - Atrial fibrillation: management

[nice.org.uk/guidance/cg180/resources/atrial-fibrillation-management-35109805981381](https://www.nice.org.uk/guidance/cg180/resources/atrial-fibrillation-management-35109805981381)

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Expanded Explanation

Overview

Clinical Presentation

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Links to NICE guidelines/CKS



Q229

A 35-year-old African-Caribbean man presents to his General Practitioner (GP) with a history of palpitations. These occur randomly at rest but there have been episodes of fast palpitations on exertion associated with dizzy spells. He has had one episode of collapse after a game of tennis.

On examination, there is a prominent apical impulse. A systolic murmur is heard over the left sternal edge on auscultation of the heart and the chest is clear. Echocardiography (ECHO) reveals septal hypertrophy with a left ventricular outflow gradient of 55 mmHg, consistent with hypertrophic obstructive cardiomyopathy. A 72 hour Holter monitor reveals episodes of non-sustained ventricular tachycardia.

Which of the following is most appropriate for managing his rhythm disturbance?

Your answer was incorrect

- A Metoprolol
- B Verapamil
- C Digoxin
- D Amiodarone
- E Implantable cardioverter defibrillator

Explanation



- E Implantable cardioverter defibrillator

This man has already suffered one episode of syncope, and has documented non-sustained VT on his 72 h Holter monitor. In the context of HOCM, he is at significant risk of sudden cardiac death related to VT, with an odds ratio of 4.35, and as such an implantable cardioverter defibrillator is the management of choice. Small studies in those with HOCM and VT show that ICDs have a positive impact on reducing the risk of sudden death.

- C Digoxin

There are no randomised, controlled data to support the use of anti-arrhythmics for the prevention of SCD in HCM. ESC guidelines state that digoxin should be avoided in patients with LVOTO, such as in this case ('By convention, LVOTO is defined as a peak instantaneous Doppler LV outflow tract gradient of ≥ 30 mm Hg, but the threshold for invasive treatment is usually considered to be ≥ 50 mm Hg'), because of its positive inotropic effects. Low-dose digoxin may be considered for patients without LVOTO who are in NYHA functional class II-IV and have an EF $< 50\%$ and permanent atrial fibrillation to control heart rate response, but it is not recommended in those with a preserved LV.

A Metoprolol

There are no randomised, controlled data to support the use of anti-arrhythmics for the prevention of SCD in HCM. Beta-blockers and/or amiodarone are recommended in patients with an ICD and who continue to have symptomatic ventricular arrhythmias or recurrent shocks despite optimal treatment and device reprogramming.

B Verapamil

There are no randomised, controlled data to support the use of anti-arrhythmics for the prevention of SCD in HCM. It is recommended (class IC) for controlling ventricular rate in patients with permanent or paroxysmal AF (beta-blockers or diltiazem represent alternative options for this indication).

D Amiodarone

If the patient were to refuse an ICD, amiodarone would be the most appropriate anti-arrhythmic choice, but it is a less suitable management option than ICD implantation. Amiodarone was associated with a lower incidence of SCD in one small observational study of patients with NSVT on Holter monitoring while in others it increased the threshold for VF, but observational data suggest that amiodarone often fails to prevent SCD.

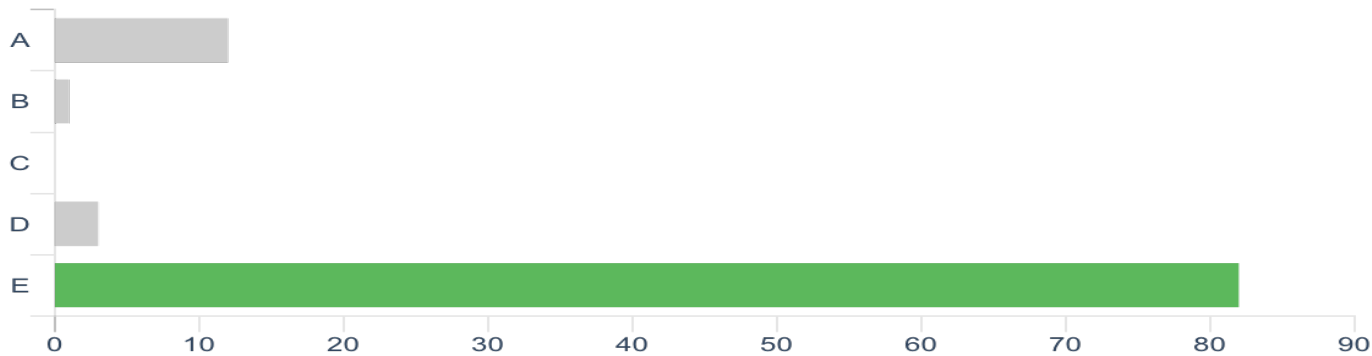
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Q230

An 81-year-old woman is admitted to the Emergency Department (ED) hospital with a fractured pubic ramus sustained in a fall. She undergoes successful surgery, but you are asked to see her by the Orthopaedic Team some 36 hours after admission as she has suffered increasing breathlessness and left-sided pleuritic chest pain.

She is rather confused and the nursing staff have measured her saturations at 94% on 8 litres oxygen. Her pulse is 110 beats per minute (bpm) and regular. Her blood pressure (BP) is 110/60 mmHg. Her chest is clear on auscultation.

Which of the following tests would be most definitive in identifying the cause of the breathlessness?

Your answer was incorrect

- A 12-lead ECG during the breathlessness
- B D-dimer
- C CT pulmonary angiogram
- D CXR
- E Troponin

Explanation



- C CT pulmonary angiogram

This is a very common clinical scenario. Because this patient is likely to be rather inactive given her pubic ramus fracture, she is at markedly increased risk of pulmonary embolus. CT pulmonary angiogram is the most appropriate definitive investigation in this context. CTPA is a fast and readily available test, with increased sensitivity compared to V/Q testing, and shows superior ability to demonstrate alternative causes of symptoms such as pneumonia. However, it has a high radiation dose delivered to breast tissue vs V/Q scanning, making it a less attractive choice for pregnant women or women of childbearing age. It also has a higher risk of inducing nephropathy due to IV contrast than V/Q scanning, making it a less attractive choice in patients with moderate-severe renal impairment.

A 12-lead ECG during the breathlessness

The patient does not have a history of cardiac chest pain, and a 12-lead ECG is only likely to be abnormal (right ventricular strain pattern) in the presence of a large pulmonary embolus.

B D-dimer

This would likely be raised secondary to her fracture, and thus would not be diagnostic if positive. Given the high pre-test possibility of PE, this would be a less appropriate investigation than CTPA.

D CXR

While appropriate to perform during the course of this patient's work-up, it is a less diagnostic investigation than CTPA in this clinical context.

E Troponin

The patient does not give a history of cardiac chest pain, and the clinical scenario is more suggestive of PE than acute MI.

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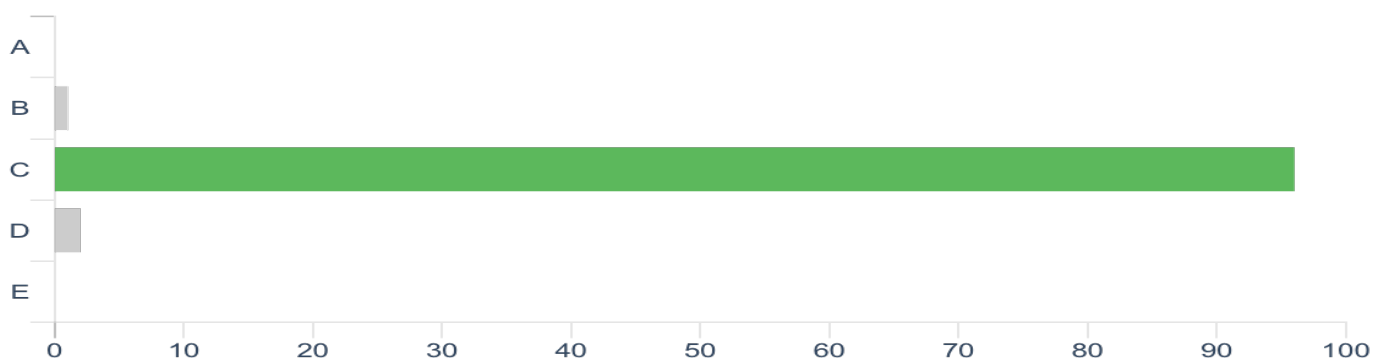
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Expanded Explanation

Overview

Clinical Presentation

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Links to NICE guidelines/CKS



Q231

A 55-year-old man is brought into the Emergency Department (ED) having been found collapsed in an alley.

On admission, he is unconscious with a pulse rate of 50 beats per minute (bpm) and a blood pressure (BP) of 110/70 mmHg. His pupils are equal and reactive, and the tone is normal in all four limbs. A 12-lead electrocardiogram (ECG) shows an AV junctional rhythm, prominent J-waves in the precordial leads and a corrected QT interval of 0.64 s. There are no acute ischaemic changes.

Investigations reveal the following:

Investigation	Result	Normal value
White cell count (WCC)	$4.5 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Haemoglobin (Hb)	13.6 g/dl	13.5-17.5 g/dl
Urea	9 mmol/l	2.5-6.5 mmol/l
Creatinine (Cr)	120 mmol/l	50-120 μ mol/l
Potassium (K^+)	3.2 mmol/l	3.5-5.0 mmol/l
Sodium (Na^+)	136 mmol/l	135-145 mmol/l
Blood alcohol level	100 μ g/dl	
Troponin-I	Normal	

What is the cause of the prolonged QT interval?

Your answer was incorrect

- A Hypokalaemia
- B Hyperthermia
- C Alcohol
- D Hypothermia
- E Intracranial haemorrhage

Explanation



D Hypothermia

The presence of J-waves, QTc of 640ms and junctional rhythm is typical of hypothermia. With a normal neurological examination and relatively normal blood tests, this is the most likely cause of the presentation of this gentleman.

The typical ECG features of hypothermia are J-waves, prolonged QT interval and AV junctional rhythm. J-waves are positive deflections in the terminal portion of the QRS complex and are highly sensitive and specific for hypothermia. Other causes of J-waves include hypercalcemia and intracranial pathology like subarachnoid haemorrhage.

E Intracranial haemorrhage

Although intracranial haemorrhage can cause reduced consciousness and J waves on ECG, with the normal neurological examination, it is very unlikely.

Elevated intracranial pressure, for instance in the setting of an intracranial haemorrhage, is also a potential cause for QT prolongation and would need to be considered along with electrolyte abnormalities if treatment of the patient's hypothermia did not improve his condition.

A Hypokalaemia

Hypokalaemia is one of the causes of prolonged QT. ECG changes of hypokalaemia includes prolonged PR, flattened T waves and presence of U wave (best seen in chest leads). These are not present in this patient.

B Hyperthermia

Hyperthermia normally causes the tachycardia and hypertension instead of the bradycardia seen in this patient.

C Alcohol

Even though the blood alcohol level of the patient is raised, it is not at the level which you would expect it to be at for a patient to be in a comatose state. Alcohol consumption or intoxication is more commonly associated with tachyarrhythmias like atrial fibrillation.

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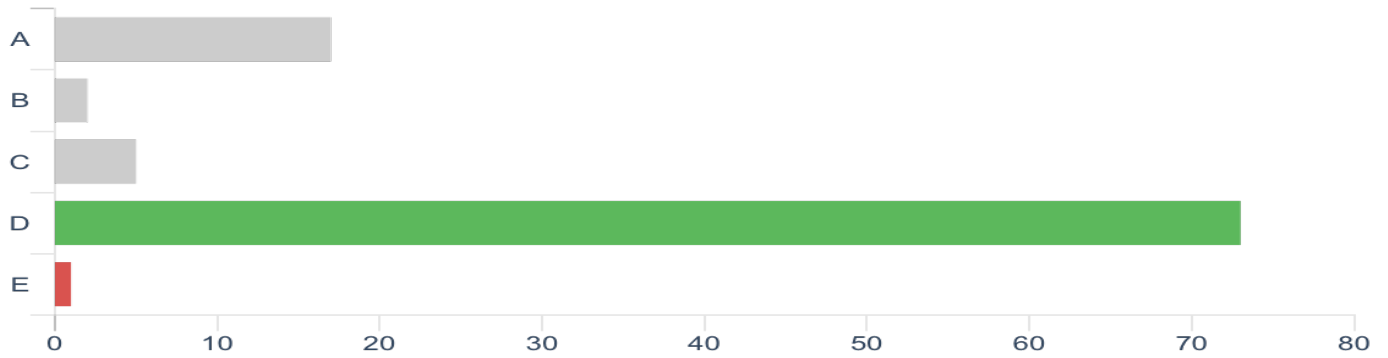
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Q232

A 48-year-old man is admitted to the Cardiology Clinic for investigation following three episodes of collapse over the past month. The episodes were self-limiting, each lasting two to three minutes and associated with some twitching of the limbs. There was no tongue biting or loss of continence and he was not confused after the attacks.

On examination, he has an ejection systolic murmur at the right sternal border and reversed splitting of S2. An electrocardiogram (ECG) shows sinus rhythm with left ventricular hypertrophy and strain. A chest X-ray (CXR) shows an area of calcification overlying the cardiac silhouette.

Which diagnosis fits best with this clinical picture?

Your answer was incorrect

- A Aortic stenosis
- B Aortic regurgitation
- C Hypertrophic cardiomyopathy
- D Coarctation of the aorta
- E Aortic sclerosis

Explanation



- A Aortic stenosis

The signs of aortic stenosis include: an ejection systolic murmur, loudest in the aortic area, which radiates to the carotids and axilla; a slow rising, small volume pulse; and, in severe stenosis, there may be reversed splitting of S2. LVH and strain on ECG shows the compensatory mechanism the heart has developed to cope with the aortic stenosis. Calcification on CXR is an indication that the valve is heavily calcified.

Aortic stenosis may be asymptomatic. Symptoms include syncope, angina and dyspnoea although the classical presentation with all 3 is only found in 30-40% of individuals with aortic stenosis.

The patient in this case is describing typical cardiogenic syncope with unprovoked attacks and generally quick recovery periods.

When symptoms appear, survival without surgery is only on average 2-3 years and is therefore an indication for surgical intervention. Sudden death occurs in 1-2% of asymptomatic patients per year. Causes of aortic stenosis include congenital or rheumatic heart disease, bicuspid valve, degenerative calcification and hypertrophic obstructive cardiomyopathy. In asymptomatic patients, the valve is usually replaced when the pressure gradient across the valve exceeds 50 mmHg.

B Aortic regurgitation

Aortic regurgitation causes a diastolic murmur and other signs like collapsing pulse which is not present in this patient. It causes LV dilatation instead of hypertrophy as it causes a volume overload state.

C Hypertrophic cardiomyopathy

The presence of LVH with strain could be an indication of HCM. The murmur could only be present if there is LV outflow tract obstruction as in the case of hypertrophic obstructive cardiomyopathy (HOCM). With the presence of calcification on CXR, it makes it more likely to be valve calcification as the cause.

D Coarctation of the aorta

Coarctation of aorta produces a late systolic murmur and radio-femoral delay. Rib notching present on chest x-ray is due to pressure erosion from enlarged collateral vessels. Patients may present with hypertension, headaches, nose bleeds, cold peripheries or intermittent claudication

E Aortic sclerosis

Aortic sclerosis is the presence of calcification on aortic valve with no outflow tract obstruction. It will produce the systolic murmur and CXR findings but would not cause the splitting of S2, LVH on ECG or the symptoms the patient is experiencing.

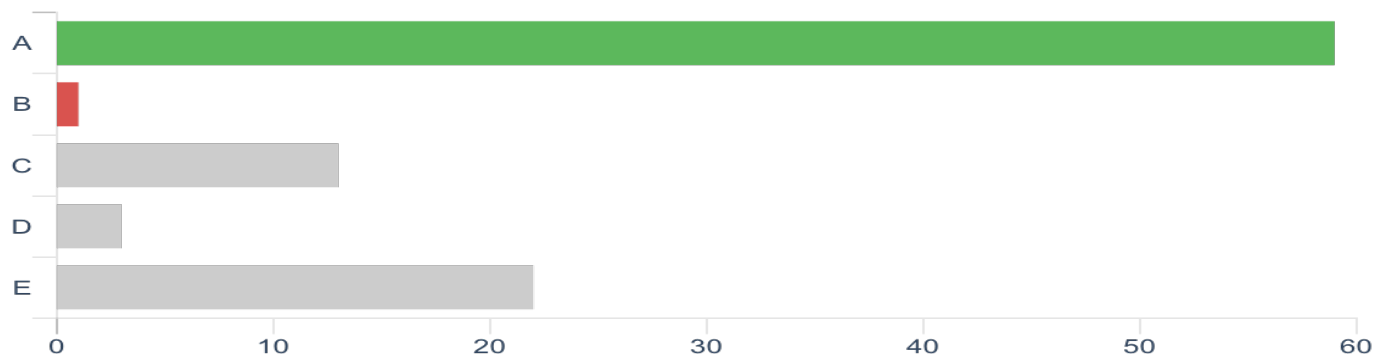
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Responses Incorrect:	186
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Q233

An 18-year-old woman is brought into the Emergency Department (ED) with severe chest pain that developed abruptly 30 minutes ago. She describes the pain as 'tearing' and says it radiates into her jaw. There is no past history of cardiovascular disease. The past history is significant for primary amenorrhoea.

On examination, her blood pressure (BP) is 170/110 mmHg in the right arm and 145/90 mmHg in the left. Her pulse is 120 beats per minute (bpm) and regularly regular, and she is afebrile. The patient appears in distress and you note a diastolic murmur, muffled heart sounds and a raised jugular venous pressure (JVP). You also notice that the patient is of short stature and has a broad neck. An electrocardiogram (ECG) is performed and reveals sinus tachycardia and widespread ST depression. A portable chest X-ray (CXR) is performed and reveals a widened mediastinum. You suspect aortic dissection.

What is the likely underlying diagnosis?

Your answer was incorrect

- A Turner's syndrome
- B Pseudoxanthoma elasticum
- C Noonan syndrome
- D Marfan syndrome
- E Osteogenesis imperfecta

Explanation



- A Turner's syndrome

This patient fits the description for Turner's syndrome – Amenorrhoea, short stature and broad neck. The presenting complain of chest pain is highly suggestive of aortic dissection and is supported by the clinical findings of blood pressure difference, diastolic murmur (AR), muffled heart sounds (effusion) and widened mediastinum.

Turner's syndrome is a chromosomal disorder resulting from the 45X karyotype. It is characterised by short stature, ovarian failure with primary or secondary amenorrhoea, webbed neck, cubitus valgus, a broad chest with widely spaced nipples, and aortic dissection

in adulthood. Aortic dissection characteristically presents with a very abrupt onset of chest pain which differentiates it from the other differentials. The mediastinum is widened on the chest X-ray in many cases of aortic dissection. Around 2/3rds of dissections in Turner's arise in the ascending aorta. Epidemiological data suggests that the incidence of aortic dissection is many times higher for young women with Turner's versus age matched controls. The annual incidence is 15/100,000 years for those <20 years, and is 73-78/100,000 years for those 20-40 years of age. This is against an incidence of 6/100,000 years for those without Turner's syndrome.

C Noonan syndrome

Noonan syndrome has similar external physical characteristics to Turner's, although in females it is associated with normal fertility. It is associated with ASDs, VSDs and pulmonary stenosis.

B Pseudoxanthoma elasticum

PXE is a genetic condition that can cause early onset atherosclerosis. It typically causes cutaneous and ophthalmic changes which are not described in the case. It is caused by an autosomal recessive gene mutation in ABCC6 gene on chromosome 16.

D Marfan syndrome

Marfan's syndrome is a connective tissue disease. Patients typically are tall and thin with long arms and legs. It is very commonly associated with aortopathy and can present with aortic dissection.

E Osteogenesis imperfecta

OI is a genetic disease affecting the bones. Patients will typically have short stature and blue sclera with varying involvement of their bones. This is not typically associated with cardiovascular disease.

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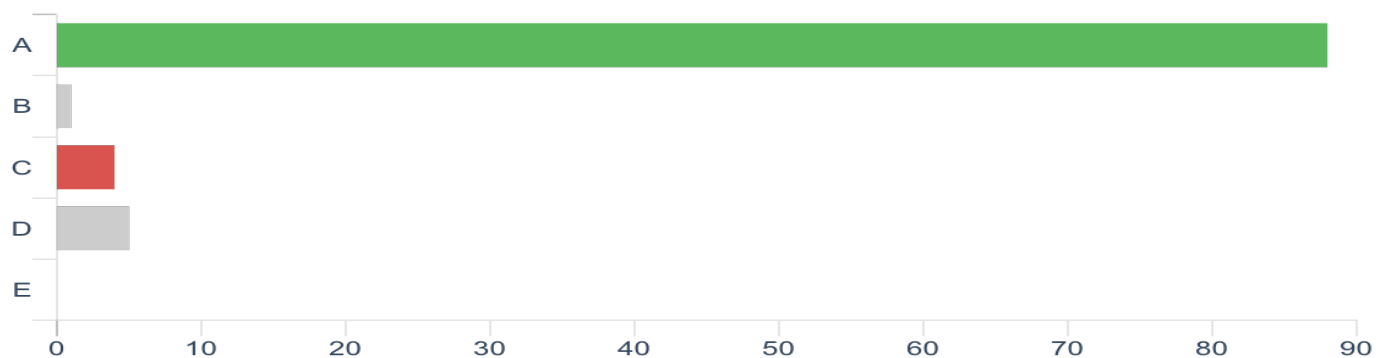
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 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q234

A 54-year-old man with a past history of hypertension and smoking presents to the Emergency Department (ED). He has suffered central chest pain radiating to his back for two hours prior to presenting at the ED. He is hypotensive, with a blood pressure (bp) of 80/60 mmHg and has a pulse of 105 beats per minute (bpm). There are bilateral basal crackles on auscultation of the chest. An electrocardiogram (ECG) shows evidence of inferior ST elevation. A transoesophageal echocardiogram (ECHO) reveals a double lumen in the ascending aorta.

Which diagnosis fits best with this clinical picture?

Your answer was incorrect

- A Aortic dissection
- B Degenerative thoracic aneurysm
- C Inferior myocardial infarction
- D Anterior myocardial infarction
- E Haemopericardium

Explanation



- A Aortic dissection

With the history of chest pain radiating to the back and haemodynamic compromise, aortic dissection is the top of the differential diagnosis. Risk factors include male, hypertension and smoking. The presence of double lumen in the ascending aorta is indicative of aortic dissection. Inferior ST elevation indicates the involvement of the RCA due to the extension of the dissection proximally towards the coronary sinus.

Case series of dissecting aneurysms put 5-year survival in the region of 70-80% with optimal medical/surgical input in a centre of excellence. Aortic dissections which compromise the coronary arteries present a particular challenge. They are usually managed with an endovascular stenting approach but where hypotension and ischaemia exist as here, prognosis is particularly poor.

C Inferior myocardial infarction

The presence of inferior ST elevation makes this a possible differential diagnosis and it would be impossible to differentiate without the findings on echocardiogram. However, the description of chest pain radiating to the back makes it more likely to be dissection and this is confirmed with TOE.

B Degenerative thoracic aneurysm

Degenerative thoracic aneurysm is unlikely to present acutely unless the aneurysm ruptured or dissected.

D Anterior myocardial infarction

ST elevation was present in the inferior leads, therefore making anterior MI unlikely.

E Haemopericardium

Haemopericardium could be present due to leaking of blood from the ruptured aorta and could lead to haemodynamic compromise. However, in the absence of trauma, the most likely cause would be a ruptured aortic dissection.

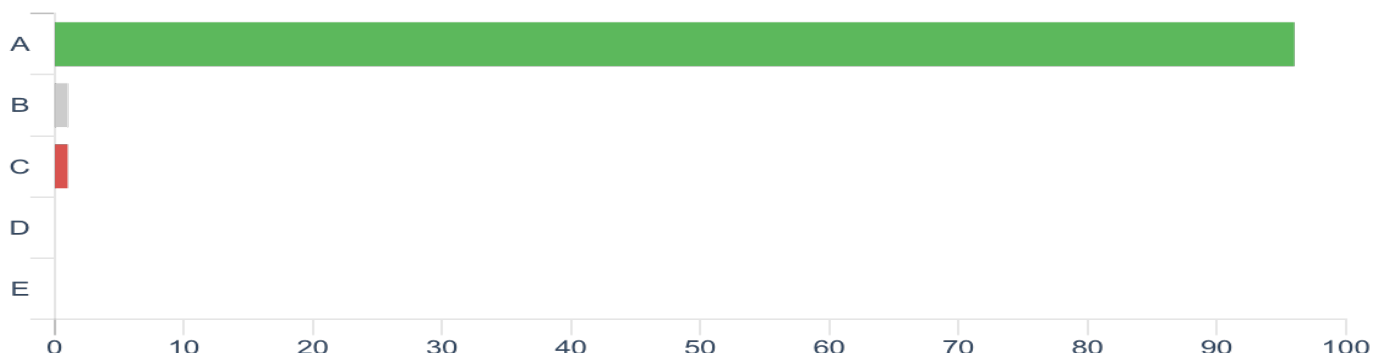
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Expanded Explanation

Overview

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Q235

A 50-year-old man presents to the Emergency Department (ED) with central crushing chest pain, which was subsequently confirmed as a myocardial infarction (MI). He developed atrial fibrillation (AF) two days post-myocardial infarction (MI) and was digitalised, although he was not fully anticoagulated at this point. Six days post-MI he banged into a bed and the wall while walking to the toilet, and appeared blind - although he denied this, attempting to describe objects around his bed space. His pupillary reflexes were normal.

Which of the following best describes the lesion that has occurred?

Your answer was incorrect

- A Bilateral occipital lobe infarcts
- B Bilateral retinal artery thrombosis
- C Bilateral retinal vein thrombosis
- D Retinal detachment
- E Branch retinal vein occlusion

Explanation



- A Bilateral occipital lobe infarcts

This patient has cortical blindness, lacking insight into the fact that he is unable to see. Denial of visual loss has been described previously as the Anton-Babinski syndrome, and indeed visual hallucinations are often also reported. The cause in this case is likely to be extensive occipital lobe infarcts as a result of emboli from his atrial fibrillation. Neuroimaging should be urgently performed to confirm the diagnosis. The pupillary response in this case is preserved. Unfortunately, the window for immediate treatment with thrombolysis is lost, and full heparinisation at this point increases the risk of haemorrhagic conversion.

Although he is at high risk of falls given his blindness, anticoagulation with NOACs or warfarin should still be considered to prevent further embolic events as his risk is high (CHADS₂Vasc = 3 without knowing if he has CCF, hypertension or diabetes). NICE guidelines has recommended that anticoagulation should not be withheld for risk of falls.

B Bilateral retinal artery thrombosis

AF can cause arterial thrombosis if not anticoagulated. However, as the patient was unaware that he is blind, this is in keeping with cortical blindness. In retinal artery thrombosis, the patient would be aware that he is blind. It normally affects only one eye and is described as sudden and painless. 'Cherry red spot' with pale retina will be seen on fundoscopy.

C Bilateral retinal vein thrombosis

In the presence of AF, arterial thrombosis is much more likely than venous thrombosis. Vein thrombosis typically causes gradual visual blurring and loss. On fundoscopy, you will see retinal haemorrhages and oedema with dilated veins.

D Retinal detachment

With no risk factor for retinal detachment described and bilateral involvement, it is very unlikely to be retinal detachment. Retinal detachment normally presents with acute symptoms of flashes of light and floaters. Typical risk factors include glaucoma and diabetic retinopathy.

E Branch retinal vein occlusion

In the presence of AF, arterial thrombosis is much more likely than venous thrombosis. Given that only a branch of the vein is affected, patients typically present with reduced peripheral vision or an enlarged blind spot.

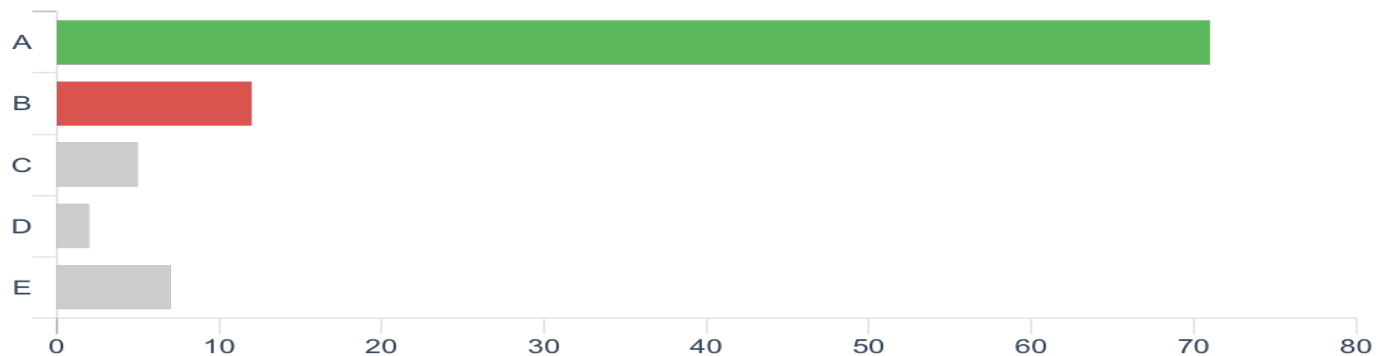
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External Links

NICE - Atrial fibrillation: management

[nice.org.uk/guidance/cg180/resources/atrial-fibrillation-management-35109805981381](https://www.nice.org.uk/guidance/cg180/resources/atrial-fibrillation-management-35109805981381)

(<https://www.nice.org.uk/guidance/cg180/resources/atrial-fibrillation-management-35109805981381>)

Expanded Explanation

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Q236

A 21-year-old man presents to the Emergency Department (ED) having collapsed with palpitations while dancing in a night club. He has a past history of cardiac surgery to fix a hole in the heart as a child and to fix an abnormal valve.

On examination in the ED, his blood pressure (BP) is 135/72 mmHg, while his pulse is 75 beats per minute (bpm) and regular. He is not in cardiac failure. An electrocardiogram (ECG) reveals sinus rhythm with a short PR interval; in addition there is right bundle branch block (RBBB) and a delta wave.

Which of the following is the most likely diagnosis?

Your answer was incorrect

- A Ebstein's anomaly
- B Lown-Ganong-Levine syndrome
- C Uncomplicated SVT
- D Amphetamine toxicity
- E Thyrotoxicosis

Explanation



- A Ebstein's anomaly

The presence of delta waves and short PR interval is indicative of WPW. When correlated with his past surgical history (repair of atrial septal defect and tricuspid valve abnormalities as a child), Ebstein's anomaly is the most likely diagnosis.

Cardiac problems associated with Ebstein's generally result from abnormal formation of the tricuspid valve, atrialisation of the right ventricle and associated defects such as ASD. The condition is rare, probably accounting for around 0.5% of cases of congenital heart disease. Ebstein's may be associated with Wolff-Parkinson-White syndrome as seen here.

Digoxin and verapamil are not recommended treatments for arrhythmias associated with WPW as they may precipitate increased conduction through the accessory pathway and worsening of tachycardia. DC cardioversion is normally the treatment of choice in the acute

management of tachyarrhythmia. However, for long-term management, given the patient's age, radiofrequency ablation of the accessory pathway is preferable.

B Lown-Ganong-Levine syndrome

LGL syndrome is like WPW in the sense that it is a pre-excitation syndrome. However, the ECG changes present is only short PR interval without delta waves or abnormal QRS complex.

C Uncomplicated SVT

The presence of an abnormal resting ECG i.e. short PR interval, delta waves and RBBB makes it very unlikely that it was an uncomplicated SVT.

D Amphetamine toxicity

Amphetamine can cause tachyarrhythmia but it should not influence PR interval or cause delta waves.

E Thyrotoxicosis

Thyrotoxicosis can cause tachyarrhythmia but it should not influence PR interval or cause delta waves.

32358

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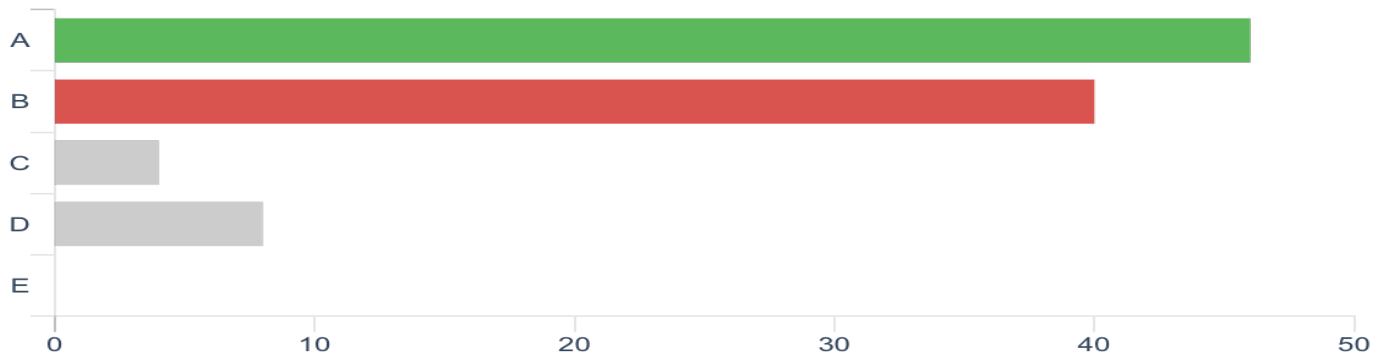
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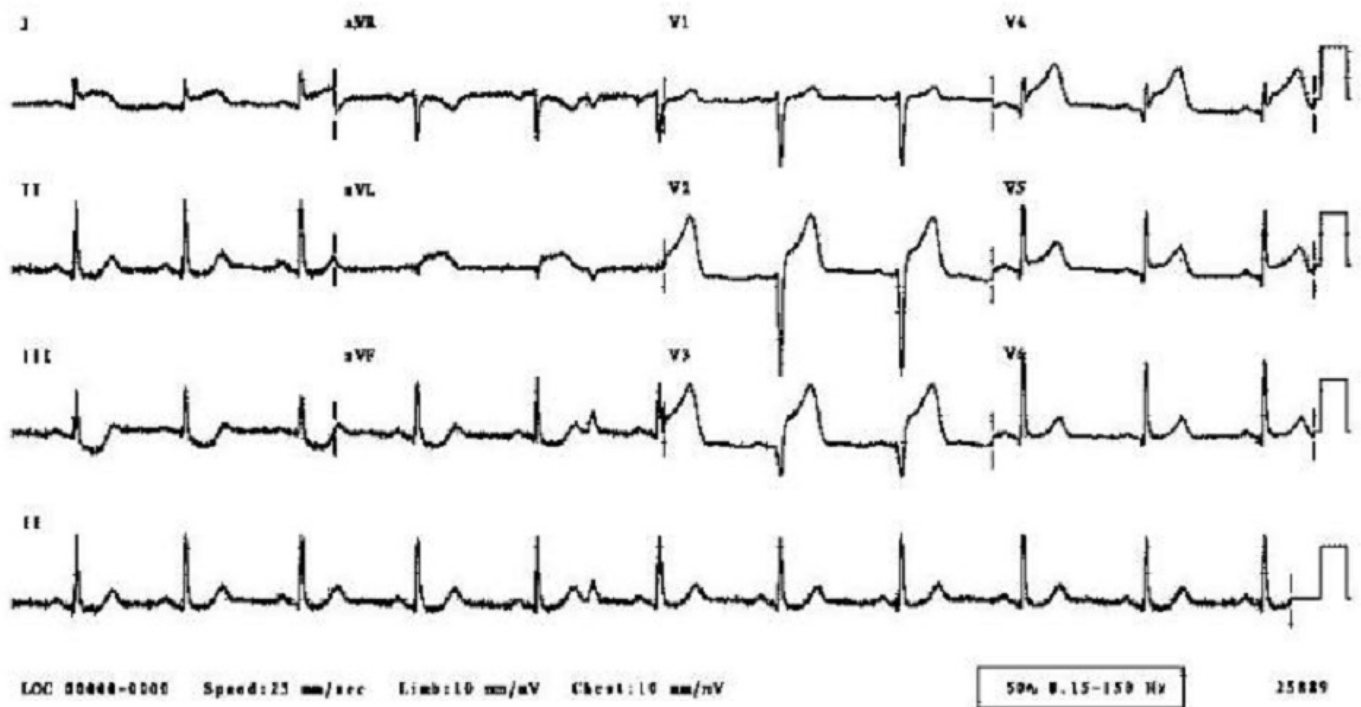
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Q237

You are called to see a 58-year old man who has had a ventricular fibrillation (VF) arrest. He reverts to sinus rhythm following the third electrical shock with a maintained blood pressure (BP) of 110/70 mmHg. He is a smoker who has significant peripheral vascular disease (PVD) and stable angina and has undergone a femoral-popliteal bypass graft on the previous day.

A post-arrest electrocardiogram (ECG) is shown below:



Occlusion of which of the following coronary arteries is most likely to be responsible for his presentation?

Your answer was correct

- A Right coronary artery
- B Left main stem
- C Left anterior descending and circumflex arteries
- D Posterior descending artery
- E Left circumflex artery

Explanation



C Left anterior descending and circumflex arteries

The ECG shows anterolateral STEMI with reciprocal inferior changes. This is likely due to the occlusion of both LAD and circumflex artery.

This man had a cardiac arrest, and was found to be in ventricular fibrillation, following an anterolateral myocardial infarction. It is not uncommon for patients undergoing vascular surgery to have an acute coronary event, as a significant number will have co-existent coronary artery disease. Due to the recent surgery, thrombolysis is contraindicated and PCI is likely to be associated with a better outcome anyway, he should therefore progress as soon as possible to the angiography suite. The fact that he has angina, suggests the disease is distal to the left mainstem, and the ECG changes fit best with the distribution of the LAD and circumflex arteries. Patients with left main stem disease often get little warning of their impending infarct.

A Right coronary artery

Occlusion of the RCA typically causes inferior changes on the ECG. Although the ECG has inferior ST depression, it is likely to be reciprocal change of the anterolateral ST elevation in this case.

B Left main stem

LMS occlusion may present with sudden cardiac arrest, and this is often seen in the absence of other signs of cardiovascular disease. ECG findings include ST elevation in aVR with diffuse ST depression in other leads.

D Posterior descending artery

The posterior descending artery is a branch of the RCA (in a right dominant system). It supplies the posterior part of the heart and occlusion causes a posterior STEMI where performing an ECG with posteriorly placed leads will show ST elevation in V7-V9.

E Left circumflex artery

Occlusion of the left circumflex artery normally causes lateral ST changes +/- posterior changes (in left dominant system).

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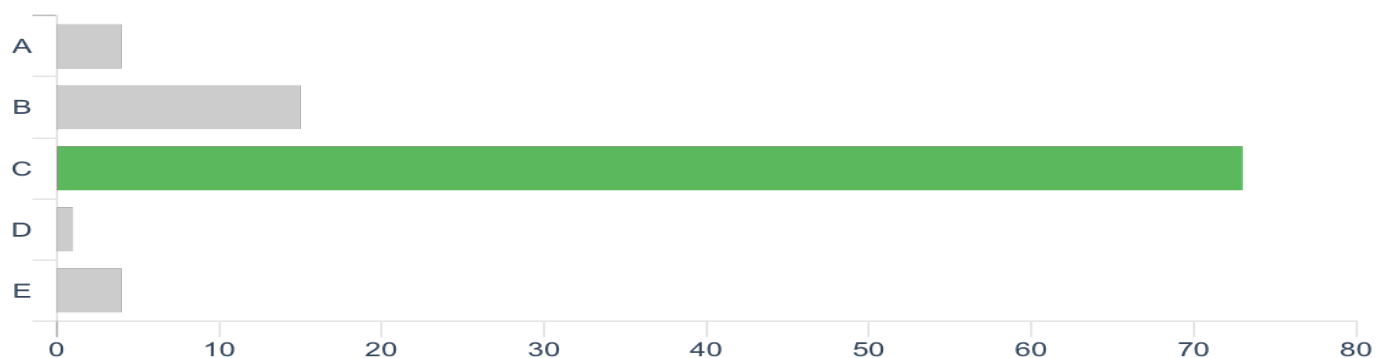
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Expanded Explanation

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Q238

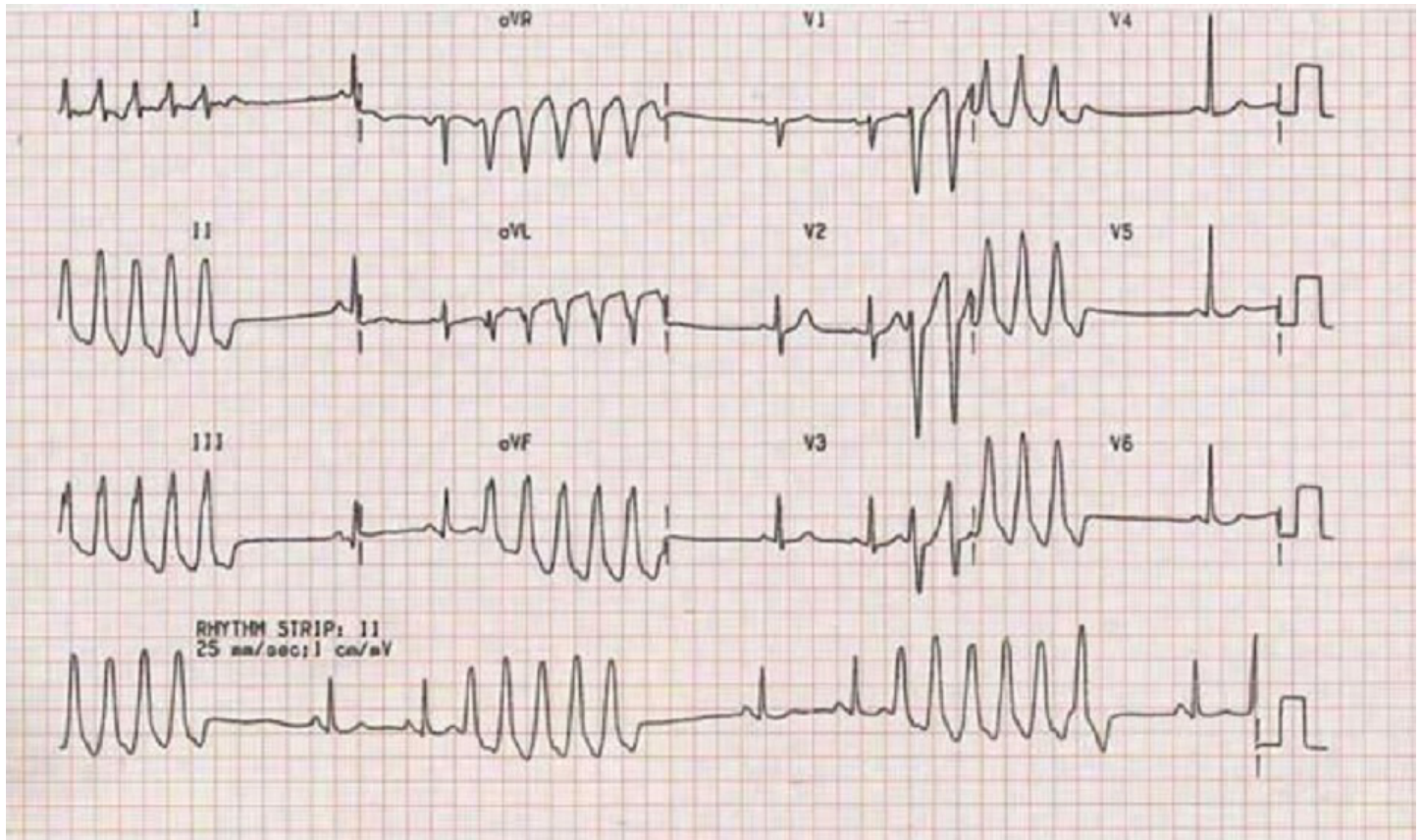
A 54-year-old man with a history of hypertension managed with indapamide 1.5 mg daily, who smokes 40 cigarettes per day, presents to the Emergency Department (ED) complaining of feeling faint. He has been unwell with diarrhoea and vomiting over the past few days. Other history of note includes reactive depression after separating from his wife, for which he has been commenced on amitriptyline.

On examination in the ED, his blood pressure (BP) is 110/70 mmHg.

Investigations reveal the following:

Investigation	Result	Normal value
Sodium (Na ⁺)	140 mmol/l	135–145 mmol/l
Potassium (K ⁺)	3.1 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	170 µmol/l	50–120 µmol/l
Urea	13.1 mmol/l	2.5–6.5 mmol/l

An electrocardiogram (ECG) is shown below:



Which of the following is the most appropriate first-line treatment?

Your answer was incorrect

- A Flecainide IV
- B Amiodarone IV
- C Sotalol IV
- D 5% dextrose fluid replacement
- E Normal saline with potassium and magnesium fluid replacement

Explanation



- E Normal saline with potassium and magnesium fluid replacement

This ECG shows short self terminating runs of ventricular tachycardia. Hypokalaemia as a result of diarrhoea and vomiting plus concurrent use of indapamide will almost certainly be pro-arrhythmogenic. Additionally, significant magnesium loss occurs in association with diarrhoea. This can cause self-terminating VT which should resolve on correction of the electrolytes. Hypokalaemia is commonly associated with hypomagnesaemia, therefore, both electrolytes should be replaced.

Appropriate fluid replacement to reverse electrolyte imbalances is the mainstay of initial therapy. If there is no improvement then amiodarone or lignocaine would be reasonable next options.

Sympathomimetics, tricyclic anti-depressants, digoxin, aminophylline and caffeine may all increase the propensity to develop the condition, as such after the acute event it would be sensible to review use of amitriptyline and consider either discontinuing it or changing to an alternative anti-depressant.

- D 5% dextrose fluid replacement

With his history of diarrhoea and vomiting, it is very likely that the patient is volume depleted. However, it is unlikely for volume depletion to lead to self-terminating VT. Therefore, the better treatment would be to treat the underlying electrolyte imbalance whilst providing fluid resuscitation.

- A Flecainide IV

Flecainide is normally used for supraventricular tachycardia. In this case, the presence of broad complexes makes it most likely to be ventricular in origin. Therefore, flecainide has limited use in this context.

B Amiodarone IV

Amiodarone could be used to terminate sustained ventricular arrhythmia in the acute setting. The ECG is showing self-terminating episodes of VT which could be treated by removing the precipitant which in this case is electrolyte imbalance. Therefore, the more appropriate first line treatment would be to correct the electrolyte abnormalities. Amiodarone could be considered if the patient continues to have arrhythmia despite correction and withholding precipitating drugs.

C Sotalol IV

Sotalol could be used as an antiarrhythmic drug. Given the episodes are self-terminating, reversible causes should be treated first before considering other pharmacological therapy.

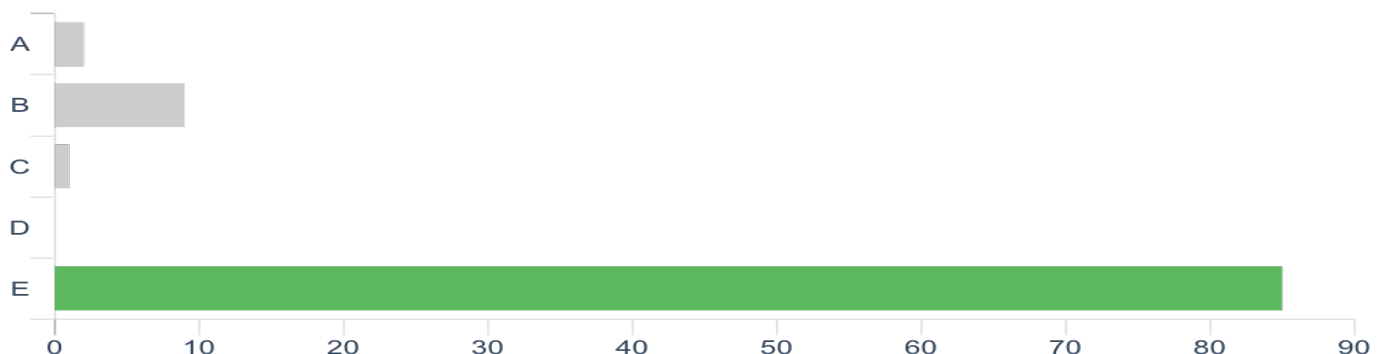
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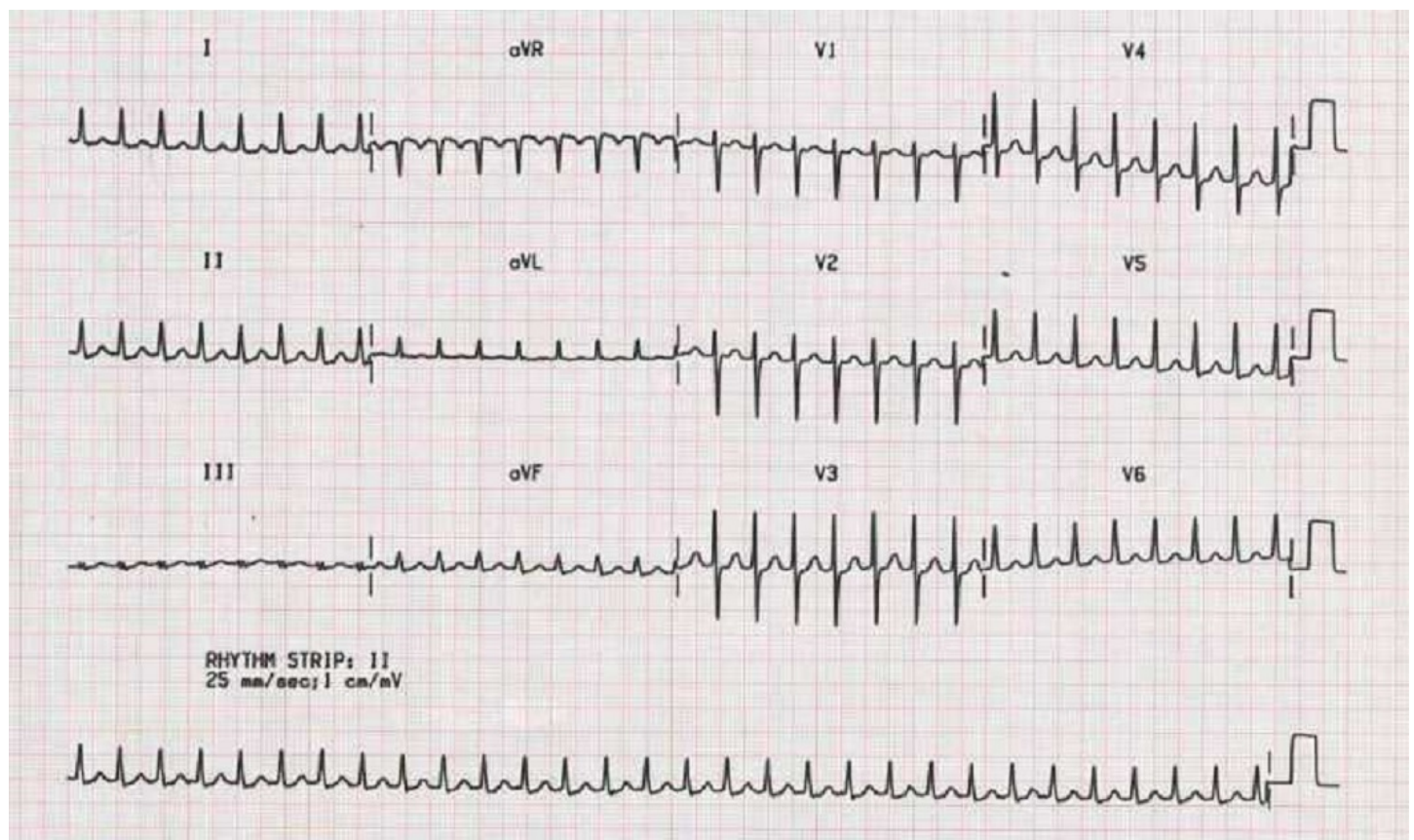


Q239

A 27-year-old man is admitted to the Emergency Department (ED) from a nightclub. He does not consume alcohol, but admits to having used amphetamines and to having snorted one line of cocaine. He tells you that his heart is thumping and he feels faint and light headed.

On examination, he has a blood pressure (BP) of 115/60 mmHg and a regular tachycardia of approximately 150 beats per minute (bpm). He is not in cardiac failure.

An electrocardiogram (ECG) is shown below:



Which of the following is the most likely diagnosis?

Your answer was incorrect

- A Paroxysmal ventricular tachycardia
- B Sinus tachycardia
- C Multi-focal atrial tachycardia

- D Atrial flutter
- E AV nodal re-entrant tachycardia

Explanation



- E AV nodal re-entrant tachycardia

The presence of pseudo R' wave in V1 and the absence of P waves on the ECG makes the diagnosis of AVNRT the most likely.

This is the most common type of re-entrant SVT, which may occur both in young healthy patients and in those with structural heart disease. The usual cause is the presence of dual AV nodal pathways (slow and fast pathways within the AV node). Patients may present at any time from the teenage years, to even as late as the seventh decade. It is likely that use of amphetamine and cocaine has precipitated this presentation.

Vagal manoeuvres could be attempted to cardiovert the patient. If it fails, the use of IV adenosine in the presence of appropriate resuscitation facility would be appropriate. Ensure that the patient is being monitored whilst adenosine is given so the underlying rhythm can be captured. This can sometimes uncover underlying atrial flutter when the rate slows.

Calcium antagonists such as verapamil are the initial pharmacological therapy of choice if cardioversion does not work as beta blockade may lead to worsening of myocardial ischaemia in the context of cocaine overdose.

- C Multi-focal atrial tachycardia

In MAT, P waves will be present on the ECG and the morphology might vary from beat to beat due to the difference in origin of the electrical activity. The rhythm will also be irregular. It is commonly associated with severe lung disease.

- A Paroxysmal ventricular tachycardia

The ECG shows a narrow complex tachycardia and therefore it is unlikely to be ventricular in origin.

- B Sinus tachycardia

There is no evidence of clear P-waves on the ECG

- D Atrial flutter

With the rate of 150bpm, this could be atrial flutter with 2:1 block. However, there is no evidence of flutter waves on the ECG.

This is the commonest type of re-entrant SVT, which may occur both in young healthy patients and in those with structural heart disease. The usual cause is the presence of dual AV nodal pathways. Patients may present at any time from the teenage years, to even as late as the seventh decade. It is likely that use of amphetamine and cocaine has precipitated this presentation. Calcium antagonists such as verapamil are the initial pharmacological therapy of choice, as beta blockade may lead to worsening of myocardial ischaemia in the context of cocaine overdose.

32363

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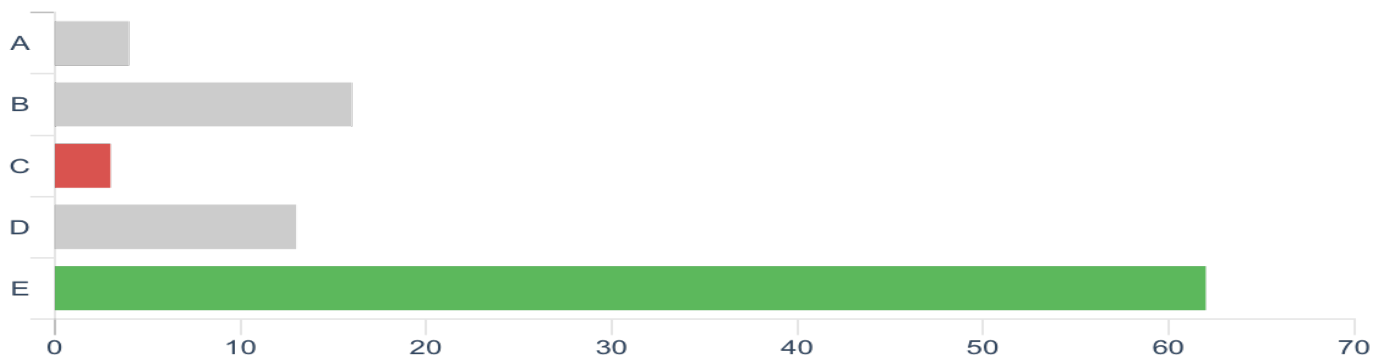
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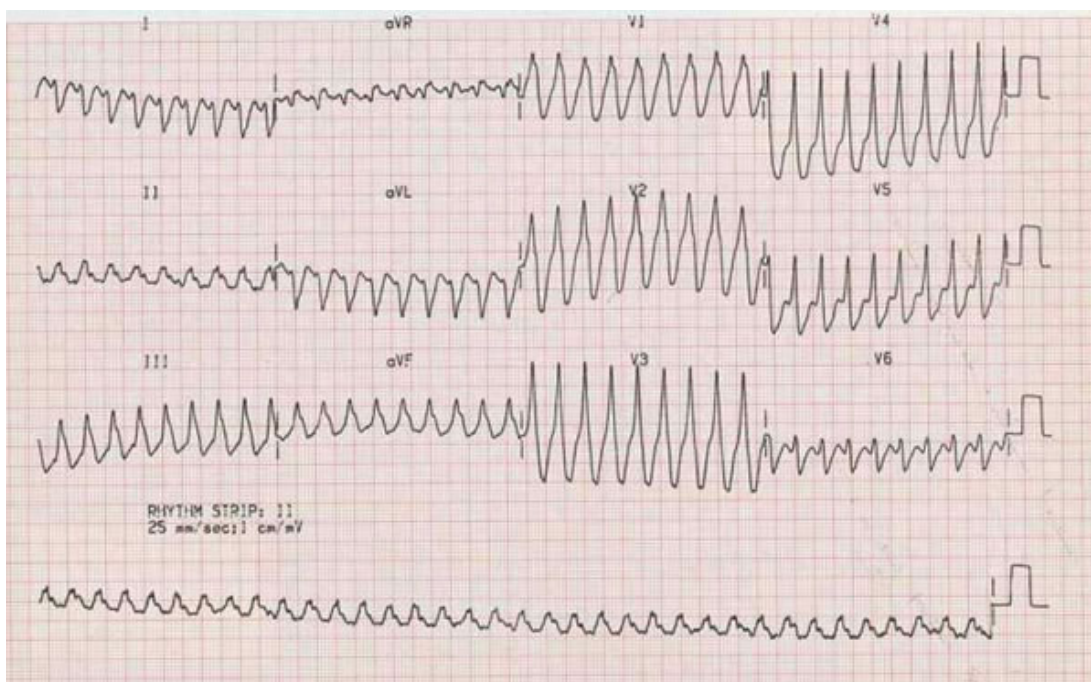


Q240

A 74-year-old woman is brought by ambulance to the Emergency Department (ED) after feeling faint while praying in church. Her friend from the church says that she had a heart attack a few years earlier, and has complained of palpitations on a few occasions since but has been relatively well, although she has fainted on two previous occasions recently. Her medications include ramipril 10 mg daily, aspirin 75 mg and simvastatin 40 mg.

On examination, she has a pulse of 170 beats per minute (bpm) with a blood pressure (BP) of 110/75 mmHg. There are no signs of left ventricular failure (LVF).

An electrocardiogram (ECG) is shown below:



Which of the following is the most likely diagnosis?

Your answer was incorrect

- A Ventricular tachycardia
- B SVT with right bundle branch block
- C Sinus tachycardia
- D Atrial fibrillation with right bundle branch block

E SVT with left bundle branch block

Explanation



B SVT with right bundle branch block

The ECG shows a RBBB pattern and with the regular rhythm and absence of p-waves, SVT is the likely cause of the patient's tachycardia. Flecanide should not be used in this situation with a history of previous ischaemic heart disease, and verapamil can lead to a significant reduction in cardiac output, as such these are best avoided. The use of adenosine to cardiovert the patient would be appropriate in the setting of appropriate resuscitation facilities. It will also help uncover the underlying rhythm should there be any doubt. If the patient is compromised, synchronised DC cardioversion would be the most appropriate treatment option.

D Atrial fibrillation with right bundle branch block

The rhythm of the ECG is regular, making it unlikely to be AF.

A Ventricular tachycardia

With the past history of MI, this could represent VT secondary to scar tissue. However, the absence of negative/positive concordance (deflecting in the same direction) in the chest leads and lack of haemodynamic compromise (normal BP, no evidence of HF), makes VT less likely.

C Sinus tachycardia

There are no visible P waves therefore it is unlikely to be sinus tachycardia.

E SVT with left bundle branch block

Positive deflection in V1 and negative deflection in V6 is RBBB.

32364

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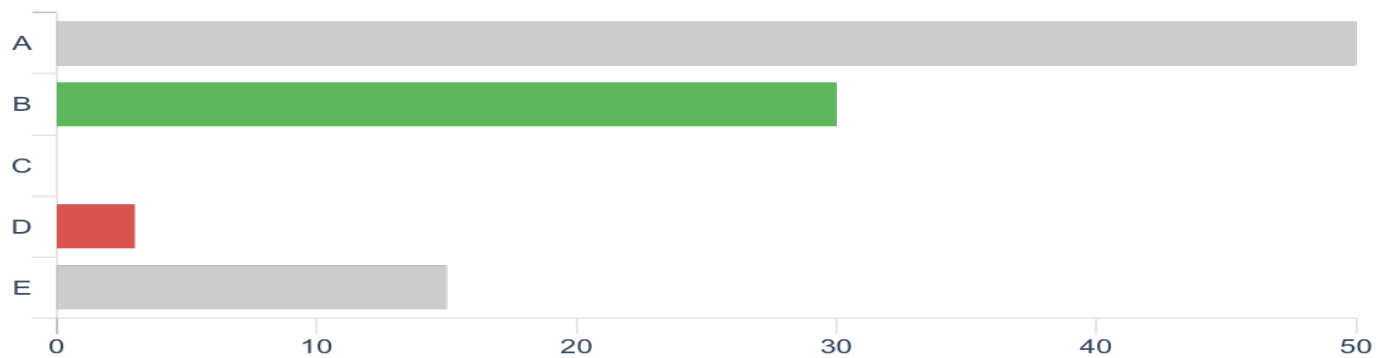
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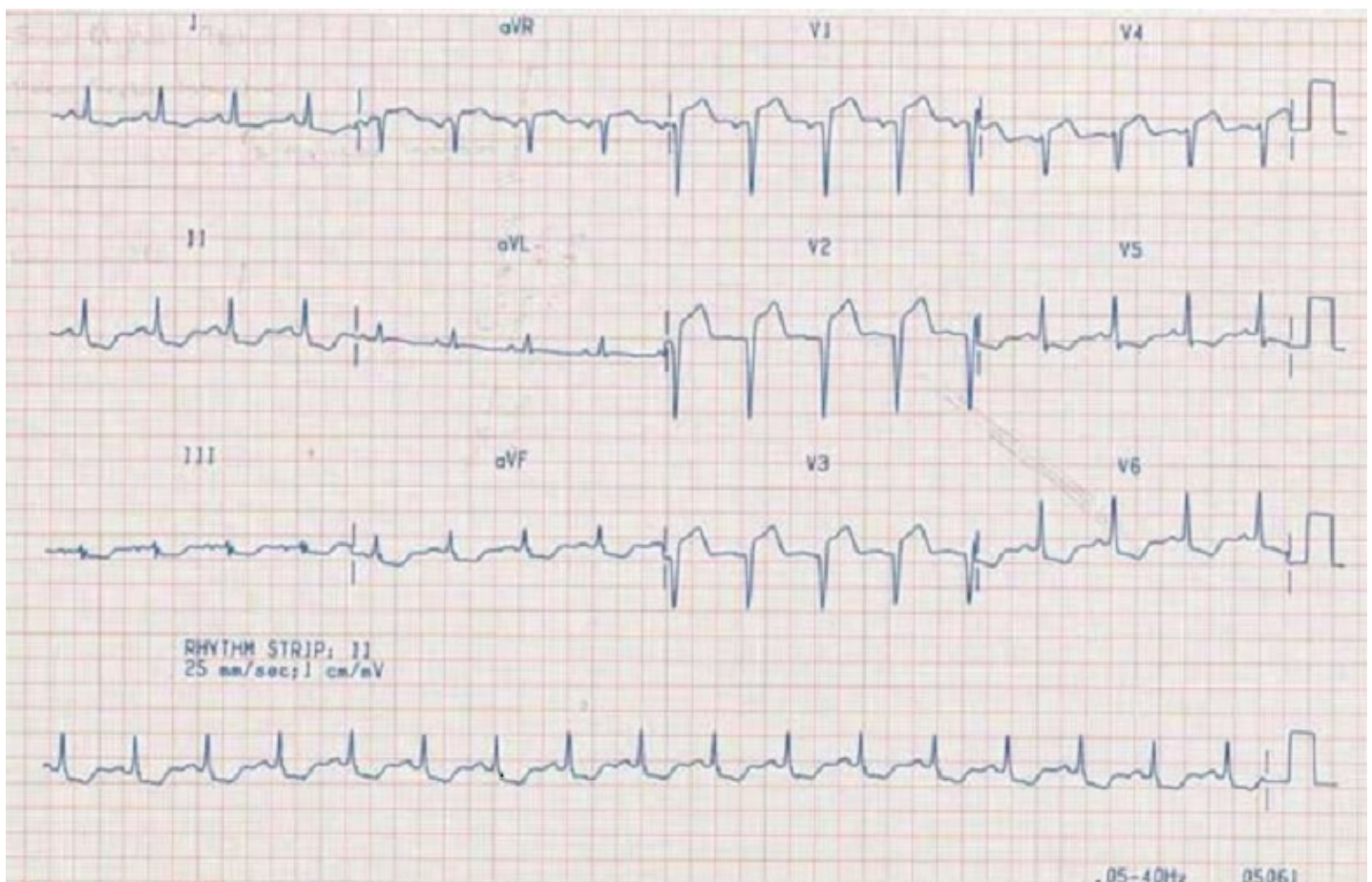


Q241

A 62-year-old woman with a history of type II diabetes presents to the Emergency Department (ED) feeling faint, sweaty and unwell. She is currently managed with metformin 1 g twice a day and ramipril 10 mg daily.

On examination, she looks unwell and has a blood pressure (BP) of 100/60 mmHg. Her chest X-ray (CXR) shows left ventricular hypertrophy and bilateral interstitial shadowing consistent with pulmonary oedema. The admission electrocardiogram (ECG) is shown below. The nurse has already given her 300 mg soluble aspirin.

She undergoes acute angioplasty and makes a good recovery. Her HbA1c is measured at 63.93 mmol/mol (8.0%). She is treated with insulin during the initial period but then switched back to metformin on day three.



What additional therapy should you commence for long-term blood glucose control?

Your answer was incorrect

A Basal bolus insulin

- B Pioglitazone
- C Repaglinide
- D Long acting Insulin
- E Gliclazide

Explanation



- E Gliclazide

Whilst the DIGAMI-1 study appeared to show a survival advantage when insulin was initiated post myocardial infarction, this was not confirmed in the DIGAMI-2 study. Some problems were however identified with the DIGAMI-2 study, in that a substantial proportion of the control group were insulin users. In spite of this, a post-hoc analysis of insulin patients in the DIGAMI-2 study demonstrated an increased risk for myocardial ischaemic events. Further data from the ACCORD and VADT studies has suggested increased risk of cardiac death when very tight glycaemic control is targeted. This was not however reflected in the ADVANCE study which utilised sulphonylureas.

This patient has inadequate control of her BM. NICE guidelines suggests aiming for an HbA1C of 7% or 54mmol/mol. Therefore, further pharmacological therapy should be initiated. The use of insulin should be considered after a trial with 2 or more oral therapy.

NICE guidelines suggest that intensification therapy should occur if HbA1C is not under control. After the use of metformin, a further agent should be added i.e. DPP4 inhibitor, sulphonylurea or glitazone. Of all the options, there is gliclazide (sulphonylurea) and pioglitazone. Glitazones are contraindicated in heart failure and this leaves gliclazide as the only viable option.

NICE guidelines (updated April 2017) have now added the new SGLT-2 inhibitors in the guidelines to consider for intensification therapy if sulphonylurea is not tolerated or patients who are at significant risk of hypoglycaemia or its consequences. SGLT-2 inhibitors block reabsorption of glucose from the renal tubules which promote excretion of glucose from the kidneys, thereby reducing blood sugar level.

GLP-1 mimetic can be used after triple therapy with metformin + 2 other oral hypoglycaemics is ineffective. GLP-1 increases insulin secretion by the pancreas.

- B Pioglitazone

Pioglitazone should be avoided in patients at risk of heart failure and therefore is not a good option in this patient. Pioglitazone may cause fluid retention and should be avoided in the immediate period post MI, a specific caution is given for patients with a past history of ischaemic heart disease.

A Basal bolus insulin

This patient has inadequate blood glucose control and therefore requires intensification of her medications. The use of insulin should be considered after a trial with 2 or more oral therapy.

C Repaglinide

Repaglinide belongs to the drug class of meglitinides. It works by stimulating beta pancreatic cells to produce insulin. Repaglinide is most useful in the early period after diagnosis of diabetes, particularly when post prandial hyperglycaemia is a problem. This is not one of the classes mentioned in NICE guidelines and therefore is not the correct response.

D Long acting Insulin

This patient has inadequate BM control and therefore requires intensification of her medications. The use of insulin should be considered after a trial with 2 or more oral therapy.

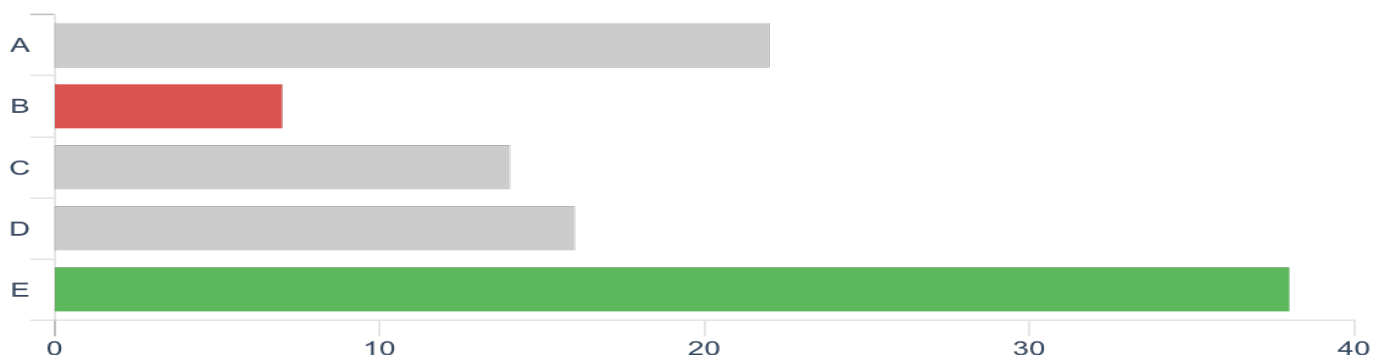
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Algorithm for blood glucose lowering therapy in adults with type 2 diabetes

[nice.org.uk/guidance/ng28/resources/algorithm-for-blood-glucose-lowering-therapy-in-adults-with-type-2-diabetes-pdf-2...](https://www.nice.org.uk/guidance/ng28/resources/algorithm-for-blood-glucose-lowering-therapy-in-adults-with-type-2-diabetes-pdf-2185604173)

(<https://www.nice.org.uk/guidance/ng28/resources/algorithm-for-blood-glucose-lowering-therapy-in-adults-with-type-2-diabetes-pdf-2185604173>)

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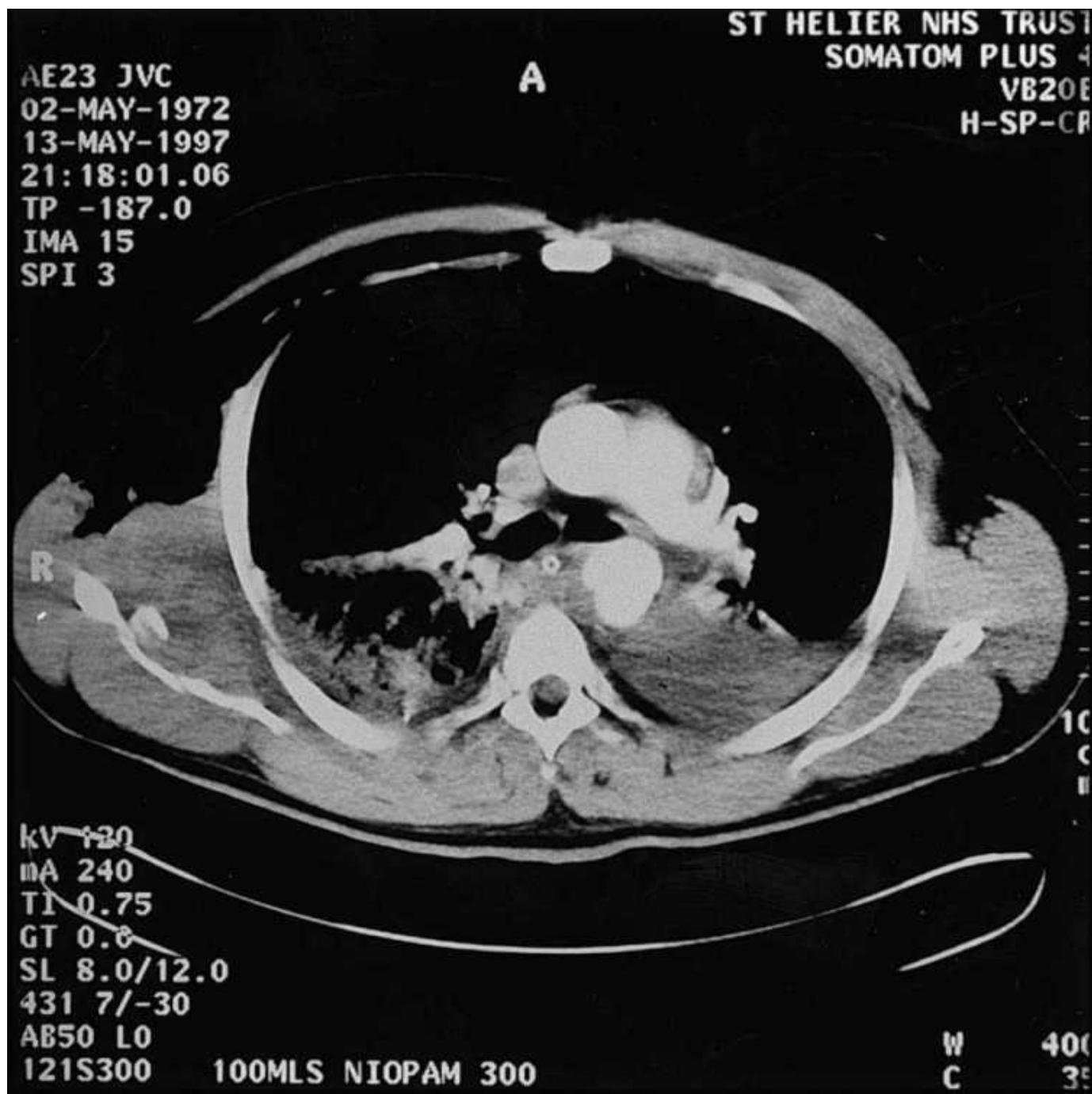


Q242

A 25-year-old man presents to the Emergency Department (ED) with excruciating central chest pain radiating to his back. This began suddenly a few hours earlier while he was playing in a game of basketball with friends. Previous medical history of note includes lens dislocation and problems with lax, dislocatable joints, including his shoulders and patellae.

On examination in the ED, the blood pressure (BP) in his left arm is significantly lower than the right, and he is complaining of some strange feelings and loss of power in his right arm and leg. His BP is 150/90 mmHg in the right arm and 110/70 mmHg in the left arm.

A slice from his thoracic computed tomography (CT) scan is shown below:



Which of the following is the most likely diagnosis?

Your answer was correct

- A Abdominal aortic aneurysm
- B Dissecting thoracic aortic aneurysm
- C Left pleural effusion
- D Pneumonia

E Ruptured oesophagus

Explanation



B Dissecting thoracic aortic aneurysm

The history is highly indicative of Marfan's syndrome and with the sudden onset chest pain, this makes it very likely to be dissection. This is further confirmed on the CT scan slice shown. Given his age, if he didn't have a condition increasing the risk of dissecting thoracic aneurysm, like Marfan's, presentation at this age would be highly unusual. In patients with Marfan's, routine screening for aortopathy is recommended. ESC guidelines have suggested intervention for dilated aortic root of $>50\text{mm}$ or >45 in presence of other risk factors.

Blood pressure control is vitally important in achieving a good prognosis for patients with dissecting aneurysm, and IV labetalol would be the agent of choice to control blood pressure in this case. It is an effective negative inotropic agent, which reduces cardiac contractility. Sodium nitroprusside is a useful additional adjunct, but would be avoided in this case as there are concerns about cerebral perfusion. Where beta blockade is unsuitable, then calcium channel antagonists, particularly non-dihydropyridines such as diltiazem would be a logical alternative.

A Abdominal aortic aneurysm

The CT scan is showing the thoracic cavity, therefore it would not be possible to diagnose AAA on this slice.

C Left pleural effusion

On the CT slice, there is evidence of a left sided pleural effusion. However, this will not explain the presentation of this patient. Aortic dissection, which is also present in the slice would fit the diagnosis better.

D Pneumonia

The acute presentation of chest pain and the presence of blood pressure difference between the arm makes it more likely to be an aortic dissection than pneumonia.

E Ruptured oesophagus

The blood pressure difference between the arms points towards a problem with the aorta and this is further confirmed on the CT slice.

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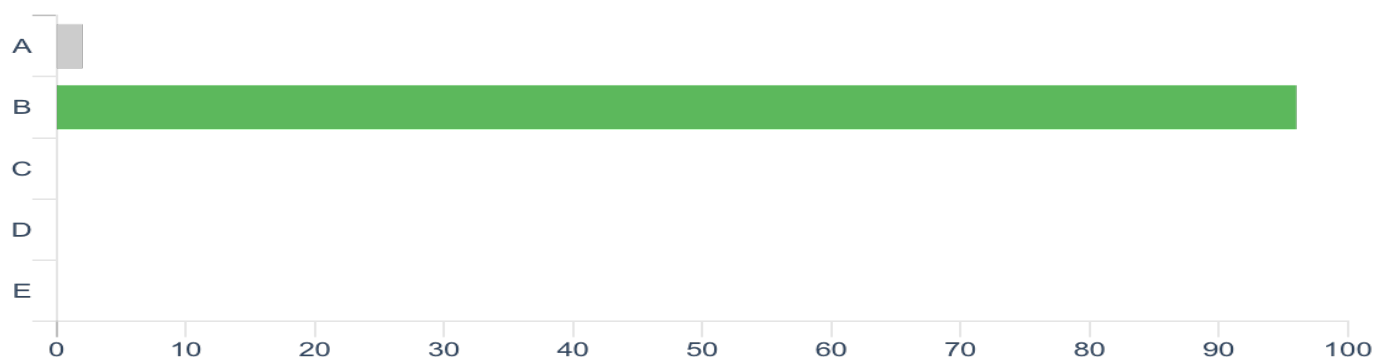
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Responses Total:	242
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Expanded Explanation

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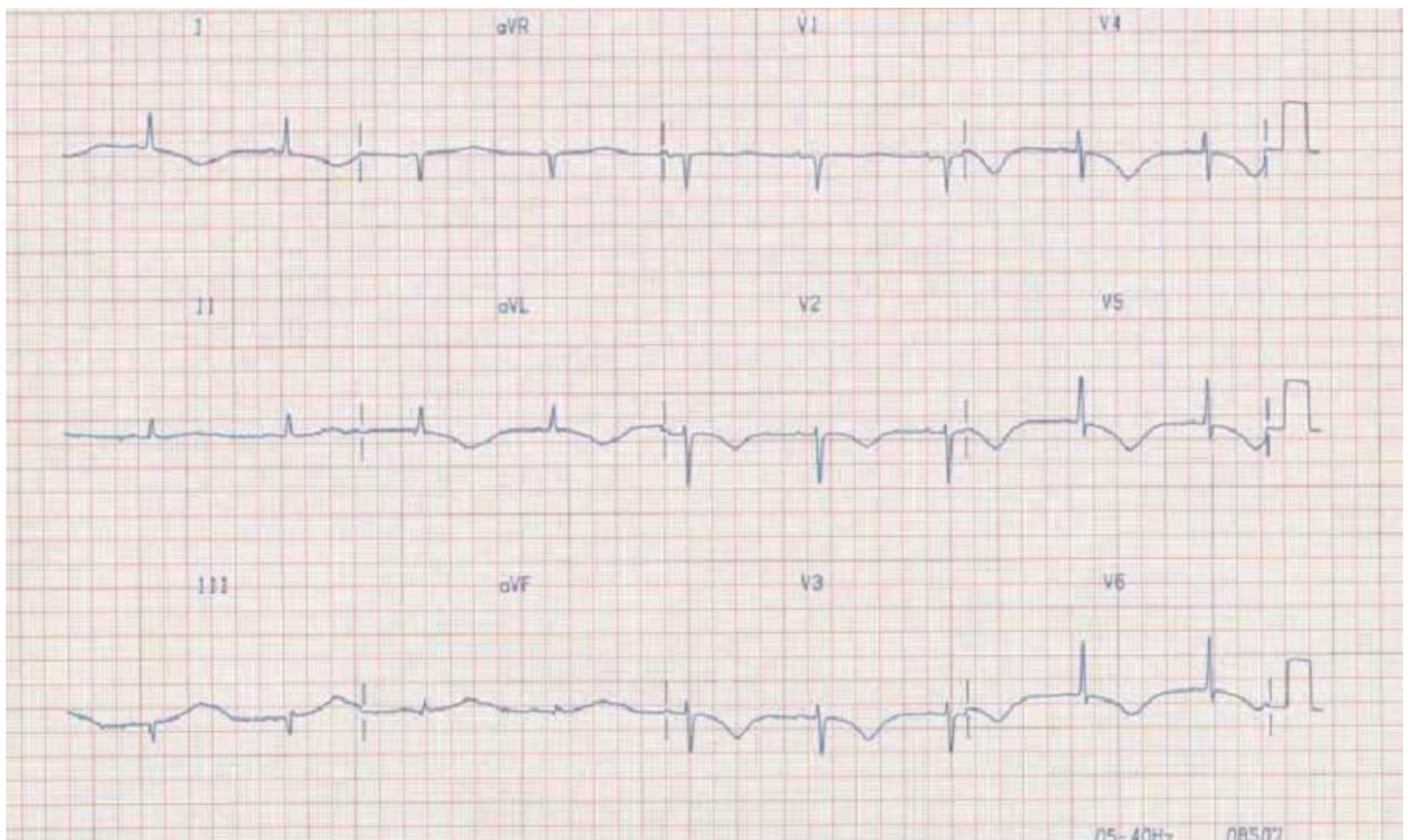
Links to NICE guidelines/CKS



Q243

A 50-year-old man with a history of hypertension presents to the Emergency Department (ED) with central chest pain which came on while he was playing squash and lasted for approximately 35 minutes. He had one previous episode three months earlier while using a cross trainer at the gym - he did not seek medical advice. His only current medication is atenolol 50 mg PO daily.

His electrocardiogram (ECG) is shown below:



He is admitted and managed with subcutaneous fondaparinux, aspirin, and ticagrelor. His blood pressure (BP) on admission is 90/70 mmHg. His pulse is 65 beats per minute (bpm) and regular. His creatinine is 132 $\mu\text{mol/l}$. There is no further chest pain and his T-wave inversion appears to be partially resolved, but a 12 hour troponin is raised at 3.5 $\mu\text{g/l}$.

Which of the following represents the optimal management in this case?

Your answer was incorrect

- A Inpatient limited exercise test
- B Plan routine angiography within 3 months

- C Plan for an inpatient angiography
- D Treat with streptokinase
- E Treat with TPA

Explanation



- C Plan for an inpatient angiography

The T wave inversion seen on ECG, raised troponin and cardiac chest pain put this patient into the NSTEMI category. As such he is at intermediate to high risk of a further NSTEMI or STEMI with a GRACE score of 6%. Whilst he has had no further chest pain, urgent angiography with angioplasty +/- stenting where appropriate would significantly reduce the risk of further events. He should of course also be aggressively managed to statin and blood pressure control targets and started on aspirin and ticagrelor.

- B Plan routine angiography within 3 months

NICE guidelines have suggested performing inpatient angiography +/- PCI within 96 hours of admission on intermediate to high risk inpatients. The risk is calculated using GRACE scoring.

- A Inpatient limited exercise test

In the presence of chest pain, ECG changes and raised troponin, this patient should be treated as an NSTEMI. Therefore, no further confirmatory investigation is needed.

- D Treat with streptokinase

Thrombolysis is no longer indicated except in the context of STEMI where PCI is not available within 90minutes of first medical contact.

- E Treat with TPA

Thrombolysis is no longer indicated except in the context of STEMI where PCI is not available within 90minutes of first medical contact.

32368

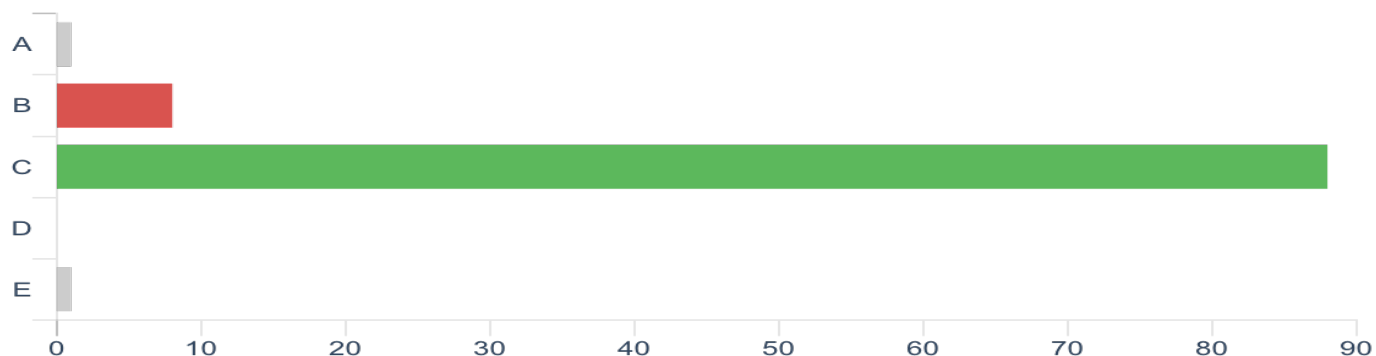
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Responses Total:	243
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External Links

NICE guidance for chest painpathways.nice.org.uk/pathways/chest-pain(<https://pathways.nice.org.uk/pathways/chest-pain>)

Expanded Explanation

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Q244

A 62-year-old man presents to the Emergency Department (ED) with central crushing chest pain radiating to his left arm. He has a history of hypertension, hypercholesterolaemia, and type II diabetes and is managed with ramipril 10 mg daily, atorvastatin 40 mg, metformin 1 g twice a day, glargine insulin 40U daily, and clopidogrel 75 mg daily

Three months earlier he presented to the ED with an anterolateral NSTEMI and received a drug eluting stent. A stenosis of the right coronary artery was also noted at angiography.

On examination, he has a blood pressure (BP) of 148/90mmHg. His pulse is 78 beats per minute (bpm) and regular and he looks pale and sweaty.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	14.0 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$5.8 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$295 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	140 mmol/l	135–145 mmol/l
Potassium (K^+)	5.0 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	130 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Electrocardiogram (ECG)	Inferior ST elevation	

You take him to the cardiac catheterisation lab for further intervention.

Which of the following is the most likely cause of his symptoms?

Your answer was correct

- A Stent thrombosis / blockage
- B New myocardial infarction
- C Worsening angina
- D Coronary artery dissection

E Pericarditis

Explanation



B New myocardial infarction

The multiple cardiovascular risk factors and presence of ST elevation in the inferior leads indicate that it is very likely the RCA is now affected.

Management of choice would be angioplasty and stenting if required. Data also suggests that post-stenting in patients with Type 2 diabetes and that dual anti-platelet therapy should be continued for approximately 1 year.

A Stent thrombosis / blockage

Stent thrombosis / blockage is incorrect. The areas affected on the ECG (see investigations) are different from where the previous stent was inserted. Therefore, it is unlikely that this is due to a stent thrombosis.

C Worsening angina

Worsening angina is incorrect. Angina does not present with ST elevation on ECG. It typically presents with chest pain on exertion (stable angina) and at rest (unstable angina) with no ECG changes or change in troponin level.

D Coronary artery dissection

Coronary artery dissection is incorrect. Coronary artery dissection more commonly affects females of childbearing age without the typical cardiovascular risk factors, and is therefore less likely in this patient. A thrombotic event is more likely although dissection remains a differential. It can present like ACS with acute chest pain and can only be diagnosed on coronary angiography.

E Pericarditis

Pericarditis is incorrect. Pericarditis will show widespread ST changes with PR depression. The pain will be characteristically worse on lying flat and improved on sitting forward. The mainstay treatment for pericarditis is NSAIDs or colchicine with advice to patients to reduce physical activity for the acute period (3 months for athletes and shorter for non-athletes).

32369

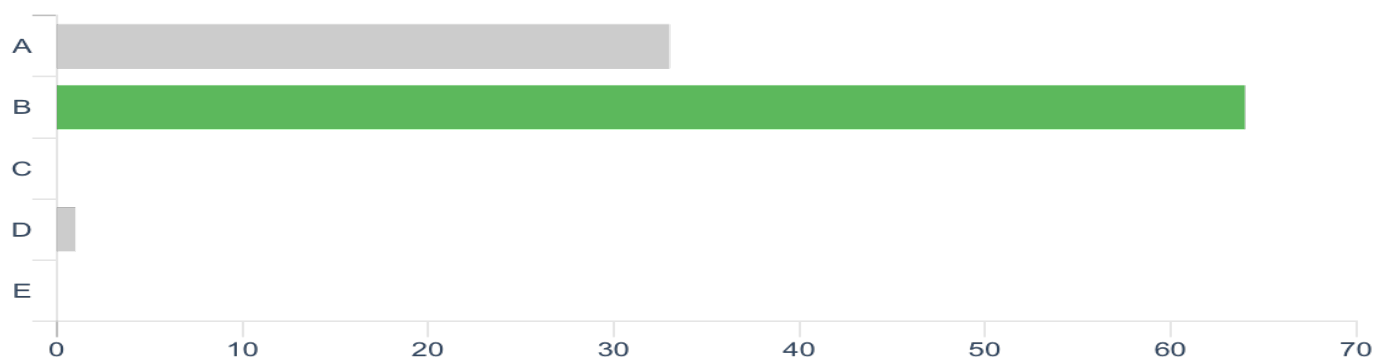
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Expanded Explanation

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Q245

A 31-year-old adopted man presents to the Emergency Department (ED) with acute onset central crushing chest pain. An electrocardiogram (ECG) confirms anterior myocardial infarction (MI). He is a non-smoker. His cholesterol on admission is 10.5 mmol/l, with relatively normal triglycerides, and a marked increase in low-density lipoprotein (LDL). You suspect he has familial hypercholesterolaemia. Physical findings in this man include tendon xanthomata, corneal arcus, and xanthelasma.

Which of the following is the most appropriate long-term treatment for his hypercholesterolaemia?

Your answer was incorrect

- A Atorvastatin 10 mg OD
- B Atorvastatin 80 mg OD
- C Nicotinic acid 1.5 g OD
- D Bezafibrate 200 mg BD
- E Pravastatin 40 mg OD

Explanation



- B Atorvastatin 80 mg OD

This patient is at serious risk of further cardiovascular events and requires maximal statin therapy to reduce his LDL cholesterol. If 80 mg of atorvastatin fails to achieve the LDL target, ezetimibe can be added. Evolocumab, a PCSK9 inhibitor, is also now available for familial hypercholesterolaemia to further drive down cholesterol levels.

- D Bezafibrate 200 mg BD

Fibrates remain the treatment of choice for hypertriglyceridaemia, although the FIELD outcome study did not indicate a significant impact on cardiovascular risk.

- A Atorvastatin 10 mg OD

This will not achieve the LDL target given the high baseline.

C Nicotinic acid 1.5 g OD

Nicotinic acid primarily targets hypertriglyceridaemia and drives a modest rise in HDL cholesterol, rather than specifically targeting LDL. Tolerability is poor in many patients due to symptoms of itching and facial flushing.

E Pravastatin 40 mg OD

Pravastatin 40 mg has only modest effects on LDL cholesterol and is therefore unlikely to achieve target here.

32910

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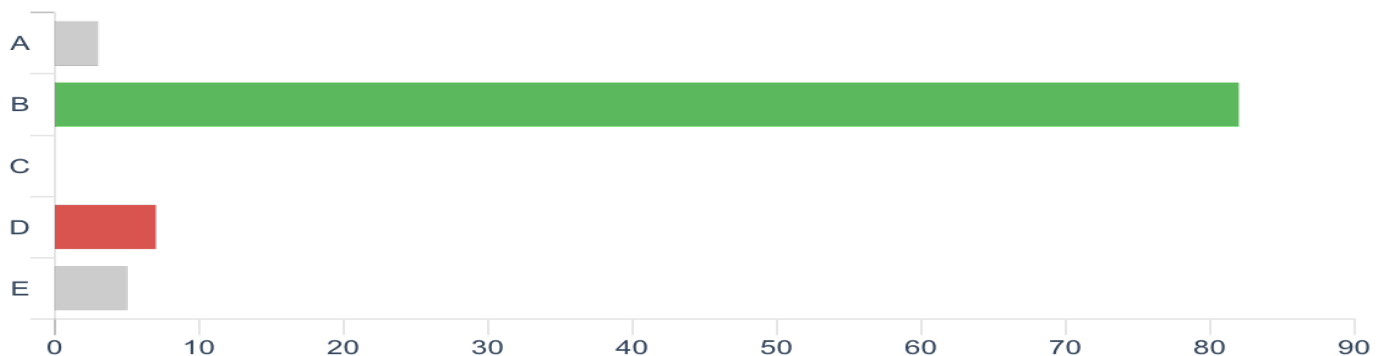
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Q246

A 32-year-old woman presents to the Cardiology Clinic with increasing shortness of breath. She has returned to work after the birth of her second child, but is breathless climbing the stairs or even on running only a few yards to catch the bus. She has been previously well, and was a keen half marathon runner in her 20's before she started having her family.

On examination, her blood pressure (BP) is 125/72 mmHg. Her pulse is 62 beats per minute (bpm) and regular. There is a loud second heart sound, but the lungs are clear. She has bilateral pitting lower limb oedema. Her abdomen is soft and non tender. Her body mass index (BMI) is 22 kg/m².

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	13.1 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$9.3 \times 10^9/l$	4.0–11.0 $\times 10^9/l$
Platelets (PLT)	$199 \times 10^9/l$	150–400 $\times 10^9/l$
Sodium (Na ⁺)	138 mmol/l	135–145 mmol/l
Potassium (K ⁺)	4.2 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	110 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Chest X-ray (CXR)	Unremarkable	
Echocardiography (ECHO)	Elevated estimated pulmonary artery pressure (no signs of right / left shunt / atrial septal defect (ASD))	
Computed tomography pulmonary angiogram (CTPA)	No evidence of pulmonary emboli	
Catheterisation –		

pulmonary artery pressure (PAP)	38 mmHg	
Acute vasoreactivity testing (AVT)	Positive	

Which of the following is the most appropriate first line therapy for her?

Your answer was incorrect

- A Amlodipine
- B Diltiazem
- C Bosentan
- D Iloprost
- E Sildenafil

Explanation



- A Amlodipine

This patient has primary pulmonary hypertension as confirmed on catheterisation showing pulmonary artery pressure of 38mmHg (>25mmHg). Two factors drive the therapy choice here, the first is the positive reactivity testing, the other is the relative bradycardia on clinical examination. Positive vasoreactivity testing drives calcium channel antagonists as initial therapy of choice. Relative bradycardia drives the choice of a non-cardioselective calcium channel antagonist, rather than diltiazem which could precipitate symptomatic bradycardia.

- C Bosentan

Bosentan is an oral active dual endothelin receptor type A and B antagonist and it is used for patients who are not vasoreactive. It can also be used as a combination therapy in patients who have not responded to high dose CCB.

- B Diltiazem

The vasoreactivity being positive makes CCB the better choice of treatment for PPH. However, with her HR of 62BPM, diltiazem is a less favourable option compared to non-rate limiting CCB.

D Iloprost

Iloprost is a prostacyclin analogue and is used for patients who are not vasoreactive. It can also be used as a combination therapy in patients who have not responded to high dose CCB.

E Sildenafil

Sildenafil is an oral selective inhibitor of phosphodiesterase type 5 and is used for patients who are not vasoreactive. It can also be used as a combination therapy in patients who have not responded to high dose CCB.

34143

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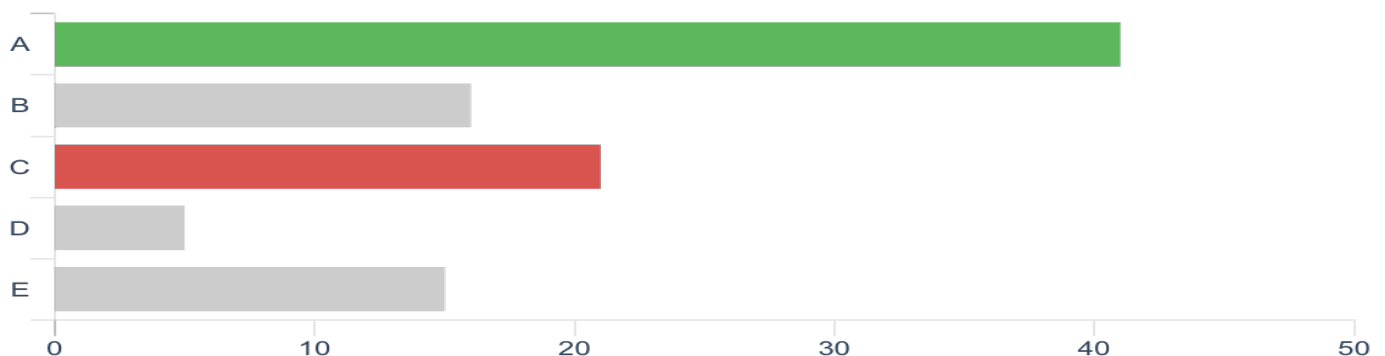
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External Links

ESC Clinical Practice Guidelines

[escardio.org/Guidelines-&-Education/Clinical-Practice-Guidelines/Pulmonary-Hypertension-Guidelines-on-Diagnosis-and-T...](http://www.escardio.org/Guidelines-&-Education/Clinical-Practice-Guidelines/Pulmonary-Hypertension-Guidelines-on-Diagnosis-and-T...)
(<http://www.escardio.org/Guidelines-&-Education/Clinical-Practice-Guidelines/Pulmonary-Hypertension-Guidelines-on-Diagnosis-and-Treatment-of>)

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Q247

A 76-year-old man who is known to have ischaemic heart disease (IHD), suffers a collapse and cardiac arrest whilst out walking his dog with his daughter. On arrival in the Emergency Department (ED), he has already been intubated and cardiopulmonary resuscitation (CPR) has commenced. He is pulseless with no respiratory effort. An electrocardiogram (ECG) on the defibrillator reveals small complexes with a normal morphology (PEA).

Which of the following is recommended as part of Advanced Life Support (ALS) 2015 guidelines?

Your answer was incorrect

- A Adrenalin 3mg repeated every 2 minutes
- B Amiodarone 300mg IV bolus
- C Adrenalin 1mg repeated every 3-5 minutes
- D Atropine 3mg repeated every 2 minutes
- E rTPA IV bolus

Explanation



- C Adrenalin 1mg repeated every 3-5 minutes

In the presence of a non-shockable rhythm as in this case, the use of adrenaline (1mg) every alternate cycle of CPR is recommended. It should be given once IV or IO access is attained.

The problem of designing ALS guidelines is that randomised controlled trial evidence is obviously difficult to obtain. Despite this, based on animal experience and the known alpha adrenergic agonist activity of adrenaline, use is still recommended in pulseless electrical activity (PEA) and asystole, every 3-5 minutes (alternate cycles of cardiopulmonary resuscitation (CPR)), and in ventricular fibrillation (VF)/ventricular tachycardia (VT) which is non-responsive to shocking, also every 3-5 minutes.

- A Adrenalin 3mg repeated every 2 minutes

In the presence of a non-shockable rhythm as in this case, the use of adrenaline (1mg not 3mg) every alternate cycle of CPR is recommended.

B Amiodarone 300mg IV bolus

The use of amiodarone is only recommended in a shockable rhythm after 3 unsuccessful shocks.

D Atropine 3mg repeated every 2 minutes

The use of atropine is not indicated in ALS guidelines for PEA arrest. Atropine was recommended until 2005, but several studies since then have not supported its use, it is therefore no longer recommended.

E rTPA IV bolus

The use of thrombolysis is not indicated in ALS guidelines for PEA arrest. In the context of a MI causing the initial cardiac arrest, PCI should be considered if feasible.

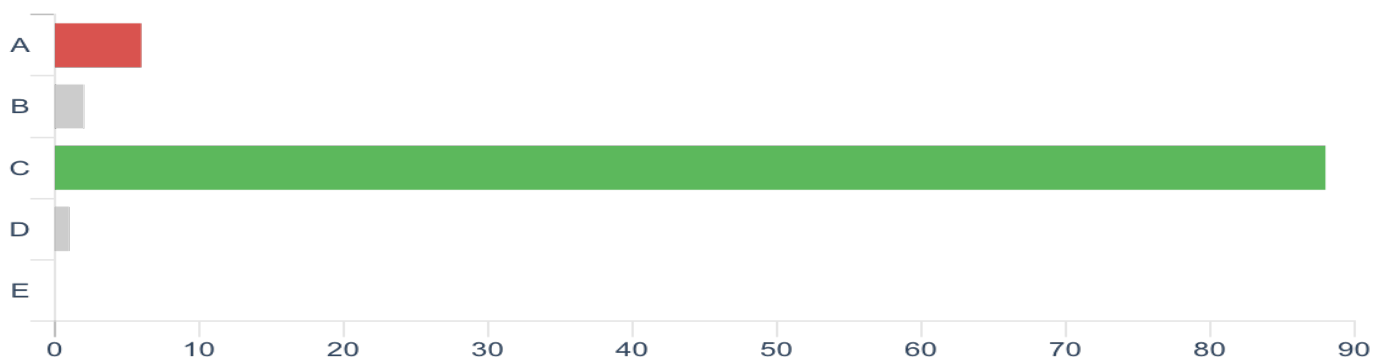
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Responses Incorrect:	198
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External Links

Resuscitation guidelines

[resus.org.uk/resuscitation-guidelines/](https://www.resus.org.uk/resuscitation-guidelines/)

(<https://www.resus.org.uk/resuscitation-guidelines/>)

Expanded Explanation

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Q248

A 26-year-old man comes to the Cardiology Clinic for review. He is concerned, as his father died suddenly some six weeks earlier at the age of 52, and was found on post mortem to have evidence of hypertrophic obstructive cardiomyopathy (HOCM).

On examination, his blood pressure (BP) is 145/85 mmHg. His pulse is 78 beats per minute (bpm) and regular. The apex beat is displaced laterally and there is an ejection systolic murmur.

Which of the following electrocardiogram (ECG) findings would most support a diagnosis of HOCM?

Your answer was incorrect

- A Anterior Q waves
- B Inferior T wave inversion
- C P mitrale
- D P pulmonale
- E Right bundle branch block

Explanation



- E Right bundle branch block

The presence of RBBB is correlated with anterior, anteroseptal and mid-septal myocardial fibrosis in HOCM. ECG changes seen in HOCM include right or left axis deviation, bundle branch block, PR prolongation, and non specific T wave abnormalities, although these are more commonly seen in anterior leads.

- B Inferior T wave inversion

Inferior T wave inversion is more in keeping with ischemia along the inferior wall of the LV.

- A Anterior Q waves

Anterior Q waves is indicative of previous full thickness infarct of the anterior wall. In HOCM, the presence of Q waves is more typically in inferolateral leads.

C P mitrale

P mitrale is associated with left atrial enlargement.

D P pulmonale

P pulmonale is associated with pulmonary disease as the name suggests.

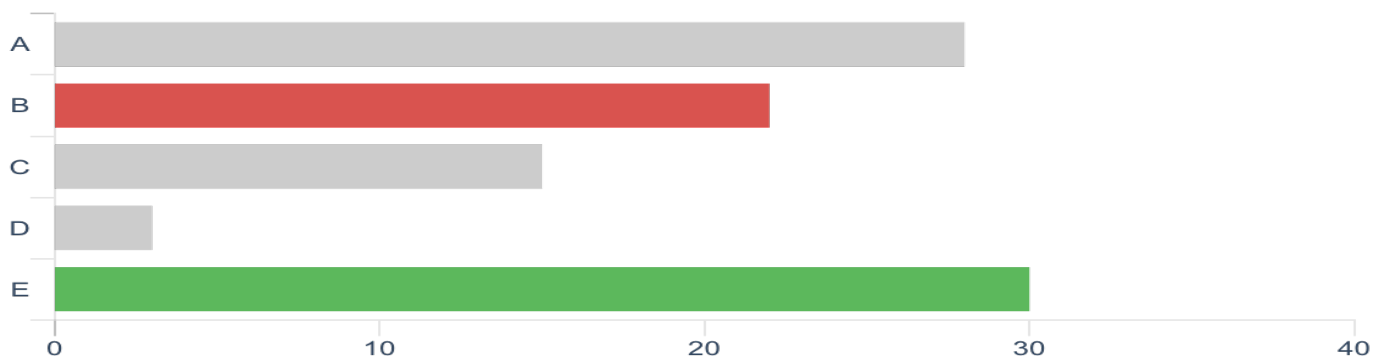
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Q249

A 74-year-old man is admitted to the Emergency Department (ED) after a collapse. He has a history of ischaemic heart disease (IHD) and chronic obstructive pulmonary disease (COPD). According to his daughter who comes to the ED soon after he is brought in, he has recently been started on some new medication by his General Practitioner (GP) for a respiratory tract infection (RTI).

On examination, his blood pressure (BP) is 80/60 mmHg, and he looks grey and sweaty. There are bilateral crackles and wheeze on auscultation of the chest. The monitor shows runs of torsades de pointes VT.

Which of the following medications is most likely to have precipitated this event?

Your answer was incorrect

- A Co-amoxiclav
- B Erythromycin
- C Ramipril
- D Spironolactone
- E Theophylline

Explanation



- B Erythromycin

Torsades de pointes VT is associated with hypokalaemia, hypomagnesaemia and drugs which prolong the QT interval, which of course include the macrolides, such as erythromycin and clarithromycin. Other drugs known to lead to prolong QT include agents such as domperidone and ketoconazole.

Treatment is to correct electrolyte abnormalities and withhold offending drugs. It is usually self-limiting and IV magnesium is commonly used to stabilise the rhythm. However, in patients who are haemodynamically compromise, DC cardioversion may be the treatment of choice.

- A Co-amoxiclav

Co-amoxiclav is not a drug that commonly causes long QT which could've precipitated torsade.

C Ramipril

Ramipril is not a drug that causes prolonged QT and can sometimes cause hyperkalaemia instead of hypokalaemia which can also precipitate Torsades.

D Spironolactone

Spironolactone does not cause QT prolongation and causes hyperkalaemia.

E Theophylline

Whilst theophylline is known to precipitate hypokalaemia, it is likely to have been used chronically in this case rather than to have been started acutely.

34146

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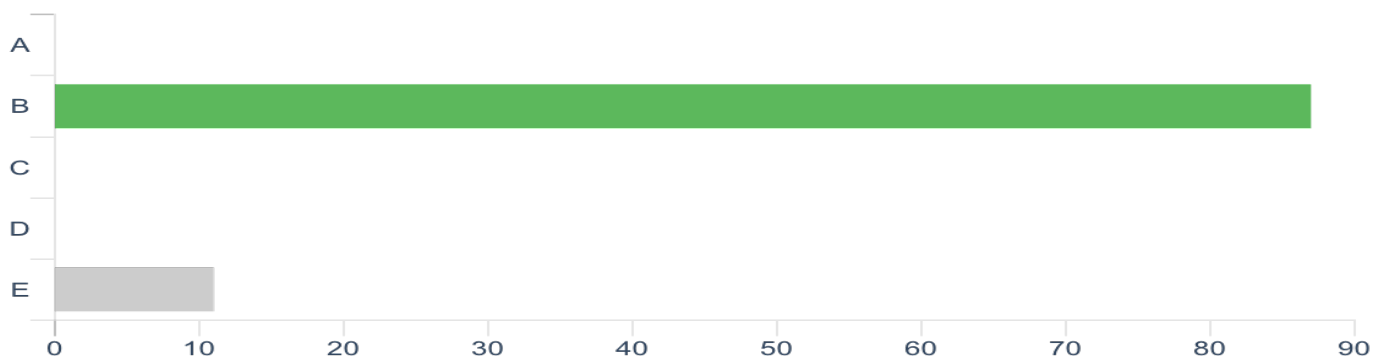
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Peer Responses %



Session Progress

Responses Correct:

49

Responses Incorrect:

200

Responses Total:	249
Responses - % Correct:	20%



Q250

You are running in the local park when a 58-year-old man training next to you suddenly clutches his chest and sits down. He complains of central crushing chest pain.

While you are talking to him he collapses. He is pulseless, unconscious and making no respiratory effort. The park is empty apart from you and him.

Which of the following is the most appropriate next step?

Your answer was correct

- A Give a precordial thump
- B Look for a defibrillator
- C Shout for help/call 999
- D Start chest compressions
- E Start mouth-to-mouth

Explanation



- C Shout for help/call 999

The guidelines for basic life support (BLS) are clear and simple to follow. The key first step is to enlist help/ensure that someone dials 999 or attempts to find an automated external defibrillator (AED). Many public areas are equipped with this type of equipment because time to defibrillation is crucial with respect to survival.

The four key steps of the Resuscitation Council 'chain of survival' are:

1. Early recognition and call for help
2. Early bystander CPR
3. Early defibrillation
4. Early advance life support and standardised post-resuscitation care.

- A Give a precordial thump

Give a precordial thump, is no longer recommended as part of the guidelines. To be successful it needs to be delivered within 2-3 s of the onset of ventricular fibrillation (VF) or ventricular tachycardia (VT) and has a very low success rate.

B Look for a defibrillator

Look for a defibrillator, will be a priority once help has arrived.

D Start chest compressions

Start chest compressions, is the next thing to do immediately after seeking help.

E Start mouth-to-mouth

Start mouth-to-mouth, will occur in combination with chest compressions, though chest compressions should be prioritised over mouth-to-mouth. The guidelines (see External Links) recommend 30 compressions to every two breaths.

34147

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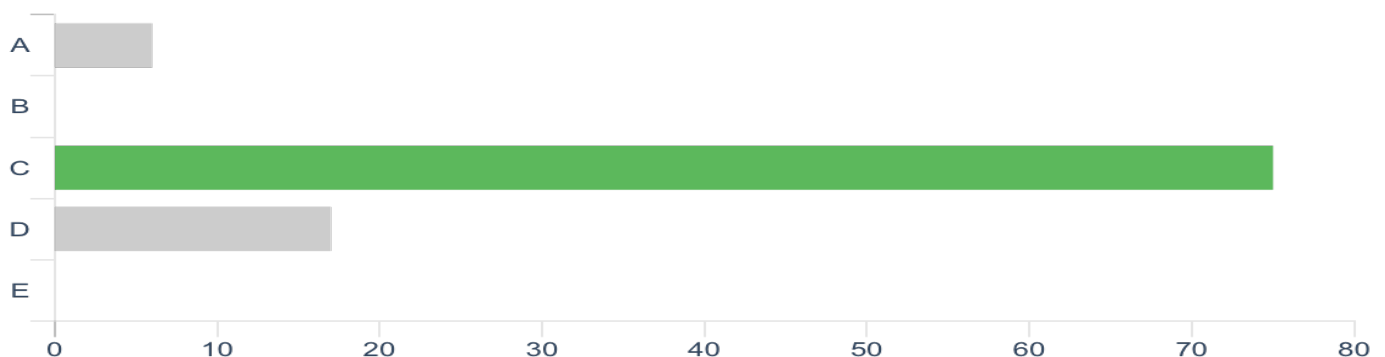
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External Links

Resuscitation guidelines

[resus.org.uk/resuscitation-guidelines/](https://www.resus.org.uk/resuscitation-guidelines/)

(<https://www.resus.org.uk/resuscitation-guidelines/>)

Expanded Explanation

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Q251

A 70-year-old woman is admitted to the Emergency Department (ED) with central crushing chest pain, nausea, sweating and syncope. She has had two inferior myocardial infarctions (MI) in the past three years. She has type II diabetes, for which she takes metformin. Recent echocardiography (ECHO) revealed an ejection fraction of 30%.

On examination, her blood pressure (BP) is 124/80 mmHg and her pulse is 85 beats per minute (bpm). There are bi-basal crackles on auscultation of the chest. A dull chest pain persists.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	12.9 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$10.2 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$243 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	138 mmol/l	135-145 mmol/l
Potassium (K^+)	4.3 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	270 μ mol/l	50-120 μ mol/l
6 hour troponin	3.9	
Electrocardiogram (ECG)	ST depression in V1-V4	

She is given aspirin 300 mg and ticagrelor. Her pain has improved slightly, but is still present.

Which of the following is the most appropriate next step (according to current NICE guidelines)?

Your answer was incorrect

- A Unfractionated heparin
- B Enoxaparin
- C Fraxiparin
- D Fondaparinux

E Bivalirudin

Explanation



A Unfractionated heparin

The National Institute for Health and Care Excellence (NICE) guideline (Acute coronary syndromes, 2020) states: 'offer fondaparinux to people with unstable angina or non-ST segment elevation myocardial infarction (NSTEMI) who do not have a high bleeding risk, unless they are undergoing immediate coronary angiography. Consider unfractionated heparin, with dose adjustment guided by monitoring of clotting function, as an alternative to fondaparinux for people with unstable angina or NSTEMI and significant renal impairment (creatinine above 265 micromoles per litre)'. In light of the renal impairment, unfractionated heparin is therefore the correct answer for this patient with an NSTEMI.

B Enoxaparin

Enoxaparin, was formerly used for acute coronary syndrome (ACS), and still is in some trusts, though is no longer part of NICE guidance.

C Fraxiparin

Fraxiparin is a low-molecular weight heparin similar to enoxaparin.

D Fondaparinux

Fondaparinux, is the antithrombin agent of choice if angiography is not being expedited.

E Bivalirudin

Bivalirudin, is an alternative to unfractionated heparin with a glycoprotein inhibitor where angiography is considered within 24 h. It is also used in patients who suffer from heparin-induced thrombocytopenia.

34960

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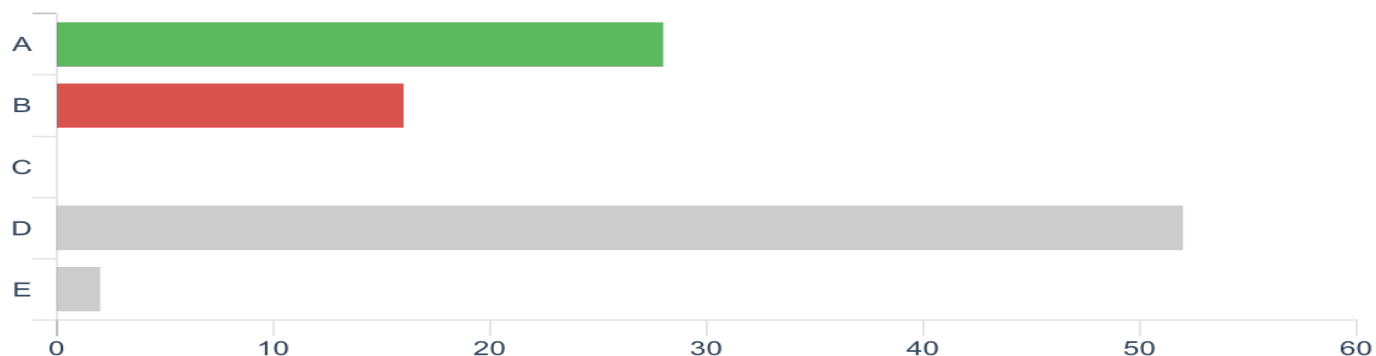
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External Links

Unfractionated heparin[nice.org.uk/guidance/qs68](https://www.nice.org.uk/guidance/qs68)<https://www.nice.org.uk/guidance/qs68>)**NICE guidance for chest pain**pathways.nice.org.uk/pathways/chest-pain<https://pathways.nice.org.uk/pathways/chest-pain>)**GRACE ACS Risk and Mortality Calculator**[mdcalc.com/grace-acs-risk-mortality-calculator](https://www.mdcalc.com/grace-acs-risk-mortality-calculator)<https://www.mdcalc.com/grace-acs-risk-mortality-calculator>)

Expanded Explanation

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Q252

A 74-year-old man with a known history of ischaemic heart disease (IHD) is brought to the Emergency Department (ED) by ambulance after collapsing in the local supermarket.

On arrival in the department, his blood pressure (BP) is 90/50 mmHg, and he looks grey and sweaty. He has very rapid, regular palpitations. On auscultation of the chest there are bilateral crackles consistent with heart failure. An electrocardiogram (ECG) shows ventricular tachycardia with a ventricular rate of around 230 beats per minute (bpm).

Arterial blood gases and investigations reveal the following:

Investigation	Result	Normal values
pH	7.40	7.35–7.45
pO ₂	8.9 kPa	> 10.5 kPa
pCO ₂	4.4 kPa	4.7–6.0 kPa
Sodium (Na ⁺)	138 mmol/l	135–145 mmol/l
Potassium (K ⁺)	4.5 mmol/l	3.5–5.0 mmol/l
Urea	6.0 mmol/l	2.5–6.5 mmol/l
Bicarbonate (HCO ₃ ⁻)	21 mmol/l	22–29 mmol/l

Which of the following is the most appropriate next step?

Your answer was incorrect

- A IV magnesium sulphate
- B IV calcium gluconate
- C IV lignocaine
- D IV amiodarone
- E Synchronised DC cardioversion

Explanation



E Synchronised DC cardioversion

This man has an unstable ventricular tachycardia with cardiovascular compromise – he is hypotensive with evidence of heart failure. He is at imminent risk of pulseless ventricular tachycardia (VT) or a ventricular fibrillation (VF) arrest. Management of this situation is covered by the Resuscitation Council guidance for peri-arrest arrhythmias. As the patient is unstable, the immediate management is synchronised DC cardioversion rather than waiting for anti-arrhythmics to take effect. Therefore option E, synchronised DC cardioversion, is correct.

B IV calcium gluconate

IV calcium gluconate is occasionally used in cardiac arrest but is not included in any of the guidelines. It works as a positive inotrope. If this patient were found to be calcium deplete, it would certainly be worth correcting this.

A IV magnesium sulphate

IV magnesium is used in the treatment of torsades de pointes VT, which usually accompanies QT prolongation. A dose of 2 g is given IV over 10 min. Electrolyte abnormalities should also be corrected.

C IV lignocaine

IV lignocaine can be used for VT, but is not part of the guidelines and should be used only with specialist involvement from the Intensive Care Unit (ITU) or Cardiology.

D IV amiodarone

Amiodarone is used in stable VT and is also indicated following unsuccessful synchronised DC cardioversion for unstable VT. Expert help should also have been sought in this situation.

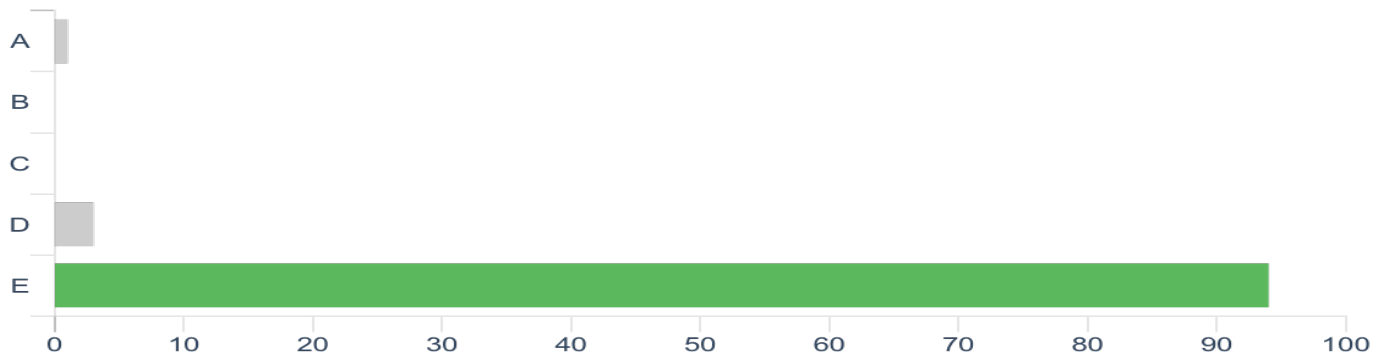
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Session Progress

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Responses Incorrect:	202
Responses Total:	252
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 External Links**Resus Council guidance**[resus.org.uk/resuscitation-guidelines/peri-arrest-arrhythmias/](https://www.resus.org.uk/resuscitation-guidelines/peri-arrest-arrhythmias/)[\(https://www.resus.org.uk/resuscitation-guidelines/peri-arrest-arrhythmias/\)](https://www.resus.org.uk/resuscitation-guidelines/peri-arrest-arrhythmias/)

Q253

A 23-year-old man comes to the Emergency Department (ED) with his third episode of paroxysmal supraventricular tachycardia (SVT) in the last three months. He has recently been diagnosed with Wolff-Parkinson-White (WPW) syndrome. He doesn't drink alcohol but drinks up to four cups of coffee per day. On this occasion he collapsed while giving a presentation at his office. He is already taking a moderate dose of sotalol as prophylaxis against further events.

On examination, his blood pressure (BP) is 95/60 mmHg, with a pulse of 160 beats per minute (bpm) and regular. He is electrically cardioverted.

Which of the following is the most appropriate next step?

Your answer was incorrect

- A Add amiodarone
- B List for implantable cardioverter defibrillator
- C Refer for electrophysiology studies
- D Switch to verapamil
- E Teach him to use the Valsalva manoeuvre

Explanation



- C Refer for electrophysiology studies

Given that this man remains symptomatic despite treatment with a b-blocker, sotalol, he is very likely to have further episodes of supraventricular tachycardia (SVT). The episodes are significantly impacting on his ability to do his job, and hence a definitive intervention is required. Electrophysiology studies (option C) followed by consideration of radiofrequency ablation is the logical next step.

- B List for implantable cardioverter defibrillator

An implantable cardioverter defibrillator (ICD) is not indicated for WPW syndrome. The indications for insertion are clear and outlined in NICE guidance.

A Add amiodarone

Amiodarone is occasionally used in tachyarrhythmias, including WPW, but would not be indicated in this situation.

D Switch to verapamil

Switching anti-arrhythmics from sotalol to verapamil is unlikely to change this patient's symptoms. Verapamil may increase the ventricular rate in WPW and is best avoided here.

E Teach him to use the Valsalva manoeuvre

Teaching him vagal manoeuvres to abort the rhythm disturbance is a poor substitute for definitive treatment. It would be reasonable if he had very infrequent episodes of arrhythmia.

34966

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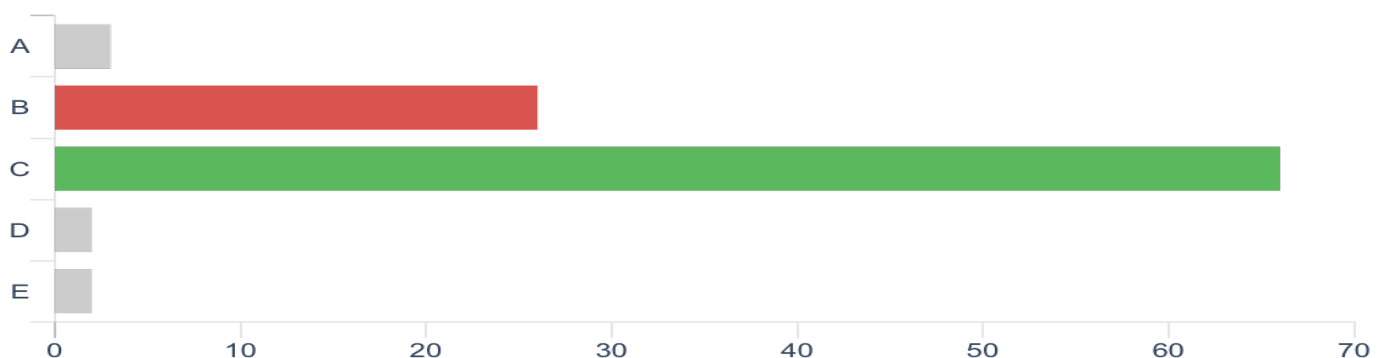
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Responses Correct:

50

Responses Incorrect:	203
Responses Total:	253
Responses - % Correct:	20%

External Links

Heart rhythm conditions overview

pathways.nice.org.uk/pathways/heart-rhythm-conditions#content=view-node%3Anodes-ventricular-arrhythmias
(<https://pathways.nice.org.uk/pathways/heart-rhythm-conditions#content=view-node%3Anodes-ventricular-arrhythmias>)



Q254

A 74-year-old man with a history of ischaemic heart disease (IHD) presents to the Emergency Department (ED) at 5 am with acute shortness of breath. The paramedics recorded oxygen saturations of 90% on air when they initially attended him at home.

His current medications include ramipril 10 mg, bisoprolol 5 mg, aspirin 75 mg, atorvastatin 10 mg and furosemide 40 mg.

On examination, his blood pressure (BP) is 165/100 mmHg, while his pulse is 100 beats per minute (bpm) and regular. He has crackles consistent with left ventricular failure (LVF) throughout both lung fields. Bloods available from two weeks earlier show a creatinine level of 150 $\mu\text{mol/l}$.

Investigations and venous blood gases reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	13.2 g/dl	13.5–17.5 g/dl
Sodium (Na^+)	137 mmol/l	135–145 mmol/l
Potassium (K^+)	5.0 mmol/l	3.5–5.0 mmol/l
Urea	9.2 mmol/l	2.5–6.5 mmol/l
pH	7.35	7.35–7.45
Bicarbonate (HCO_3^-)	22 mmol/l	22–29 mmol/l

An electrocardiogram (ECG) reveals sinus tachycardia and lateral ST depression.

Oxygen therapy has been commenced by ambulance staff.

Which of the following is the most appropriate next intervention?

Your answer was incorrect

- A IV dobutamine
- B IV furosemide
- C Continuous positive airway pressure (CPAP)
- D IV nitrate

E IV diamorphine

Explanation



B IV furosemide

This patient is hypertensive with signs of pulmonary oedema. The key to improving his symptoms will be to offload fluid with a loop diuretic, in this case IV furosemide (option B). Although both urea and creatinine are elevated, a small rise in both consequent to diuretic use is acceptable because of the accompanying likely improvement in LVF symptoms.

C Continuous positive airway pressure (CPAP)

Non-invasive ventilation such as CPAP is also not routinely advocated, because of a recent study which showed no improvement in mortality or need for invasive ventilation versus standard medical therapy alone. Its use is no longer recommended by NICE, but it may be of symptomatic benefit and its use would be at the clinician's discretion.

A IV dobutamine

Dobutamine is an inotrope used in low-cardiac output states secondary to myocardial infarction (MI), cardiac surgery, cardiomyopathy, sepsis and in cardiac stress testing. Its use is restricted to the ITU/CCU.

D IV nitrate

IV nitrate, is often used alongside diuresis in clinical practice, titrated according to blood pressure. However, this is not recommended routinely by NICE (see weblink below).

E IV diamorphine

The use of diamorphine in acute pulmonary oedema is contentious, as there have been outcome data published suggesting that opiates may be associated with increased need for intervention with respect to ventilation. Again, this is no longer part of the recommended management of acute pulmonary oedema.

36024

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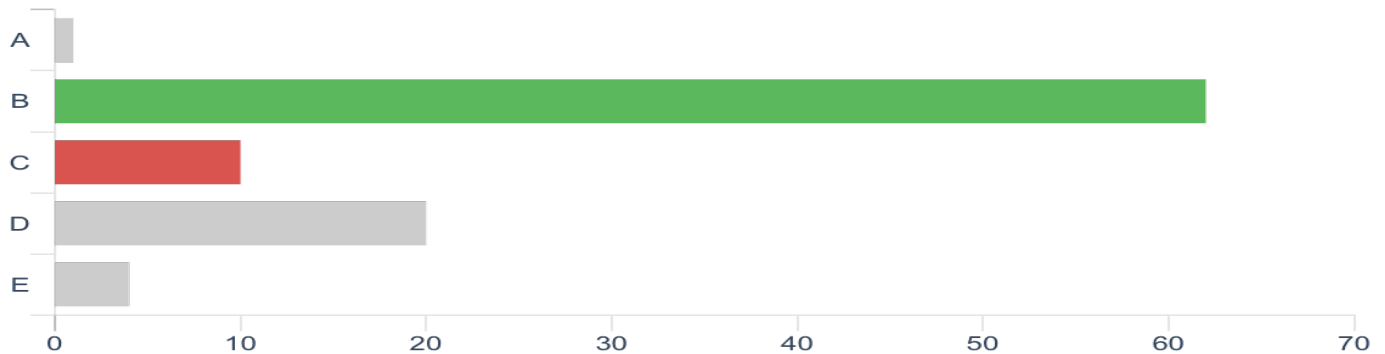
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Responses Correct:	50
Responses Incorrect:	204
Responses Total:	254
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External Links

Acute heart failure: diagnosis and management

[nice.org.uk/guidance/cg187/chapter/1-recommendations#initial-nonpharmacological-treatment](https://www.nice.org.uk/guidance/cg187/chapter/1-recommendations#initial-nonpharmacological-treatment)

(<https://www.nice.org.uk/guidance/cg187/chapter/1-recommendations#initial-nonpharmacological-treatment>)

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

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Q255

You are crash-called to a 67-year-old man who is recovering on the Surgical Ward after a cholecystectomy. He has a history of ischaemic heart disease (IHD) and type II diabetes mellitus.

On examination, his blood pressure (BP) is 70/50 mmHg. His pulse is 240 beats per minute (bpm) and regular. He is attached to the defibrillator, and it is showing what looks like ventricular tachycardia (VT).

Which of the following is the most important intervention?

Your answer was incorrect

- A IV amiodarone
- B IV lignocaine
- C DC cardioversion
- D IV adrenaline
- E IV magnesium

Explanation



- C DC cardioversion

This man has unstable VT and is at imminent risk of developing pulseless VT or ventricular fibrillation (VF). Following the Resuscitation Council adult tachyarrhythmia guidelines, the immediate treatment is DC cardioversion and therefore option C is correct. Anaesthetics should be involved so that sedation can be used.

- D IV adrenaline

IV adrenaline, is part of the adult advanced life support (ALS) algorithm, but is not indicated in this situation where the patient has not yet descended to cardiac arrest.

- A IV amiodarone

IV amiodarone, is used second line after DC cardioversion or for stable VT.

B IV lignocaine

IV lignocaine, can also be used for VT, but is not part of the guidelines and should be used only with specialist involvement – ITU or Cardiology.

E IV magnesium

IV magnesium, is used for broad-complex tachycardias including polymorphic VT (torsades de pointes), again with expert advice. It will also be worth considering why the patient has developed this arrhythmia and become so unwell. Given that the patient has undergone abdominal surgery, he may be potassium and magnesium depleted, but these can be replaced soon after the cardioversion if required.

36025

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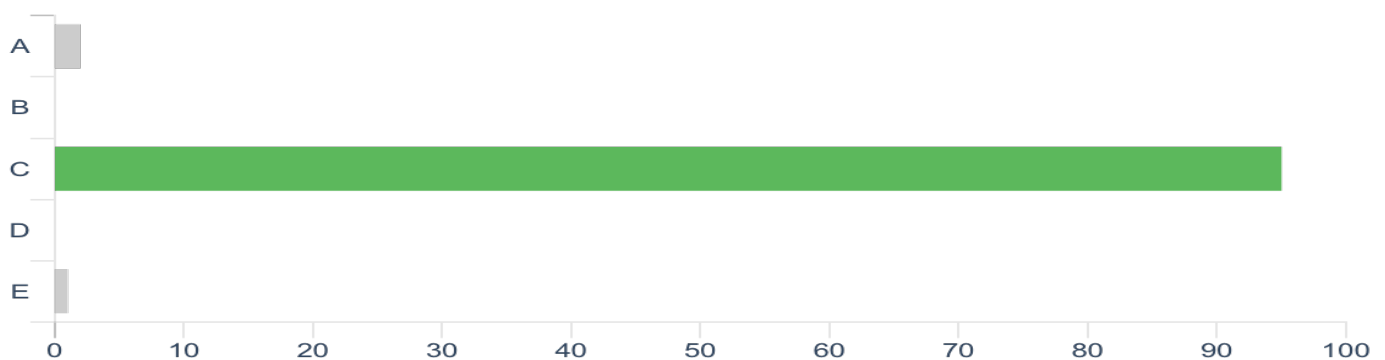
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Difficulty: Easy

Peer Responses %



Session Progress

Responses Correct:	50
Responses Incorrect:	205
Responses Total:	255
Responses - % Correct:	20%

External Links

Resus council arrhythmia guidelines

[resus.org.uk/resuscitation-guidelines/peri-arrest-arrhythmias/#tachycardia](https://www.resus.org.uk/resuscitation-guidelines/peri-arrest-arrhythmias/#tachycardia)

(<https://www.resus.org.uk/resuscitation-guidelines/peri-arrest-arrhythmias/#tachycardia>)

Resuscitation Council UK. Resuscitation Guidelines; Adult Advanced Life Support.

[resus.org.uk/resuscitation-guidelines/adult-advanced-life-support/](https://www.resus.org.uk/resuscitation-guidelines/adult-advanced-life-support/)

(<https://www.resus.org.uk/resuscitation-guidelines/adult-advanced-life-support/>)



Q256

A 38-year-old man is admitted to the Emergency Department (ED) with palpitations and an episode of pre-syncope. He had completed a half-marathon for charity that afternoon and had since been drinking beer with friends to celebrate. He estimates that he has consumed some 6-8 pints of lager over the past five hours.

On examination, his blood pressure (BP) is 110/60 mmHg. His pulse is 150 beats per minute (bpm). His chest is clear, with no signs of left ventricular failure (LVF).

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	13.2 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$8.1 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$200 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	138 mmol/l	135-145 mmol/l
Potassium (K^+)	3.9 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	110 μ mol/l	50-120 μ mol/l
Electrocardiogram (ECG)	Atrial flutter with 2:1 AV conduction	
Chest X-ray (CXR)	No evidence of cardiomegaly or heart failure	

Which of the following is the most appropriate intervention?

Your answer was incorrect

- A IV flecainide
- B IV digoxin
- C IV verapamil
- D IV amiodarone
- E IV esmolol

Explanation



A IV flecainide

This patient is fit and healthy, with no history of previous ischaemic heart disease or evidence of structural heart disease. As such, pharmacological cardioversion with flecainide is indicated and is associated with the greatest chance of attaining sinus rhythm.

C IV verapamil

IV verapamil, is used for urgent rate control in acute atrial fibrillation (AF) as an alternative to b-blockade. It can also be administered alongside an agent for rhythm control, such as flecainide. A contraindication to its use as monotherapy in this situation is the high likelihood of successful cardioversion

B IV digoxin

IV digoxin, is less frequently used in clinical practice now. It provides rate control and is a weakly positive inotrope, although it may be associated with increased cardiovascular risk. This has niched its use to the elderly with symptoms despite other interventions. IV digoxin and verapamil achieve rate control rather than attaining sinus rhythm.

D IV amiodarone

IV amiodarone, would be the correct agent for pharmacological cardioversion in the presence of structural heart disease, and is indeed an alternative to flecainide even with a structurally normal heart.

E IV esmolol

Esmolol, is a short-acting beta-blocker used in the treatment of paroxysmal supraventricular tachycardia (SVT) such as AF or atrial flutter. Its use is not routinely recommended in this situation where cardioversion may be possible.

36470

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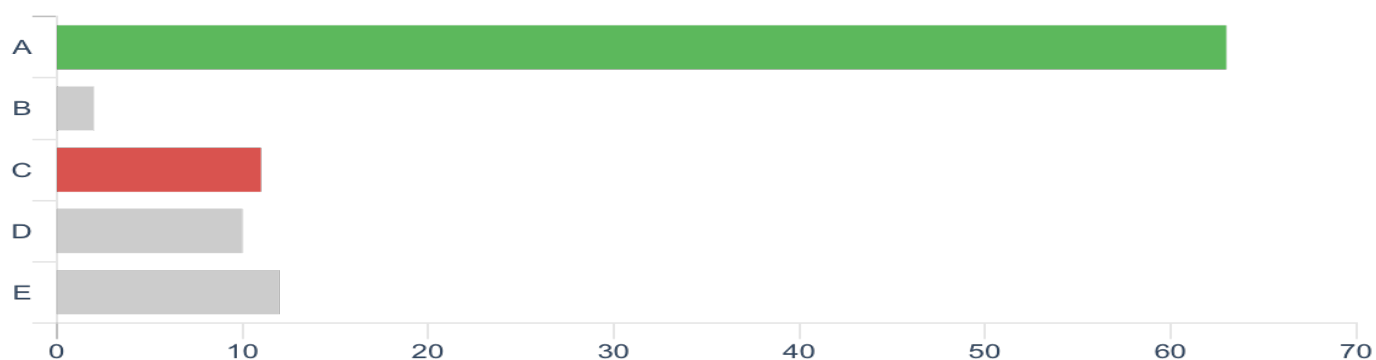
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Difficulty: Average

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Session Progress

Responses Correct:	50
Responses Incorrect:	206
Responses Total:	256
Responses - % Correct:	20%

Expanded Explanation

Overview

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Links to NICE guidelines/CKS



Q257

A 69-year-old man is admitted to the Emergency Department (ED) with palpitations and syncope. He has a history of end-stage chronic obstructive pulmonary disease (COPD) for which he takes high-dose seretide and tiotropium, and uses home oxygen. He had an inferior myocardial infarction (MI) five years earlier.

On examination, his blood pressure (BP) is 100/50 mmHg. His pulse is 135 beats per minute (bpm), and atrial fibrillation (AF) is observed. There are bilateral crackles on auscultation of the chest consistent with left ventricular failure (LVF), and widespread wheeze. He has bilateral ankle swelling.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	12.7 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$11.1 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$201 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	138 mmol/l	135–145 mmol/l
Potassium (K^+)	4.3 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	115 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Glucose	6.7 mmol/l	3.9–7.1 mmol/l
Electrocardiogram (ECG)	Fast AF, antero-lateral ST depression	

He is given intravenous (IV) furosemide.

Which other intervention is most appropriate?

Your answer was incorrect

- A IV flecainide
- B IV amiodarone
- C IV digoxin
- D Oral bisoprolol

E Oral verapamil

Explanation



C IV digoxin

This patient has long-term COPD and, as such, he is very likely to have significant atrial dilatation and chronic AF. In this case rate control is the most appropriate intervention. Given that his BP is borderline low at 100/50 mmHg and there are signs of LVF, digoxin, which is a mildly positive inotrope, is the best option.

D Oral bisoprolol

Although bisoprolol is indicated for rate control in AF, in this stage with unstable blood pressure and signs of cardiac failure, it may worsen symptoms of LVF in the short term.

A IV flecainide

Flecainide is indicated for new onset AF in the absence of significant structural or ischaemic heart disease, which is clearly not the case here.

B IV amiodarone

Amiodarone is indicated for rhythm control in patients with paroxysmal AF who have a history of IHD. In this scenario, rate control is the desired intervention.

E Oral verapamil

Verapamil would have a significantly negative inotropic effect in this situation and is likely to worsen symptoms of heart failure and reduce systolic blood pressure further.

36472

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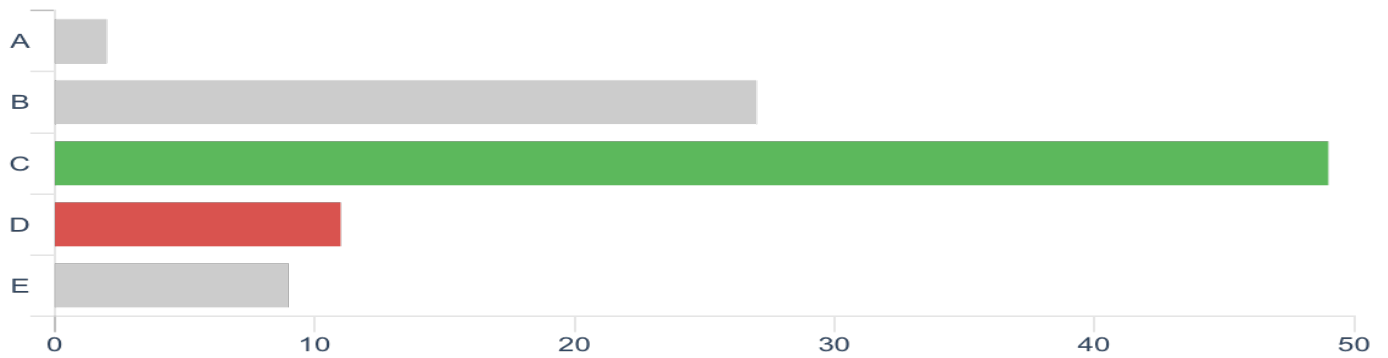
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Responses Total:	257
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 Expanded Explanation**Overview****Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q258

A 67-year-old Afro-Caribbean man with a history of hypertension comes to the Cardiology Clinic for review. He didn't tolerate a calcium channel blocker due to ankle swelling, so has been commenced on indapamide as the first intervention for his hypertension.

After three months of treatment, his blood pressure (BP) is still elevated at 155/95 mmHg. His body mass index (BMI) is 33 kg/m². His creatinine level is measured at 105 µmol/l.

Which of the following is the most appropriate next intervention?

Your answer was incorrect

- A Amlodipine
- B Valsartan
- C Bendroflumethiazide
- D Atenolol
- E Chlorthalidone

Explanation



- B Valsartan

Treatment of hypertension is indicated in patients under the age of 80 with stage 1 hypertension (>140/90) and one of the following: target organ damage, established cardiovascular disease, renal disease, diabetes or a 10-year cardiovascular risk equivalent to 20% or greater.

The choice of initial drug treatment is different in the under-55s and the over-55s or black people of African or Caribbean origin. An angiotensin-converting enzyme (ACE) inhibitor or angiotensin II receptor blocker (ARB) is first-line treatment in the first group, whereas a calcium-channel blocker is recommended in the latter. For the next step of treatment, angiotensin receptor blockers are preferred to ACE inhibitors in patients of Afro-Caribbean origin – for this reason valsartan is the preferred option in this case.

- C Bendroflumethiazide

Thiazide diuretics such as bendroflumethiazide are included in step three of the guidelines for management of hypertension, and should be added on top of an ACE inhibitor or ARB and calcium-channel blocker.

A Amlodipine

Amlodipine is contraindicated as the patient previously developed ankle swelling on a calcium antagonist.

D Atenolol

Atenolol, is not recommended as a first- or second-line anti-hypertensive agent, particularly in the obese population because of its association with impaired glucose tolerance.

E Chlorthalidone

Chlorthalidone, is a thiazide-like diuretic with a similar mechanism of action to indapamide. Since he remains hypertensive on indapamide, there would be little benefit of adding another agent of the same class.

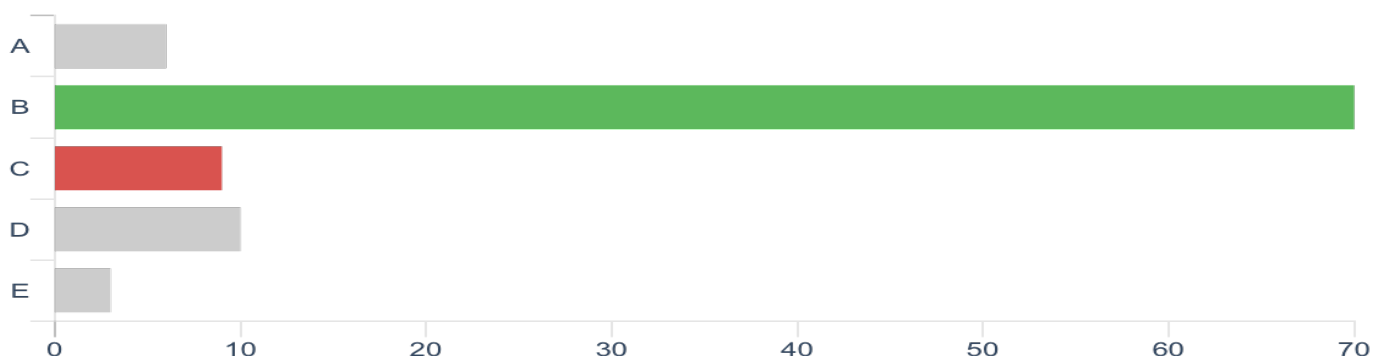
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Responses Incorrect:	208
Responses Total:	258
Responses - % Correct:	19%

External Links

Hypertension in adults: diagnosis and management

[nice.org.uk/guidance/cg127](http://www.nice.org.uk/guidance/cg127)

(<http://www.nice.org.uk/guidance/cg127>)

Expanded Explanation

Overview

Clinical Presentation

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Q259

A 71-year-old man is admitted to the Emergency Department (ED) after a collapse. This is his third episode of syncope in the past three months. An electrocardiogram (ECG) from the previous episode reveals Mobitz type 2 heart block. He has a history of inferior myocardial infarction (MI) and hypertension, managed with ramipril, bisoprolol 2.5mg and indapamide.

On examination, his blood pressure (BP) is 80/60 mmHg and his pulse is 35 beats per minute and regular. He is not in cardiac failure. An electrocardiogram (ECG) is taken which reveals complete heart block with broad QRS complexes.

Which of the following is the most appropriate next step?

Your answer was incorrect

- A Administer 500mcg of atropine IV
- B Discharge and list for a permanent pacemaker as an outpatient
- C Stop bisoprolol and review in 4 weeks as an outpatient
- D Admit for permanent pacing
- E Give a bolus of 500 mcg adrenaline IV

Explanation



- A Administer 500mcg of atropine IV

This patient has had three collapses and is now in complete heart block with broad QRS complexes. Management of this situation is made simple by following the Resuscitation Council guidelines for bradycardia (see weblink below).

This patient has had three collapses and is now in complete heart block. In the presence of heart failure, shock, syncope or myocardial infarction, the immediate first step management options of this patient include one of the following:

- Atropine 500 mcg IV, up to a maximum dose of 3 mg if repetition is needed.
- Temporary pacing
- Alternative drugs such as isoprenaline or adrenaline.

These measures should also be considered in patients who are at risk of asystole - such as those with recent asystole, Mobitz type 2 AV block, complete heart block with broad QRS complexes, or episodes of ventricular pause lasting more than 3 seconds.

B Discharge and list for a permanent pacemaker as an outpatient

Discharging the patient home and listing for outpatient pacemaker insertion, represents a significant mortality risk given the three collapses over the course of 12 weeks. This would not be the appropriate management of this patient.

C Stop bisoprolol and review in 4 weeks as an outpatient

Stopping bisoprolol, is unlikely to impact significantly on the heart rate, though would be a sensible concurrent intervention. However stopping the beta blocker and then reviewing after 4 weeks would not be appropriate management of this patient.

D Admit for permanent pacing

Admitting for permanent pacing as an inpatient will be required, but this is not the most important next step in the patient's management.

E Give a bolus of 500 mcg adrenaline IV

Although adrenaline would be a valid drug choice in this situation, the dose would be 2-10 mcg IV.

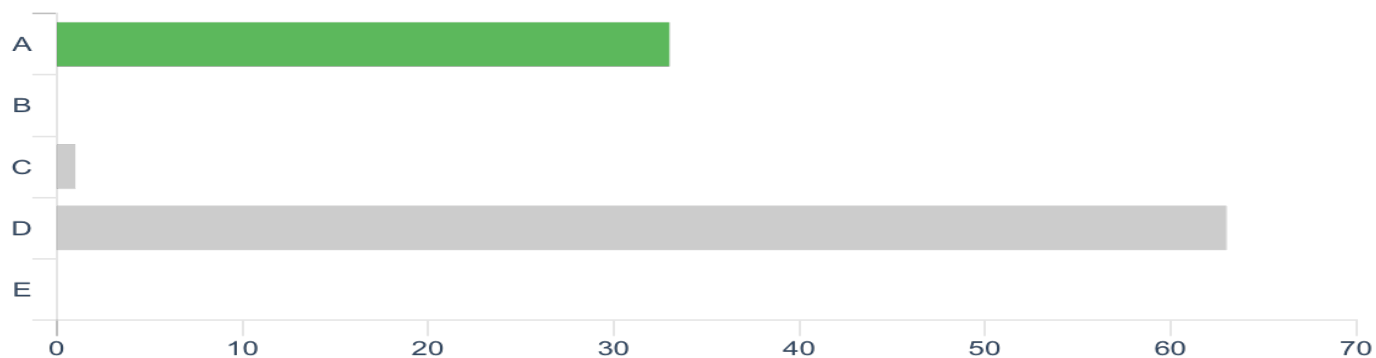
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Responses Incorrect:	209
Responses Total:	259
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External Links

Resus Council guidance

[resus.org.uk/resuscitation-guidelines/peri-arrest-arrhythmias/](https://www.resus.org.uk/resuscitation-guidelines/peri-arrest-arrhythmias/)

(<https://www.resus.org.uk/resuscitation-guidelines/peri-arrest-arrhythmias/>)



Q260

A 32-year-old woman is being prepared for surgery for medullary carcinoma of the thyroid. She also has a history of poorly controlled hypertension, and a preoperative abdominal computed tomography (CT) raises the possibility of a left phaeochromocytoma.

Her blood pressure (BP) is 165/90 mmHg, while her pulse is 85 beats per minute and regular.

Which of the following is the optimal initial intervention with respect to controlling her BP preoperation?

Your answer was incorrect

- A Atenolol
- B Amlodipine
- C Indapamide
- D Phenoxybenzamine
- E Ramipril

Explanation



- D Phenoxybenzamine

This patient has a phaeochromocytoma, a neuroendocrine tumour of the adrenal medulla that secretes catecholamines (primarily nor-adrenaline). Blockade of adrenoceptors is thus required to control blood pressure. α -Blockade should be initiated first; if beta-blockade is undertaken initially, this can lead to unopposed alpha stimulation and precipitate a hypertensive crisis. The presence of medullary-type carcinoma of the thyroid combined with phaeochromocytoma should raise the possibility of multiple endocrine neoplasia type 2.

- B Amlodipine

Amlodipine is a dihydropyridine-type calcium channel blocker. Phaeochromocytomas result in elevated circulating levels of catecholamines and it is through this mechanism that hypertension results. As such, α -blockade should be the primary mechanism by which

hypertension is controlled in this patient. Calcium channel blockade can be undertaken if further therapy is required to control blood pressure.

A Atenolol

Atenolol is a selective β_1 antagonist. If β -blockade is undertaken as initial therapy in a phaeochromocytoma, unopposed alpha-receptor stimulation by circulating nor-adrenaline can result in a hypertensive crisis. β -Blockade, usually with a selective β_1 antagonist, can be considered during surgical resection of the tumour.

C Indapamide

Indapamide is a thiazide-like diuretic. α -Blockade is required to counteract the high circulating levels of catecholamines secondary to the phaeochromocytoma. Indapamide has no central role in the treatment of hypertension in this situation.

E Ramipril

Ramipril is an ACE-inhibitor. Although it has a central role in the management of hypertension within the general hypertensive population, it is not used as a primary antihypertensive agent in those with phaeochromocytoma.

36484

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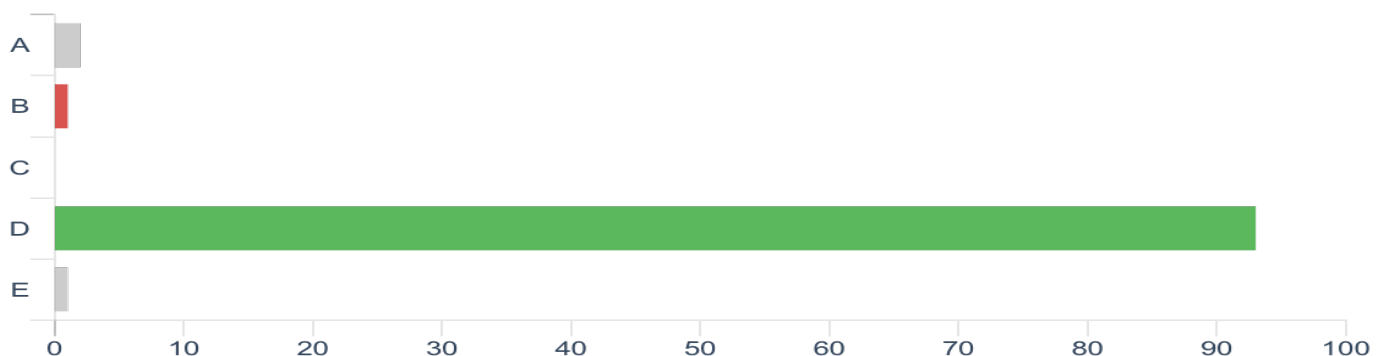
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Expanded Explanation

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Q261

A 62-year-old, previously fit and well man undergoes primary angioplasty for a infero-posterior myocardial infarction (MI). He initially stabilises, but you are asked to see him the following day because of concerns from the nursing staff about his condition.

On examination, his blood pressure (BP) is 80/50 mmHg, while his pulse is 45 beats per minute (bpm) and regular. His jugular venous pressure (JVP) is elevated at 7 cm. A creatinine level taken on the morning you see him is elevated at 145 $\mu\text{mol/l}$. 3 mg of atropine does not improve his pulse or BP significantly. A central venous pressure (CVP) line is inserted, which measures a CVP of 11.

Which of the following is the most appropriate next intervention?

Your answer was incorrect

- A Normal saline
- B Inotropic support
- C Intravenous (iv) furosemide
- D Repeat dose of atropine
- E Digoxin-specific antibody fragments (eg Digibind)

Explanation



- B Inotropic support

This patient has right heart failure as a result of their infero-posterior infarct, and despite being adequately filled, has poor cardiac output. As such, inotropes rather than further crystalloid loading are the most appropriate next step. Potential options are β_1 agonists, dopamine and dobutamine. Although dobutamine can cause vasodilation, it is used in the setting of cardiogenic shock and it is likely to only lead to a small decrease in blood pressure.

An urgent cardiological opinion should be sought with consideration given to a papillary muscle rupture causing acute mitral regurgitation secondary to this patient's inferior aspect of his MI. However, the emergency treatment here is to rescue this patient from cardiogenic shock.

C Intravenous (iv) furosemide

Furosemide is a loop diuretic which works by inhibiting the Na-K-Cl cotransporter in the thick ascending limb of the loop of Henle. Although this patient has acute right heart failure with a mildly raised CVP, his current blood pressure clearly precludes the use of diuretics.

A Normal saline

This patient is not underfilled as evidenced by the mildly high CVP. As such, the patient requires inotropic support to maintain his blood pressure.

D Repeat dose of atropine

Atropine is certainly the first line treatment given to patients with bradycardia and hemodynamic compromise, however, given the lack of response to an initial dose and the clinical features indicating cardiogenic shock from acute right heart failure the optimum next treatment here is vasopressors given central access has been established. Atropine is initially given as a 500 mcg intravenous dose and this can be given repeated up to a maximum of 3 mg. It works by blocking the vagus nerve at the sinoatrial node and atrioventricular node increasing sinus automaticity and facilitating AV node conduction.

E Digoxin-specific antibody fragments (eg Digibind)

Digoxin toxicity can quite easily occur in the setting of an acute kidney injury causing a profound bradycardia and hypotension. However, given the regular pulse rate found, lack of response to atropine and lack of past medical history of heart failure it is unlikely this patient is taking digoxin, it is more likely he is in cardiogenic shock. Digoxin toxicity would be treated by withdrawing its use, treating any underlying electrolyte disturbance (particularly disorders of potassium), repeat administration of atropine, use of Digibind and cardiac pacing, if necessary.

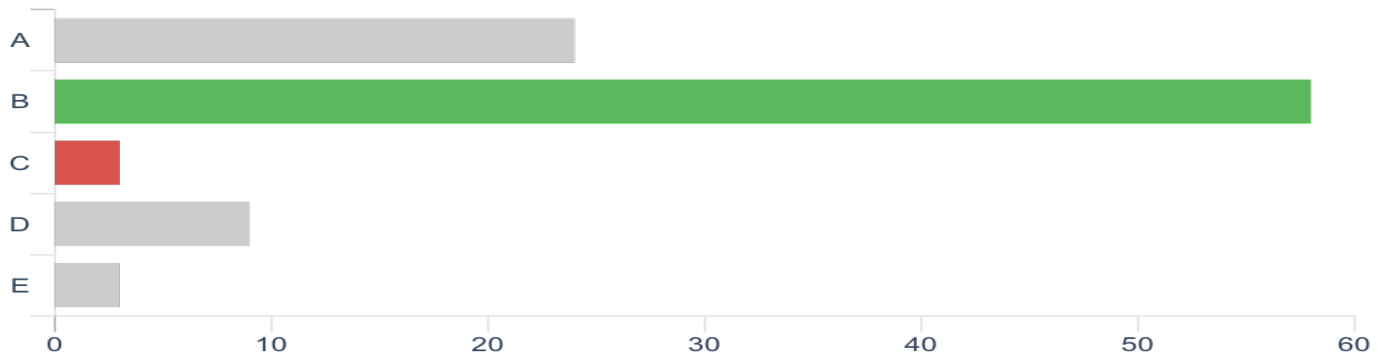
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Q262

A 28-year-old woman presents to the Emergency Department (ED) with sudden onset of palpitations whilst doing the cleaning at home.

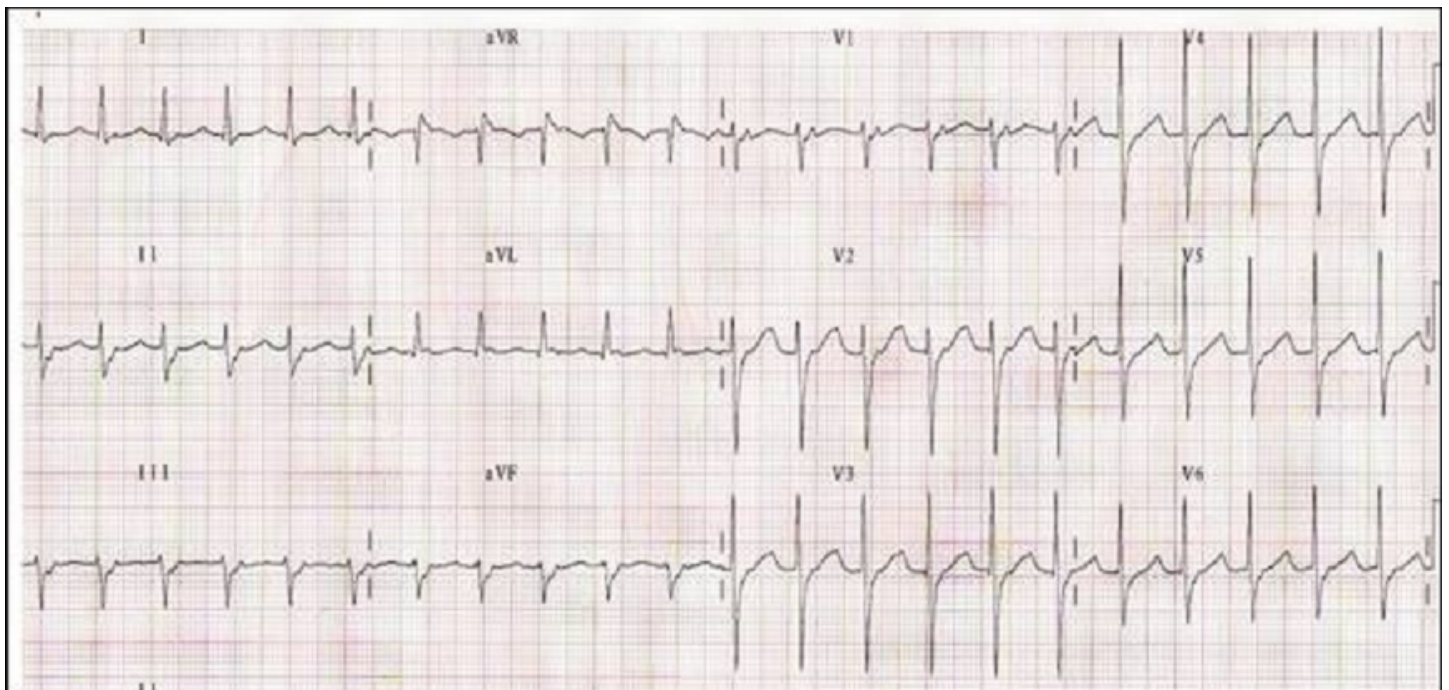
She has no past medical history of note and her only medication is the combined oral contraceptive pill (COCP). She drinks six cups of coffee per day.

On examination, her blood pressure (BP) is 122/70 mmHg, while her pulse is 140 beats per minute (bpm) and regular. Her chest is clear.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	13.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$6.2 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$221 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	138 mmol/l	135-145 mmol/l
Potassium (K^+)	4.5 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	85 μ mol/l	50-120 μ mol/l

An electrocardiogram (ECG) reveals the following:



Which of the following is the most appropriate initial intervention?

Your answer was incorrect

- A Adenosine
- B Amiodarone
- C Carotid sinus massage
- D Direct current (DC) cardioversion
- E Esmolol

Explanation



- C Carotid sinus massage

The ECG shows a regular narrow-complex tachycardia. There is no clear atrial activity visible, in part due to the ventricular rate. Given the patient's age and clinical background, atrioventricular re-entrant tachycardia (AVRT) or AV nodal re-entrant tachycardia (AVNRT) is the most likely diagnosis. The first-line treatment for such arrhythmias, when the patient is haemodynamically stable, is vagal stimulation. This stimulation reduces the rate of depolarisation of the AV node, a central component for both arrhythmias. If sufficient vagal stimulation is achieved, this will temporarily break the re-entrant circuit and terminate the arrhythmia. Techniques for vagal stimulation include carotid sinus massage, Valsalva manoeuvre and triggering of the diving reflex by placing the patient's face in cold water (note this final technique has a more profound effect on heart rate in the paediatric population). Carotid sinus massage should be used with caution in older patients, as there is a risk of causing a stroke by breaking off plaque for an atherosclerotic carotid artery.

- D Direct current (DC) cardioversion

DC cardioversion in AVRT and AVNRT is primarily reserved for patients with haemodynamic compromise, chest pain, developing heart failure and syncope. This patient does not demonstrate any of these significant features and, as such, DC cardioversion would not be appropriate as an initial intervention.

- A Adenosine

Adenosine has a central role in the treatment of arrhythmias involving the AV node (i.e. AVRT and AVNRT). Adenosine is an agonist for adenosine receptors (A_1) in the AV node, stimulation of these receptors leading to hyperpolarisation of the AV node. If sufficiently hyperpolarised,

this breaks the re-entrant circuit and terminates the arrhythmia. Adenosine should be used as a second-line treatment after vagal manoeuvres in most patients. Caution should be used in patients with airway disease (e.g. asthma or COPD).

B Amiodarone

Amiodarone is a type III antiarrhythmic agent and does not have a primary role in the treatment of regular narrow-complex tachy-arrhythmias. The primary indications for amiodarone include the treatment of haemodynamically stable ventricular tachycardia, in cardiac arrest scenarios where a patient has a shockable rhythm, and potentially in patients with atrial fibrillation not controlled by initial treatments.

E Esmolol

Esmolol is a selective β_1 antagonist. β -Blockade is a primary treatment for patients with atrial fibrillation or atrial flutter. Although atrial flutter will often present as a narrow-complex regular tachycardia, it is unlikely in this case (due to patient age, ventricular rate and clinical scenario). If, when vagal manoeuvres or adenosine are used, flutter waves are revealed, then β -blockade could be considered.

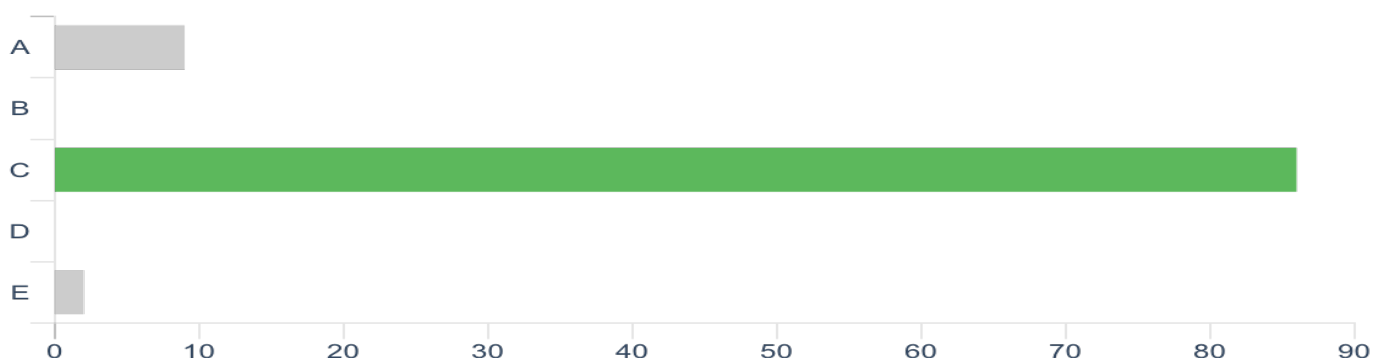
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Responses Total:	262
Responses - % Correct:	19%



Q263

A 62-year-old man with no previous cardiac history presents to the Emergency Department (ED) with central chest pain of 30 min duration and associated diaphoresis. He smokes five cigars per day and has a body mass index (BMI) of 32 kg/m². He has no past medical history of note and takes no regular medications.

On examination, his blood pressure (BP) is 100/60 mmHg. His pulse is 85 beats per minute (bpm) and regular. He has no clinical features of cardiac failure.

An electrocardiogram (ECG) is shown below; one taken for an insurance medical 6 months earlier showed no QRS widening.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	13.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$7.8 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$203 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na ⁺)	138 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.3 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	103 μ mol/l	50-120 μ mol/l



Which of the following is the most appropriate way to manage him?

Your answer was incorrect

- A Aspirin, clopidogrel and fondaparinux and supportive care
- B Urgent troponin
- C GTN and bisoprolol
- D Thrombolysis
- E Primary PCI

Explanation

- E Primary PCI

The ECG is consistent with new-onset left bundle branch block. Together with the history of severe central chest pain, this should raise strong suspicion of an acute coronary syndrome. As such, the most appropriate next step is urgent PCI. Managing for unstable angina with medical therapy, or waiting for the 6 h troponin, risks further loss of myocardium.

Thrombolysis is proven to be inferior to angioplasty. It is therefore first line only if angioplasty is unavailable within recommended timescales, or unsuitable for any reason.

- C GTN and bisoprolol

While GTN should be offered for symptomatic relief and bisoprolol should be provided as part of post-ACS medical therapy, these do not represent the most appropriate immediate management of this patient, who should undergo primary PCI as a matter of priority.

- A Aspirin, clopidogrel and fondaparinux and supportive care

While aspirin, clopidogrel and fondaparinux are key components of ACS therapy, and will comprise ongoing treatment, the main priority here is revascularisation and primary PCI should be performed.

- B Urgent troponin

Troponin is a useful test in the context of diagnostic uncertainty, but here the ECG and history are strongly suggestive of an ongoing acute coronary syndrome and primary PCI should be performed without delay.

D Thrombolysis

Current ESC guidelines on the management of STEMI recommend that PCI should be first line if it is available within 120 min of the diagnosis of STEMI. Otherwise, thrombolysis could be considered.

37189

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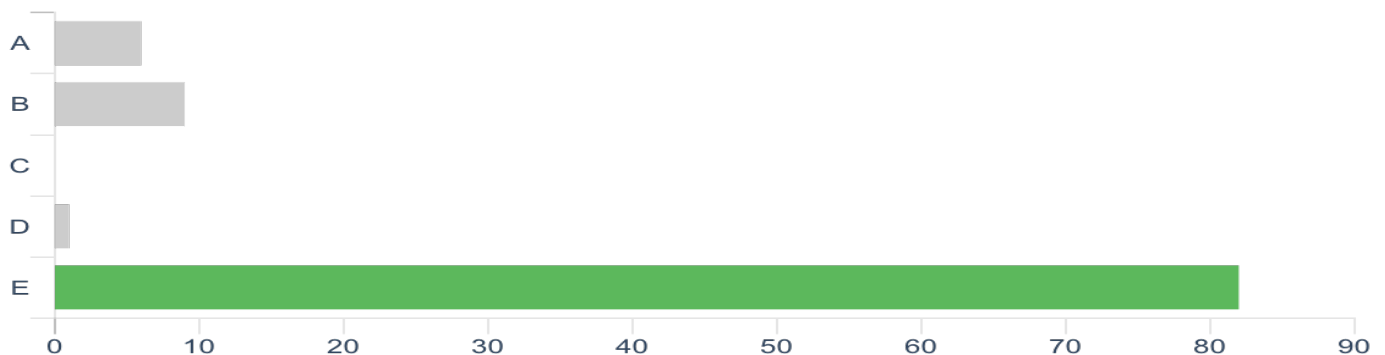
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis

Links to NICE guidelines/CKS



Q264

A 54-year-old man presents to the Emergency Department (ED) two weeks after discharge following percutaneous intervention for acute myocardial infarction (MI). He received an LAD stent and was treated post-procedure with aspirin and clopidogrel in combination. On this occasion he has a history of 20 minutes central crushing chest pain, sweating and pre-syncope.

On examination, his blood pressure (BP) is 95/60 mmHg. His pulse is 95 beats per minute (bpm) and regular. He has bilateral crackles consistent with left ventricular failure on auscultation of the chest. An electrocardiogram (ECG) reveals ST elevation in leads V₁-V₅ consistent with an acute infarct.

Which of the following is the most appropriate intervention?

Your answer was incorrect

- A Clopidogrel, aspirin and fondaparinux
- B Diamorphine, IV nitrate and aspirin
- C Low-molecular weight (LMW) heparin, abciximab, and aspirin
- D Percutaneous intervention (PCI)
- E Thrombolysis

Explanation



- D Percutaneous intervention (PCI)

This patient has recently had stenting for an acute MI and represents with significant cardiac chest pain associated with haemodynamic compromise. This is highly suggestive of acute in-stent thrombosis. Use of dual anti-platelet therapy has fortunately made this event rare. Better outcomes occur in patients who undergo acute PCI. PCI allows for thrombus aspiration, balloon angioplasty and placement of an additional stent as necessary.

- B Diamorphine, IV nitrate and aspirin

This forms part of the bundle for the acute treatment of a myocardial infarction with ongoing pain. Diamorphine and IV nitrate both lead to vasodilatation, thus lowering afterload. Additionally, diamorphine acts on opioid receptors to relieve pain. However, neither of these interventions will have a significant prognostic benefit for stent thrombosis. This patient is likely already on aspirin following their recent stent placement.

A Clopidogrel, aspirin and fondaparinux

This bundle would be appropriate for the treatment of an acute coronary syndrome event. However, this patient is likely already on dual anti-platelet therapy given their recent stent, and the addition of fondaparinux is not the most appropriate management for stent thrombosis.

C Low-molecular weight (LMW) heparin, abciximab, and aspirin

Abciximab is a glycoprotein IIb/IIIa receptor antagonist. It is primarily recommended as an adjunct during PCI and would not be appropriate as management here. Additionally, the patient is likely already on aspirin. Furthermore, LMW heparin is likely to be insufficient therapy for the stent thrombosis this patient has presented with.

E Thrombolysis

Thrombolysis has reduced benefit in acute myocardial infarction compared with PCI. However, it should be attempted if it likely that PCI is unavailable or will be significantly delayed. In the case of stent thrombosis, thrombolysis is also thought to have less benefit than PCI: it allows for less control and does not provide the direct visualisation of the coronary anatomy available with angiography. Furthermore, given that this patient is likely already on dual anti-platelet therapy, there is an increased risk of bleeding with thrombolysis that should be considered.

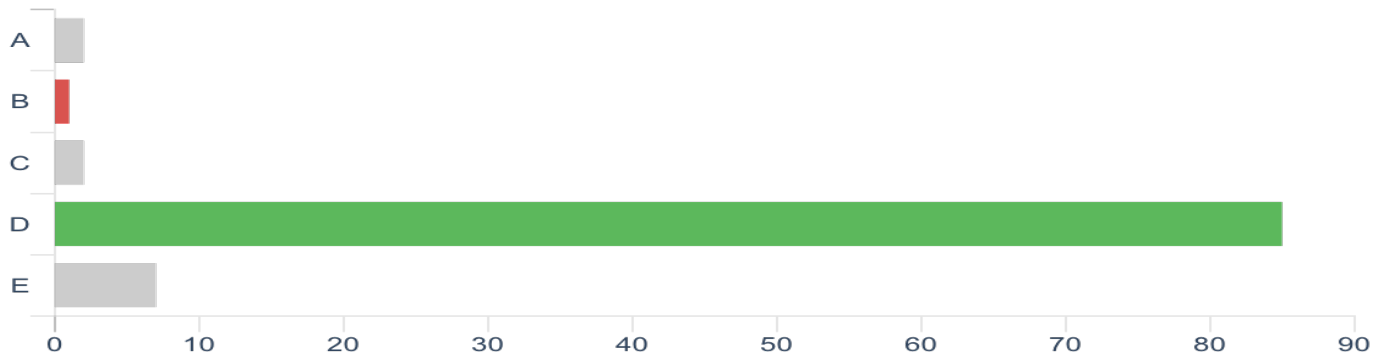
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Responses Total:	264
Responses - % Correct:	19%



Q265

A 19-year-old student from West Africa comes to the Cardiology Clinic for review. Apart from malaria as a child, he has no significant past medical history. He complains of a chronic dry cough and night sweats. He has lost one stone in weight over the past six months and feels like his exercise tolerance has significantly decreased because of shortness of breath.

On examination, his blood pressure (BP) is 105/60 mmHg and his pulse is 80 beats per minute (bpm) and regular. His jugular venous pressure (JVP) is elevated, and there is mild bilateral ankle swelling. You can hear a pericardial friction rub and the chest is clear on auscultation.

Investigations reveal the following:

Investigations	Results	Normal Values
Haemoglobin (Hb)	11.0 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$10.3 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$198 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	138 mmol/l	135-145 mmol/l
Potassium (K^+)	4.3 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	110 μ mol/l	50-120 μ mol/l
Erythrocyte sedimentation rate (ESR)	75 mm/hour	1-20 mm/hour

A chest X-ray (CXR) reveals left upper lobe changes consistent with old tuberculosis (TB) and possible cardiac calcification.

An electrocardiogram (ECG) shows low voltage complexes and non-specific T-wave changes.

Which of the following is the most useful investigation to assess the cause of his decrease in exercise tolerance?

Your answer was incorrect

- A Transthoracic echocardiography
- B Cardiac magnetic resonance imaging (MRI)
- C Computed tomography (CT) thorax

- D Quantiferon gamma testing
- E Sputum Ziehl-Neelsen (ZN) staining

Explanation



- B Cardiac magnetic resonance imaging (MRI)

The childhood exposure to tuberculosis, coupled with the symptoms of right heart failure and cardiac calcification on CXR, raises the possibility of constrictive pericarditis related to tuberculosis. Out of the options given, cardiac MRI gives the best characterisation with respect to the extent of pericardial disease, including localised versus generalised pericardial thickening and the presence of any pericardial effusion.

- C Computed tomography (CT) thorax

CT thorax would elicit any evidence of pericardial calcification. However, it would not allow for analysis of cardiac function and is therefore less appropriate in this case than cardiac MRI scanning.

- A Transthoracic echocardiography

Echocardiography would be a useful investigation to assess the patient's systolic and diastolic function. Left ventricular ejection fraction can be calculated using the Simpson's bi-plane formula. Left ventricular diastolic function can be measured through assessment of the E/A wave ratio and tricuspid annular plane systolic excursion (TAPSE). Cardiac MRI is superior to echocardiography in this case, as it will allow a more accurate assessment of the pericardium and any calcific deposits.

- D Quantiferon gamma testing

Quantiferon gamma testing is useful in assessing if a patient has been infected with tuberculosis bacteria. However, it does not highlight if a patient has latent or active tuberculosis.

- E Sputum Ziehl-Neelsen (ZN) staining

While sputum ZN staining may reveal underlying tuberculosis, it will not confirm the cause of symptoms of cardiac failure.

38128

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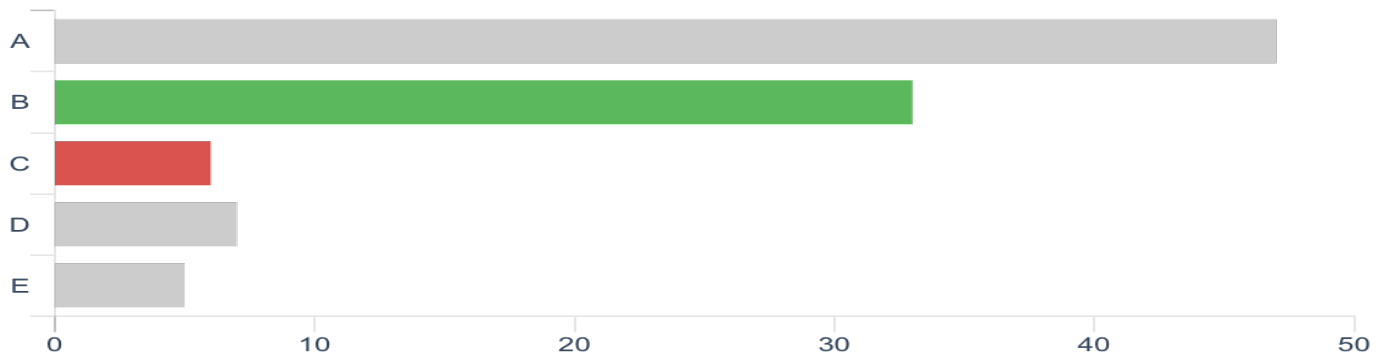
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Q266

A 17-year-old man with a history of Down syndrome is admitted to the Emergency Department (ED) with increased shortness of breath. He has a history of congenital heart disease.

On examination, his blood pressure (BP) is 155/80 mmHg and his pulse is 75 beats per minute (bpm) and regular. There are giant *a* waves on examination of the jugular venous pressure (JVP), and an ejection systolic murmur best heard at the left sternal edge. Auscultation of the chest reveals evidence of consolidation at the right base, consistent with pneumonia.

Which of the following is the most likely underlying cardiac defect?

Your answer was incorrect

- A Atrial septal defect (ASD)
- B Hypoplastic left heart
- C Mitral regurgitation
- D Pulmonary stenosis
- E Ventricular septal defect (VSD)

Explanation



- D Pulmonary stenosis

Giant *a* waves are consistent with impaired right atrial emptying and are therefore seen in both tricuspid and pulmonary stenosis, not the other conditions listed here. Down syndrome is associated with a large number of congenital cardiac defects, the most common of which are atrioventricular septal defects and tetralogy of Fallot.

- A Atrial septal defect (ASD)

An ASD is associated with pulmonary hypertension and atrial arrhythmias. Giant *a* waves are not associated with this condition.

B Hypoplastic left heart

Hypoplastic left heart syndrome presents with symptoms of severe heart failure very early in life and requires extensive cardiac surgery. It would not present with giant a waves on assessment of the JVP.

C Mitral regurgitation

Mitral regurgitation is associated with a pansystolic murmur heard at the apex, not at the left sternal edge as seen here.

E Ventricular septal defect (VSD)

A VSD is associated with a systolic thrill along the left sternal edge. It is also associated with a machinery-like murmur heard over the third/fourth intercostal space.

38178

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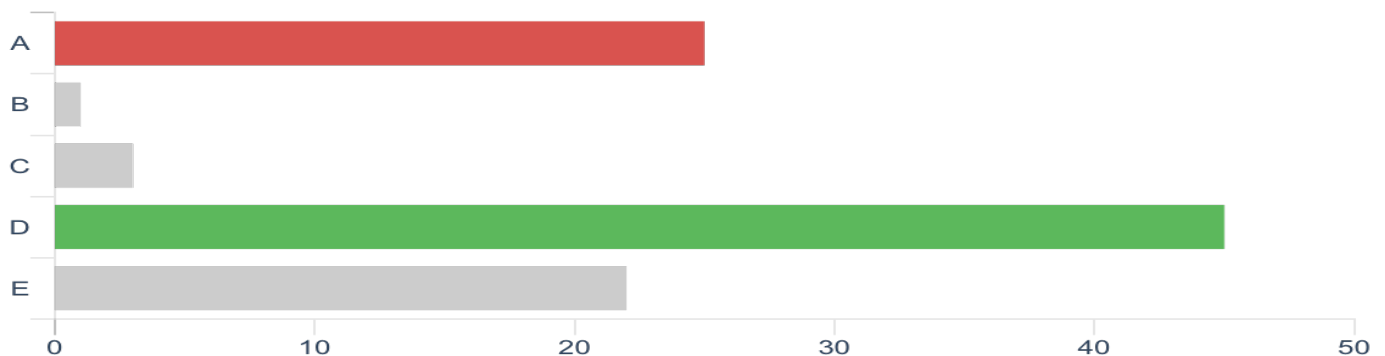
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Q267

A 19-year-old man who has not had much contact with medical facilities comes to the Cardiology Clinic for review. He has had headaches and nosebleeds over the past few months and is worried because he has developed chest pain on exercise. He has no past medical history of note.

On examination, his blood pressure (BP) is 165/90 mmHg, higher in the right arm than the left. Pulses seem more difficult to palpate in both lower limbs. There is a systolic murmur loudest in the left infraclavicular area.

Investigations reveal the following:

Investigations	Results	Normal Values
Haemoglobin (Hb)	13.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$8.7 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$198 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135-145 mmol/l
Potassium (K^+)	4.3 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	129 μ mol/l	50-120 μ mol/l

A chest X-ray (CXR) reveals left ventricular hypertrophy (LVH) with evidence of rib notching.

Which of the following is the most likely diagnosis?

Your answer was incorrect

- A Aortic stenosis
- B Coarctation of the aorta
- C Endocardial fibroelastosis
- D Hypertrophic obstructive cardiomyopathy (HOCM)
- E Pulmonary stenosis

Explanation



B Coarctation of the aorta

The picture of hypertension, coupled with a systolic murmur and a fall in blood pressure when measured in the left arm and both lower limbs, raises the possibility of coarctation. The murmur loudest in the infraclavicular area and rib notching on the CXR are very supportive of the diagnosis. Management includes control of hypertension and assessment for possible balloon angioplasty $\pm$ stenting or surgical repair of the lesion.

D Hypertrophic obstructive cardiomyopathy (HOCM)

Differential blood pressures and rib notching on the CXR are not consistent with a diagnosis of HOCM. It is more likely to be associated with an ejection systolic murmur heard in the aortic region. Patients may present with symptoms of syncope or left ventricular failure.

A Aortic stenosis

Aortic stenosis is a disease that is more likely to present later in life as a result of senile valve degeneration. Examination of patients with the condition reveals an ejection systolic murmur, which radiates to the carotids. It is not associated with rib notching on CXR.

C Endocardial fibroelastosis

Endocardial fibroelastosis presents in early childhood with features of congestive cardiac failure. It is not associated with the blood pressure discrepancies or rib notching as seen in this case.

E Pulmonary stenosis

Patients with pulmonary stenosis are likely to present with giant a waves on assessment of the jugular venous pressure and an ejection systolic murmur heard at the left sternal edge. The examination findings in this case are not consistent with a diagnosis of pulmonary stenosis.

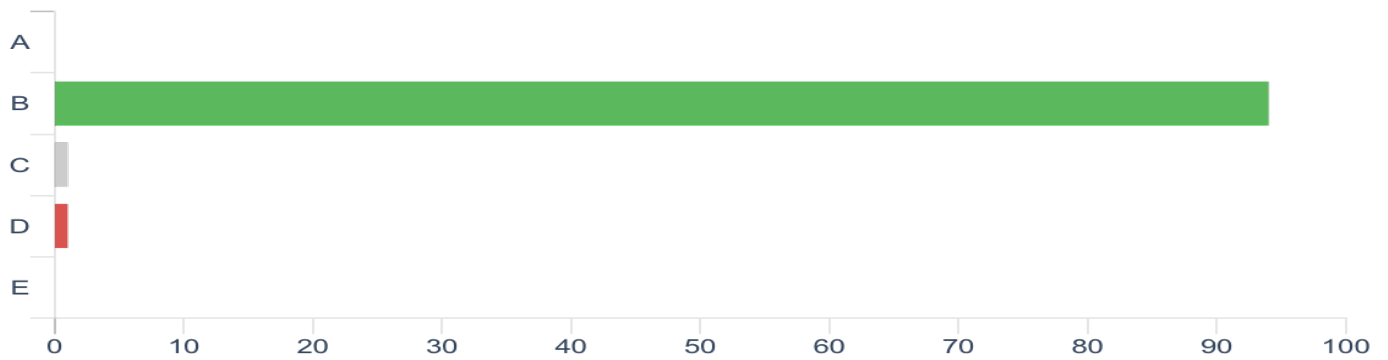
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Responses Total:	267
Responses - % Correct:	19%

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

Prognosis



Q268

A 19-year-old man comes to the Emergency Department (ED) for review. He tells you that he had fast palpitations that lasted for up to 30 minutes before reverting to normal, and he had to rest on the bed because of light-headedness/presyncopal symptoms. This is apparently the fifth time he has had palpitations over the past four months; the episodes normally last for three to five minutes in total. He is a long-distance runner who runs up to 30 miles per week and drinks up to five cups of coffee per day.

Examination in the clinic reveals a blood pressure (BP) of 95/60 mmHg and a pulse of 50 beats per minute (bpm) and regular. There are no murmurs, and his chest is clear.

Investigations reveal the following:

Investigations	Results	Normal Values
Haemoglobin (Hb)	13.5 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$5.9 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$192 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135–145 mmol/l
Potassium (K^+)	4.3 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	90 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Thyroid-stimulating hormone (TSH)	2.9 $\mu\text{U/l}$	0.17–3.2 $\mu\text{U/l}$
Glucose	5.1 mmol/l	3.9–7.1 mmol/l

An electrocardiogram (ECG) reveals normal function, with a ventricular rate of 52 bpm. A chest X-ray (CXR) is normal.

Which of the following is the most likely diagnosis?

Your answer was correct

- A Atrial ectopics
- B Paroxysmal atrial fibrillation
- C Sinus tachycardia
- D Ventricular ectopics

E Ventricular tachycardia

Explanation



B Paroxysmal atrial fibrillation

The clue here is the history of long-distance running, coupled with relative bradycardia on clinical examination and a normal ECG and CXR. With a history of symptoms of presyncope, atrial fibrillation related to a 'runner's heart' is the most likely diagnosis. It would be important to confirm the diagnosis through the use of a 24-hour cardiac monitor. Given the symptoms of presyncope, it would be prudent to perform an echocardiogram to exclude any structural cardiac abnormality, eg hypertrophic cardiomyopathy.

A Atrial ectopics

Isolated atrial ectopics may cause short palpitations where a patient complains of 'their heart skipping a beat'. They are not associated with prolonged palpitations or feelings of presyncope.

C Sinus tachycardia

This would not be associated with presyncopal symptoms. Also the resting bradycardia makes this unlikely.

D Ventricular ectopics

Isolated ventricular ectopics may cause short palpitations where a patient complains of 'their heart skipping a beat'. They are not associated with prolonged palpitations or feelings of presyncope. If there is a high percentage of ventricular ectopics on 24-hour Holter monitoring, then it would be appropriate to refer the patient for an echocardiogram, as this can be an indication of an underlying structural abnormality.

E Ventricular tachycardia

The resting ECG is normal and the patient is young and fit. This makes ventricular tachycardia unlikely. It is important to investigate the patient with a 24-Holter monitor to exclude this as a diagnosis.

38209

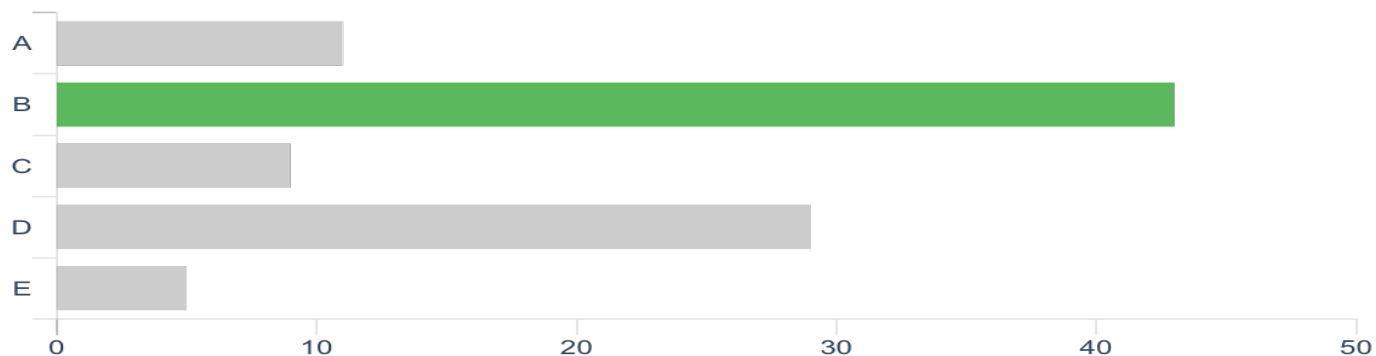
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**



Q269

A 59-year-old man with a history of ischaemic heart disease (IHD) is admitted to the Emergency Department (ED) after an out-of-hospital cardiac arrest. He was thought to have been collapsed for about ten minutes before the paramedic crew arrived. He was in ventricular fibrillation (VF) with no spontaneous respiration, and he reverted to sinus rhythm after three direct current (DC) shocks.

Examination in the ED reveals a blood pressure (BP) of 155/80 mmHg and a pulse of 85 beats per minute (bpm) and regular. His temperature is 37.4 °C. His Glasgow Coma Scale (GCS) score is 5.

Investigations reveal the following:

Investigations	Results	Normal Values
Haemoglobin (Hb)	13.1 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$8.9 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$203 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	139 mmol/l	135–145 mmol/l
Potassium (K^+)	5.9 mmol/l	3.5–5.0 mmol/l
Bicarbonate (HCO_3^{2-})	13 mmol/l	23–30 mmol/l
Creatinine (Cr)	142 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
pH	7.21	7.35–7.45

An electrocardiogram (ECG) reveals anterolateral ST depression.

Which of the following is the optimal way to manage him?

Your answer was incorrect

- A Intravenous (iv) dopamine
- B iv insulin and dextrose
- C iv sodium bicarbonate
- D Observation only

E Therapeutic hypothermia

Explanation



E Therapeutic hypothermia

A number of trials have suggested that when an out-of-hospital cardiac arrest has occurred and there is significant neurological impairment, outcomes are improved by a period of therapeutic hypothermia with respect to neurological status at discharge.

The Resuscitation Council advises: 'targeted temperature management remains important, but the target temperature can be in the range of 32 °C to 36 °C according to local policy. There was a preference for 36 °C among the guidelines group because it is easier to implement and there is no evidence that it is inferior to 33 °C.'

Given that spontaneous circulation has been restored and the patient is being ventilated, the acidosis and hyperkalaemia should correct rapidly without the need for other pharmacological intervention at this stage.

B iv insulin and dextrose

The patient has mild hyperkalaemia, which is likely as a result of his cardiac arrest. The potassium level should normalise without any treatment.

A Intravenous (iv) dopamine

Now that the patient is in sinus rhythm and is maintaining a good blood pressure, there is no indication for inotropic support.

C iv sodium bicarbonate

iv sodium bicarbonate is incorrect, as it will exacerbate intracellular acidosis. Now that the patient has reverted to sinus rhythm and is being ventilated, the acidosis will resolve spontaneously.

D Observation only

This is a reasonable option if therapeutic hypothermia is unavailable, though it is less effective with regard to long-term neurological recovery.

38210

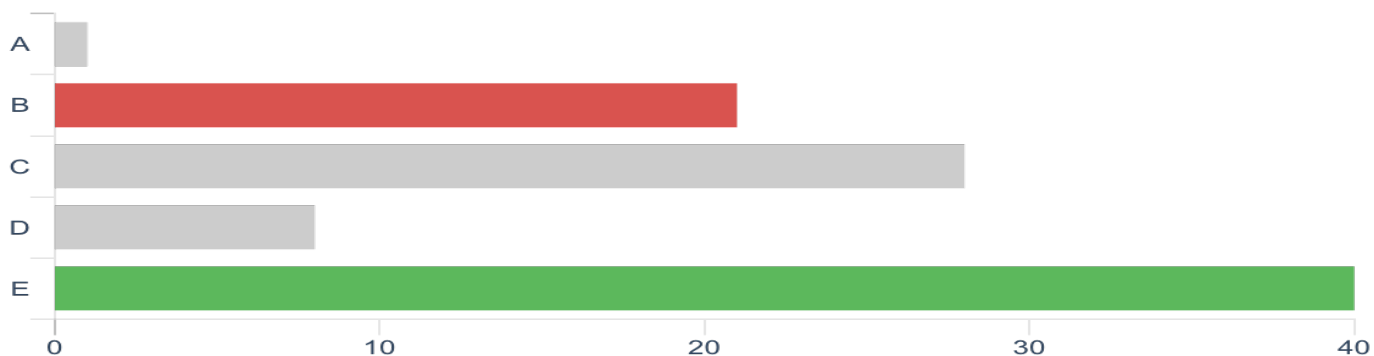
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation**

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Prognosis



Q270

A 29-year-old known intravenous (IV) drug abuser is brought to the Emergency Department (ED) after being found by a passer-by in cardiorespiratory arrest. He has been intubated and ventilated at the scene by the ambulance crew. Cardiopulmonary resuscitation (CPR) is ongoing. The monitor shows asystole, but medical personnel have been unable to gain IV access to give him adrenaline.

Which of the following is the most appropriate alternative route to administer adrenaline in his case?

Your answer was incorrect

- A Intracardiac
- B Intramuscular
- C Intraosseous
- D Subcutaneous
- E Via the endotracheal (ET) tube

Explanation



- C Intraosseous

Intraosseous administration of drugs was formerly only practised in the paediatric setting, but intraosseous administration, usually via the tibia or humerus, has been shown to be effective in adults. Studies have demonstrated that drugs delivered via this route still achieve adequate plasma concentration.

- D Subcutaneous

Due to the lack of a functional circulation, absorption via the subcutaneous route is very poor.

- A Intracardiac

Intracardiac administration of drugs holds no advantages, compared to the intraosseous or iv route, in this setting and could potentially result in further problems because of the trauma associated with the injection and it interrupts the process of CPR.

B Intramuscular

Due to the lack of a functional circulation, absorption via the intramuscular route is very poor.

E Via the endotracheal (ET) tube

Absorption via the trachea is possible, but plasma concentrations achieved via this route are unpredictable and likely to be lower, compared to the iv or intraosseous route.

38211

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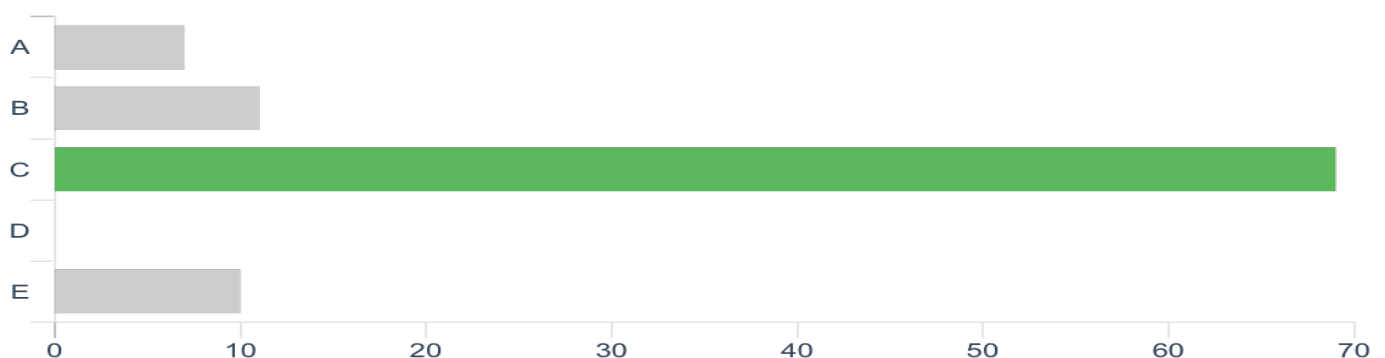
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Expanded Explanation

Overview

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Q271

A 42-year-old man presents to the Emergency Department (ED) with central chest pain radiating to his back.

When he arrives, he looks grey and sweaty, and his blood pressure (BP) is 150/85 mmHg and his pulse is 105 beats per minute (bpm) and regular. There is a differential blood pressure between the right and left arms. His chest is clear, and there is no peripheral oedema. You see from the computer he had two previous ED attendances for joint dislocations, and on one of these occasions, a mitral valve murmur was noted.

Investigations reveal the following:

Investigations	Results	Normal values
Haemoglobin (Hb)	13.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$8.3 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$209 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135-145 mmol/l
Potassium (K^+)	4.3 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	112 μ mol/l	50-120 μ mol/l

An electrocardiogram (ECG) reveals inferior ST elevation. A chest X-ray (CXR) shows no signs of cardiac failure.

Which of the following is the most appropriate next step?

Your answer was correct

- A Check Troponin
- B Coronary angiography
- C Computed tomography (CT) aortogram
- D Echocardiogram
- E Thrombolysis

Explanation



C Computed tomography (CT) aortogram

While we are not given all the features of an underlying connective tissue disease in the scenario, the mitral valve murmur, coupled with recurrent joint dislocations, raises this as a possible problem. Given the presentation with chest pain radiating to the back, the diagnosis that must be excluded is clearly aortic dissection, and a CT aortogram is therefore the most appropriate next step. Treatment of an aortic dissection is with intravenous (iv) labetalol, aiming for a systolic blood pressure of < 120 mmHg. If it involves the ascending aorta, then the patient should be referred for surgical repair.

A Check Troponin

While myocardial infarction is a reasonable differential, in this case, the patient should first have a computed tomography (CT) aortogram to look for a potential dissection. Waiting for the result of a troponin would only add unnecessary delay.

B Coronary angiography

Coronary angiography is appropriate for the investigation and treatment of myocardial infarction, but the history here suggests that this patient could have an aortic dissection. Therefore, dissection must be excluded first.

D Echocardiogram

An echocardiogram would be an appropriate option once the diagnosis of aortic dissection was confirmed. This would be to look for a potential pericardial effusion.

E Thrombolysis

Thrombolysis is a treatment for massive pulmonary embolism. This scenario is more suggestive of an aortic dissection. Thrombolysis in this setting could have life-threatening consequences.

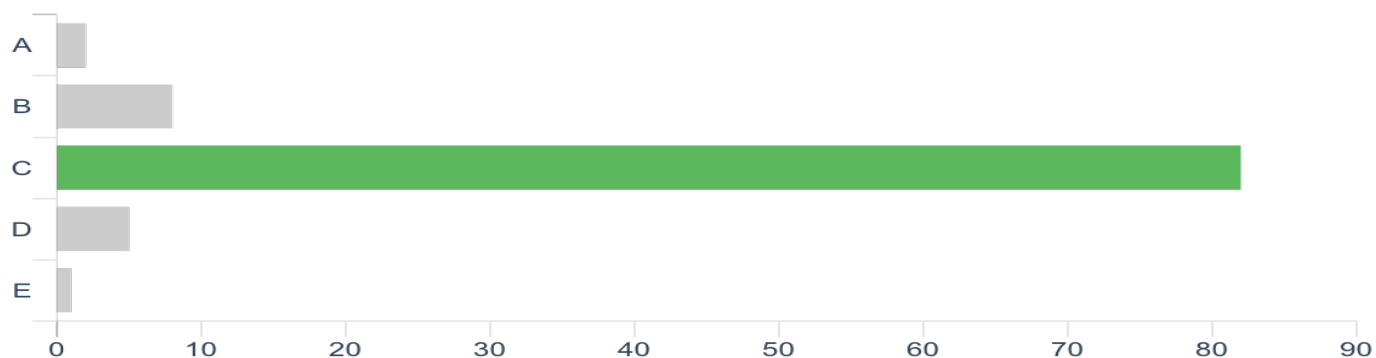
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q272

A 17-year-old woman with a history of Noonan syndrome comes to the Cardiology Clinic for review. She has shortness of breath, pitting oedema affecting both ankles and decreased exercise tolerance to only a few yards before she gets short of breath.

On examination, her blood pressure (BP) is 115/80 mmHg, and her pulse is 80 beats per minute (bpm) and regular. There are prominent *a* waves on examination of the jugular venous pressure (JVP), a soft systolic murmur at the left sternal edge and mild pitting oedema affecting both ankles. The chest appears clear.

Which of the following is the most likely underlying cardiac diagnosis?

Your answer was incorrect

- A Aortic stenosis
- B Atrial septal defect (ASD)
- C Mitral regurgitation
- D Pulmonary stenosis
- E Tricuspid regurgitation

Explanation



- D Pulmonary stenosis

Congenital heart disease may be seen in up to 50% of Noonan syndrome sufferers. Pulmonary lesions are classically described with a dysplastic or stenotic valve and are said to occur more commonly than ASDs. The character of the murmur here and the signs of right heart failure are consistent with pulmonary stenosis. Valvotomy and percutaneous valve replacement are both potential surgical interventions in this situation.

- C Mitral regurgitation

Mitral regurgitation would not be consistent with the prominent *a* waves seen on assessment of the patient's JVP. The murmur of mitral regurgitation is a pansystolic murmur loudest at the apex, which radiates to the axilla, as opposed to the murmur described in this case.

A Aortic stenosis

Aortic stenosis would not be consistent with the prominent *a* waves seen on assessment of the patient's JVP. The murmur of aortic stenosis is an ejection systolic murmur heard loudest in the second intercostal space on the right-hand side, which radiates to the carotids.

B Atrial septal defect (ASD)

ASDs are common in Noonan syndrome. While the majority of ASDs do not present with a murmur, if the patient has a large ASD, then a soft ejection systolic murmur may be heard. ASD murmurs are classically described as being 'scratchy' in nature. An ASD is more commonly associated with a wide fixed S2. It is also not associated with prominent *a* waves on assessment of the JVP.

E Tricuspid regurgitation

This patient likely has an element of tricuspid insufficiency. However, that will be secondary to the pulmonary stenosis, as opposed to being the primary problem. Isolated tricuspid stenosis is not classically associated with Noonan syndrome. The murmur of tricuspid regurgitation is a monosystolic rumbling murmur heard at the left sternal edge.

38251

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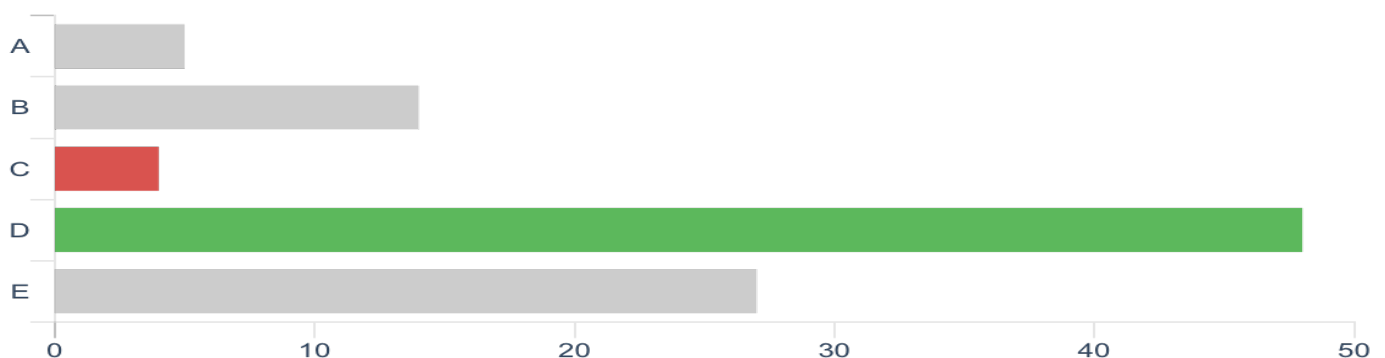
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Q273

A 61-year-old man is reviewed in the Cardiology Clinic one week into therapy with flucloxacillin and gentamicin for aortic valve endocarditis. The murmur has not changed significantly in character since you last reviewed him three days earlier, although he continues to have night-time fevers and feels 'washed out'.

His blood pressure (BP) is stable at 110/75 mmHg, while his pulse is 80 beats per minute (bpm) and regular. He is not in heart failure when you review him, and his temperature is 37.4 °C.

Investigations reveal the following:

Investigations	Results	Normal Values
Haemoglobin (Hb)	10.9 g/dl	13.5-17.5 g/dl
White cell count (WCC)	11.8 × 10 ⁹ /l (13.2 on admission)	4.0-11.0 × 10 ⁹ /l
Platelets (PLT)	201 × 10 ⁹ /l	150-400 × 10 ⁹ /l
C-reactive protein (CRP)	232 mg/l (244 on admission)	< 10 mg/l
Sodium (Na ⁺)	137 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.3 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	132 µmol/l	50-120 µmol/l

An electrocardiogram (ECG) reveals a PR interval of 280 milliseconds (up from 230 milliseconds on admission).

Which of the following is the most appropriate next step?

Your answer was incorrect

- A Add an antifungal
- B Change antibiotics
- C Continue current therapy
- D Repeat blood cultures
- E Repeat echocardiography

Explanation



E Repeat echocardiography

The presence of symptoms of ongoing infection, coupled with persistently raised inflammatory markers and the PR prolongation, raises the suspicion of an aortic root abscess. The most important next step is therefore to repeat imaging. If an abscess is confirmed, then surgery is essential for debridement and valve replacement, as continued antibiotics alone will be ineffective.

A number of indications for surgery in endocarditis are listed below:

Congestive heart failure:

- congestive heart failure caused by severe aortic or mitral regurgitation or, more rarely, by valve obstruction caused by vegetations
- severe acute aortic or mitral regurgitation with echocardiographic signs of elevated left ventricular end-diastolic pressure or significant pulmonary hypertension
- congestive heart failure as a result of prosthetic dehiscence or obstruction.

Periannular extension:

- most patients with abscess formation or fistulous tract formation.

Systemic embolism:

- recurrent emboli despite appropriate antibiotic therapy
- large vegetations (> 10 mm) after one or more clinical or silent embolic events after initiation of antibiotic therapy
- large vegetations and other predictors of a complicated course.

D Repeat blood cultures

Initial blood cultures taken at the time of initial antibiotic therapy are likely to be most accurate with respect to guiding any change in antibiotic therapy, and the repeat echocardiogram is most important with respect to determining any need for surgical intervention.

A Add an antifungal

Fungal endocarditis is rare and is more likely to be seen in patients with indwelling lines, particularly where there is immunosuppression or immunocompromise. Amphotericin B is an appropriate intervention for fungal endocarditis.

B Change antibiotics

A change in antibiotics may be required, but this would be triggered by culture and sensitivity results questioning the suitability of flucloxacillin and gentamicin, not by initial failure to respond to intervention.

C Continue current therapy

The problem here is that the prolongation of the PR interval does suggest worsening of the disease and possible abscess formation. For this reason, further investigations to assess the need for surgery are essential.

38371

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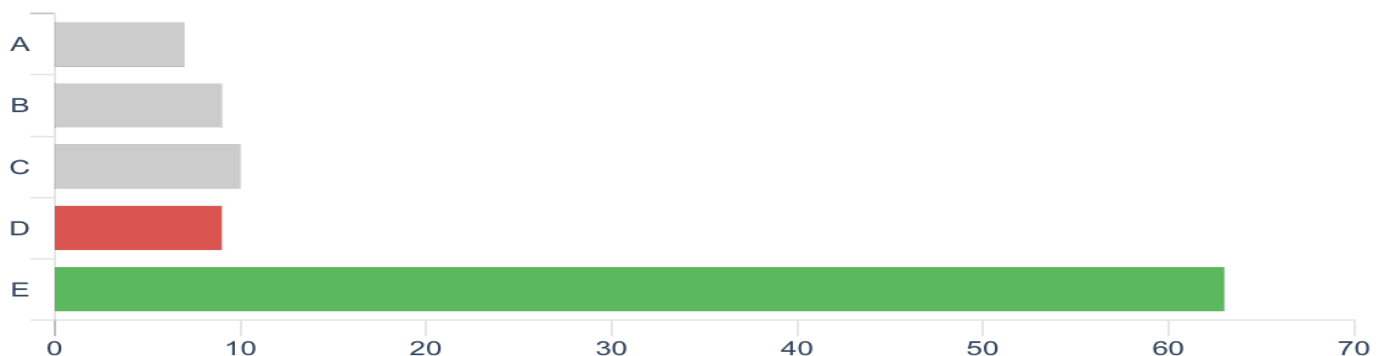
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Expanded Explanation

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Q274

You are called to a cardiac arrest on the Orthopaedic Ward. A 70-year-old man is five days post-left total hip replacement and has collapsed on the toilet.

When you arrive, basic life support is in progress and defibrillator pads are attached. These show pulseless ventricular tachycardia (VT). He undergoes six minutes of cardiopulmonary resuscitation (CPR) with three defibrillator shocks. He is given adrenaline and a bolus of intravenous (IV) fluid. Spontaneous circulation returns, although his blood pressure is measured at 80/60 mmHg and his pulse is 110 beats per minute (bpm).

He still requires ventilatory support and is intubated and ventilated before transfer to the Intensive Therapy Unit (ITU) with 50% oxygen. His chest appears clear on auscultation.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	11.2 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$6.1 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$201 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135–145 mmol/l
Potassium (K^+)	4.3 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	110 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
pO_2	9.1 kPa	> 10.5 kPa
pCO_2	5.6 kPa	4.7–6.0 kPa
Portable chest X-ray (CXR)	Endotracheal tube in position, no signs of heart failure	

Which of the following is the most appropriate next step?

Your answer was correct

A Inotropic support and observe for 12 hours

- B Portable echocardiography on the ITU
- C Thrombolysis
- D Coronary angiography
- E Computerised tomography pulmonary angiogram (CTPA)

Explanation



- B Portable echocardiography on the ITU

This patient has had a cardiac arrest following an orthopaedic procedure. Following return of circulation and ventilator support, this patient's $p(\text{O}_2)$ remains low. Given this clinical scenario, the most likely diagnosis is a large pulmonary embolism (PE), likely occupying the bifurcation of the pulmonary trunk (a 'saddle' PE). Direct visualisation of the PE may be possible on an echocardiogram, and if not directly visualised, right ventricular dysfunction is likely to provide significant support for this diagnosis. If the clinical suspicion for PE remains high following an echocardiogram, thrombolysis would be appropriate in this patient.

- A Inotropic support and observe for 12 hours

Inotropic support may be necessary to maintain blood pressure. However, this does not deal with any underlying diagnosis that has caused a cardiac arrest in this post-operative patient. It may be necessary, but it is not the most appropriate next step.

- C Thrombolysis

This clinical scenario strongly supports the presence of a large 'saddle' PE, and thrombolysis may well be beneficial if this diagnosis is correct. However, it is important to note that the patient is only 5 days post-operative from an orthopaedic procedure. As such, his risk for bleeding is high, and the diagnosis should be further investigated before thrombolysis is employed. If return of circulation had not been reached, then urgent thrombolysis without further investigation may have been appropriate.

- D Coronary angiography

This patient is haemodynamically compromised and would be unsuitable for transfer from the ITU at this time. Additionally, the underlying diagnosis points towards a large PE, based on the clinical history and arterial blood gas, rather than an acute coronary event. If further investigation does not support a diagnosis of PE, then this investigation should be reconsidered once the patient is stabilised.

E Computerised tomography pulmonary angiogram (CTPA)

CTPA is a first-line investigation for PE in most patient groups. However, this would require transfer to Radiology and for the patient to be placed in a small CT scanner. There is a high risk for a further cardiac arrest or deterioration acutely in this patient and, as such, this would not be an appropriate initial investigation at this time.

39041

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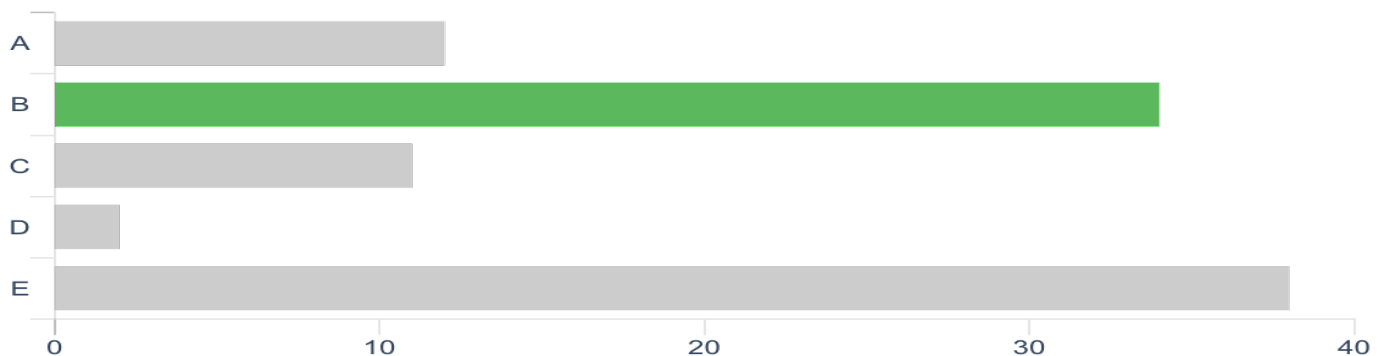
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Q275

A 32-year-old man with a history of Marfan's disease comes to the Emergency Department (ED). He is complaining of severe central chest pain radiating to his back. He has a previous lens dislocation and takes beta-blockers to reduce the risk for aortic dissection. He smokes ten cigarettes per day and has a family history of hypercholesterolaemia.

On examination, his blood pressure (BP) is 132/80 mmHg and his pulse is 90 beats per minute (bpm) and regular. He is in pain. His chest is clear.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	13.1 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$8.2 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$193 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135–145 mmol/l
Potassium (K^+)	4.3 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	100 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Chest X-ray (CXR)	Moderate mediastinal widening, in keeping with chest X-ray findings from 6 months previously	
Electrocardiogram (ECG)	Inferior T-wave inversion	

Which of the following is the most appropriate next step?

Your answer was correct

- A Aspirin, fondaparinux and clopidogrel
- B Computerised tomography (CT) angiogram of the aorta

- C Observation pending troponin result
- D Transthoracic echocardiography
- E Urgent percutaneous coronary intervention (PCI)

Explanation



- B Computerised tomography (CT) angiogram of the aorta

The answer is Computerised tomography (CT) angiogram of the aorta (Option B).

This patient presents with clinical features highly suggestive of an aortic dissection. The typical symptoms of severe chest pain radiating to the back are demonstrated here. Furthermore, this patient has a history of Marfan's disease, a significant risk factor for aortic dissection. CT angiogram of the aorta is the gold standard imaging technique for the diagnosis of aortic dissection and should be undertaken urgently. This will be able to identify an aortic dissection and characterise whether it involves the ascending aorta.

- A Aspirin, fondaparinux and clopidogrel

Aspirin, fondaparinux and clopidogrel (Option A) is incorrect.

There are some features here that may suggest an acute coronary syndrome, including central chest pain and T-wave inversion on the ECG. However, this case highlights that aortic dissection can present similarly. It is vital to exclude the diagnosis of aortic dissection in this patient before giving either antiplatelet or anticoagulant agents, as these may be fatal if a dissection is present.

- C Observation pending troponin result

Observation pending troponin result (Option C) is incorrect.

A rise in troponin suggests damage to the myocardium and is primarily used in the diagnosis of a myocardial infarction. This patient does have features suggestive of a possible acute coronary syndrome, but an aortic dissection must be ruled out first. The time course of troponin release from the myocardium requires approximately 10-12 hours to reach a peak, and waiting before obtaining a troponin result would be wasting valuable time in this patient. Furthermore, an aortic dissection can increase cardiac strain and lead to a positive troponin result, making the test non-specific for differentiating between these diagnoses.

- D Transthoracic echocardiography

Transthoracic echocardiography (Option D) is incorrect.

The likely diagnosis in this patient is aortic dissection. Echocardiography can reveal a dissection flap in the ascending aorta that would point towards a type A dissection. However, if no features of a dissection are revealed on echocardiography, this cannot rule out a dissection. As such, it is not the most appropriate next step in this patient.

E Urgent percutaneous coronary intervention (PCI)

Urgent percutaneous coronary intervention (PCI) (Option E) is incorrect.

If this patient has an acute coronary syndrome, they may benefit from PCI. However, there is no evidence of ST-elevation on the ECG to suggest a full-thickness infarct of the myocardium that necessitates urgent PCI. An aortic dissection must be ruled out in this patient initially. If there is no dissection, then PCI could be considered for a possible non-ST-elevation acute coronary syndrome. On angiography, a dissection flap can be visualised in some cases when an aortogram is undertaken.

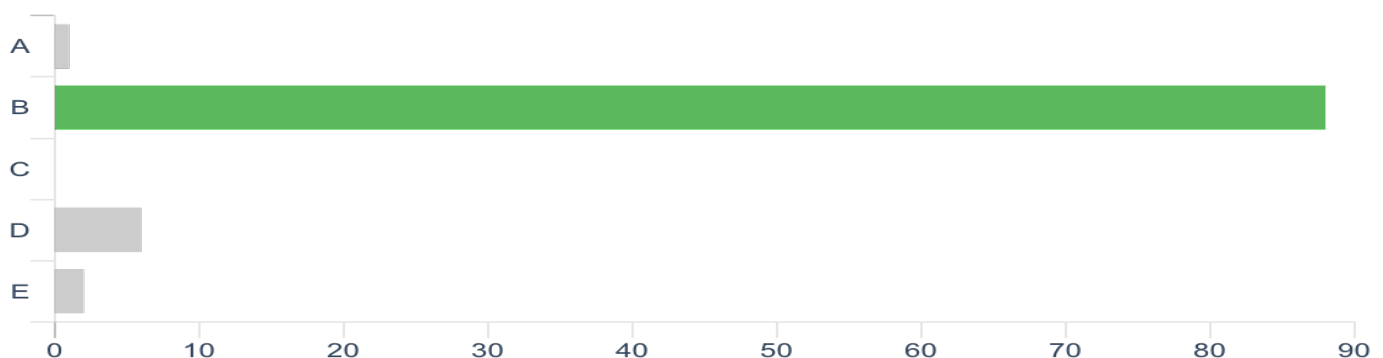
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Expanded Explanation

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Q276

A 56-year-old woman, with a history of right coronary artery stent placement three years earlier for an inferior myocardial infarction, presents to the Emergency Department (ED) with palpitations lasting for an hour, and syncope related to the fast heart rate. She had one previous episode of palpitations the previous month, which reverted spontaneously after 30 minutes. Medication includes bisoprolol 2.5 mg once a day, ramipril 10 mg once a day, atorvastatin 20 mg at night and aspirin 75 mg once a day.

On examination, her blood pressure (BP) is 80/60 mmHg. Her pulse is 140 beats per minute (bpm) and irregular and there are bilateral basal crackles on auscultation of the chest.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	12.9 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$7.4 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$208 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135-145 mmol/l
Potassium (K^+)	4.5 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	105 μ mol/l	50-120 μ mol/l
Glucose	5.4 mmol/l	3.9-7.1 mmol/l
Electrocardiogram (ECG)	Atrial fibrillation (AF) with evidence of lateral ischaemia	

Which of the following is the most appropriate intervention?

Your answer was incorrect

- A Amiodarone
- B DC cardioversion
- C Digoxin

- D Esmolol
- E Flecainide

Explanation



- B DC cardioversion

The clinical history and examination findings reveal a patient in atrial fibrillation (AF) with clear signs suggestive of haemodynamic compromise secondary to the arrhythmia. Of note, the patient has a significant hypotension, clinical features of heart failure on examination, syncope and signs of cardiac ischaemia on the ECG. Any one of these four features would necessitate the use of urgent DC cardioversion to correct the arrhythmia. This will usually require sedation or general anaesthesia and airway management. The on-call anaesthetist is likely to be the first port of call when getting help in this situation.

- C Digoxin

Digoxin acts by reducing conduction through the AV node and will be unlikely to lead to cardioversion. Additionally, the onset of action for digoxin is significantly longer than a number of the other options listed here, which makes it less appropriate in this emergent clinical situation.

- A Amiodarone

Amiodarone is a class III antiarrhythmic and is primarily indicated in refractory AF or broad-complex tachy-arrhythmias without haemodynamic compromise. In this case, Amiodarone is not the best treatment option. The patient has haemodynamic compromise with a narrow complex tachycardia and requires urgent DC cardioversion.

- D Esmolol

Beta-blockade has a central role in the management of irregular narrow-complex tachy-arrhythmias (e.g. AF) when they are not leading to haemodynamic compromise. If this patient were stable, this would likely be the correct management option. However, given the clinical instability, urgent rhythm correction is indicated with DC cardioversion.

- E Flecainide

Flecainide is a class I antiarrhythmic which is often successful in leading to pharmacological cardioversion in AF. However, this patient has a history of ischaemic heart disease, which is a contra-indication to the use of class I anti-arrhythmics due to the increased risk of pro-

arrhythmic effects.

39052

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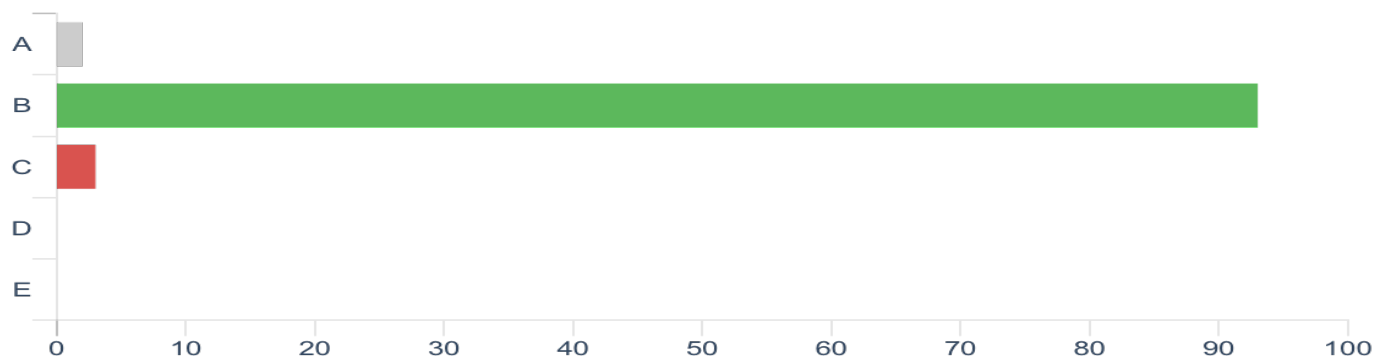
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Expanded Explanation

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Q277

A 58-year-old man with a history of type II diabetes mellitus and hypertension comes to the Emergency Department (ED) complaining of central crushing chest pain radiating to his left arm. He takes a number of medications including ramipril, simvastatin, aspirin, metformin and gliclazide.

On examination, his blood pressure (BP) is 155/90 mmHg and his pulse is 88 beats per minute (bpm) and regular. There are bilateral crackles on auscultation of the chest consistent with heart failure.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	13.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$8.9 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$210 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135-145 mmol/l
Potassium (K^+)	4.5 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	132 μ mol/l	50-120 μ mol/l
HbA1c	56 mmol/mol (7.3%)	9.29-53.0 mmol/mol (3 - 7%)
Electrocardiogram (ECG)	Anterolateral ST depression	
Chest X-ray (CXR)	Cardiomegaly, evidence of LVF	

His pain eases from 8/10 to 3/10 with two doses of sublingual GTN and one dose of intravenous (IV) morphine. He is given fondaparinux, aspirin and clopidogrel. His ST depression has resolved on a repeat ECG, but his BP is still elevated.

Which of the following is the most appropriate immediate intervention?

Your answer was incorrect

- A IV beta-blockade
- B IV GTN
- C IV Morphine

- D Proceed to percutaneous intervention (PCI)
- E Thrombolysis

Explanation



- B IV GTN

This patient has presented with features highly suggestive of a non-ST-elevation myocardial infarction. He remains hypertensive and has some ongoing pain despite the use of sublingual GTN, although his ST depression has resolved. GTN acts as a vasodilator through the production of NO. Vasodilatation reduces cardiac afterload, which has the effect of improving heart failure symptoms and reducing the cardiac oxygen demand.

- D Proceed to percutaneous intervention (PCI)

PCI is likely to be the most appropriate definitive intervention. However, this patient's ECG changes have resolved in response to GTN. This suggests that PCI may not be required in the immediate period.

- A IV beta-blockade

β -Blockade will have negative chronotropic and inotropic effects, reducing cardiac oxygen demand. However, this patient has signs of acute heart failure (bilateral crackles on respiratory auscultation). The use of β -blockade in acute heart failure can lead to further decompensation and should not be initiated in this setting.

- C IV Morphine

IV morphine would have a dual effect if given to a patient in this setting. Morphine acts as a vasodilator and will reduce cardiac afterload. Furthermore, it will act as an analgesic to reduce the ongoing chest pain. The reduction in afterload is the key to immediate intervention in this case; the effect of IV morphine as a vasodilator is less significant than with IV GTN. Furthermore, IV GTN has a short half-life allowing for more effective titration.

- E Thrombolysis

Thrombolysis may be considered in an ST-elevation myocardial infarction in a setting where PCI is not available or will be significantly delayed. Although the patient has ongoing chest pain at present, there is no sign of ST elevation and the previous ST depression has now resolved. If there was ongoing chest pain despite maximal IV GTN and PCI was not available, then thrombolysis could be considered.

39054

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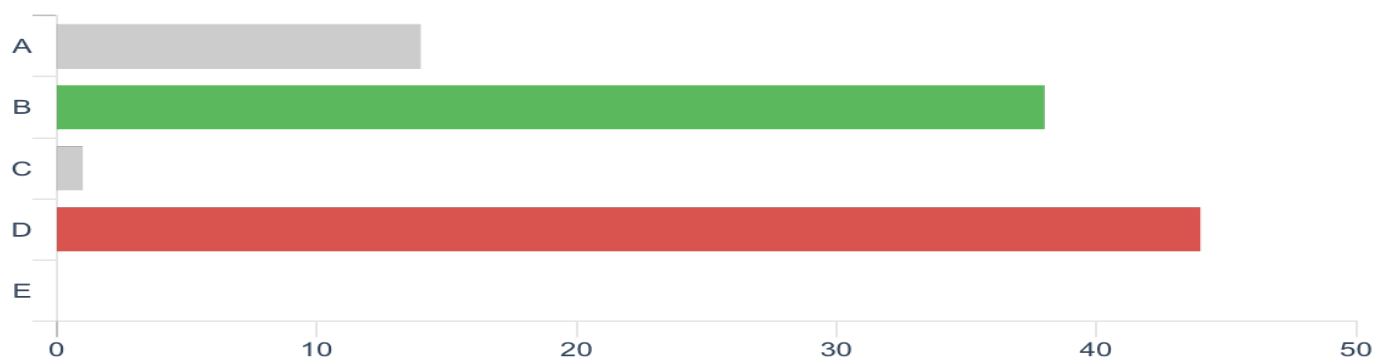
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management**

Prognosis

Links to NICE guidelines/CKS



Q278

A 32-year-old woman presents to the Cardiology Clinic having been discharged from the Emergency Department (ED) after an episode of collapse. She says at the time she felt extremely fast palpitations, light-headed, and then fell. She reports a number of other shorter episodes when her heart 'flutters' while at home.

There is no past medical history of note, although she does say her father died suddenly of a heart attack when she was only eight years old.

On examination, her blood pressure (BP) is 122/72 mmHg. His pulse is 70 beats per minute (bpm) and regular. There are no murmurs and her chest is clear.

Investigations reveal the following:

Investigation	Result
Electrocardiogram (ECG)	Sinus rhythm, QT interval 495 milliseconds
24 hour ECG	Multiple ventricular ectopics

Which of the following is the most appropriate next step?

Your answer was incorrect

- A Amiodarone
- B Implantable cardioverter defibrillator (ICD)
- C Metoprolol
- D Reassurance
- E Repeat monitor for 72 hours

Explanation



- C Metoprolol

This patient most likely has familial long QT syndrome, given the presentation of a collapse, the premature death of her father and the prolonged QT interval seen on the ECG. Palpitations can be precipitated by sympathetic activation like stress or exercise. In these

patients, metoprolol is effective in reducing symptoms. In patients with continued symptoms, only then would consideration for an ICD or left cervicothoracic stellectomy be clinically indicated.

B Implantable cardioverter defibrillator (ICD)

Although ICD devices are an option to reduce the risk for sudden death, as a first option, it is unlikely to be of benefit. It can be considered if further palpitations despite medical treatment.

A Amiodarone

The most likely diagnosis is familial long QT syndrome. Amiodarone is known to prolong the QT interval and therefore is contraindicated.

D Reassurance

Given the diagnosis of likely familial long QT syndrome, there is a possibility of further cardiac arrhythmias without treatment, and therefore, this is not the correct answer.

E Repeat monitor for 72 hours

Given there is evidence of ventricular tachycardia and multiple ventricular ectopics, with a prolonged QT interval seen on ECG, there is limited value in monitoring for 72 hours as a next step in management.

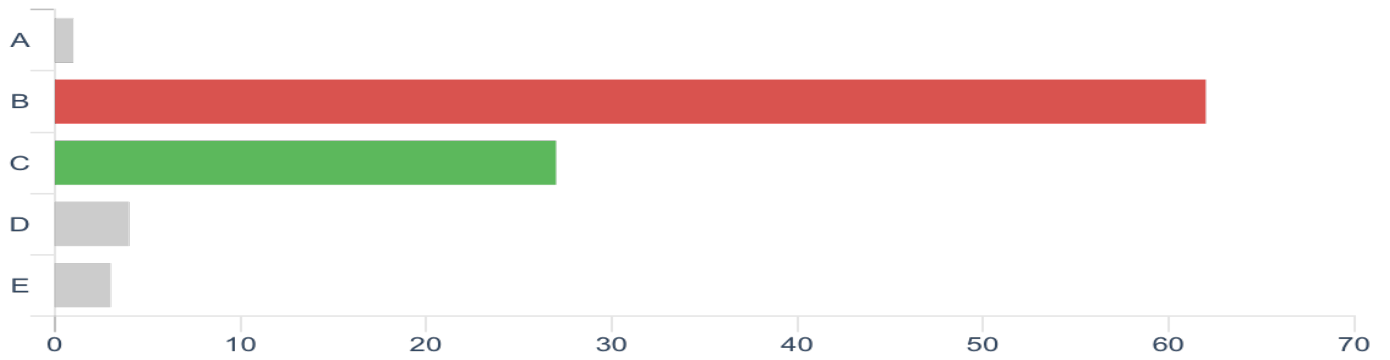
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Q279

A 72-year-old man comes to the Cardiology Clinic for review of medication for his atrial fibrillation (AF). He had previously suffered from paroxysmal AF, but over the past few weeks, it has become permanent and he failed a recent cardioversion. A past history of diabetes mellitus is noted.

On examination, his blood pressure (BP) is 152/82 mmHg and his pulse is 75 beats per minute (bpm) in AF. There is residual clumsiness of the right arm from a previous stroke. Routine bloods reveal an elevated creatinine of 131 $\mu\text{mol/l}$.

Which of the following is the most important risk factor with respect to predicting the risk for a future stroke?

Your answer was correct

- A Creatinine 131 $\mu\text{mol/l}$
- B Diabetes mellitus
- C Male sex
- D Previous stroke
- E Systolic blood pressure (BP) 151 mmHg

Explanation



- D Previous stroke

The CHADS₂VASc score is used to evaluate the risk for stroke in patients with a history of AF. Factors which score 2 points (ie contribute more to risk) include previous stroke and age > 75 years.

The components of the score are listed below:

		Points
C	Congestive heart failure (or left ventricular systolic dysfunction)	1
H	Hypertension: consistently above 140/90 mmHg	1

	(or treated hypertension on medication)	
A ₂	Age ≥ 75 years	2
D	Diabetes mellitus	1
S ₂	Prior stroke or transient ischaemic attack or thromboembolism	2
V	Vascular disease	1
A	Age 65–74 years	1
Sc	Sex category (ie female sex)	1

A Creatinine 131 µmol/l

Although renal failure is a risk factor for cardiovascular disease, it is not part of the CHADS₂VASc score in patients with previous AF. Hypertension, often related to renal impairment, is considered a stronger risk factor for a further stroke.

B Diabetes mellitus

Diabetes mellitus is associated with small-vessel cerebrovascular disease and is a risk factor for future stroke. It is, however, considered a lesser risk factor, compared to prior stroke, transient ischaemic attack or thromboembolism.

C Male sex

Women, not men, appear at greater risk for stroke related to AF. It is female sex which therefore scores a point on the CHADS₂VASc score.

E Systolic blood pressure (BP) 151 mmHg

Hypertension is a risk factor for future stroke, although it is a lesser risk factor, compared to previous stroke or transient ischaemic attack, scoring 1 on the CHADS₂VASc score.

39119

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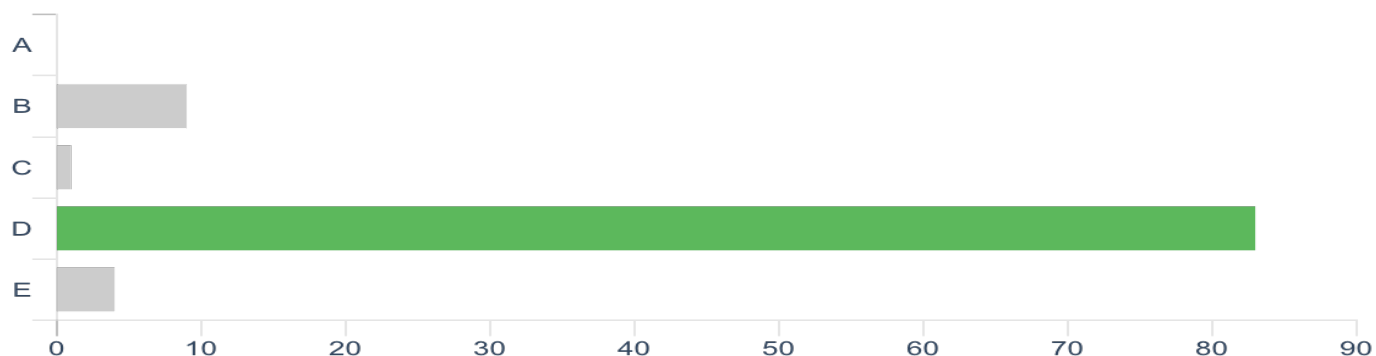
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**

Q280

A 72-year-old man who has a history of ischaemic heart disease (IHD) and stable chronic obstructive pulmonary disease (COPD) comes to the Emergency Department (ED) with palpitations. He stopped amiodarone, which he was taking for paroxysmal atrial fibrillation (AF), some two weeks earlier because of overt thyrotoxicosis. His current medications include ramipril, furosemide, carbimazole, atorvastatin, high-dose Seretide® and aspirin.

On examination, his blood pressure (BP) is 122/72 mmHg, and his pulse is 110 beats per minute (bpm) and AF. There are bilateral basal crackles on auscultation of the chest, consistent with heart failure, although there is no ankle swelling.

Investigations reveal the following:

Investigations	Results	Normal Vales
Haemoglobin (Hb)	12.9 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$7.1 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$199 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na ⁺)	137 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.3 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	110 μ mol/l	50-120 μ mol/l
Glucose	5.9 mmol/l	3.5-5.5 mmol/l
Thyroid-stimulating hormone (TSH)	0.2 μ U/l	0.17-3.2 μ U/l

An electrocardiogram (ECG) reveals AF with lateral ST depression.

Which of the following is the most appropriate intervention for his AF?

Your answer was incorrect

- A Bisoprolol
- B Flecainide
- C Prednisolone
- D Propranolol

E Verapamil

Explanation



A Bisoprolol

Bisoprolol is a cardioselective beta-blocker which is the most appropriate intervention for rate control in AF. Although this patient has COPD, his disease is stable, and studies suggest in this scenario that bisoprolol has no clinical impact on lung function. Given his cardiovascular history, beta-blockade is also prudent because of its impact on cardiovascular outcomes.

B Flecainide

Flecainide is effective in cardioverting acute AF but is contraindicated in patients with structural and/or ischaemic heart disease. Given this patient's medical history, it should not be used here.

C Prednisolone

Prednisolone is used in the initial treatment of amiodarone-induced thyroiditis. The fact that he has not been started on it initially suggests he has type 1 amiodarone-induced thyroid disease, rather than type 2 (amiodarone-induced thyroiditis).

D Propranolol

In contrast to bisoprolol, propranolol does have a negative effect on lung function in stable COPD. It should not be used here, given this patient's medical history.

E Verapamil

Verapamil is an alternative to bisoprolol if the latter is not tolerated. It has potentially more negative inotropic effects than bisoprolol and does not have a positive impact on cardiovascular outcomes.

39368

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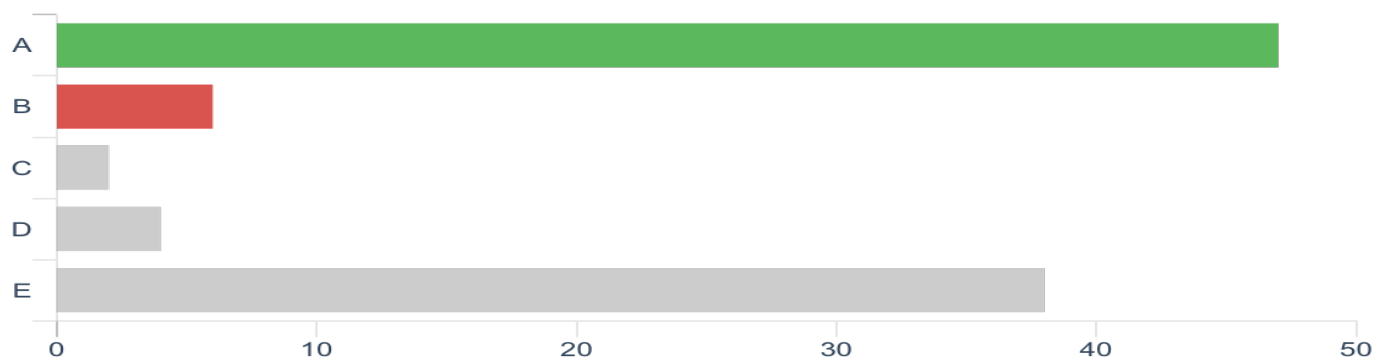
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Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

Management

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Links to NICE guidelines/CKS



Q281

A 64-year-old man is brought to the Emergency Department (ED) following an episode of collapse. According to his wife, he was shaving in the bathroom when she heard a crash, and he fell to the floor having fainted. He has ischaemic heart disease (IHD), having suffered an inferior myocardial infarction (MI) some eight years ago, and is taking a range of agents for control of blood pressure (BP), including ramipril and indapamide.

On examination, in the ED, his BP is 133/82 mmHg and his pulse is 70 beats per minute (bpm) and regular. There are no murmurs and his chest is clear. There is no sign of peripheral oedema.

Investigations reveal the following:

Investigations	Results	Normal Values
Haemoglobin (Hb)	131 g/l	13.5-17.5 g/dl
White cell count (WCC)	$8.1 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$203 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135-145 mmol/l
Potassium (K^+)	4.3 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	105 mmol/l	50-120 μ mol/l
Cholesterol	4.0 mmol/l	< 5.2 mmol/l
High-sensitivity (HS) troponin	Negative	< 0.1 ng/m

An electrocardiogram (ECG) reveal no acute changes with old inferior Q waves.

Which of the following diagnoses would you consider most likely?

Your answer was correct

- A Carotid sinus hypersensitivity
- B Epileptic seizure
- C Myocardial ischaemia
- D Sick sinus syndrome

E Transient ischaemic attack

Explanation



A Carotid sinus hypersensitivity

The big clue to the underlying diagnosis is that the attack came on while he was shaving. This fits with a period of bradycardia or hypotension as a result of local pressure. In total, approximately 75% of cases are cardioinhibitory, the other 25% being associated with a precipitous fall in blood pressure. Attacks are also reported in association with neck extension and wearing of tight-collared shirts. Cardiac pacing is the treatment of choice for cardioinhibitory carotid sinus hypersensitivity. Support stockings, fludrocortisone and midodrine are all potential preventative treatment options for hypotensive carotid sinus hypersensitivity.

B Epileptic seizure

There is no evidence to suggest epilepsy here, with no mention of limb jerking, incontinence or tongue biting and no evidence of prolonged recovery after the event.

C Myocardial ischaemia

The negative troponin and benign ECG make myocardial ischaemia unlikely. There are no signs of cardiac failure and no reports of chest pain.

D Sick sinus syndrome

It would be very unlikely for sick sinus syndrome to present with a first fainting episode in the absence of previous events of palpitations (either tachycardia or bradycardia).

E Transient ischaemic attack

A transient ischaemic attack would be expected to lead to some evidence of short-term neurological deficit, rather than an isolated collapse.

39589

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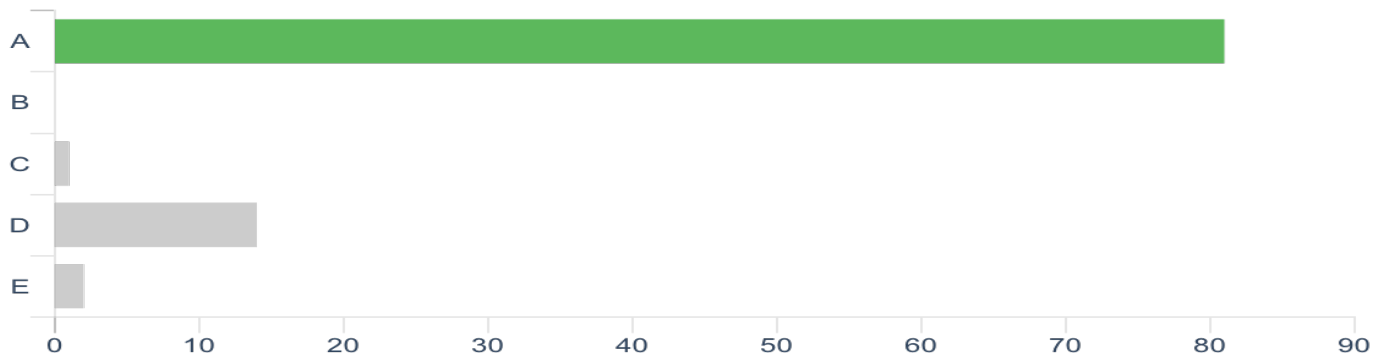
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Q282

A 74-year-old man with a history of angina comes to the Cardiology Clinic for review. His current medications include bisoprolol 10 mg daily and isosorbide dinitrate 60 mg for control of symptoms. He can still walk up to two miles each day but says over the past six months, he has begun using his glyceryl trinitrate (GTN) spray more, particularly on cold mornings and if he is going up a steep hill on his walk.

On examination in the clinic, he looks well. His blood pressure (BP) is 133/82 mmHg and his pulse is 80 beats per minute (bpm) and regular. His chest is clear and there is no ankle swelling.

How would you best investigate his chest pain?

Your answer was incorrect

- A Angiography
- B Computed tomography pulmonary angiography (CTPA)
- C Echocardiogram
- D Exercise stress test
- E Myocardial perfusion scanning

Explanation



- A Angiography

This patient has a worsening of his angina symptoms over a prolonged period. Given he is already taking two anti-anginals, it is sensible to consider investigation for a lesion or lesions that could be treated with angioplasty and stenting. An increase in his medication is also possible; for example, adding ivabradine or a conventional calcium channel antagonist could be considered.

- B Computed tomography pulmonary angiography (CTPA)

CTPA is most useful in investigating for pulmonary embolism. In this case, with symptoms typical of those for angina, angiography is much more appropriate.

C Echocardiogram

An echocardiogram may indicate areas of previous infarction, valve disease or abnormal ventricular wall motion, although it will not indicate areas of reversible ischaemia.

D Exercise stress test

Exercise stress testing is not recommended for investigation of angina, according to the National Institute for Health and Care Excellence (NICE) guidelines. It may expose patients to significant risk for arrhythmias precipitated by exercise, and it has a relatively low sensitivity and specificity for diagnosing myocardial ischaemia, at only around 70%.

E Myocardial perfusion scanning

Myocardial perfusion scanning can identify areas of ischaemia and can be used in the event that angiography is unavailable. It is less useful, compared to angiography, as it will not identify the coronary artery anatomy adequately to assess suitability for stenting. Additionally, performing angiography to investigate for any lesions in this high-risk case means treatment can be immediately given, rather than the delay caused by proceeding to treat after a perfusion scan.

39594

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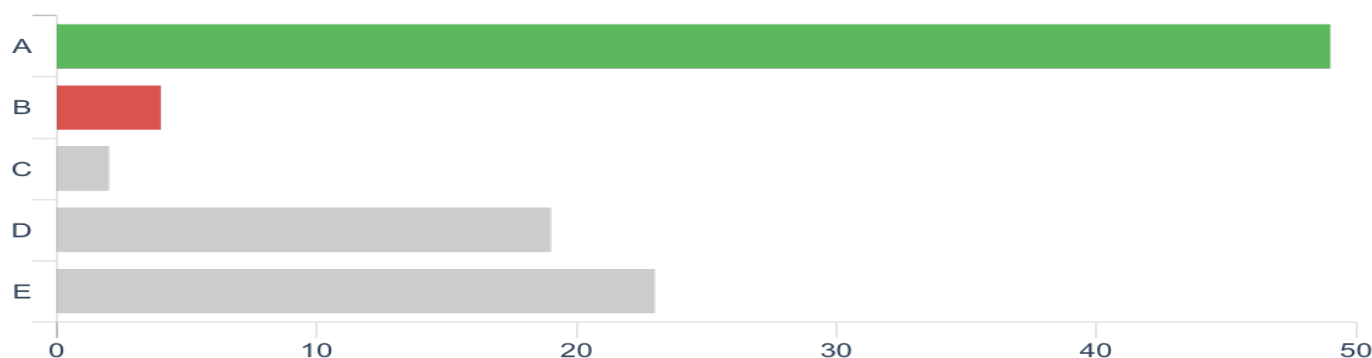
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External Links

Stable angina: management

[nice.org.uk/guidance/cg126](http://www.nice.org.uk/guidance/cg126)

(<http://www.nice.org.uk/guidance/cg126>)

Expanded Explanation

Overview

Clinical Presentation

Differential Diagnosis

Diagnosis / Investigation

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Prognosis

Links to NICE guidelines/CKS



Q283

A 62-year-old man with a history of type II diabetes and hypertension comes to the Emergency Department (ED) with central crushing chest pain radiating to his left arm. The pain had lasted for 30 minutes by the time he called for an ambulance and only just began to resolve once the paramedic crew gave him three doses of glyceryl trinitrate (GTN). His daily medications include metformin, sitagliptin, aspirin, atorvastatin, ramipril and indapamide.

On examination, his blood pressure (BP) is 122/82 mmHg and his pulse is 85 beats per minute (bpm) and regular. His chest is clear.

Investigations reveal the following:

Investigations	Results	Normal Values
Haemoglobin (Hb)	131 g/l	13.5-17.5 g/dl
White cell count (WCC)	$7.9 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$203 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135-145 mmol/l
Potassium (K^+)	4.5 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	105 μ mol/l	50-120 μ mol/l
Glucose	10.1 mmol/l	3.5-5.5 mmol/l
High-sensitivity (HS) troponin	Negative	< 0.1 ng/ml

An electrocardiogram (ECG) reveals new inferior T wave inversion. He recovers with no further chest pain and discharge is planned the following evening.

How should his prognosis with respect to risk of further myocardial ischaemia be assessed?

Your answer was incorrect

- A Angiography
- B Echocardiogram
- C Exercise test
- D Myocardial perfusion testing

E 6-minute walk test

Explanation



A Angiography

Given this man's type II diabetes, significant chest pain and new ECG changes, he would be considered at high risk for myocardial infarction. As such, early angiography should be considered to determine whether there is arterial disease suitable for intervention. Distal disease is a possibility, given the history of diabetes. If only distal disease is demonstrated on angiography, then the patient may be suitable for medical management only.

C Exercise test

Exercise testing is not recommended under the National Institute for Health and Care Excellence (NICE) guidance. In this case, post-myocardial infarction, a modified Bruce protocol is used for exercise testing. Even so, this would be associated with a risk for precipitating acute ischaemia and should be avoided here.

B Echocardiogram

Echocardiography can identify an area of abnormal motion consistent with myocardial ischaemia, although it will not identify whether this is reversible or not.

D Myocardial perfusion testing

This is not the preferred option post-myocardial infarction, because if it demonstrated an area of ischaemia, angiography would still be required to allow for possible intervention.

E 6-minute walk test

The 6-minute walk test gives information on functional capacity, response to therapy and prognosis across a broad range of chronic cardiopulmonary conditions. In this case, however, given potentially unstable coronary artery disease, angiography with or without intervention with stenting is the preferred next step.

39596

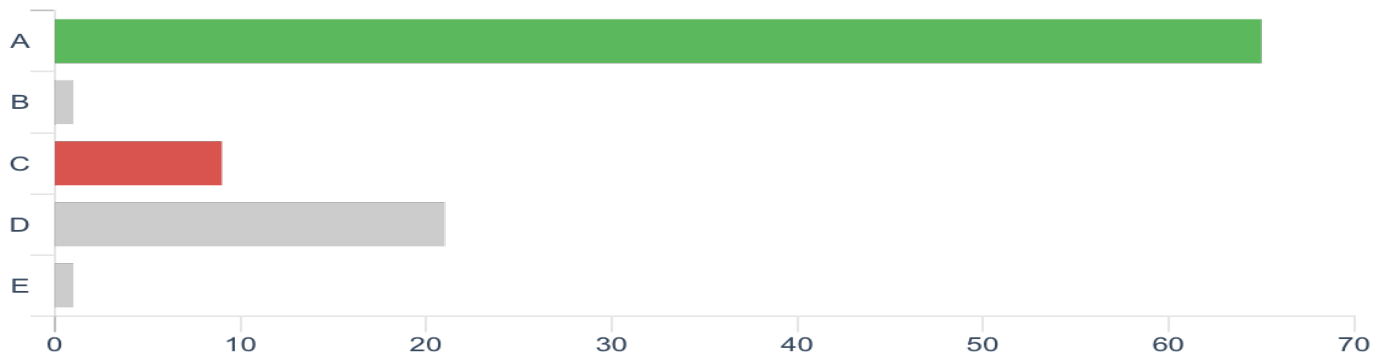
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External Links

NICE Pathways. Chest Pain Overview

pathways.nice.org.uk/pathways/acute-coronary-syndromes#path=view%3A/pathways/acute-coronary-syndromes/early-m...
(<http://pathways.nice.org.uk/pathways/acute-coronary-syndromes#path=view%3A/pathways/acute-coronary-syndromes/early-management-of-unstable-angina-and-nstemi.xml&content=view-node%3Anodes-person-at-intermediate-high-or-highest-risk>)

Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis**

Diagnosis / Investigation

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Prognosis

Links to NICE guidelines/CKS



Q284

A 61-year-old man comes to the Cardiology Clinic for review. He has had three previous myocardial infarctions (MI) and takes lisinopril 20 mg and furosemide 80 mg for control of biventricular heart failure. He has recently failed a trial of bisoprolol, which he could not take due to extreme fatigue and nightmares. His exercise tolerance is only 50 metres, and he only climbs the stairs once per day.

On examination his blood pressure (BP) is 122/82 mmHg and his pulse is 85 beats per minute (bpm) and regular. There are bilateral crackles at both bases, and pitting oedema of both ankles.

Investigations reveal the following:

Investigations	Results	Normal Values
Haemoglobin (Hb)	12.9 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$8.2 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$201 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135-145 mmol/l
Potassium (K^+)	4.5 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	123 μ mol/l	50-120 μ mol/l

His ejection fraction is recorded as 32%.

Which of the following agents to control his symptoms of heart failure is associated with outcome benefit?

Your answer was incorrect

- A Digoxin
- B Diltiazem
- C Furosemide
- D Indapamide
- E Ivabradine

Explanation



E Ivabradine

This patient has reduced ejection fraction and signs of heart failure and has failed a trial of beta-blockade. In patients who fall into this category with a heart rate of > 75 bpm, ivabradine has been shown to produce benefit. This drug has a novel mechanism, being a 'funny channel' inhibitor that slows heart rate and improves myocardial perfusion. The SHIFT trial demonstrated that ivabradine reduced the composite primary endpoint of hospitalisation for heart failure or cardiovascular death by 18%.

D Indapamide

Indapamide is a thiazide-like diuretic which is effective in controlling blood pressure but is relatively ineffective in fluid offloading. Like a number of the other options here, thiazides are not associated with a significant outcome benefit in patients with cardiac failure.

A Digoxin

Although digoxin improves symptoms of heart failure, it does not have an outcome benefit. Meta-analyses of patients taking digoxin have even suggested mortality may be increased in patients taking the drug.

B Diltiazem

Although diltiazem is effective in slowing heart rate, it is negatively inotropic and is not associated with positive outcomes in patients with cardiac failure.

C Furosemide

Furosemide will achieve some offloading in patients with biventricular failure, although it is not associated with an outcome benefit, compared to reducing the ventricular rate with ivabradine.

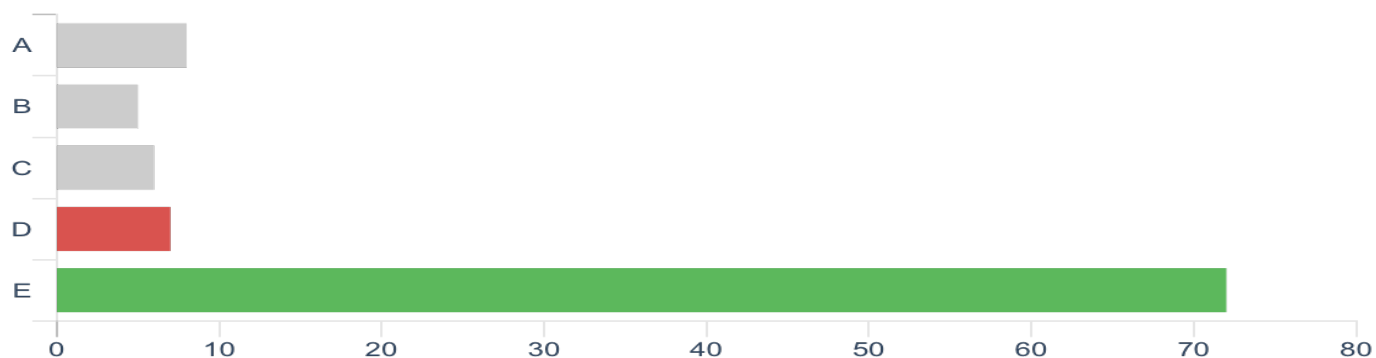
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External Links

Ivabradine for treating chronic heart failure[nice.org.uk/guidance/ta267](http://www.nice.org.uk/guidance/ta267)[\(http://www.nice.org.uk/guidance/ta267\)](http://www.nice.org.uk/guidance/ta267)

Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**



Q285

A 55-year-old man with a history of previous myocardial infarction (MI) comes to the Cardiology Clinic for review. He has a New York Heart Association (NYHA) functional classification II heart failure and is currently managed with ramipril 10 mg daily, furosemide 40 mg, aspirin and atorvastatin. He has recently returned to work.

On examination, his blood pressure (BP) is 135/82 mmHg. His pulse is 67 beats per minute (bpm) and regular. There are scattered bibasal crackles consistent with mild heart failure, and no signs of peripheral oedema.

Investigations reveal the following:

Investigation	Result	Normal value
Haemoglobin (Hb)	13.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$7.2 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$201 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135-145 mmol/l
Potassium (K^+)	4.5 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	103 μ mol/l	50-120 μ mol/l
Ejection fraction	35%	

Which of the following interventions has been proven to impact on mortality in this situation?

Your answer was correct

- A Amiloride
- B Diltiazem
- C Eplerenone
- D Furosemide
- E Ivabradine

Explanation



C Eplerenone

Eplerenone is an aldosterone receptor antagonist which has been shown to improve outcomes with patients with heart failure. Post myocardial infarction significant improvement in mortality has been seen. In patients with NYHA II, the drug was shown to reduce a composite of ischaemic cardiovascular events coupled with a first hospitalisation for heart failure reduction by 37%. Unfortunately, the trials were compared to placebo instead of spironolactone which carries a much lower acquisition cost and therefore has caused significant debate.

A Amiloride

Amiloride is a diuretic which is used for symptomatic relief and has not been shown to impact on mortality in patients with heart failure.

B Diltiazem

Diltiazem is a calcium channel blocker and has not been shown to reduce mortality rates. They are known to increase sympathetic overdrive and therefore are not clinically appropriate.

D Furosemide

Although furosemide is a diuretic that can cause symptomatic benefit in patients, there has been no associated morbidity and mortality reduction associated with its use. Furosemide has shown to increase sympathetic overdrive in chronic use and probably reflects why there has been no reduction in mortality seen in clinical trials.

E Ivabradine

Although there is an evidence basis for ivabradine in patients with severe heart failure on adequate treatment and heart rates above 75, this currently does not apply to this clinical situation.

39599

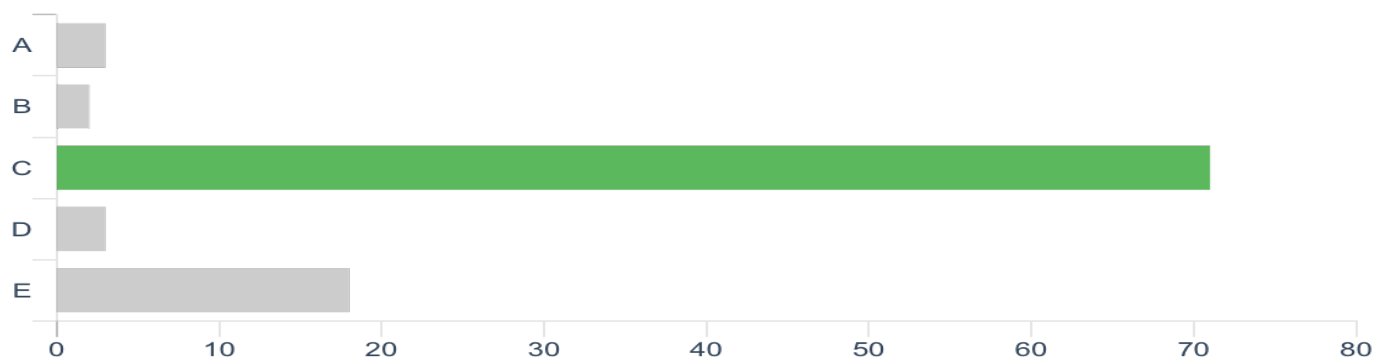
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Q286

A 33-year-old woman comes to the Emergency Department (ED) for review. She complains of feeling missed beats in her chest. There is no past medical history of note, and she is a lifelong non-smoker who drinks only four units of alcohol per week. She runs 15 km per week as part of a running club and has no shortness of breath and no chest pain.

On examination, her blood pressure (BP) is 100/70 mmHg and her pulse is 62 beats per minute (bpm) and regular. Routine bloods and a 12-lead electrocardiogram (ECG) are entirely normal.

Which of the following is the most likely cause of the feelings of missed beats?

Your answer was incorrect

- A Atrial fibrillation
- B Atrial flutter
- C Non-sustained ventricular tachycardia (VT)
- D Paroxysmal supraventricular VT (SVT)
- E Ventricular ectopics

Explanation



- E Ventricular ectopics

Given that these episodes come on while at rest, are non-sustained and have no pattern, in the absence of ischaemic heart disease, ventricular ectopics are the most likely cause. There is only a potential impact on left ventricular function if > 1 000 are seen in a 24-hour period (an increased incidence of cardiomyopathy), and no treatment is required. Even when > 1 000 are seen over the 24-hour period, more often than not, the cause is benign and no intervention is needed.

- C Non-sustained ventricular tachycardia (VT)

In the presence of normal exercise tolerance, significant left ventricular dysfunction leading to VT is very unlikely. Episodes of non-sustained VT are often associated with feelings of pre-syncope.

A Atrial fibrillation

Atrial fibrillation and paroxysmal SVT in this age group may be related to an accessory pathway or to thyroid dysfunction. When patients suffer from atrial fibrillation, they are usually able to describe the presence of fast irregular palpitations.

B Atrial flutter

In atrial flutter, patients are more likely to complain of fast palpitations, rather than the missed beats at rest which are reported here. Patients with atrial tachycardia also usually suffer symptoms of syncope or pre-syncope.

D Paroxysmal supraventricular VT (SVT)

Paroxysmal SVT leads to fast regular palpitations, hypotension and pre-syncope. It is not consistent with the picture seen here. In this age group, ruling out an accessory pathway or thyroid dysfunction are essential in the workup of patients presenting with SVT.

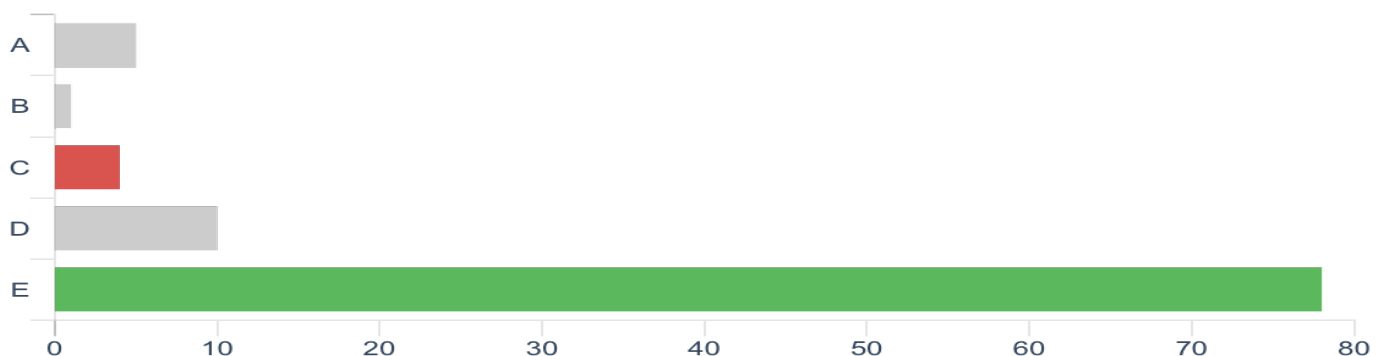
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Responses Correct:	57
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Q287

You are asked to provide critical appraisal on the trial of a new agent for the treatment of heart failure. There were some protocol violations in the study, some patients who withdrew consent, and others who were lost to follow-up. You believe an intention to treat analysis is the most robust way to present the data.

Which of the following correctly reflects the definition of an intention to treat analysis?

Your answer was incorrect

- A Includes all patients analysed by treatment allocation at study start
- B Includes all patients who maintained study consent
- C Includes all patients who complied with the study protocol
- D Includes all patients for whom follow up is available
- E Includes all randomised patients and screen failures

Explanation



- A Includes all patients analysed by treatment allocation at study start

Intention to treat analyses are often used to assess clinical effectiveness and are based on the group that were initially allocated. This is regardless of whether patients were lost to follow-up or fully adhered to treatment. It is often seen as the most robust because it more closely reflects clinical practice.

- C Includes all patients who complied with the study protocol

The intention to treat analyses of a clinical trial includes patients that not only complied with study protocol, but patients who were lost to follow-up or had not maintained consent throughout the trial. In comparison, a per-protocol analysis includes only patients who have strictly adhered to the protocol; it provides an estimate of true efficacy of treatment.

- B Includes all patients who maintained study consent

An intention to treat analyses includes patients who not only maintained study consent, but all patients – including those who did not maintain consent.

D Includes all patients for whom follow up is available

In a clinical trial, an intention to treat analyses is inclusive of all patients regardless of whether follow-up is available or not.

E Includes all randomised patients and screen failures

An intention to treat analyses is used to assess clinical effectiveness. Therefore, patients who are screen failures did not meet the requirements of the trial and are not included in an intention to treat analyses.

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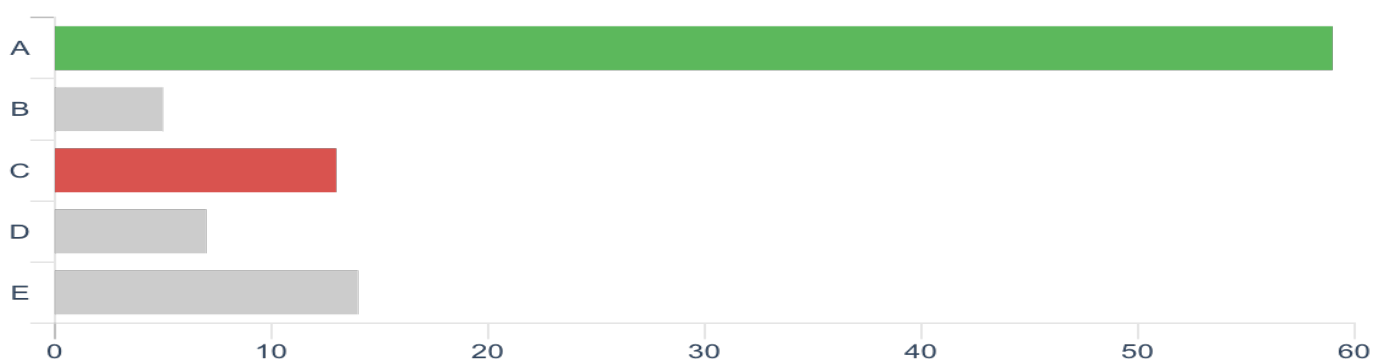
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Expanded Explanation

Overview

Clinical Presentation

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Q288

A 65-year-old man who has had two previous myocardial infarctions (MI) and now has chronic heart failure comes to the Cardiology Clinic with worsening shortness of breath and a fall in his exercise tolerance. His current medication includes ramipril 10 mg once a day, furosemide 80 mg once a day, bisoprolol 10 mg once a day and spironolactone 25 mg once a day.

On examination, his blood pressure (BP) is 125/82 mmHg. His pulse is 85 beats per minute (bpm) and regular. Auscultation of the chest reveals bi-basal crackles and he has mild pitting oedema affecting both ankles.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	12.9 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$6.4 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$189 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135-145 mmol/l
Potassium (K^+)	5.0 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	115 μ mol/l	50-120 μ mol/l
Glucose	5.1 mmol/l	3.9-7.1 mmol/l
Chest X-ray (CXR)	Cardiomegaly	
Echocardiogram (ECHO)	Left ventricular ejection fraction 32%	
Electrocardiogram (ECG)	Sinus rhythm with poor R-wave progression QRS 110 milliseconds	

Which of the following is the most appropriate next management step?

Your answer was incorrect

- A Cardiac resynchronisation therapy (CRT)
- B Increase furosemide

- C Increase spironolactone
- D Start digoxin
- E Start ivabradine

Explanation



- E Start ivabradine

This case is one of a patient with significant heart failure on a wide range of medications appropriate for their clinical case. Despite this, they have continued to deteriorate. Ivabradine acts as an inhibitor of the I_f current within the myocardium. This current, particularly present in the sino-atrial and atrio-ventricular nodes, acts as the cardiac pacemaker. By inhibiting this current, ivabradine reduces the heart rate without impacting the force of cardiac contraction. This has been shown to reduce heart failure hospitalisation and mortality in patients already on maximum medical therapy. Due to its mechanism, ivabradine is only effective in patients in sinus rhythm.

- A Cardiac resynchronisation therapy (CRT)

CRT is a type of cardiac device designed to stimulate the septal and lateral walls of the left ventricle to contract at the same time. This improves cardiac output and results in improved heart failure symptoms in some patients. Ventricular dys-synchrony is suggested by an ECG showing a broad QRS complex (especially LBBB), where CRT is therefore indicated. Because this is not demonstrated here, implantation of such a device is not indicated. It may be considered once medical therapy is maximised, including with ivabradine.

- B Increase furosemide

Despite significant heart failure in this patient, clinical examination reveals that he is not significantly fluid overloaded. Furosemide improves heart failure symptom burden but does not improve survival in heart failure. Given a lack of significant fluid overload, up-titration of furosemide is unlikely to improve the clinical situation significantly.

- C Increase spironolactone

Use of K^+ -sparing diuretics (e.g. spironolactone) in heart failure has been shown to improve mortality in those already on maximal tolerated doses of both an ACE inhibitor and β -blocker. Spironolactone at 25 mg OD is the standard dose for this medication in heart failure. There is no significant evidence to suggest that an increase in dose improves outcomes in heart failure patients. In this particular patient, the K^+ concentration is already on the upper limit of normal and increasing this diuretic may further increase this level.

D Start digoxin

Digoxin decreases heart rate and increases force of contraction through blockade of the Na^+/K^+ ATPase. Digoxin has been shown to reduce hospital admissions for patients with heart failure but does not improve mortality. In clinical practice it is primarily used in patients with heart failure and atrial fibrillation (not present in this case).

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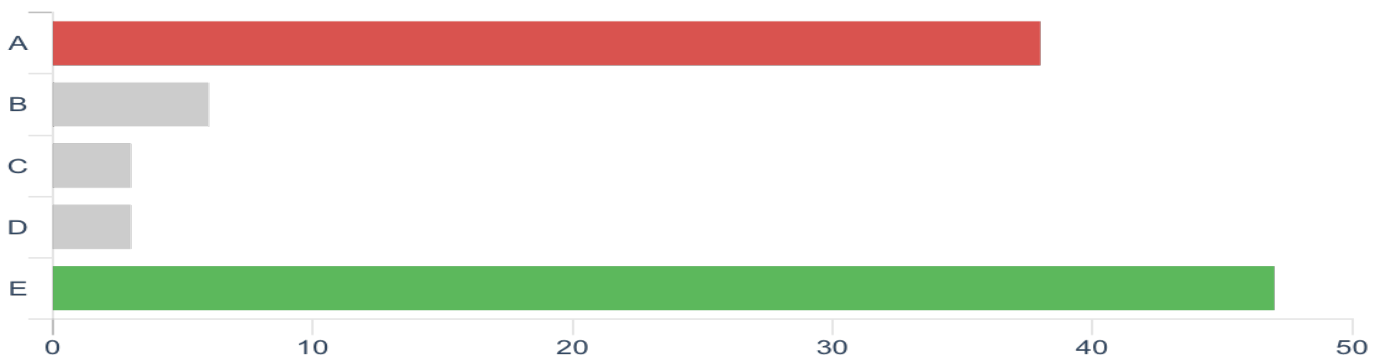
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Expanded Explanation

Overview

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Q289

A 78-year-old man presents to the Cardiology Clinic for review. For the past two years he has suffered dull, aching chest pains and reduced exercise tolerance, having to cut the length of his dog walk from three to two miles, missing out a steep hill at the end. There is no chest pain at rest. When he gets pain on exercise it settles when he rests for three to four minutes. He is an ex-smoker, having given up 20 years ago, and has a history of hypertension for which he takes ramipril and indapamide. His General Practitioner (GP) has also prescribed aspirin 75 mg once a day and atorvastatin 10 mg at night. Apparently he tried a GTN spray but this gave him a headache.

On examination, his blood pressure (BP) is 142/85 mmHg, while his pulse is 80 beats per minute (bpm) and regular. His chest is clear and there is no peripheral oedema. He has a body mass index (BMI) of 24kg/m².

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	13.1 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$8.0 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$178 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na ⁺)	137 mmol/l	135-145 mmol/l
Potassium (K ⁺)	5.0 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	112 μ mol/l	50-120 μ mol/l
Cholesterol	4.1 mmol/l	< 5.2 mmol/l
Chest X-ray (CXR)	Unremarkable	

Which of the following is the most appropriate intervention to manage his chest pain?

Your answer was incorrect

- A Bisoprolol
- B Ranolazine
- C Isosorbide mononitrate – sustained release

D Ivabradine

E Nicorandil

Explanation



A Bisoprolol

This patient presents with features strongly suggestive of angina. NICE guidance on chest pain of recent onset suggests that such patients (with typical angina symptoms) should undergo CT coronary angiography. However, in the meantime treatment should be initiated. NICE guidance for stable angina supports the use of β -blockade or calcium channel blockers as first line. No long term difference in either benefit or side effects have been consistently identified. Choice is based on comorbidities and patient tolerance. Beta blockers are marginally cheaper but not to the degree that they always be used first.

C Isosorbide mononitrate – sustained release

Isosorbide mononitrate is a long-acting nitrate and is a treatment option considered if both β -blockers and calcium channel blockers are contraindicated or not tolerated. This option could also be considered as a third agent if symptoms are not controlled using both β -blockade and a calcium channel blocker combined.

B Ranolazine

This drug blocks the persistent inward sodium channels (I_{Na}) in the myocardium, reducing ventricular wall tension and workload. It is reserved for when other treatments are ineffective/not tolerated.

D Ivabradine

Ivabradine acts by blocking the I_f current primarily located in the sino-atrial node. This leads to a reduced heart rate and lowers myocardial oxygen demand. Much like long-acting nitrates, ivabradine can be considered if both β -blockers and calcium channel blockers are contra-indicated, not tolerated or insufficient to manage the patient symptoms. Of note, ivabradine is only effective in patients in sinus rhythm and should not be initiated in patients in atrial fibrillation.

E Nicorandil

Nicorandil acts as a vasodilator and can be considered for the treatment of angina. It has the same indications as long-acting nitrates and should be considered if β -blockade and/or calcium channel blockade is contraindicated, not tolerated or ineffective.

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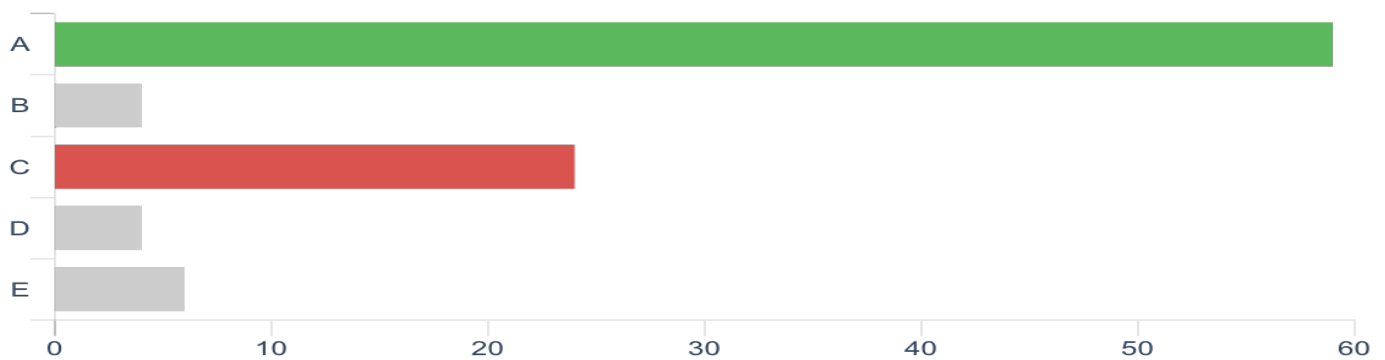
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External Links

NICE. G95 Chest pain of recent onset: assessment and diagnosis. 2016

[nice.org.uk/guidance/cg95](https://www.nice.org.uk/guidance/cg95)

(https://www.nice.org.uk/guidance/cg95)

NICE. CG126 Stable angina: management. 2016.

[nice.org.uk/guidance/cg126/](https://www.nice.org.uk/guidance/cg126/)

(https://www.nice.org.uk/guidance/cg126/)

Expanded Explanation

Overview

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Links to NICE guidelines/CKS



Q290

A 76-year-old man with a history of hypertension and type II diabetes mellitus is reviewed in the Cardiology Clinic. His General Practitioner (GP) has referred him having noted an irregular pulse at a routine check-up. His current medication includes ramipril, indapamide, atorvastatin and aspirin.

On examination, his blood pressure (BP) is 132/88 mmHg, while his pulse is 82 beats per minute (bpm) and irregular. His chest is clear and there is no ankle swelling. His abdomen is soft and non-tender and he has a body mass index (BMI) of 28kg/m².

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	12.8 g/dl	13.5-17.5 g/dl
White cell count (WCC)	$5.6 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$203 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na ⁺)	137 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.3 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	123 μ mol/l	50-120 μ mol/l
Glucose	5.9 mmol/l	3.9-7.1 mmol/l
Echocardiogram (ECHO)	Increased left atrial size, left ventricular ejection fraction 37%	
Electrocardiogram (ECG)	Atrial fibrillation (AF) with changes consistent with an old inferior infarct	

Which of the following is the most appropriate intervention with respect to stroke prophylaxis?

Your answer was incorrect



- A Add clopidogrel to aspirin
- B Add dipyridamole to aspirin
- C Continue aspirin
- D Switch aspirin to clopidogrel
- E Switch aspirin to apixaban

Explanation



- E Switch aspirin to apixaban

This patient has non-valvular atrial fibrillation. His CHA₂DS₂-VASc score is 5 (age >75 years, heart failure, diabetes mellitus and hypertension). This patient requires anticoagulation for stroke prophylaxis. Both NICE and European Society of Cardiology guidelines suggest that direct-action oral anticoagulants should be initiated. Apixaban is a factor-Xa inhibitor (others include rivaroxaban and edoxaban).

- D Switch aspirin to clopidogrel

Switching between antiplatelet agents will have no significant benefit in this patient. The increased risk of stroke in atrial fibrillation should be managed through anticoagulation. As such, the use of antiplatelet agents is not sufficient or appropriate.

- A Add clopidogrel to aspirin

This patient has atrial fibrillation and requires anticoagulation rather than antiplatelet therapy. Both clopidogrel and aspirin are antiplatelet agents and, as such, neither is appropriate as management for this patient.

- B Add dipyridamole to aspirin

Both of these medications are anti-platelet agents and, as such, are not appropriate for this patient. Atrial fibrillation requires anticoagulation as stroke prophylaxis.

- C Continue aspirin

Aspirin was previously considered appropriate treatment for patients with atrial fibrillation thought to have a low-moderate risk of stroke. However, this is no longer considered appropriate as the bleeding risk with aspirin outweighs any reduction in stroke risk.

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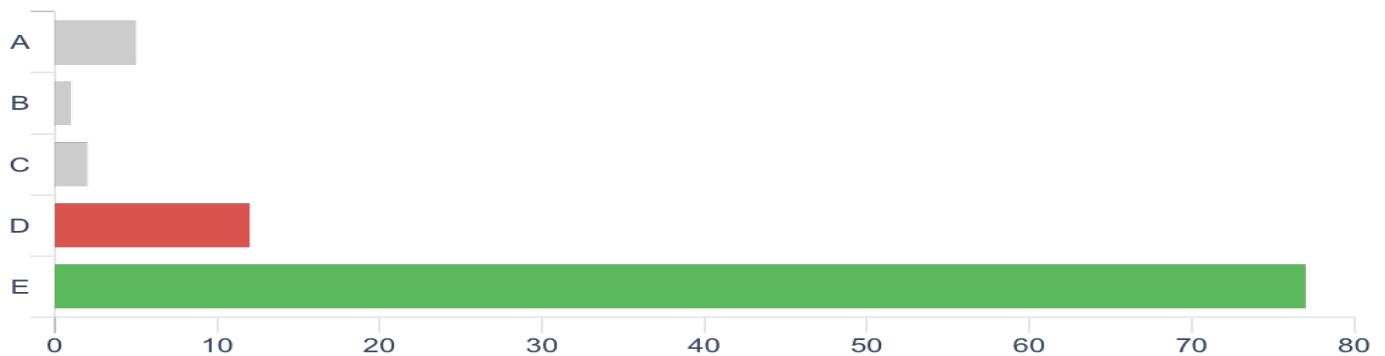
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External Links

NICE. CG180 Atrial fibrillation: management

[nice.org.uk/guidance/cg180](https://www.nice.org.uk/guidance/cg180)

(https://www.nice.org.uk/guidance/cg180)

European Society of Cardiology. Atrial Fibrillation 2016 (management of).

[escardio.org/Guidelines/Clinical-Practice-Guidelines/Atrial-Fibrillation-Management](https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Atrial-Fibrillation-Management)

(<https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Atrial-Fibrillation-Management>)

Expanded Explanation

Overview

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Links to NICE guidelines/CKS



Q291

An 18-year-old woman presents to the Emergency Department (ED) for review. She has been unwell for the past few days with fevers, lethargy and joint pains, and has an erythematous rash over her trunk which started on her back. A severe episode of tonsillitis/pharyngitis began a short period before these new symptoms.

On examination, she has a blood pressure (BP) of 115/82 mmHg, with pulse of 85 beats per minute (bpm) that is regular. There is a mitral murmur but otherwise auscultation of the chest is normal. You note joint pains predominantly affecting her knees and elbows, subcutaneous nodules over each elbow and an erythematous rash over the trunk.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	13.0 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$10.4 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$181 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135–145 mmol/l
Potassium (K^+)	4.3 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	101 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Erythrocyte sedimentation rate (ESR)	75 mm/hour	1–20 mm/hour
C-reactive protein (CRP)	132 mg/l	< 10 mg/l
Urine	Blood+, protein+	
Throat swab	Streptococcus Group A	

Which of the following is the most important intervention?

Your answer was correct

- A Antibiotic therapy
- B Aspirin
- C Ibuprofen

D Prednisolone

E Bed rest

Explanation



A Antibiotic therapy

This patient presents with a likely diagnosis of rheumatic fever. The major and minor manifestations of this condition are presented in the table below. Rheumatic fever is an inflammatory disease that develops following a streptococcal throat infection. Diagnosis is based on evidence of a streptococcal throat infection with two major or one major and two minor criteria. Streptococcal throat infections should be treated with penicillin, in part to avoid the risk of rheumatic fever and the late manifestation of rheumatic heart disease.

Major criteria	Minor criteria
Migrating polyarthritis	Fever
Carditis	Raised ESR or CRP
Erythema marginatum	Arthralgia
Sydenham's chorea	ECG showing heart block
Subcutaneous nodules	Previous rheumatic fever

B Aspirin

Aspirin is considered to be an effective agent for the treatment of inflammation in the case of rheumatic fever. There is limited evidence to support the use of aspirin or corticosteroids over one another. However, although useful for treating inflammation, antibiotics are the key treatment in this condition.

C Ibuprofen

NSAIDs can form a part of the treatment bundle for rheumatic fever, but aspirin would be preferred over ibuprofen. The management of the inflammatory elements for rheumatic fever are secondary to effective antibiotic therapy.

D Prednisolone

Steroids and NSAIDs have limited evidence to suggest one over the other in the treatment of the inflammatory component of rheumatic fever, and either can be considered. Steroids are preferred in cases with cardiac involvement. Although an important element of the treatment

of this patient, it is secondary to the use of antibiotics.

E Bed rest

Rheumatic fever must be treated to reduce the incidence of long-term sequelae. Bed rest alone is not an appropriate treatment option.

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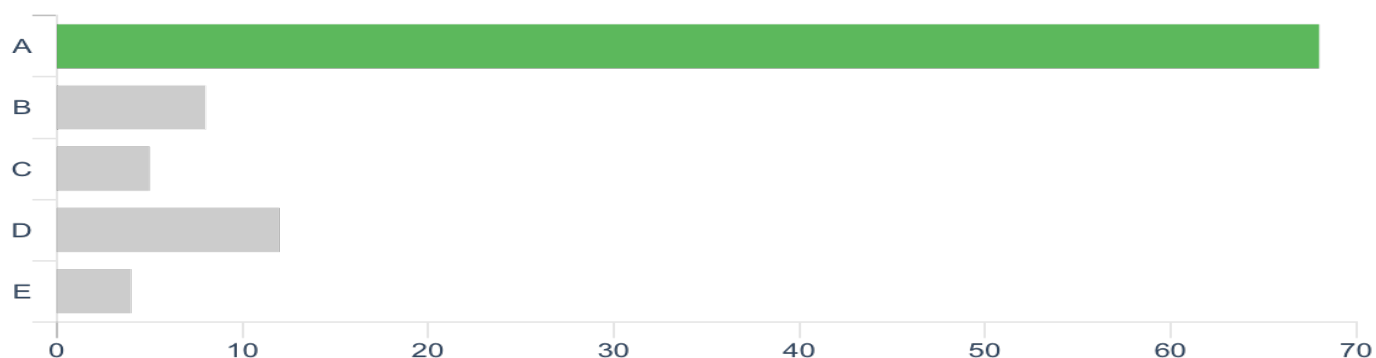
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Session Progress

Responses Correct:	58
Responses Incorrect:	233
Responses Total:	291
Responses - % Correct:	20%



Q292

An 18-year-old man is brought to the Emergency Department (ED) by ambulance after collapsing at the local Dental Surgery. He is previously fit and well, but apparently passed out in the dentist's chair whilst receiving a local anaesthetic injection. According to staff he went very pale and collapsed with loss of consciousness; there was some asynchronous jerking of the upper limbs whilst he was in the chair, which only resolved after he was laid flat on the floor. He awoke a few seconds later, and was orientated within one minute. He had one episode of vomiting.

Clinical examination in the ED including full neurological assessment is entirely normal. A 12-lead resting electrocardiogram (ECG) is normal.

Given the likeliest diagnosis, which of the following is the most appropriate next step?

Your answer was incorrect

- A CT head
- B EEG
- C 24hr holter monitor
- D Reassurance and discharge
- E 4hr ECG monitoring in the department

Explanation



- D Reassurance and discharge

The answer is Reassurance and discharge -

The history as described is entirely consistent with vasovagal syncope. The jerking is likely because the patient remained head up at onset of the episode, and is due to cerebral hypoperfusion. The rapid recovery followed by entirely normal assessment in the Emergency department is reassuring. No intervention is required.

- E 4hr ECG monitoring in the department

4hr ECG monitoring is incorrect this is not required because there are no sinister features associated with this event that suggest it is required.

A CT head

CT head is incorrect because it would only be indicated where there is a more prolonged period of loss of consciousness, where there is residual neurological deficit, or other suspicious features such as prolonged severe headache.

B EEG

EEG is incorrect because the description is much more suggestive of vagal syncope than seizure, notably the clinical context of the episode, the pallor at onset and rapid recovery.

C 24hr holter monitor

24hr holter monitor is incorrect because this is a first episode of syncope with an obvious precipitant in the dental injection. Prolonged monitoring is therefore not needed.

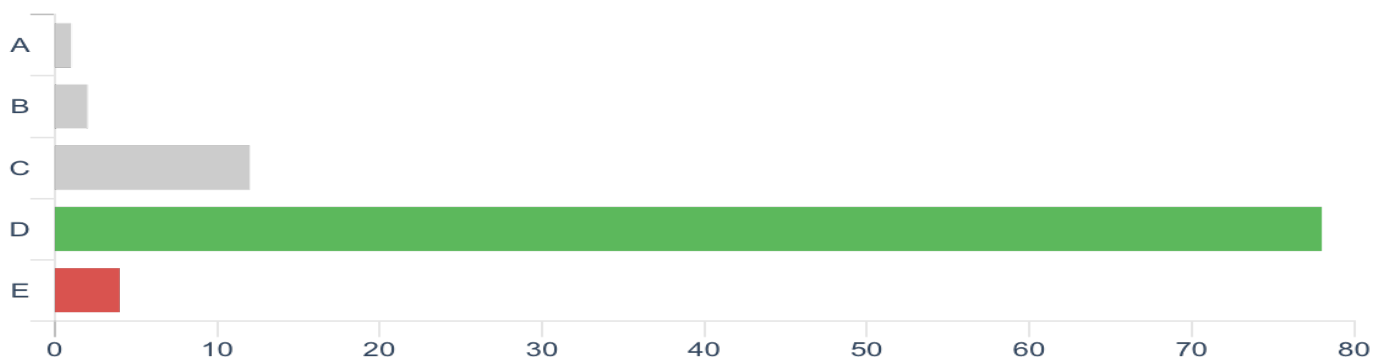
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Responses Correct:	58
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Responses Total:	292
Responses - % Correct:	20%



Q293

A 63-year-old man with a history of three previous myocardial infarctions (MI) comes to the Cardiology Clinic for review. He has increased shortness of breath and decreased exercise tolerance despite therapy with Lisinopril 20 mg, Bisoprolol 10 mg and 80 mg of Furosemide per day. Other medication includes Atorvastatin 40 mg per day and Aspirin 75 mg.

On examination, his blood pressure (BP) is 112/80 mmHg. His pulse is 65 beats per minute (bpm) and regular. He has bilateral crackles on auscultation of the chest and pitting oedema affecting both ankles.

Investigations reveal the following:

Investigation	Result	Normal values
Haemoglobin (Hb)	12.8 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$7.2 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$197 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na^+)	137 mmol/l	135–145 mmol/l
Potassium (K^+)	5.1 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	123 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$
Electrocardiogram (ECG)	Sinus rhythm, rate 65 bpm, left bundle branch block (LBBB)	
Ejection fraction (EF)	27%	

Which of the following is the most appropriate next step?

Your answer was correct

- A Cardiac resynchronisation therapy
- B Increase Furosemide

- C Start Digoxin
- D Start Ivabradine
- E Start Valsartan

Explanation



- A Cardiac resynchronisation therapy

The answer is Cardiac resynchronisation therapy, (CRT) -

In a patient managed with optimised medical therapy, where there is conduction delay, CRT can significantly improve symptoms of heart failure. According to NICE guidance as well as maximised medical therapy, patients must also have an ejection fraction less than 35%.

- B Increase Furosemide

Increased Furosemide, is incorrect because whilst it may improve symptoms of fluid overload, it will potentially increase creatinine significantly and may drive postural hypotension.

- C Start Digoxin

Start Digoxin, is incorrect because digoxin has not been shown to positively impact on cardiac outcomes, although it may improve symptoms.

- D Start Ivabradine

Start Ivabradine, is incorrect because the heart rate is already below 80 BPM.

- E Start Valsartan

Start Valsartan, is incorrect because there is limited symptom benefit in combining ACE inhibitor and ARB, and this is coupled with significant risk of hyperkalaemia.

40431

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Expanded Explanation

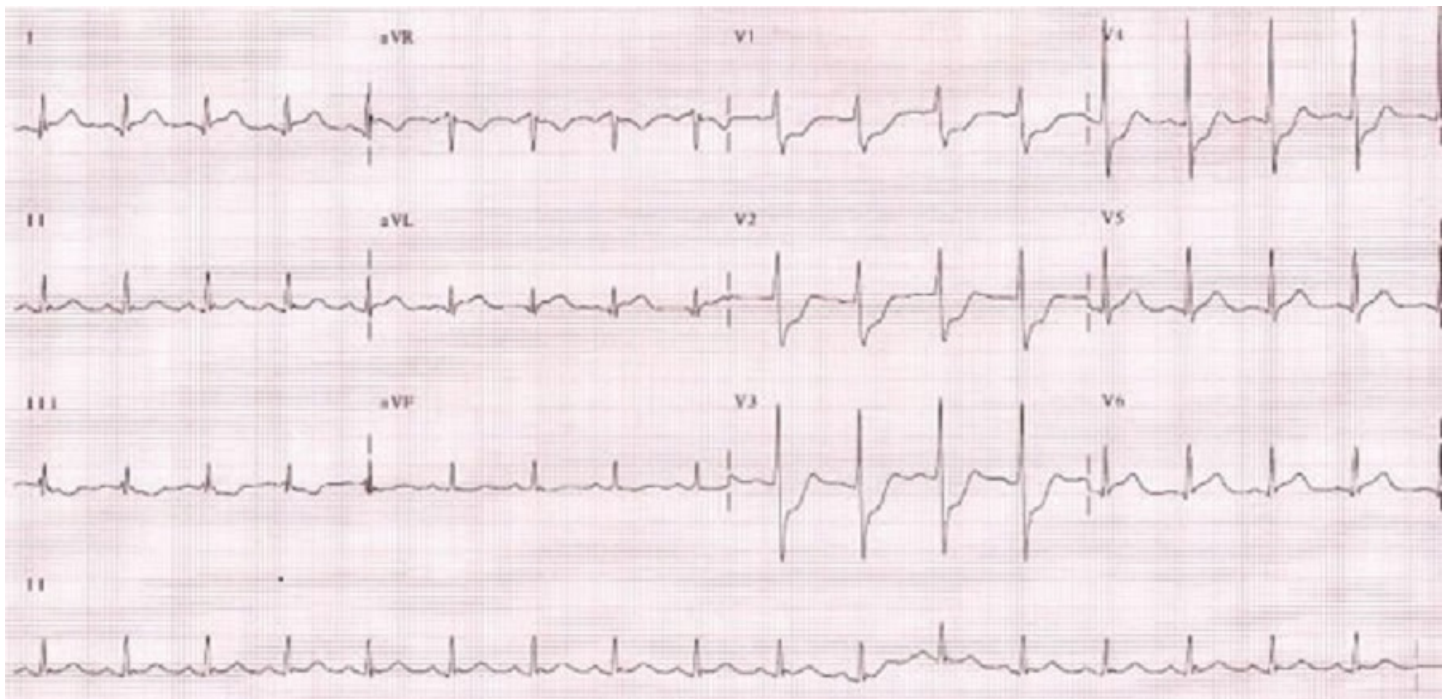
Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Q294

A 45-year-old man presents to the Emergency Department (ED) with history of left precordial pain that started two hours ago when he was watching television after dinner. The pain is moderate in intensity, radiates to ulnar aspects of both arms, and is associated with nausea and one episode of vomiting. He has a 20 pack-year history of smoking. He consumes three to four glasses of wine each week and generally has a sedentary lifestyle.

On examination, his pulse is 77 beats per minute(bpm). His blood pressure (BP) is 150/90 mmHg and his respiratory rate is 14 breaths per minute. There is no jugular venous distension (JVD). His heart sounds are normal and his lungs are clear to auscultation. A chest X-ray (CXR) is normal.

A 12-lead electrocardiogram (ECG) is obtained and is shown below.



What is the coronary artery that supplies most of the affected territory?

Your answer was incorrect

- A Left main coronary artery
- B Left circumflex artery
- C Left anterior descending artery

- D Right coronary artery
- E Ramus/intermediate artery

Explanation



- D Right coronary artery

This patient has presented with typical features suggestive of an acute coronary syndrome. The ECG shows ST-depression in the anterior chest leads (V_1 - V_4), upright T-waves and prominent R-waves. These features highlight a posterior myocardial infarction. The posterior aspect of the myocardium is normally supplied by the right coronary artery (right coronary artery supply of the posterior aspect is present in 70% of patients). If the ECG of this patient was repeated with the leads V_1 - V_6 repositioned on the posterior aspect of the chest (labelled as V_7 - V_{12}), then a ST-elevation picture is seen (as shown in the figure below).

- A Left main coronary artery

The left coronary artery supplies the septal, anterior and lateral aspects of the left ventricle. In most cases it bifurcates into the left anterior descending artery and the left circumflex artery. Obstruction of this artery would present typically with widespread changes across the ECG.

- B Left circumflex artery

The left circumflex artery supplies the lateral aspect of the left ventricle. This is represented in the ECG by leads I, V_5 and V_6 . There are no lateral changes seen in the above ECG.

- C Left anterior descending artery

The left anterior descending artery supplies the anterior aspect of the left ventricle and the anterior 2/3 of the interventricular septum. This is represented on the ECG as leads V_1 - V_4 . The above ECG could be confused as an NSTEMI in the anterior septal region. However, the prominent R-waves and upright T-waves should point you towards a posterior MI.

- E Ramus/intermediate artery

The intermediate artery is an additional artery that can form as a trifurcation where the left main stem splits into the left anterior descending artery and the left circumflex artery. It is present in around 20% of the population and can supply variable extents of the anterior and lateral aspects of the left ventricle.

70194

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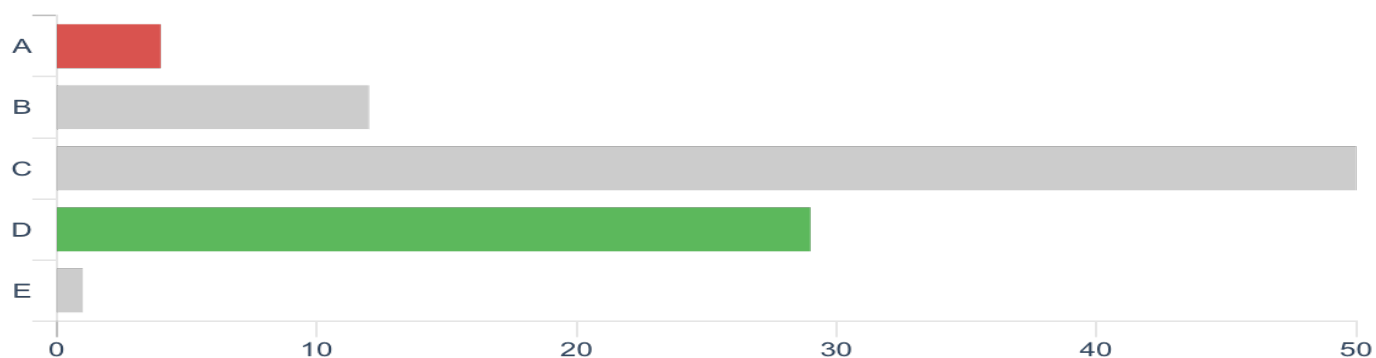
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management**

Prognosis

Links to NICE guidelines/CKS



Q295

A 71-year-old woman comes to the Hypertension Clinic for review. Her General Practitioner (GP) is struggling to manage her hypertension, which is still poorly controlled despite treatment with ramipril 10 mg once a day and amlodipine 5 mg once a day. She suffered an inferior myocardial infarction (MI) five years earlier.

On examination, her blood pressure (BP) is 155/95 mmHg. His pulse is 65 beats per minute (bpm) and regular. There are bibasal crackles on auscultation. There is no ankle swelling. Her abdomen is soft and non-tender with no palpable masses. Her body mass index (BMI) is 31 kg/m².

Investigations reveal the following:

Investigation	Result	Normal Values
Haemoglobin (Hb)	13.0 g/l	13.5-17.5 g/dl
White cell count (WCC)	$7.1 \times 10^9/l$	$4.0-11.0 \times 10^9/l$
Platelets (PLT)	$203 \times 10^9/l$	$150-400 \times 10^9/l$
Sodium (Na ⁺)	140 mmol/l	135-145 mmol/l
Potassium (K ⁺)	4.9 mmol/l	3.5-5.0 mmol/l
Creatinine (Cr)	112 μ mol/l	50-120 μ mol/l
Glucose	6.5 mmol/l	3.9-7.1 mmol/l

Which of the following is the most appropriate next step?

Your answer was incorrect

- A Add atenolol
- B Add bendroflumethiazide
- C Add doxazosin
- D Add indapamide
- E Increase amlodipine to 10 mg OD

Explanation



D Add indapamide

This patient presents with significant ongoing hypertension. Along with other risk factors reported in the clinical vignette, she has a significant risk of vascular complications from her hypertension, which should be controlled aggressively. She is already on an ACE inhibitor and calcium channel blocker. The next step recommended in the NICE guideline (see below) would be to add a thiazide-like diuretic (such as indapamide).

C Add doxazosin

Doxazosin is an α -blocker - these agents are not recommended for the routine treatment of hypertension. In the case of this patient, her previous MI increases the risk of heart failure, which would be worsened by the use of an α -blocker.

A Add atenolol

Atenolol is a B1 selective β -blocker. β -blockade is not recommended for routine treatment of hypertension, due to the limited benefit compared with other agents. Additionally, in this patient with a raised BMI, β -blockade is known to impair glucose tolerance.

B Add bendroflumethiazide

Bendroflumethiazide is a thiazide diuretic. Although commonly used for the treatment of hypertension, it is no longer recommended in current NICE guidance.

E Increase amlodipine to 10 mg OD

Up-titration of amlodipine to 10 mg OD is likely to result in only a modest reduction in systolic blood pressure (by ≤ 5 mmHg). As such, the patient will still require a further agent. Additionally, increasing the dose of amlodipine may increase the risk of adverse effects occurring (including ankle swelling).

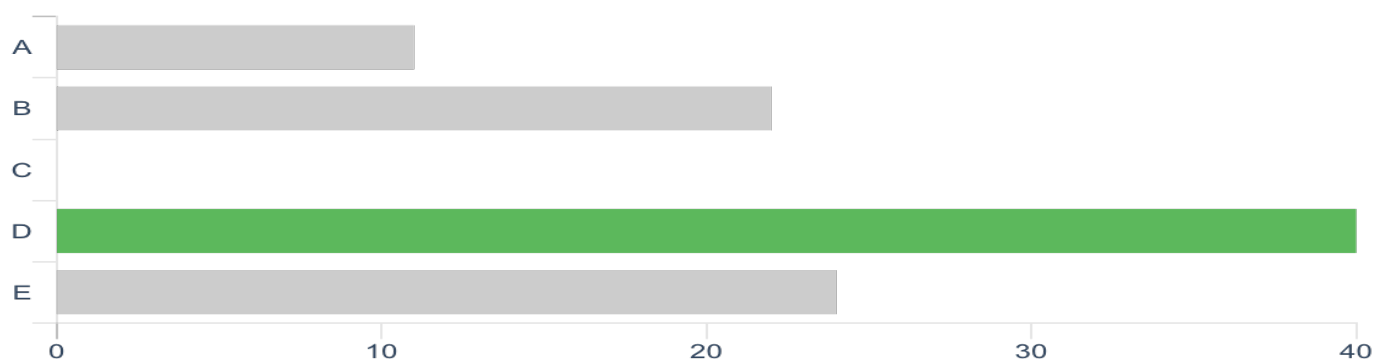
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External Links

NICE. CG127 Hypertension in adults: diagnosis and management. 2011.

[nice.org.uk/guidance/cg127](https://www.nice.org.uk/guidance/cg127)

(<https://www.nice.org.uk/guidance/cg127>)

Expanded Explanation

Overview

Clinical Presentation

Diagnosis / Investigation

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Q296

A 56-year-old man is reviewed on the Cardiology Ward. He is currently prescribed vancomycin 500 mg twice a day for bacterial endocarditis, and his trough vancomycin levels are available for your review.

He is responding to therapy. His blood pressure (BP) is 122/72 mmHg, while his pulse is 70 beats per minute (bpm) and regular. He has a murmur consistent with mitral regurgitation, and has not spiked a fever over the past 24 hour. His estimated glomerular filtration rate (eGFR) level is 50 ml/min and the trough vancomycin level is measured at 35 mg/l (upper limit of trough recommended 15 mg/l).

Which of the following is the correct course of action?

Your answer was incorrect

- A Increase dose to 750 mg BD
- B Increase dose to 1 g BD
- C Omit dose and restart when level <15 mg/l
- D Omit single dose and continue at 500 mg BD in 12 h
- E Reduce dose to 250 mg OD

Explanation



- C Omit dose and restart when level <15 mg/l

Vancomycin is an antibiotic used systemically to treat methicillin-resistant *Staphylococcus aureus* infections. IV administration is necessary for systemic treatment as vancomycin is not absorbed from the intestine. The trough level listed above is significantly higher than the toxic threshold (30 mg/l). As such, dose omission is required to reduce the risk of significant complications (including ototoxicity and nephrotoxicity). The BNF recommends trough levels towards the higher end of the recommended range, (5 - 15 mg/l) for endocarditis. Specific protocols for the dosing of vancomycin differ between NHS trusts, but all should suggest omission if the trough level is as high as documented here. Re-initiation once in range should be in consultation with the microbiology team.

A Increase dose to 750 mg BD

The trough level described in this vignette is much higher than the therapeutic range. Increasing the dose in this situation will only make the situation worse.

B Increase dose to 1 g BD

This will further increase the circulating levels of vancomycin, increasing the risk of significant adverse effects.

D Omit single dose and continue at 500 mg BD in 12 h

The half-life of vancomycin is highly variable and dependent on renal function. It is possible that the concentration of vancomycin may have reached a normal level after 12 h; however, further trough levels should be taken to confirm this before re-initiating.

E Reduce dose to 250 mg OD

Although it is likely that over time this would correct the high vancomycin concentration described here, administration of further vancomycin to this patient is incorrect. At least one dose should be omitted and vancomycin only re-initiated when levels are within the normal range.

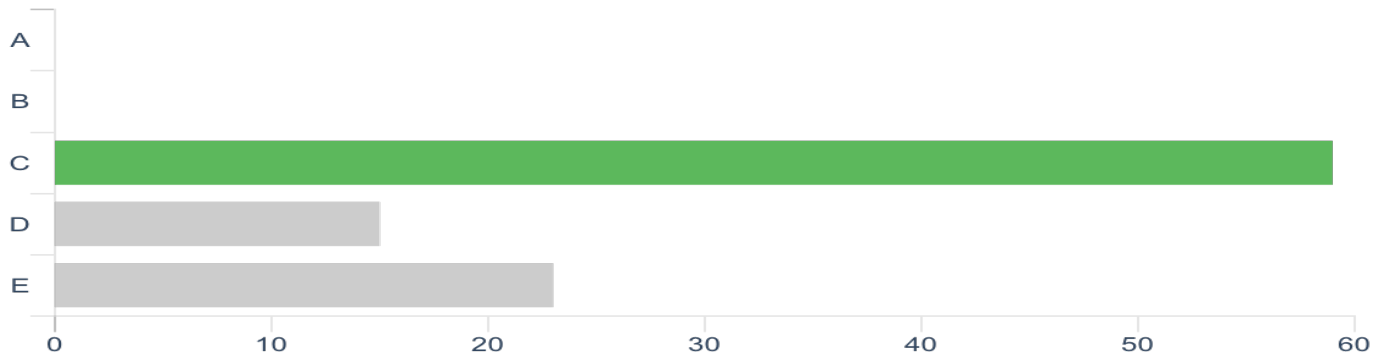
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Responses Incorrect:	237
Responses Total:	296
Responses - % Correct:	20%

Expanded Explanation

Overview

Clinical Presentation

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Q297

A 50-year-old man with longstanding type I diabetes managed with NovoRapid twice a day and insulin glargine comes to the Cardiology Clinic for assessment. His HbA1c is not well managed at 67.21 mmol/mol (8.3%) and he has had a number of episodes of hypoglycaemia. His medication includes ramipril 10 mg daily and bendroflumethiazide 2.5 mg daily. Additionally, he has had three fainting attacks in the past three months.

You measure his lying and standing blood pressure (BP): lying it is 155/102 mmHg, but this drops to 105/60 mmHg on standing. Routine urea and electrolytes (U&Es) reveal a sodium level of 138 mmol/l and a potassium level of 4.5 mmol/l.

Which of the following is the most appropriate way to manage his blood pressure?

Your answer was incorrect

- A Oral hydrocortisone
- B Compression stockings
- C Oral fludrocortisone
- D Stop ramipril
- E Stop bendroflumethiazide

Explanation



- E Stop bendroflumethiazide

It seems that he has a significant postural drop in blood pressure (BP), which is almost certainly related to diabetic autonomic neuropathy. The fact that his standing blood pressure is normal puts him into a lower risk cardiovascular group, and stopping the bendroflumethiazide is likely to have a significant positive impact on his symptoms.

- A Oral hydrocortisone

In this context long-term oral hydrocortisone would never be considered to have a positive benefit risk profile.

B Compression stockings

Compression stockings are the logical next intervention where the patient fails to respond to discontinuation of the bendroflumethiazide.

C Oral fludrocortisone

Oral fludrocortisone is only considered when postural hypotension persists despite discontinuing bendroflumethiazide and conservative measures such as compression stockings.

D Stop ramipril

Given that ramipril has proven outcome benefits in patients with diabetes, it should not be discontinued.

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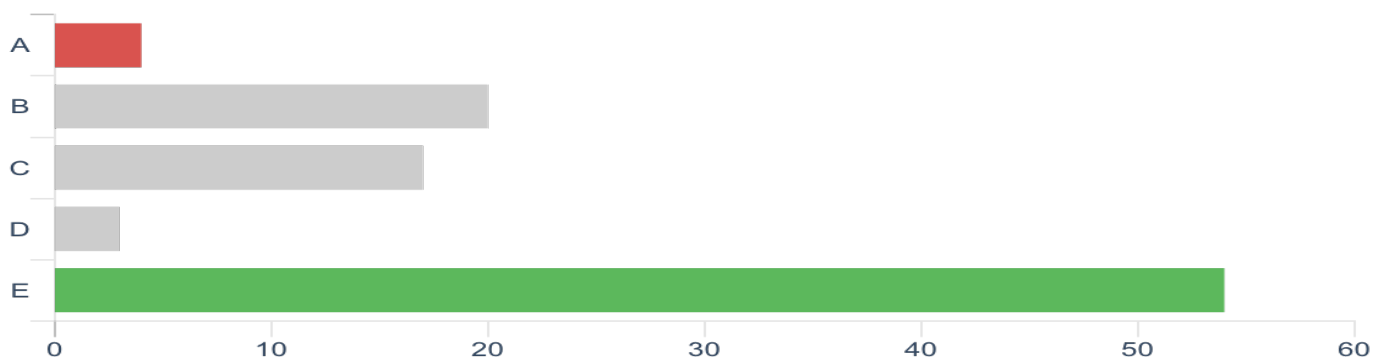
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Session Progress

Responses Correct: 59

Responses Incorrect: 238

Responses Total: 297

Responses - % Correct:

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Q298

A 54-year-old man is admitted to the Emergency Department (ED) with shortness of breath and increasing peripheral oedema. He has extremely limited exercise tolerance and is barely able to move around the pub.

On examination, he has signs of chronic liver disease (CLD) and biventricular cardiac failure. His blood pressure (BP) is 110/70 mmHg, with a pulse of 85 beats per minute (bpm). You diagnose cardiomyopathy. He admits that he is unable to reduce his consumption of alcohol.

Which of the following will have the biggest impact on his prognosis?

Your answer was correct

- A Alcohol cessation
- B Bisoprolol
- C Furosemide
- D Ramipril
- E Valsartan / sacubitril

Explanation



- A Alcohol cessation

This patient has alcoholic cardiomyopathy, where the patient can gain rapid improvement in their symptoms as long as they give up alcohol. This improves ejection fraction, exercise tolerance and ultimately mortality. Unfortunately, with continued symptoms of heart failure, annual mortality approaches 20%.

- B Bisoprolol

Heart failure associated with alcohol abuse is often low-output/hypotensive heart failure, meaning that there is a more limited role for beta blockade.

- C Furosemide

Fluid offloading with loop diuretics is important in the management of alcoholic cardiomyopathy, although giving up alcohol is more important with respect to outcome.

D Ramipril

ACE inhibitors do have a positive impact on outcomes in alcoholic cardiomyopathy, although lower blood pressure and decreased renal perfusion associated with continued alcohol abuse may limit their effectiveness.

E Valsartan / sacubitril

Valsartan/sacubitril does improve cardiac output and mortality in patients with dilated cardiomyopathy and is an important addition to alcohol cessation in improving outcomes, but is the second step in managing the condition after giving up alcohol.

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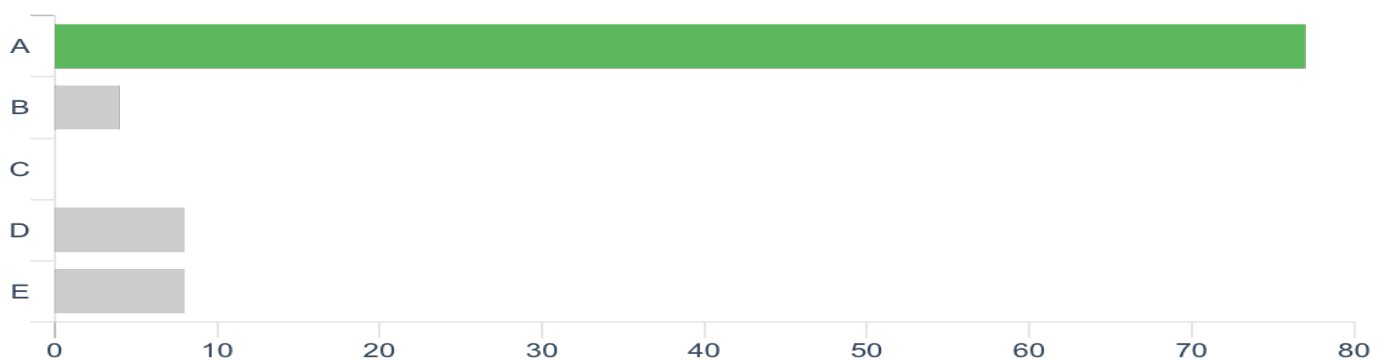
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Session Progress

Responses Correct:	60
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Responses Total:	298
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Q299

A 42-year-old adopted man presents to the Cardiology Clinic with symptoms of angina and intermittent claudication.

On examination, he is obese and has evidence of tendon xanthomas. Lipid profiling reveals a low-density lipoprotein (LDL) cholesterol level of 8.2 mmol/l, with normal triglyceride levels.

Which of the following is the first step in his lipid management?

Your answer was incorrect

- A Fenofibrate
- B Atorvastatin
- C Ezetimibe
- D Evolocumab
- E Nicotinic acid

Explanation



- B Atorvastatin

This patient has markedly raised low-density lipoprotein cholesterol (LDL-c) levels and almost certainly has heterozygous familial hypercholesterolaemia (FH). Prognosis in these patients depends on reducing LDL-c to as near normal levels as possible, and treating other risk factors such as smoking and hypertension as aggressively as possible. The dose of atorvastatin should be titrated to the maximum tolerated or 80 mg/day, whichever is greater.

- A Fenofibrate

Fibrates are the intervention of choice for familial hypertriglyceridaemia, rather than hypercholesterolaemia.

- C Ezetimibe

Ezetimibe can further reduce LDL cholesterol on top of statins alone and is therefore the default oral add-in therapy for patients not at target cholesterol.

D Evolocumab

Evolocumab is a PCSK9 inhibitor that can significantly reduce LDL cholesterol and achieve target levels in patients unable to attain them on statins alone. It is given as a 2-weekly or monthly injectable therapy, and is usually second or third line in the management of FH.

E Nicotinic acid

Nicotinic acid is most useful in reducing elevated triglycerides, not LDL cholesterol.

70807

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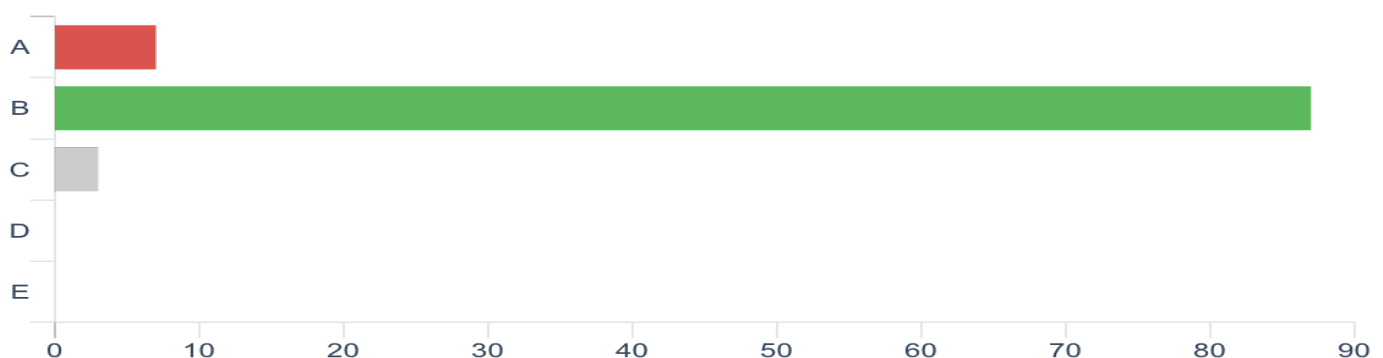
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Expanded Explanation

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Links to NICE guidelines/CKS



Q300

A 69-year-old woman is admitted to the Emergency Department (ED) with palpitations. The palpitations started while she was doing some house chores two hours ago. There is no associated shortness of breath but she is just uncomfortable, being aware of her heart beating fast. She has had palpitations in the past, but these have been brief and lasted for only a very short time. A previous Holter has captured periods of SVT with underlying left bundle branch block. She has a past medical history of hypertension for which she takes 10 mg of amlodipine.

On examination, she is anxious, with a blood pressure (BP) of 130/70 mmHg. Her pulse is 143 beats per minute (bpm) and her respiratory rate is 22 breaths per minute. Her oxygen saturation is 99% on air and her chest is clinically clear. Her jugular venous pulse (JVP) is not raised and there is no peripheral oedema. The first and second heart sounds are heard but you are not sure whether there is a third heart sound.

Investigations reveal the following:

Investigation	Result
Electrocardiogram (ECG)	Broad complex tachycardia, QRS complex > 140 milliseconds, but you are not sure whether this is a supraventricular or a ventricular tachycardia
Chest X-ray (CXR)	Appears normal

What is the most appropriate next step?

Your answer was correct

- A Adenosine IV
- B Amiodarone IV
- C DC cardioversion
- D Esmolol IV
- E Observation

Explanation



A Adenosine IV

This patient is haemodynamically stable but has a broad complex tachycardia. It is not always easy to tell whether the broad complex tachycardia is of ventricular or supraventricular origin, but the safest course of action is to consider a drug like adenosine, which will cause short-lived AV block in SVT but not in VT. It is the presence of aberrant conduction which can lead to diagnostic confusion. The haemodynamic status has little bearing in distinguishing whether it is of ventricular or supraventricular origin. Chemical cardioversion would be appropriate in this patient, who is haemodynamically stable.

B Amiodarone IV

Amiodarone may be an appropriate next step for cardioversion, once the underlying rhythm has been elucidated.

C DC cardioversion

Progressing directly to DC cardioversion isn't warranted given that this patient has a stable blood pressure. Determining the underlying rhythm with adenosine first is appropriate.

D Esmolol IV

Esmolol is appropriate for rhythm control in paroxysmal VT, although adenosine is easier to administer in the Emergency Room setting and is therefore the preferred option.

E Observation

Due to the risk of sudden deterioration, either in heart rate or blood pressure, observation is not appropriate here.

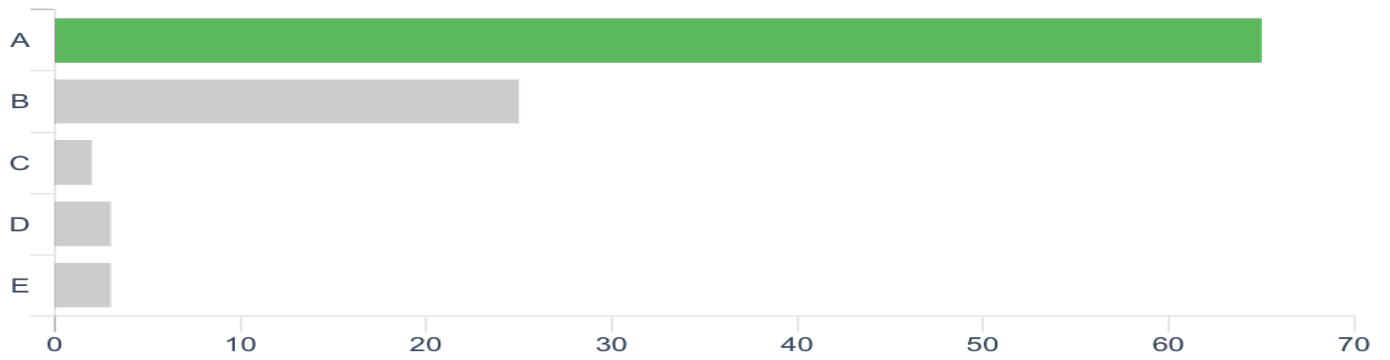
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Q301

A 73-year-old woman comes to the Cardiology Clinic for follow-up. Her General Practitioner (GP) referred her to the Cardiology Clinic when she was found to have isolated systolic hypertension three months ago. Her systolic blood pressure (BP) ranged between 155 and 188 mmHg and her diastolic BP ranged between 70 and 82 mmHg. She was not started on medication and was encouraged to reduce her salt intake, lose some weight, and start exercising.

On examination in your clinic, her BP is 180/75 mmHg. She had been taking a series of BPs at home, with the systolic ranging from 150 to 180 mmHg and diastolic ranging from 65 to 75 mmHg.

What is the most appropriate management option for this patient?

Your answer was correct

- A Amlodipine
- B Bendroflumethiazide
- C Bisoprolol
- D Continue lifestyle measures
- E Valsartan

Explanation



- A Amlodipine

This patient has isolated systolic hypertension, and according to NICE guidelines this should be managed in the same way as hypertension where both the systolic and diastolic blood pressure are elevated. Given that she is over 55 years, amlodipine is an appropriate initial therapy.

- B Bendroflumethiazide

Thiazide diuretics are no longer a first-line intervention for the treatment of hypertension in patients with diabetes. They were shown in a meta-analysis to be associated with increased risk of incident type 2 diabetes.

C Bisoprolol

Either ACE inhibitors or calcium channel blockers are the preferred first option for the treatment of hypertension according to NICE guidance.

D Continue lifestyle measures

Given this lady's marked elevation in systolic blood pressure, pharmacological intervention is required.

E Valsartan

ARBs are not recommended as initial therapy unless other options including ACE inhibitors are not tolerated, and should not be used according to NICE guidance in combination with ACE inhibitors.

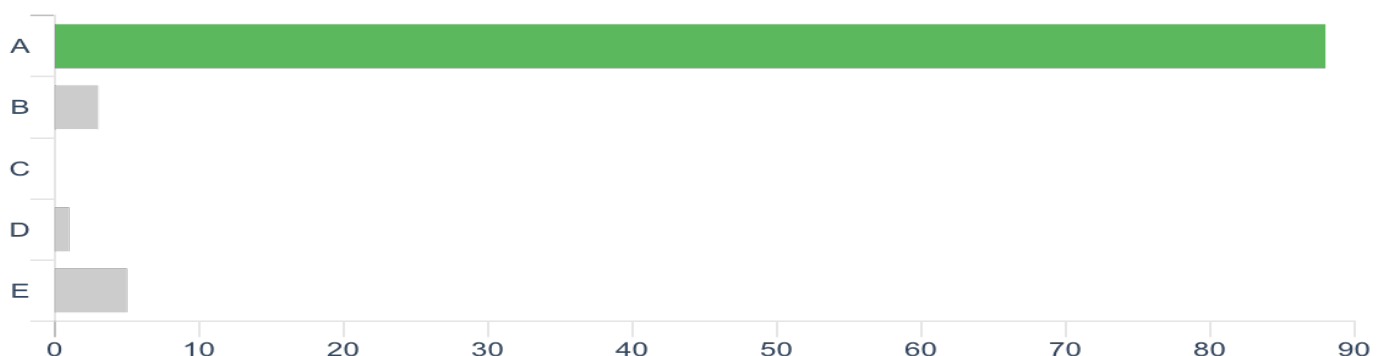
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External Links

Hypertension in adults: diagnosis and management

[nice.org.uk/guidance/cg127](http://www.nice.org.uk/guidance/cg127)

(<http://www.nice.org.uk/guidance/cg127>)

Expanded Explanation

Overview

Clinical Presentation

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Q302

A 38-year-old man is referred to the Cardiology Clinic by a company doctor for an abnormal heart murmur detected during a routine medical check-up. He had to undergo a medical check-up before starting a new job with the company. He is asymptomatic. His past medical history is unremarkable and he is not on any medication.

On examination, his blood pressure (BP) is 135/65 mmHg, while his pulse is 74 beats per minute (bpm) and regular. His apex beat is in the 6th intercostals space in the anterior axillary line and his jugular venous pulse (JVP) is not raised. First and second heart sounds are heard and there is a pan-systolic murmur of grade 3/6 radiating to the axilla.

His chest is clinically clear.

Investigations reveal the following:

Investigation	Result
Electrocardiogram (ECG)	Sinus rhythm with evidence of left ventricular hypertrophy
Chest X-ray (CXR)	Slight cardiomegaly
Echocardiography (ECHO)	Diastolic left ventricular dimension of 6.6 cm with an ejection fraction of 35%. The left atrial dimension is 5.5 cm and there is moderate mitral regurgitation
Full blood count (FBC), Urea and electrolytes (U&Es), Liver function tests (LFTs), Thyroid function tests (TFTs), Urinalysis and Lipid profile	All within normal range

What is the most appropriate initial management option?

Your answer was incorrect

- A Review in 6 months
- B Furosemide
- C Digoxin
- D Amlodipine

E Ramipril

Explanation



E Ramipril

There is evidence that ACE inhibitors reduce adverse events in patients with left ventricular dysfunction with no overt heart failure. The Studies of Left Ventricular Dysfunction (SOLVD) study investigated left ventricular dysfunction with and without overt congestive heart failure. In the prevention arm, enalapril reduced the combined incidence of death and development of overt congestive heart failure, and was statistically significant. Surgical intervention should be considered as per the ESC/EACTS 2017 guidelines.

A Review in 6 months

Given that the ejection fraction is significantly reduced at 35%, and there is functional MR, non-intervention is inappropriate here.

B Furosemide

Diuretics alone do not impact on outcomes in left ventricular dysfunction, and are unlikely to be of symptomatic benefit bearing in mind there is no overt cardiac failure.

C Digoxin

Digoxin does not carry outcome benefit in heart failure and may indeed increase mortality; it should not therefore be used here.

D Amlodipine

Although dihydropyridine calcium channel blockers reduce BP, they won't impact on the prognosis of heart failure in this situation.

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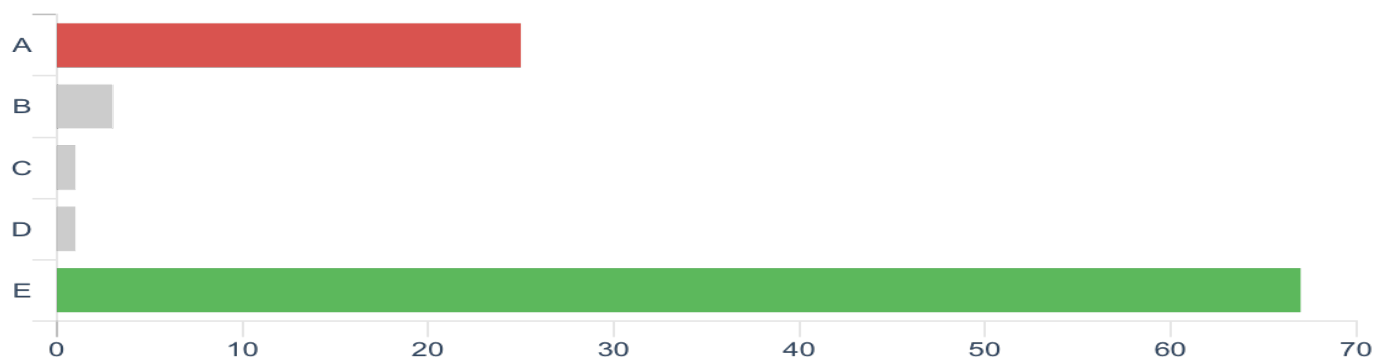
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Q303

A 61-year-old patient called the emergency services with a history of central crushing chest pain radiating down his left arm. He has a history of hypertension, treated with atenolol, and smokes 20 cigarettes per day.

On examination by the paramedic crew, his blood pressure (BP) was 100/60 mmHg, with a pulse of 38 beats per minute (bpm). An initial electrocardiogram (ECG) is suggestive of complete heart block with ST elevation in II, III (maximally) and aVF, and ST depression in aVL.

On arrival he continues to have further chest pain and his BP is now 85/60 mmHg. You notice that his jugular venous pressure (JVP) is elevated. His chest is clear and there is no evidence of peripheral oedema.

Investigations reveal the following:

Investigation	Result	Normal Values
Haemoglobin (Hb)	13.1 g/dl	13.5–17.5 g/dl
White cell count (WCC)	$8.2 \times 10^9/l$	$4.0\text{--}11.0 \times 10^9/l$
Platelets (PLT)	$199 \times 10^9/l$	$150\text{--}400 \times 10^9/l$
Sodium (Na ⁺)	138 mmol/l	135–145 mmol/l
Potassium (K ⁺)	4.9 mmol/l	3.5–5.0 mmol/l
Creatinine (Cr)	156 $\mu\text{mol/l}$	50–120 $\mu\text{mol/l}$

Which coronary artery is most likely to be affected?

Your answer was incorrect

- A Left anterior descending
- B Circumflex
- C Right coronary artery
- D Left main stem
- E Diagonal

Explanation



C Right coronary artery

The presentation with initial complete heart block followed by hypotension with a raised JVP is highly suggestive of right ventricular infarction. Management includes optimising right ventricular filling pressure, and closely monitoring pressures with a pulmonary artery catheter where appropriate. Once filling is optimised, if hypotension persists, addition of inotropes may be required. He should be considered for urgent primary PCI to open the culprit artery.

A Left anterior descending

Occlusion of the left anterior descending would be expected to cause an anterior STEMI. This would be associated with ST elevation in the precordial leads (particularly V_2 - V_4), and reciprocal ST depression in the inferior leads. The more extensive the area of ischaemic myocardium (i.e. the more proximal the occlusion), the more leads will demonstrate ST elevation.

B Circumflex

In patients with a right dominant circulation (the majority of patients), the right coronary artery supplies the posterior descending artery. In this case, the circumflex artery supplies the posterolateral wall of the left ventricle, and ST changes would be those of posterior infarction (i.e. ST depression in V_1 - V_3 with tall, broad R waves). If the patient has a left dominant circulation, the circumflex also supplies the posterior descending artery, and inferior ST changes will also be seen (i.e. ST elevation in II, III and aVF).

D Left main stem

Left main stem occlusion is associated with diffuse ST depression ($\geq 1\text{mm}$ in ≥ 6 surface leads) and ST elevation in lead aVR and/or V1.

E Diagonal

An isolated diagonal occlusion would be expected to produce a lateral infarction with ST elevation in the lateral leads: I, aVL and V_5 - V_6 , with reciprocal depression.

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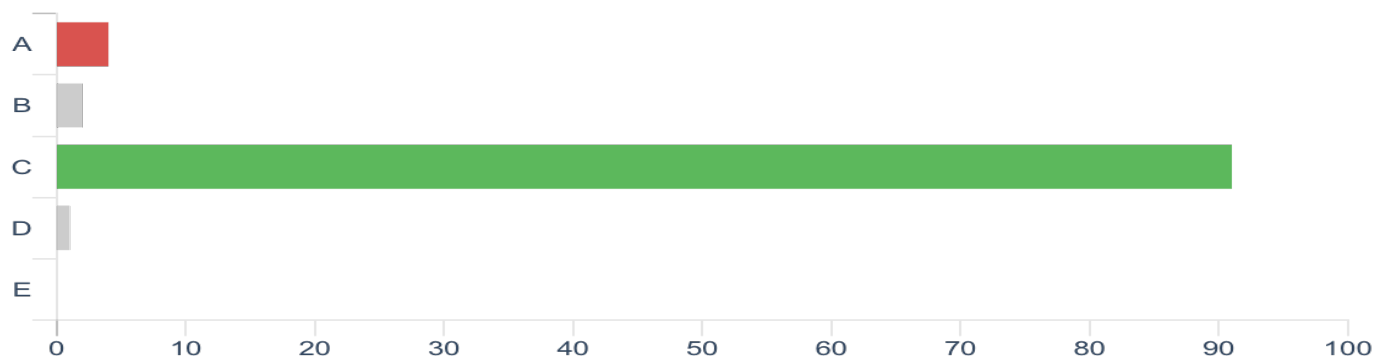
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Expanded Explanation

Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis****Links to NICE guidelines/CKS**



Q304

A 67-year-old man suffers a cardiac arrest on the Cardiology Ward shortly after coming back from the operating theatre.

Arterial blood gases results, taking five minutes after the cardiac arrest call, along with further investigations reveal the following:

Investigation	Result	Normal Values
pH	6.73	7.35–7.45
pCO ₂	7.2 kPa	4.7–6.0 kPa
pO ₂	6.2 kPa	> 10.5 kPa
Bicarbonate (HCO ₃ ²⁻)	14 mmol/l	22–29 mmol/l
Anion gap	24	3.0–10.0
Lactate	14 mmol/l	0.5–1.0 mmol/l

Which of the following best describes his acid–base disturbance?

Your answer was incorrect

- A Metabolic alkalosis
- B Compensated metabolic acidosis
- C Mixed metabolic and respiratory acidosis
- D Compensated respiratory acidosis
- E Compensated respiratory alkalosis

Explanation



- C Mixed metabolic and respiratory acidosis

This patient has suffered a significant postoperative event, with raised lactate and low bicarbonate consistent with tissue hypoxia, and elevated CO_2 and decreased O_2 consistent with disordered gas exchange, for example due to postoperative pulmonary oedema.

A Metabolic alkalosis

The bicarbonate and pH are both low, ruling out a metabolic alkalosis.

B Compensated metabolic acidosis

Compensation implies increased respiratory effort to blow off CO_2 . In this case the CO_2 is clearly elevated, meaning this is not compensated.

D Compensated respiratory acidosis

Compensated respiratory acidosis is seen in patients with COPD, where there is elevated bicarbonate. The fact that bicarbonate is low confirms that metabolic compensation has not occurred.

E Compensated respiratory alkalosis

Respiratory alkalosis is seen in patients with aspirin overdose; however the elevated pCO_2 and low pH rule out respiratory alkalosis here.

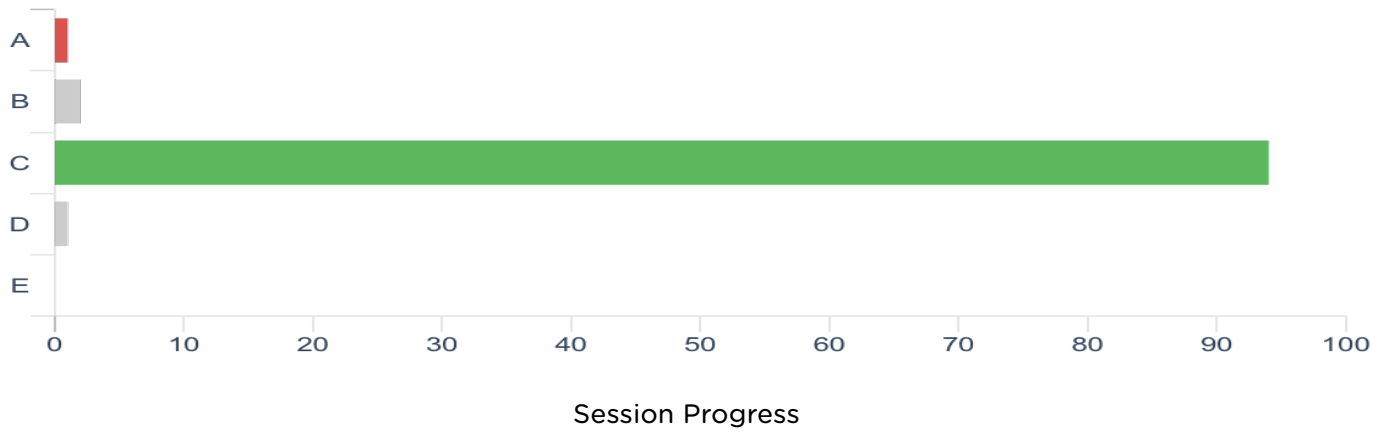
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Expanded Explanation

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Q305

A 27-year-old woman who has recently arrived in the United Kingdom (UK) from India is referred to the Cardiology Department because of intermittent palpitations associated with dizziness. She describes the palpitations as fast and irregular, with sudden onset and termination. She remembers a prolonged illness as a child but is unsure as to the nature of this. Additionally, she reports that she suffers from asthma.

On examination, she appears comfortable but underweight. Her pulse is 80 beats per minute (bpm) and regular. Her jugular venous pressure (JVP) is not raised and there is no peripheral oedema. There is a rumbling diastolic murmur over the apex on auscultation of the heart and the chest is clear.

An echocardiogram (ECHO) confirms the presence of rheumatic mitral stenosis (RMS). The patient is referred for a cardiothoracic opinion.

Two weeks later, she attends the Emergency Department (ED) feeling extremely unwell. She has suffered from fast palpitations for 20 minutes before calling the ambulance. On arrival, she is found to be in atrial fibrillation (AF) with a pulse of 145 bpm and a blood pressure (BP) of 110/70 mmHg. Oxygen saturations of 95% on air. She is placed in the resuscitation area for closer monitoring.

Which of the following would be the best pharmacological intervention?

Your answer was incorrect

- A IV esmolol
- B Oral digoxin
- C IV verapamil
- D IV flecainide
- E DC Cardioversion

Explanation



- C IV verapamil

Verapamil is a calcium channel blocker which can be given in acute situations in intravenous form. Whilst prompt therapy is indicated here, in the setting of mitral stenosis, rate control is more suitable than rhythm control given the high recurrence rate of atrial fibrillation. Due to the co-existent asthma here β -blockers should be avoided making calcium channel blockers the next suitable therapy. Should the patient be unstable then cardioversion is indicated.

A IV esmolol

IV β -blockade would be appropriate in most patients, and here it would provide rapid rate control and would likely improve cardiac output. It would also be appropriate despite the low blood pressure (which is likely secondary to rate-related reduced cardiac output). However, the patient reports a history of asthma, which is a relative contraindication to the use of a β -blocker in this setting.

B Oral digoxin

Oral digoxin has a slow onset of action and will likely take several hours to have a significant effect in this patient.

D IV flecainide

This patient has a history of rheumatic heart disease with mitral stenosis and requires either rapid rate or rhythm control. Patients with mitral stenosis do poorly in atrial fibrillation. Unfortunately, concern exists about the use of flecainide in patients with 'structural heart disease', which means it carries a label contra-indication for patients with haemodynamically significant valvular heart disease. This concern came about following the results of the CAST trial which examined the use of flecainide in the acute post-MI period.

The Cardiac Arrhythmia Suppression Trial Investigators: Preliminary report: Effect of encainide and flecainide on mortality in a randomized trial of arrhythmia suppression after myocardial infarction. *N Engl J Med* 1989;321(6):406-412.

E DC Cardioversion

This patient requires rapid rate or rhythm control to improve cardiac output. DC cardioversion may well be required if the patient deteriorates further. However, currently she is stable with no features of myocardial ischaemia, heart failure, syncope or hypoperfusion. As such, alternative treatment options should be considered initially.

71295

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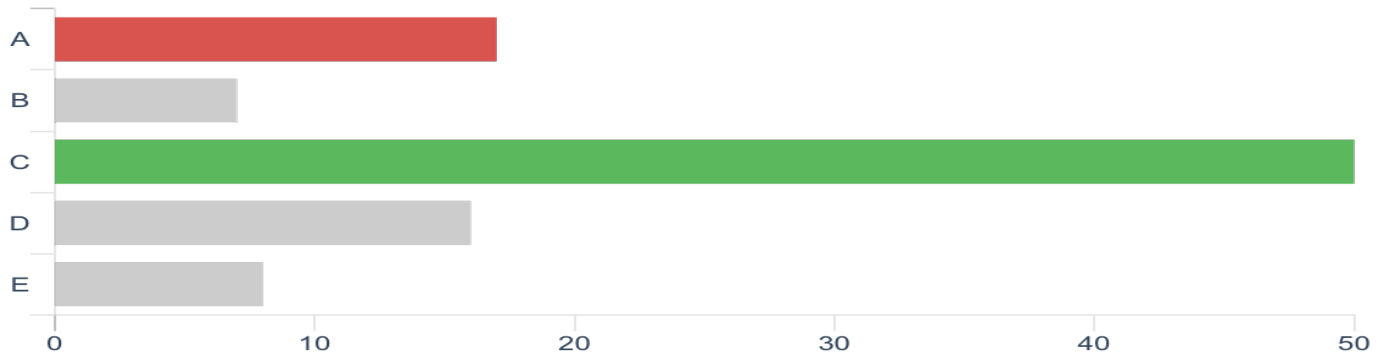
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External Links

Approach to Management of Atrial Fibrillation in the Indian Scenario

[japi.org/april2007/suppliment/Suppliment_30-32.pdf](http://www.japi.org/april2007/suppliment/Suppliment_30-32.pdf)

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What Is Structural Heart Disease?

onlinelibrary.wiley.com/doi/10.1002/clc.4960230603/pdf

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Preliminary Report: Effect of Encainide and Flecainide on Mortality in a Randomized Trial of Ar...

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(<http://www.nejm.org/doi/full/10.1056/NEJM198908103210629>)



Q306

A 52-year-old man with type II diabetes calls the emergency services due to new-onset central chest pain.

When the emergency services he is found to have anterior ST elevation and is transferred directly to the local Percutaneous Coronary Intervention (PCI) Centre. On angiography, he is found to have a lesion of his left anterior descending (LAD) coronary artery, and treatment is planned.

What is the best way to treat this patient and minimise the risk of restenosis?

Your answer was incorrect

- A Bare-metal stent (BMS) insertion
- B Drug-eluting stent (DES) insertion
- C Bare-metal stent and pioglitazone
- D Thrombolysis
- E Coronary artery bypass graft (CABG)

Explanation



- B Drug-eluting stent (DES) insertion

The correct answer is Drug-eluting stent (DES) insertion (Option B).

DES were seen in a 2004 meta-analysis to reduce the relative risk of restenosis in diabetic patients by around 80%, as compared to BMS, in the first year of follow-up. There is a further reduced incidence of restenosis when second-generation DES are compared to first-generation DES.

- A Bare-metal stent (BMS) insertion

Bare-metal stent (BMS) insertion (Option A) is incorrect.

Studies have shown that in patients with type 2 diabetes, coronary stents are liable to a high rate of restenosis at a rate of 40-50% by the end of a 6-month follow-up period. Predictors of restenosis include small vessel size, increased stented length, complex lesion morphology, diabetes mellitus and prior bypass surgery.

C Bare-metal stent and pioglitazone

Bare-metal stent and pioglitazone (Option C) is incorrect.

Pioglitazone has been shown to reduce in-stent restenosis, but given that it is a cause of fluid retention and may worsen heart failure, particularly when combined with insulin, any effect on stent restenosis is subsidiary to the increased risk of heart failure.

D Thrombolysis

Thrombolysis (Option D) is incorrect.

Given that the patient has presented at a PCI Centre, treatment with stent insertion is the recommended therapy.

The National Institute for Health and Care Excellence (NICE) guidelines recommend the following approach for the acute management of myocardial infarction with ST-segment elevation.

Offer coronary angiography, with follow-on primary PCI if indicated, as the preferred coronary reperfusion strategy for people with acute ST-elevation myocardial infarction (STEMI) if:

- presentation is within 12 hours of onset of symptoms and
- primary PCI can be delivered within 120 minutes of the time when fibrinolysis could have been given.

E Coronary artery bypass graft (CABG)

Coronary artery bypass graft (CABG) (Option E) is incorrect.

In most cases, PCI or fibrinolysis can usually restore flow to the ischaemic myocardium more quickly than CABG, largely attributable to delays in getting the patient to the operating room and the time it takes to complete the bypass surgical procedure. Thus, CABG is uncommonly used as the reperfusion strategy of choice in STEMI; it is estimated that CABG is performed in < 5% of cases. NICE guidelines do not recommend the use of CABG in the acute management of STEMI.

71460

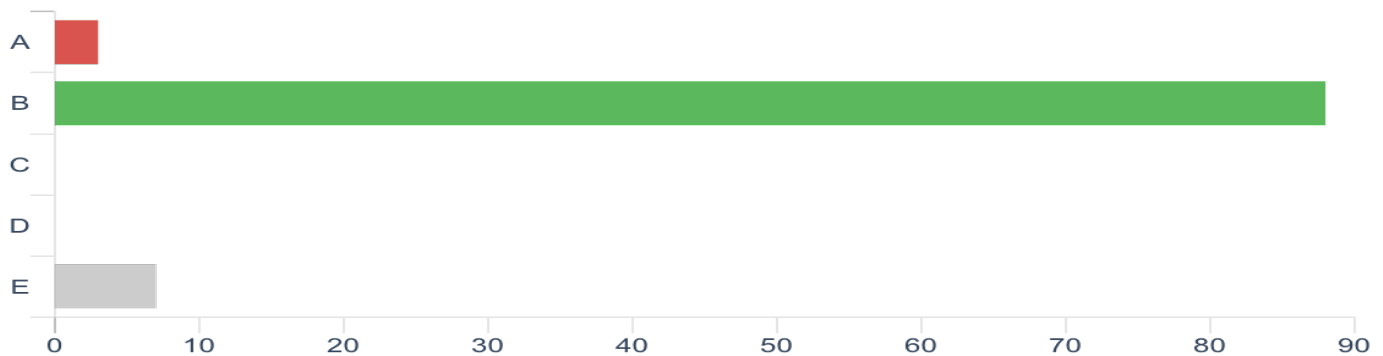
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(<https://www.nice.org.uk/guidance/cg167/chapter/1-Recommendations>)

Expanded Explanation

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Links to NICE guidelines/CKS



Q307

A 32-year-old man presents to the Cardiology Clinic for review. He has been referred because he has had an echocardiogram (ECHO) showing aortic root dilatation.

He has had a history of lens dislocation and his father is known to have Marfan syndrome.

A photograph of his mouth is shown below.



He is concerned about the implications of the aortic root dilatation.

Which of the following treatments would slow the progression of aortic root dilatation?

Your answer was incorrect

- A Aspirin
- B Atorvastatin
- C Azathioprine
- D Bisoprolol
- E Ramipril

Explanation



D Bisoprolol

The picture shows a high arched palate consistent with Marfan's syndrome. Beta blockers, such as bisoprolol, are a useful medication to slow the progression of aortic root dilatation in patients with Marfan's. They slow the time to aortic root dilatation that is sufficient to need surgery by decreasing myocardial contractility and pulse pressure. Ultimately, annual echocardiograms are necessary to monitor for aortic root dilatation. When dilatation progresses to 4.5 cm, surgery can become necessary to prevent aortic dissection and rupture. Alternatives are angiotensin receptor blockers such as losartan.

A Aspirin

Aspirin is an antiplatelet drug and will not affect the progression of aortic root dilatation. It would be useful in coronary artery disease and peripheral vascular disease.

B Atorvastatin

Atorvastatin is a statin and will not affect the progression of aortic root dilatation. It is useful to control elevated lipids and as secondary prevention in atherosclerotic disease.

C Azathioprine

Azathioprine is an immunomodulating drug and will not affect the progression of aortic root dilatation. It is useful as a steroid-sparing agent to control inflammatory conditions such as rheumatoid arthritis and inflammatory bowel disease.

E Ramipril

Ramipril is an angiotensin-converting enzyme (ACE) inhibitor and can be useful in controlling hypertension, which is an important aspect in preventing aortic root dilatation. However, this patient does not have hypertension and this treatment is not going to be helpful currently.

71614

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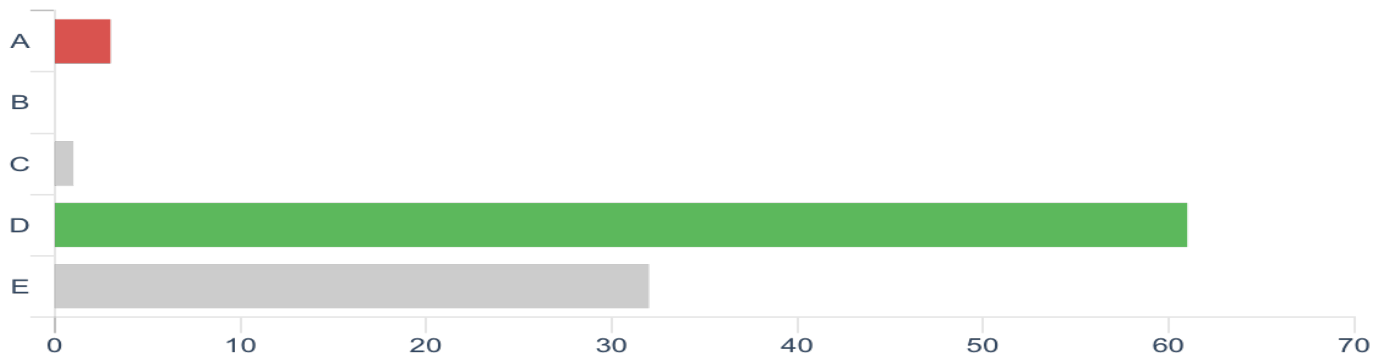
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Q308

You review a 54-year-old woman in the Cardiology Clinic who is tired and lethargic. She has undergone multiple dental extractions during the past few months. There is a past history of Sydenham's chorea, but nothing else of note.

On examination, you notice subungual splinter haemorrhages and an ejection systolic murmur. A trans thoracic echocardiogram (TTE) is performed, the results of which do not confirm the presence of vegetations.

Which of the following is the most appropriate next investigation?

Your answer was incorrect

- A A transoesophageal echocardiogram (TOE)
- B Labelled white cell scan
- C At least three sets of blood cultures from different sites
- D Erythrocyte sedimentation rate (ESR)
- E Plasma viscosity

Explanation



- C At least three sets of blood cultures from different sites

According to Duke's criteria for diagnosis of infective endocarditis, the 2 major criteria would be a positive blood culture of typical organism and presence of vegetation on echocardiogram. In this patient, the index of suspicion is high (dental work, previous history of valvular heart disease, peripheral signs and murmur). Therefore, the initial investigation would be to obtain the blood cultures before starting antibiotic therapy.

Three sets of blood cultures from different sites are positive in 75% of cases of bacterial endocarditis, the suspected diagnosis here. The past history of Sydenham's chorea, (a condition associated with rheumatic fever) is suggestive of a pre-existing valve lesion (Duke's minor), the recent dental work providing a vector for infection. Clinical examination finding of splinters (Duke's minor) and murmur also increases the index of suspicion.

Streptococcus viridans is the usual infecting agent from dental work and is in total responsible for around 60% of cases of subacute bacterial endocarditis. *Staphylococcus aureus* is the most common cause of endocarditis in prosthetic valve disease, acute infective endocarditis, and endocarditis related to IV drug abuse. Benzylpenicillin and gentamicin is the treatment of choice, this being a circumstance when the gentamicin is usually given in divided doses rather than the usual practice of once daily dosing. The antibiotics are normally given for a prolonged period (4-6 weeks) depending on response. Some patients require surgical intervention on their valves due to complications from IE (aortic root abscess, septic emboli, large vegetations causing significant valvular dysfunction).

A A transoesophageal echocardiogram (TOE)

The use of TOE should be reserved for cases where the transthoracic echocardiogram was inconclusive. However, three sets of blood cultures is a much less invasive way of confirming a major criteria and hence diagnosis in this case. If blood cultures were negative, then you would consider TOE.

B Labelled white cell scan

A labelled white cell scan would be indicated if both TTE and TOE were inconclusive for infective endocarditis to find the source of sepsis. It would not be indicated as a first line investigation for suspected infective endocarditis.

D Erythrocyte sedimentation rate (ESR)

ESR will be raised in the presence of any inflammatory process. Although it might aid in the diagnosis, it is too non-specific to help and therefore would not be the best initial investigation although one might still perform it as part of the initial workup.

E Plasma viscosity

Like ESR, PV is raised in inflammatory processes. The low specificity makes it a less useful test.

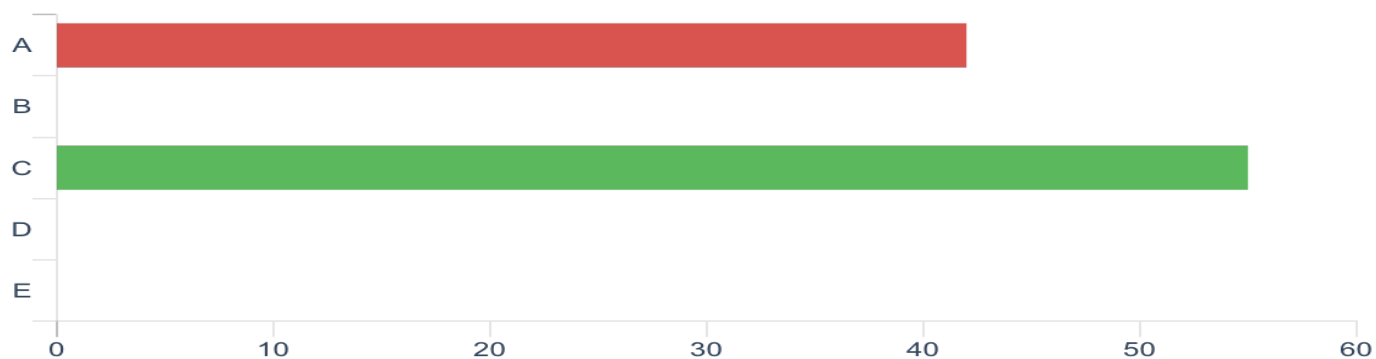
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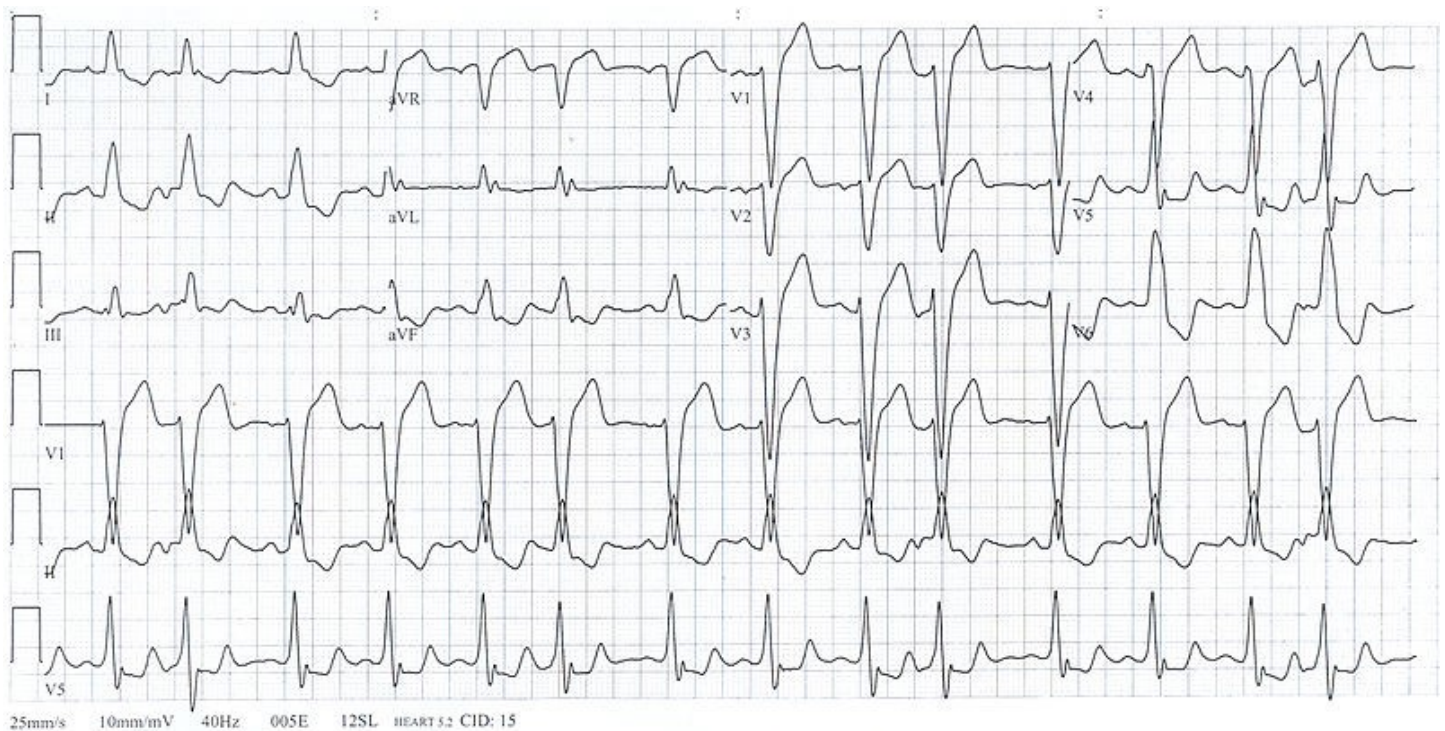
Overview**Clinical Presentation****Differential Diagnosis****Diagnosis / Investigation****Management****Prognosis**

Q309

A 51-year-old man presents to the Emergency Department (ED) with chest pain. It is central and does not radiate. He describes some previous exertional angina, and the pain is associated with mild shortness of breath and clamminess. A troponin level is awaited.

A previous electrocardiogram (ECG) undertaken one year ago was normal.

An ECG taken at triage is shown below:



What is the ECG finding in this presentation?

Your answer was incorrect

- A Anterior ST elevation
- B Bifascicular block
- C Left bundle branch block (LBBB)
- D Right bundle branch block (RBBB)
- E Trifascicular block

Explanation



C Left bundle branch block (LBBB)

The QRS morphology in this ECG suggests a left bundle branch block, with an 'M'-shaped QRS complex in lead aVL, a notched R wave in lead I and a monophasic R wave in lead V6. In the context of chest pain and new LBBB, a myocardial infarction is highly likely.

A Anterior ST elevation

This ECG demonstrates a new LBBB, and while there are some suspicious changes in the anterior leads, these cannot be interpreted in the context of a new LBBB.

B Bifascicular block

Bifascicular block is the combination of RBBB and either left anterior or left posterior fascicular block. These are not present.

D Right bundle branch block (RBBB)

The diagnostic criteria for RBBB include broad QRS (> 120 ms), RSR' pattern in leads V1–3 and wide, slurred S wave in the lateral leads.

E Trifascicular block

Trifascicular block is a combination of bifascicular block and heart block. Neither of these are present on this ECG.

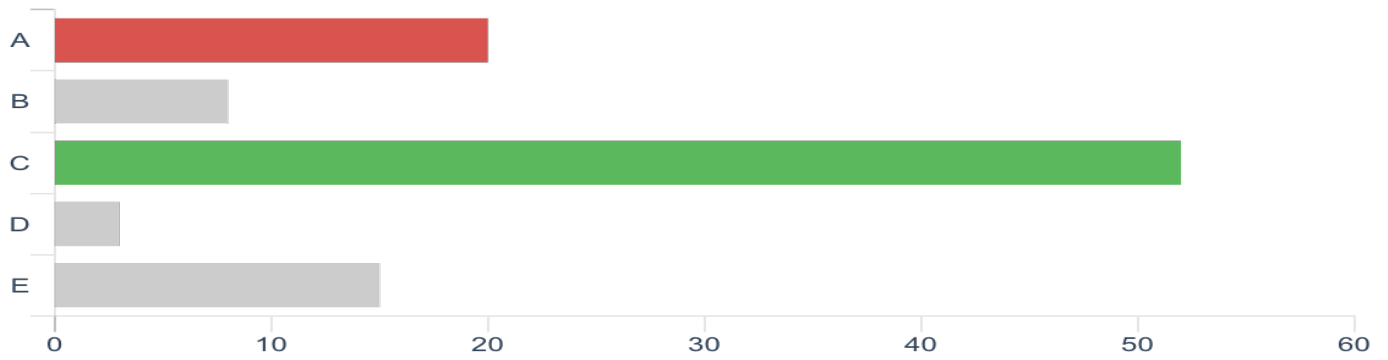
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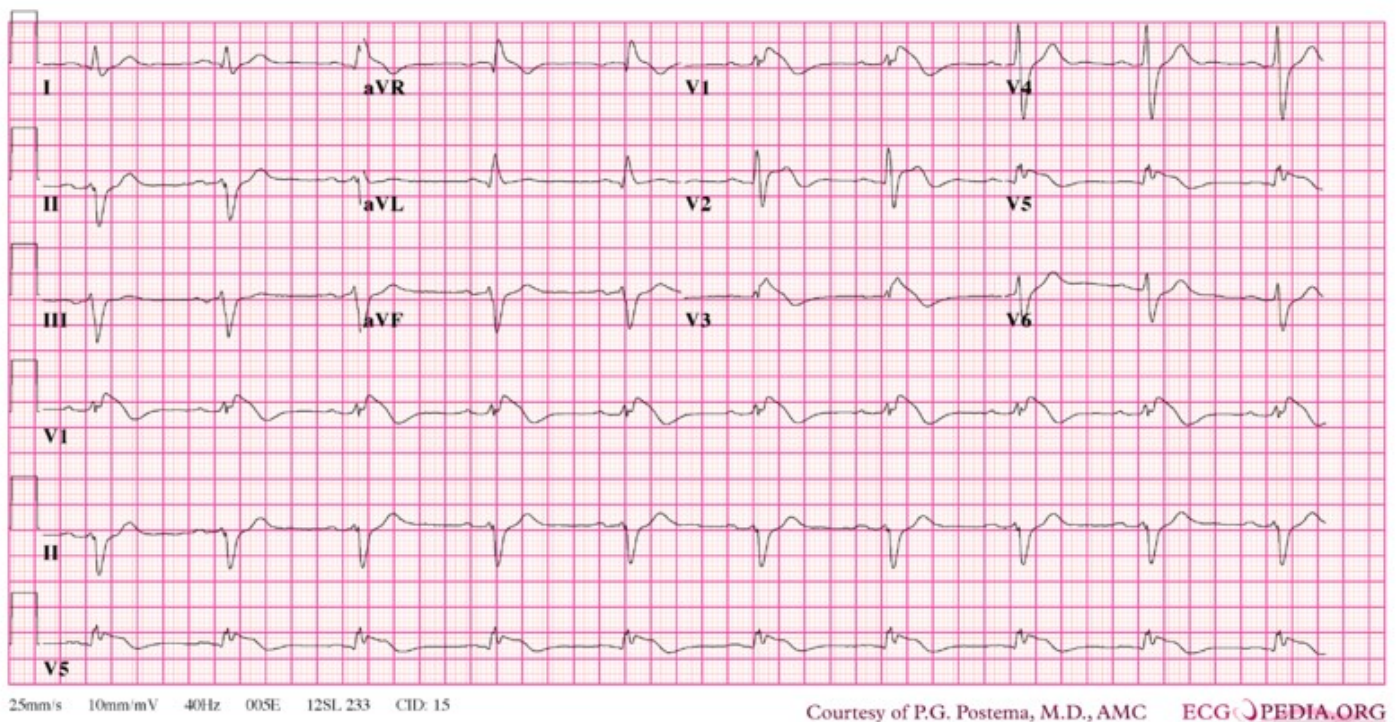
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Q310

A 27-year-old man presents to the Cardiology Clinic following a referral from the Armed Forces after an abnormal electrocardiogram (ECG). He has been asymptomatic, other than one fainting episode three months ago, which he put down to the warm weather.

His ECG is shown below:



What is the most likely cause of his ECG changes?

Your answer was incorrect

- A Bifascicular block
- B Brugada syndrome
- C Left bundle branch block
- D Trifascicular block
- E Wolff-Parkinson-White syndrome

Explanation



B Brugada syndrome

This is Brugada syndrome, a cause of sudden cardiac death, featuring Brugada waves on the ECG and a history of collapse. The Brugada wave is a coved ST segment elevation of > 2 mm in more than one the V1-V3 leads, followed by an inverted T wave. The only truly effective management of Brugada syndrome is via an implantable cardioverter-defibrillator.

A Bifascicular block

Bifascicular block is the combination of right bundle branch block (RBBB) with either left anterior fascicular block or left posterior fascicular block. This ECG shows Brugada waves.

C Left bundle branch block

There is no evidence of left bundle branch block on this ECG, while Brugada waves are present. This, in addition to the history of syncope, suggests Brugada syndrome.

D Trifascicular block

Trifascicular block is the combination of bifascicular block and atrioventricular (AV) node block. This is absent on this ECG. Instead there are Brugada waves, which, in conjunction with syncope, point to Brugada syndrome.

E Wolff-Parkinson-White syndrome

ECG changes in Wolff-Parkinson-White syndrome include shortened PR interval, wide QRS complexes and delta waves, rather than the Brugada waves on this ECG.

ECG - Brugada Syndrome - By CardioNetworks: [] [CC BY-SA 3.0 (<https://creativecommons.org/licenses/by-sa/3.0/>)], via Wikimedia Commons

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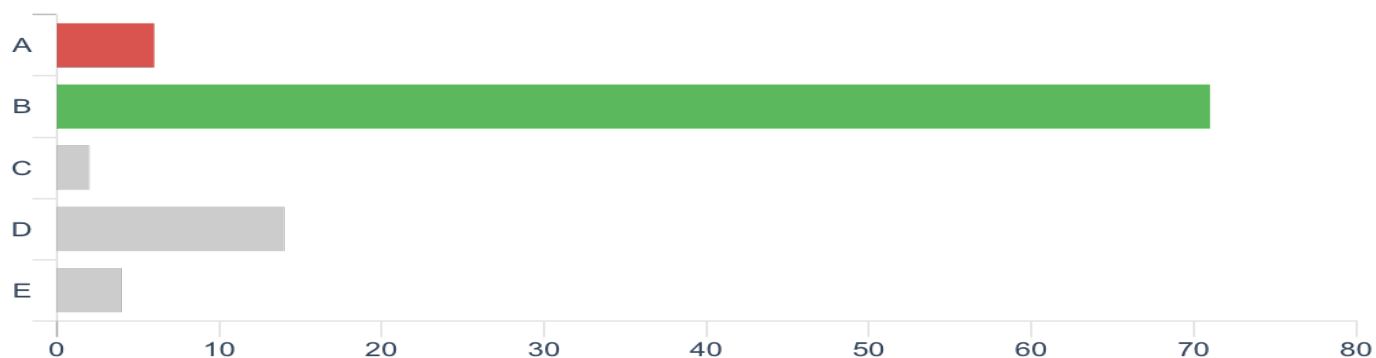
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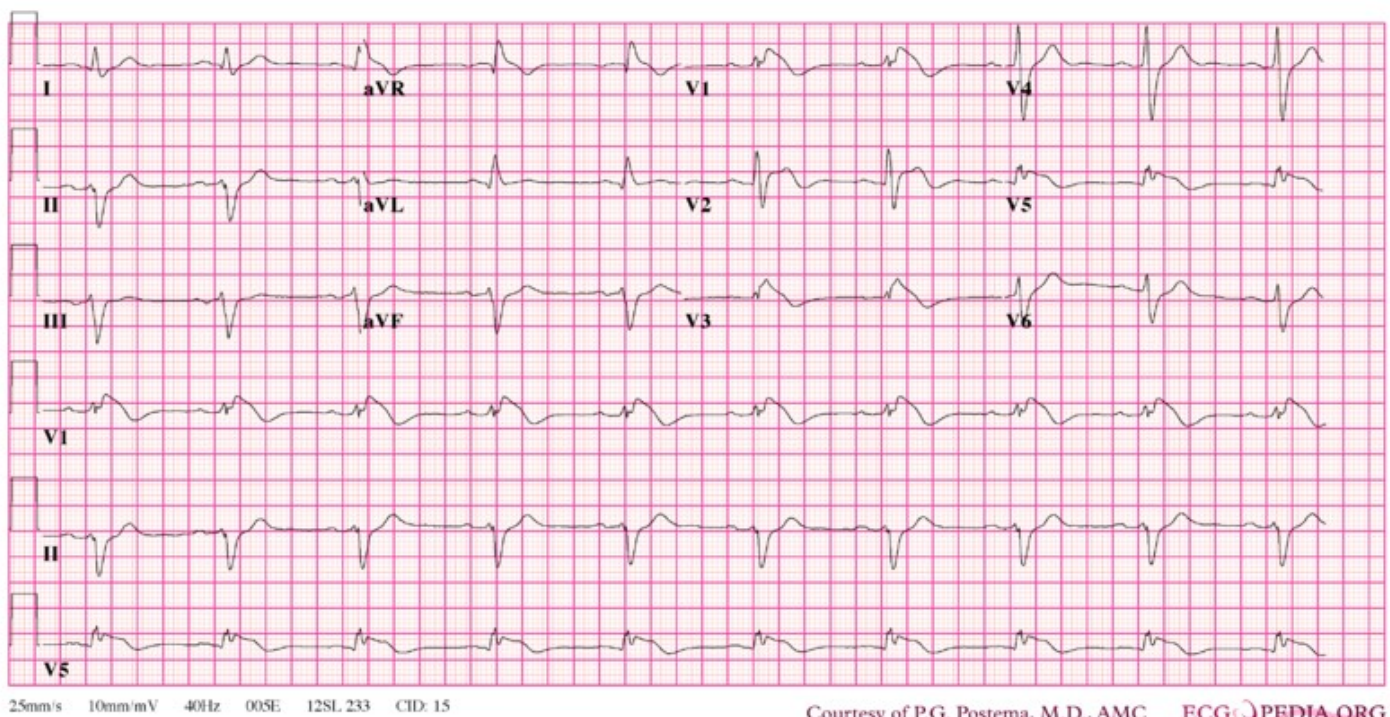
Links to NICE guidelines/CKS



Q311

A 31-year-old man is admitted to the Emergency Department (ED) following a collapse on a night out. His friends, who brought him in, state that he had been drinking since early afternoon, which included around eight pints of lager. He does this most weekends, but this is the first time he has collapsed. There was no obvious seizure activity and no head injury. One friend states that he suspects the patient has had cocaine, but the patient denies this. He has completely recovered from his collapse but remains intoxicated.

His electrocardiogram (ECG) is shown below:



What is the most appropriate management plan?

Your answer was incorrect

- A Bisoprolol 2.5 mg orally
- B Chlordiazepoxide reducing regime
- C Implantable cardioverter-defibrillator (ICD)

- D No further management required
- E Permanent pacemaker

Explanation



- C Implantable cardioverter-defibrillator (ICD)

This is Brugada syndrome, as evidenced by the Brugada waves on the ECG and the history of syncope. The Brugada wave is a coved ST segment elevation of > 2 mm in more than one of the V1-V3 leads, followed by an inverted T wave. The only effective management of Brugada syndrome is via Implantable cardioverter-defibrillator (ICD) implantation. Of note, alcohol excess may unmask Brugada syndrome, which can be transiently visible on an ECG.

- A Bisoprolol 2.5 mg orally

This is Brugada syndrome, a cause of sudden cardiac death requiring treatment. The only truly effective management of Brugada syndrome is via an ICD, as medical therapy will not suffice.

- B Chlordiazepoxide reducing regime

While intoxication is a common cause of collapse and a differential diagnosis before an ECG being undertaken, the ECG here reveals Brugada syndrome, which must be managed with an ICD. Regardless, the patient does not appear to be alcohol-dependent, rather a binge drinker, and chlordiazepoxide is unlikely to be of benefit.

- D No further management required

The ECG in this case features Brugada waves and this, in conjunction with syncope, is highly suggestive of Brugada syndrome. This requires treatment, as it may lead to sudden cardiac death.

- E Permanent pacemaker

Permanent pacemaker is ineffective in Brugada syndrome, and the favoured treatment is ICD implantation.

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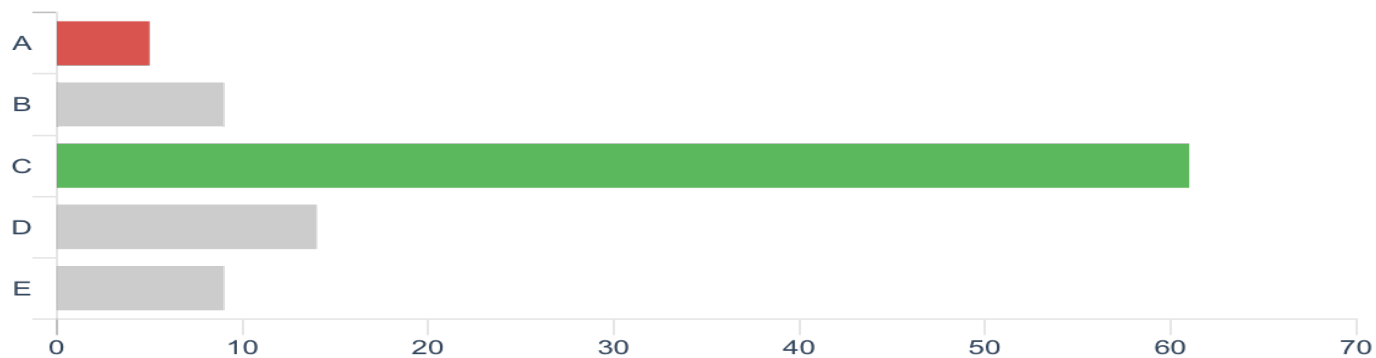
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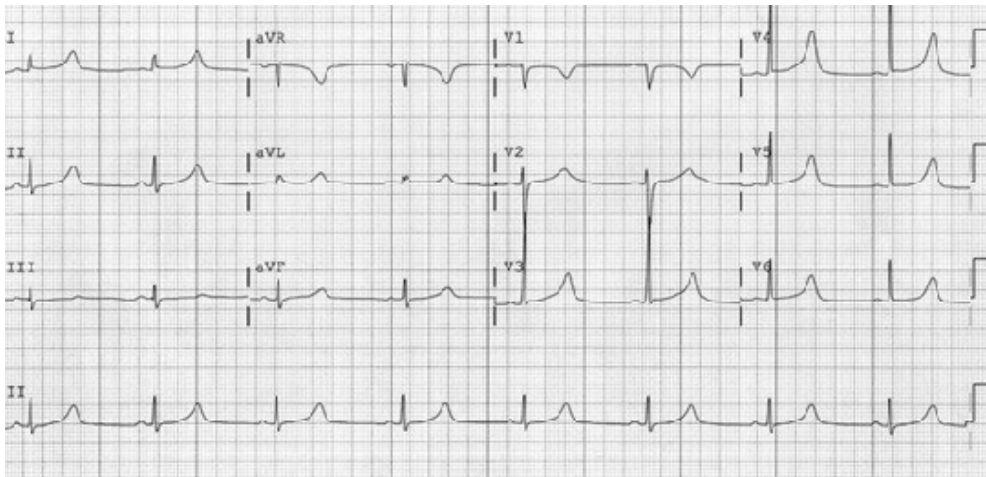
Links to NICE guidelines/CKS



Q312

A 25-year-old woman with no past medical history is admitted to the Emergency Department (ED) following a collapse. This is the third such episode; however it is the first time that she has sought medical advice. There were no witnesses, but she denies postictal symptoms, chest pain or palpitations. She thinks she has an uncle who passed away suddenly in his thirties but is unaware of the circumstances.

Her electrocardiogram (ECG) is shown below.



What is the most likely cause of her collapse?

Your answer was incorrect

- A Brugada syndrome
- B Dilated cardiomyopathy
- C Hypertrophic obstructive cardiomyopathy (HOCM)
- D Romano-Ward syndrome
- E Wolff-Parkinson-White syndrome

Explanation



- D Romano-Ward syndrome

This is a young person with prolonged QT. Romano-Ward syndrome is the most common inherited cause of long QT. It should be remembered that medication is usually the most common cause of long QT; however, in the absence of a drug history here, Romano-Ward syndrome is the most likely answer.

A Brugada syndrome

Brugada syndrome is a cause of sudden cardiac death and important to rule out. This should be considered particularly, given the family history of early sudden cardiac death. However, this presents with the Brugada sign on the ECG, which is absent here. Long QT is present instead.

B Dilated cardiomyopathy

Dilated cardiomyopathy is an inherited cause of heart failure, stroke, arrhythmia and sudden cardiac death. However, ECG usually shows sinus tachycardia, left bundle branch block or non-specific changes, unlike long QT on this ECG.

C Hypertrophic obstructive cardiomyopathy (HOCM)

Hypertrophic cardiomyopathy is a very important cause to rule out, given it is associated with sudden cardiac death in otherwise asymptomatic individuals. ECG changes include left ventricular hypertrophy, ST changes and T wave inversion, rather than QT prolongation.

E Wolff-Parkinson-White syndrome

Wolff-Parkinson-White syndrome can cause collapse and sudden cardiac death. However, ECG changes include shortened PR interval, wide QRS complexes and delta waves, rather than the long QT in this stem.

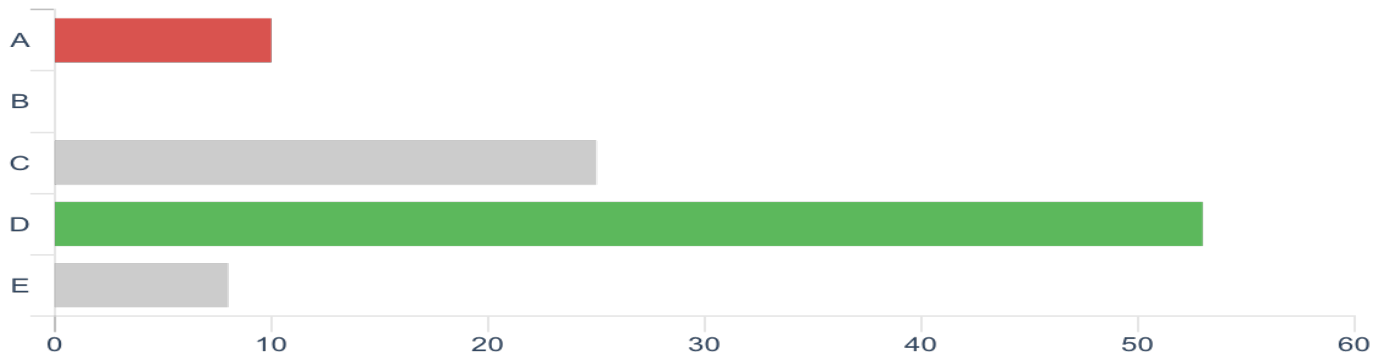
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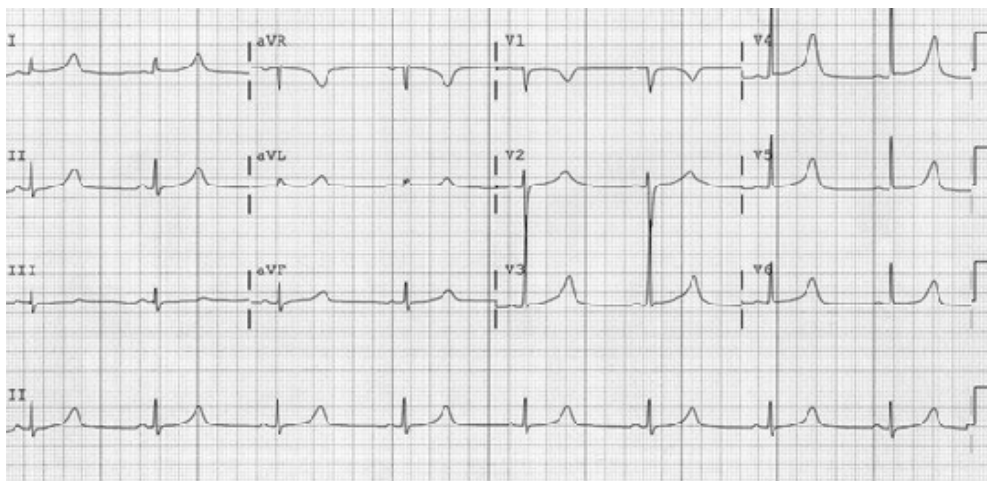
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Q313

An 84-year-old man requires review in the Emergency Department (ED) following a collapse. He has been admitted for a recent fractured neck of femur, which required a hemiarthroplasty. He has a urine dip which is positive for nitrites and leukocytes. He has been increasingly confused over the last 48 hours since his surgery, and his abbreviated mental test score (AMTS) has varied between 3/10 and 5/10. His medications include subcutaneous enoxaparin, amlodipine 5 mg once daily, bisoprolol 1.25 mg once daily, salbutamol as required, codeine 30 mg as required, paracetamol 1 g four times daily, atorvastatin 40 mg at night, and haloperidol 500 µg.

His electrocardiogram (ECG) is shown below:



What is the most appropriate initial management step?

Your answer was incorrect

- A Commence trimethoprim
- B Discontinue codeine
- C Discontinue haloperidol
- D Increase bisoprolol dose
- E Implantable cardioverter-defibrillator (ICD)

Explanation



C Discontinue haloperidol

This case features long QT on the ECG, which is likely due to medication. A review of this patient's medication will highlight haloperidol, which is known to prolong QT interval. He likely received this for post-operative delirium. While beta blockage, implantable cardioverter-defibrillator (ICD) insertion or cardiac pacing may be required if the QT interval does not shorten, the initial step should be to deal with the underlying cause.

A Commence trimethoprim

While the confusion and collapse could be due to infection post-operatively, the ECG shows long QT, which must be managed quickly. Note that the positive urine dip here is a red herring; the urine dip is not an effective test for urinary tract infection (UTI) in patients over the age of 65, as per Scottish Intercollegiate Guidelines Network (SIGN) 88 guidelines, due to false positives and negatives.

B Discontinue codeine

This ECG shows long QT which must be managed appropriately. A medication review is the first step here. However, codeine is not linked to long QT and is not the appropriate medication to stop in this case. Moreover, the patient is post-surgery and will require appropriate pain relief.

D Increase bisoprolol dose

While increased beta blockade can be an important treatment of long QT, the first step must be to deal with the underlying cause; here this is likely haloperidol.

E Implantable cardioverter-defibrillator (ICD)

While ICD implantation can be an important treatment for long QT resistant to beta blockade, the first step must be to deal with the underlying cause; here this is likely haloperidol.

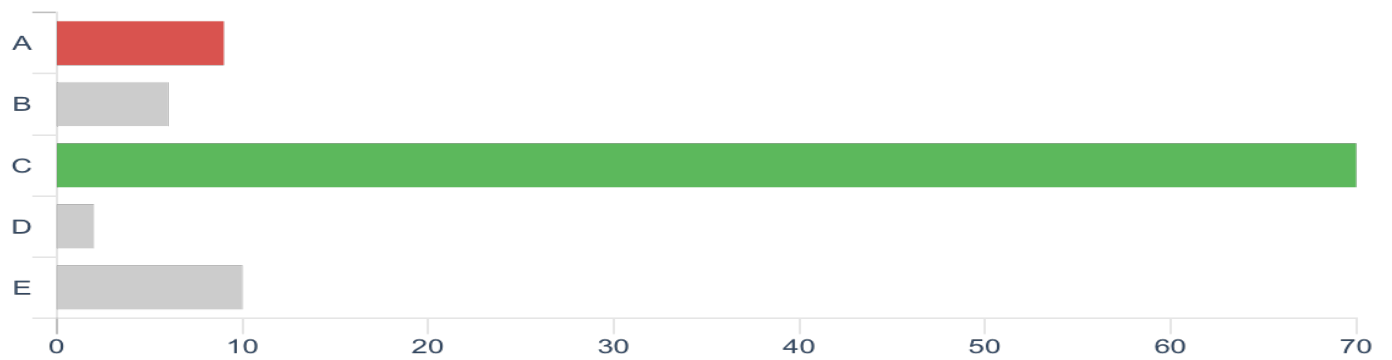
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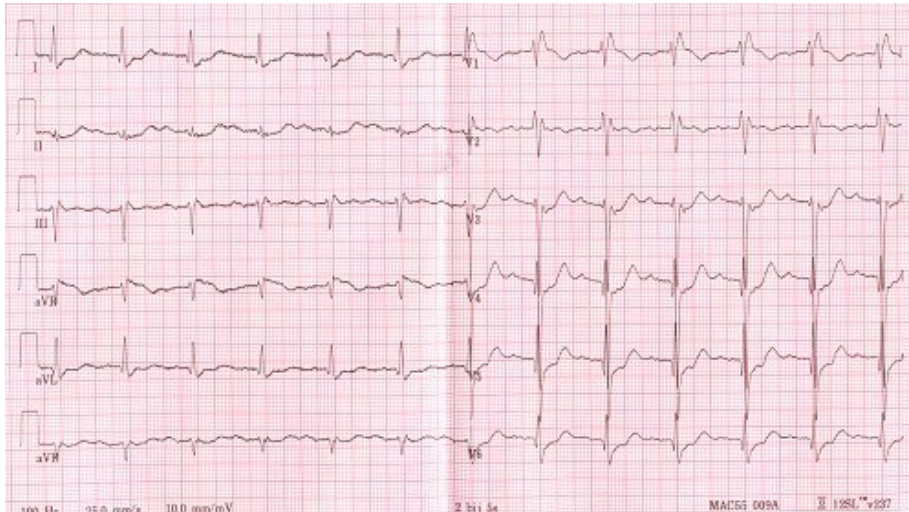
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Q314

A 45-year-old woman is admitted to the Emergency Department (ED) following a collapse. She does not recall any prodromal symptoms, including palpitations or light-headedness, stating she 'must have tripped'. There were no postictal symptoms. She has no known past medical history.

An electrocardiogram (ECG) is undertaken, the results of which are shown below:



What is the most likely cause of her collapse?

Your answer was incorrect

- A Bifascicular block
- B Brugada syndrome
- C Complete heart block
- D First-degree heart block
- E Trifascicular block

Explanation

- E Trifascicular block



Trifascicular block is the combination of bifascicular block (right bundle branch block with either left anterior fascicular block or left posterior fascicular block) and atrioventricular node block. This is present on this ECG. It is likely, given the patient is symptomatic, that they will require cardiac intervention, including pacing.

A Bifascicular block

Bifascicular block is the combination of right bundle branch block (RBBB) with either left anterior fascicular block or left posterior fascicular block. This is present on this ECG. However, first-degree heart block is also present, making this trifascicular block.

B Brugada syndrome

Brugada syndrome is a cause of sudden cardiac death and important to rule out. However, this presents with the Brugada sign on the ECG and clinical features, including a family history of early sudden cardiac death or ventricular tachycardia (VT)/ventricular fibrillation (VF).

C Complete heart block

In complete heart block, there is no relationship between P waves and QRS complexes. This is not present on this ECG.

D First-degree heart block

First-degree heart block is present on this ECG; however, there is also left axis deviation and right bundle branch block, making this a trifascicular block.

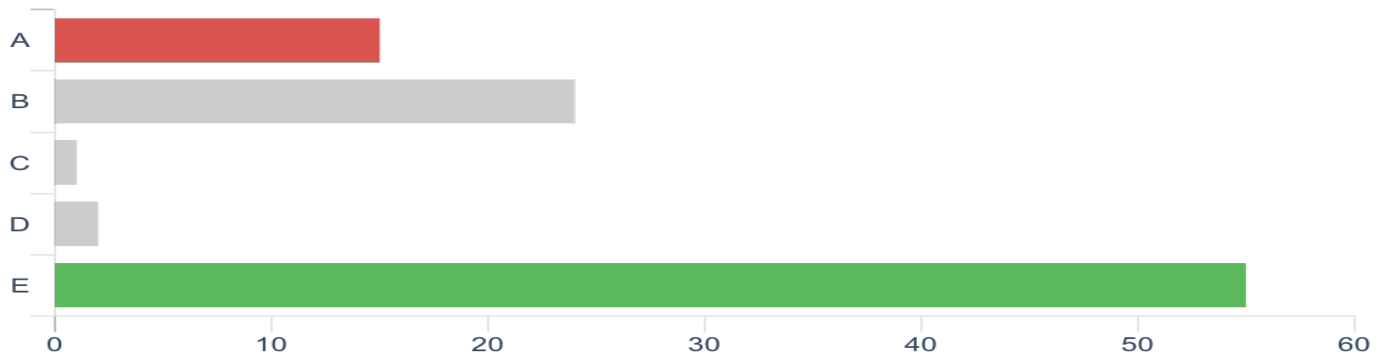
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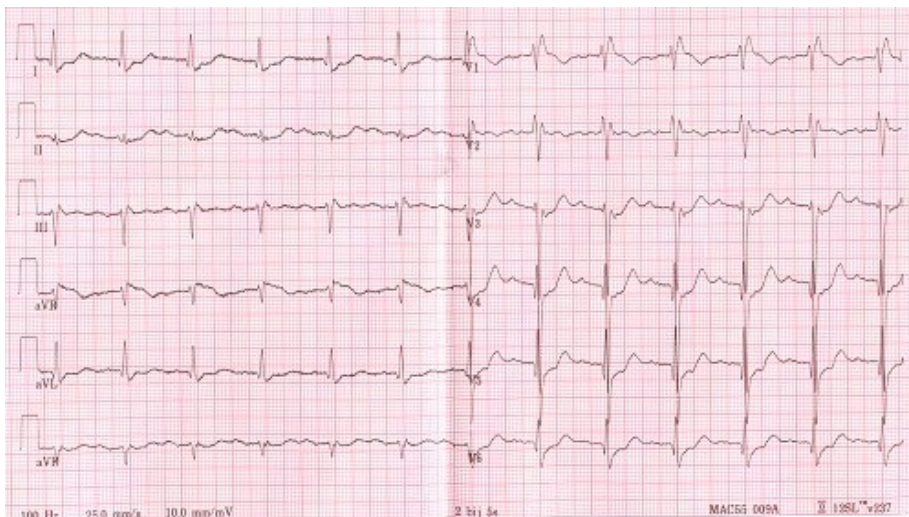
Q315

A 61-year-old man is admitted to the Cardiology Clinic after a collapse. He does not recall the circumstances surrounding the fall, but states that he has been getting chest tightness on exertion lately. This is his third such collapse in six months. He has a background of previous non-ST elevation myocardial infarction (NSTEMI) and has an ejection systolic murmur on auscultation.

On examination, his lying blood pressure (BP) is 135/85 mmHg, while his standing (BP) is 133/80 mmHg.

An echocardiogram (ECHO) reveals an ejection fraction of approximately 40%, moderate left ventricular (LV) systolic function, and moderate aortic stenosis (AS).

An electrocardiogram (ECG) is shown below:



What is the most appropriate intervention?

Your answer was incorrect

- A Implantable cardioverter-defibrillator (ICD)
- B No intervention required
- C Percutaneous coronary intervention (PCI)
- D Permanent pacemaker (PPM) implantation
- E Transcatheter aortic valve implantation (TAVI)

Explanation



D Permanent pacemaker (PPM) implantation

This is a symptomatic trifascicular block, as demonstrated on the ECG. Trifascicular block is the combination of bifascicular block (right bundle branch block with either left anterior fascicular block or left posterior fascicular block) and atrioventricular node block. In symptomatic trifascicular block, where other causes are not suspected, Permanent pacemaker (PPM) implantation is required. This is particularly pertinent if complete heart block or second-degree heart block are also present.

A Implantable cardioverter-defibrillator (ICD)

ICD is usually indicated in those who have had a life-threatening arrhythmia or who are at risk of such an arrhythmia, including Brugada syndrome, long QT or hypertrophic cardiomyopathy. This is a symptomatic trifascicular block and requires a PPM.

B No intervention required

This is a symptomatic trifascicular block and requires a PPM; otherwise, it may lead to a fatal episode or further collapse.

C Percutaneous coronary intervention (PCI)

His history of exertional chest pain could be consistent with ischaemia (which in this patient would probably be due to his aortic stenosis), however, the ECG does not show a STEMI and there are no signs of acute ischaemia, therefore there is no indication for PCI.

E Transcatheter aortic valve implantation (TAVI)

While this patient has aortic stenosis, this is measured as moderate. They may eventually require a TAVI if the stenosis worsens. However, it is more likely that these collapses are secondary to trifascicular block shown on the ECG.

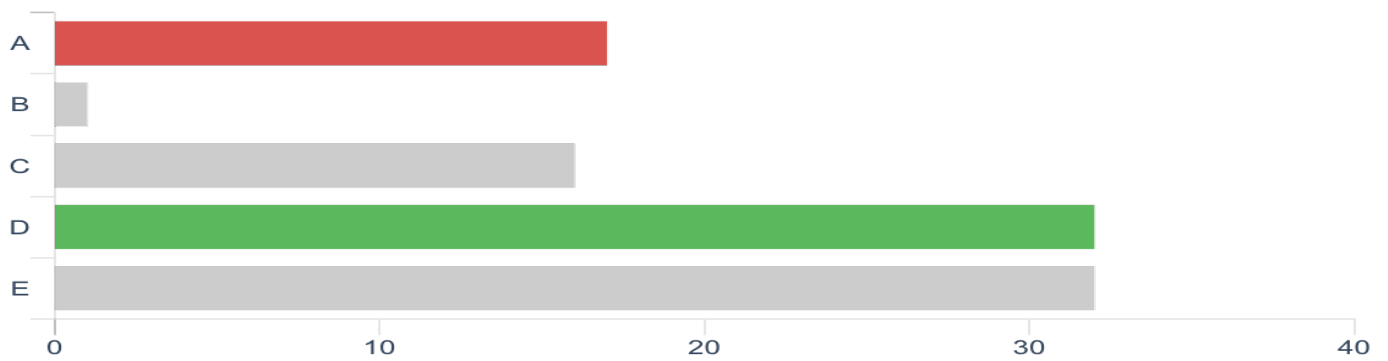
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