

➤ **Hypoventilation**, where inadequate alveolar ventilation results in low alveolar PO_2 , is the only cause of hypoxia that inevitably causes raised $PaCO_2$.

- A decrease in the area of the lung available for gas exchange (such as in chronic bronchitis)
- Neuromuscular problems (**respiratory muscle weakness**) (Guillain-Barre syndrome motor neuron disease)
- Deformed (kyphoscoliosis), rigid (ankylosing spondylitis), or flail chest.

Bronchial Asthma

Basics

Immunomodulators involved in asthma:

Inhalation of allergens by individuals with atopic asthma initiates:

• **Immediate response:**

➤ **type I hypersensitivity** (IgE)

immunomodulators involved:

➤ **mast cells**

➤ histamine

➤ Result in immediate bronchoconstriction reaction

➤ Usually subsides within two hours

➤ Reversible with bronchodilators.

• **Late phase:**

➤ **type IV hypersensitivity response**

➤ immunomodulators involved:

➤ Eosinophil cationic protein (ECP)

➤ Major basic protein (MBP)

➤ Results in bronchoconstriction, airways inflammation, hyper-responsiveness and oedema. (**Status asthmaticus**)

➤ This **typically occurs three to 12 hours after the immediate response**

➤ Less susceptible to bronchodilators.

Pathogenesis of asthma:

- **Asthma occurs due to a combination of airway hyper-responsiveness, airflow limitation and airway inflammation**
- **The alveolar functional structure is preserved in asthma.**

Genetics of bronchial asthma

- autosomal recessive pattern of inheritance is prominent in asthma;
- parental consanguinity (صلة قرابة) and **serum intracellular cell adhesion molecule-1 (ICAM-1)** is significantly associated with asthma
- **There is a contribution from HLA alleles**

* **occupational asthma:** get better when he in holiday or out of work.
غالباً يكون سبب formalkhazale, cotton dust, wood dust, NO

* Chronic cough is the 1st presentation of asthma.

asthma / extrinsic: atopic, IgE mediated
intrinsic: No

630

Pulmonology

relation to atopy

- There may be genetic linkage of atopic trait to chromosome 11, with association between response to antigen and HLA haplotype.
- IgE concentrations are influenced by genetic factors.

asthma مريض يكون غالباً male أكثر من female بكونه equal بداراهم بغير غالب female أكثر.

Classification of asthma severity

- **Mild, intermittent asthma** - symptoms occur less than weekly, with normal or near-normal lung function between episodes
- **Mild persistent asthma** - symptoms occur more than weekly but less than daily, with normal or near-normal lung function between episodes
- **Moderate persistent asthma** - symptoms occur daily, with mild to moderate variable airflow limitation
- **Severe persistent asthma** - symptoms occur daily and interfere with normal activities; there is frequent nocturnal waking and moderate to severe variable airflow limitation
- **Severe asthma** - severe distressing symptoms prevent sleep; severe airflow limitation responds poorly to inhaled bronchodilators and can be life-threatening

Near fatal asthma

- The British Thoracic Society defines **near fatal asthma as an attack with raised PaCO_2** and/or requiring mechanical ventilation with raised inflation pressures.
- A **raised PaCO_2** is an important sign that intubation may be required if the patient is not responding to maximum medical management.

Allergic and non-allergic forms of asthma

- Allergic asthma (**extrinsic**)
 - results from excess immunoglobulin E (IgE) produced in response to environmental allergens such as house dust mites, pollen and moulds.
- Non-allergic asthma (**intrinsic**)
 - can be triggered by factors such as anxiety, stress, exercise, cold air, smoke and infection.

• **comorbid condition exacerbate asthma:** aspergillosis, obstructive sleep apnea, GERD, obesity.

Diagnosis of asthma in adults

Asthma - intermediate probability - do spirometry first-line

include challenge test لو المريض ما يستجيب لـ steroid
for asthma.

أsthma diagnosis - if high probability of asthma - start treatment

histamine / obstructive
في

- If the $\text{FEV}_1/\text{FVC} < 0.7$ then a trial of treatment is appropriate. Otherwise further investigations should be performed.
- If a patient has typical symptoms of asthma, a trial of treatment is recommended.
- we should classify patients as having either a high, intermediate or low probability of asthma based on the presence or absence of certain symptoms.
- For adults it is recommend that they have a **clinical assessment including spirometry** (or Peak Expiratory Flow measurement if spirometry is not available).
- The BTS produced a list of features, which are helpful when deciding this:

Pulmonology

Features which make a diagnosis of asthma more likely

More than one of the following symptoms: wheeze, breathlessness, chest tightness and cough, **particularly if:**

- symptoms worse at night and in the early morning
- symptoms in response to exercise, allergen exposure and cold air
- symptoms after taking aspirin or beta blockers
- History of atopic disorder *eczema*
- Family history of asthma and/or atopic disorder
- Widespread wheeze heard on auscultation of the chest
- Otherwise unexplained low FEV₁ or PEF (historical or serial readings)
- Otherwise unexplained peripheral blood eosinophilia

Features which make a diagnosis of asthma less likely

Prominent dizziness, light-headedness, peripheral tingling
Chronic productive cough in the absence of wheeze or breathlessness
Repeatedly normal physical examination of chest when symptomatic
Voice disturbance
Symptoms with colds only
Significant smoking history (ie > 20 pack-years)

Cardiac disease (*cardiac asthma*)
Normal PEF or spirometry when symptomatic

طبيب أمراض صدرية: لطيف خريز
(٨٢) فكام بالحرف

بعد فكام
after give bronchodilator
عشان ال wheeze كف

• High probability of asthma

- patient has many symptoms which make a diagnosis of asthma more likely
- BTS recommend that we start a trial of treatment.
- A good response is considered a positive 'test of reversibility'.
- If a patient has a poor response to treatment then further investigations should be considered.

• Low probability of asthma

- an alternative diagnosis should be sought.
- Further investigations and referral to a respiratory specialist should be considered.

• Intermediate probability of asthma

- BTS recommend 'to carry out further investigations, including an explicit trial of treatments for a specified period, before confirming a diagnosis and establishing maintenance treatment.
- Spirometry is the preferred initial test
- Treatment should be partly guided by the **FEV₁/FVC ratio**:
 - ❖ a ratio of < 0.7 is suggestive of asthma → trial of treatment
 - ❖ a ratio of > 0.7 → further investigation/consider referral

بـ فار عاكس بـ فار عاكس

Spirometer vs peak flow meter

- **Spirometer** measures the total volume of air that can be exhaled or inhaled. It can also measure the rate at which a certain volume of air is expelled from the lungs.
- Spirometry is the most accurate breathing test for asthma.

- spirometry may be normal in asymptomatic patients so it may be necessary to repeat spirometry or peak flow readings on a number of occasions in patients where the diagnosis is not clear.
- In adults with obstructive spirometry, an **improvement in FEV1 of 12% or more** in response to either β_2 agonists or corticosteroid treatment trials, together with an **increase in volume of 200 ml or more**, is regarded as a positive test. (British guideline on the management of asthma 2016) **(this fact was tested in mrcp part 1 sep 2017)**
- **Peak flow meter**, on the other hand, only measures the rate at which air is forced out of the lungs. This is known as the peak expiratory flow.
 - It is now advised to interpret peak flow variability with caution due to the poor sensitivity of the test
 - diurnal variation % = $[(\text{Highest} - \text{Lowest PEFr}) / \text{Highest PEFr}] \times 100$
 - assessment should be made over 2 weeks
 - **greater than 20% diurnal variation is considered significant**
 - A variation of $> 25\%$ on a peak flow chart (pre- and post-bronchodilator) would support a diagnosis of asthma.

NICE quality statement : **Adults with new onset asthma are assessed for occupational causes.**

- Are you better on days away from work?
- Are you better on holiday?

asthma diagnosis (NICE guidelines 2017) *trade mark is subtle exercises like bicycle and FEV1 $\geq 20\%$ $\therefore$ asthma.*

- **Patients ≥ 17 years**
 - patients should be asked if their symptoms are better on days away from work/during holidays. If so, patients should be referred to a specialist as possible occupational asthma
 - all patients should have spirometry with a bronchodilator reversibility (BDR) test
 - all patients should have a FeNO test
- **Patients 5-16 years**
 - all patients should have spirometry with a bronchodilator reversibility (BDR) test
 - a FeNO test should be requested if there is normal spirometry or obstructive spirometry with a negative bronchodilator reversibility (BDR) test
- **Patients < 5 years**
 - diagnosis should be made on clinical judgement Do not use symptoms alone without an objective test to diagnose asthma.

Objective tests for diagnosing asthma:

- **Airway inflammation measures**
 - Fractional exhaled nitric oxide (FeNO) test *confirm eosinophilic asthma*
 - FeNO level of 40 parts per billion (ppb) or more is a positive test.
 - current smoking status can lower FeNO levels

- **Lung function tests**

- Peak flow variability: variability over 20%
- Direct bronchial challenge test with histamine or methacholine: PC20 of 8 mg/ml or less

forced expiratory flow 25–75% of vital capacity (FEF 25–75)

- One of parameters measured in spirometry
- the flow (or speed) of air coming out of the lung during the middle portion of a forced expiration.
- **It reflects the status of the small airways**
- **It is more sensitive than the forced expiratory volume in 1 second (FEV1) for identifying early airway obstruction.**
- This portion of the flow volume curve is the most **effort independent** portion.
- A normal FEF₂₅₋₇₅ was defined as $\geq 60\%$ predicted.

Lab findings

- sputum

➤ Curschmann's spirals

- microscopic finding in the sputum of asthmatics.
- spiral-shaped mucus plugs from subepithelial mucous gland ducts or bronchioles.

➤ Charcot-Leyden crystals

- microscopic crystals found in allergic diseases such as asthma or parasitic infections
- hallmark of eosinophil-associated allergic inflammatory diseases such as asthma, allergic rhinitis and also atopic dermatitis.
- formed from the breakdown of eosinophils in sputum and crystallization of major basic protein.

بأن المريض يجرى أسبوعين متتاليين العلاج 4 أسبوعين عتاش أمداد asthma severity 1) presence of symptom ≥ 2 weeks 2) night awake because of asthma

Management of asthma (NICE guidance 2017).

One of the key changes is in 'step 3' - patients on a SABA + ICS whose asthma is not well controlled should be offered a leukotriene receptor antagonist, not a LABA

3) use SABA ≥ 2 weeks

4) limitation of activity because of asthma.

Step	Notes
1 Newly-diagnosed asthma	Short-acting beta agonist (SABA) عنقود أوفوفوبون ICS لأو ينز <u>exacerbation</u>
2 Not controlled on previous step OR Newly-diagnosed asthma with symptoms	SABA + low-dose inhaled corticosteroid (ICS)

Management

- In acute severe asthma, **$\beta 2$ -agonists should be administered as soon as possible, preferably nebulised driven with high flow oxygen.**
 - salbutamol administration can rapidly worsen the V/Q mismatch which is the cause of hypoxia in asthma. They can therefore cause reduction in arterial oxygen tension unless supplemental oxygen is given

Physiologic changes following a nebuliser in acute asthma:
initially, poor ventilation $\rightarrow$ hypoperfusion to certain lung areas.
Following a nebuliser and subsequent improved ventilation, there is then a ventilation/perfusion mismatch which may lead to $\rightarrow$ **a transient drop in oxygen saturation.**

- Nebulised ipratropium bromide** should be added for patients with acute severe or life threatening asthma, or those with a poor initial response. Its addition produces significantly greater bronchodilation than a $\beta 2$ -agonist alone.
- Oxygen:**
 - Targeted oxygen in asthma $\Rightarrow$ SpO₂ level of 94–98%.
 - Patients with saturations less than 92% on air should have an ABG to exclude hypercapnia. However, starting treatment should not be delayed to do the ABG.
 - Initially high-flow oxygen is used, and then weaned to maintain adequate saturations. Unless you suspect COPD there is no need to be cautious with oxygen therapy.

- Steroids:** *low doses 2 daily Not 4* but *Not people with acute asthma*

Nice 2013 $\rightarrow$ People aged 5 years or older presenting to a healthcare professional with a severe or life-threatening acute exacerbation of asthma receive **oral or intravenous steroids within 1 hour of presentation.**

- see the peak and 100% bioavailability after 1 hour.*
 - steroids $\rightarrow$ reduce mortality, relapses, subsequent hospital admission and requirement for $\beta 2$ -agonists $\rightarrow$ $\uparrow$ its effect with OCS.
 - The earlier they are given in the attack, the better the outcome.
 - A dose of 40-50 mg should be given once oxygen and nebuliser therapy has been established. This should be continued for five days, and can then be stopped abruptly. *use IV steroid initially with Resp. failure*
- Magnesium sulphate** recommended as next step for patients who are not responding (e.g. 1.2 - 2g IV over 20 mins). *Calc²⁺ receptor antagonist $\rightarrow$ antidote*
 - Mechanism: low magnesium levels in bronchial smooth muscle favour bronchoconstriction.
 - reduce rates of admission to intensive therapy units
- little evidence to support use of IV aminophylline (although still mentioned in management plans) *thisophylline*
- if no response consider IV salbutamol
- Intensive care** is indicated for patients with severe acute or life threatening asthma who are failing to respond to therapy.
- Strongest indicator of a need for intubation and ventilation?**
 - PH 7.31

اللي بصير فاول عمل بكل عالقات

في قاعدة ال 1/3
بوصية امنت
في قاعدة ال 1/3
في قاعدة ال 1/3

Asthma in pregnancy

usually exacerbate during 2nd + 3rd + trimester

- In general, the medicines used for asthma are safe during pregnancy.
- The British Thoracic Society (BTS) guidelines make it clear that short-acting beta 2-agonists, inhaled and oral corticosteroids should all be used as normal during pregnancy.
- The BNF advises that 'inhaled drugs, theophylline and prednisolone can be normal during pregnancy and breast-feeding'.

Asthma during labour:

- Women receiving steroid tablets at a dose exceeding prednisolone 7.5 mg per day more than two weeks prior to delivery should receive parenteral hydrocortisone 100 mg 6-8 hourly during labour.
- prostaglandin F2α → inducing bronchoconstriction

Extra notes

Pulsus paradoxus:

- The right heart responds directly to changes in intrathoracic pressure, while the left heart depends on the pulmonary vascular volume.
- At high respiratory rates, with severe air flow limitation (for example, acute asthma) there is an increased and sudden negative intrathoracic pressure on inspiration which will enhance the normal fall in blood pressure.

Exercise-induced asthma:

- The most likely diagnosis would be with **spirometry before and after exercise** (NOT before and after administration of bronchodilators) where a typical obstructive pattern may be displayed following exercise.

Cough-variant asthma

- airway inflammation but minimal bronchoconstriction.
- Response to steroids is helpful when making the diagnosis of asthma.**
- Bronchodilators often have little effect.
- No typical asthma history; the cough is typically worse in the mornings, in the cold and after exercise.
- Treatment is with high-dose inhaled steroids for at least 2 months, or a short course of oral steroids.

where is the commonest finding in physical exam in asthma

و غالباً يكون expiration و لكنه يكون inspir. يرفو و في حركات تالية يتجلى في CHF و COPD و pericardial disease and lung cancer and in 20% of bronchiectasis patient.

Difficult asthma → persisting asthma, despite prescription of high-dose asthma therapy.

- Always consider poor adherence to maintenance therapy.
- Consider monitoring induced sputum eosinophil counts to guide steroid treatment.
- Dysfunctional breathing should be considered as part of a difficult asthma assessment.
- allergen testing to moulds should be performed.
- Commonly associated with co-existent psychological differential diagnosis in difficult asthma clinic:

➤ **Subglottic stenosis**

- defined as a narrowing of the airway below the vocal cords (subglottis) and above the trachea. It may be congenital or acquired.
- can occur from birth, idiopathically and **in patients who have been intubated.**
- predominance of **inspiratory** rather expiratory **wheeze**

Chronic Obstructive Pulmonary Disease (COPD)

Definition

- COPD is a long-term respiratory condition characterised by airflow obstruction that is not fully reversible.

Subtypes of COPD

1. chronic bronchitis

- defined as chronic cough and sputum production for at least three months of two consecutive years in the absence of other disease which could explain these symptoms.
- inflammatory changes leads to ciliary dysfunction and increased goblet cell size and number, which leads to the excessive mucus secretion.

2. Emphysema: loss of elastic recoil, ↑ TLC, ↑ compliance, air trapping.

↳ def: permanent enlarge of air spaces distal to terminal bronchiole
due to destruction of alveolar walls.

Pathophysiology

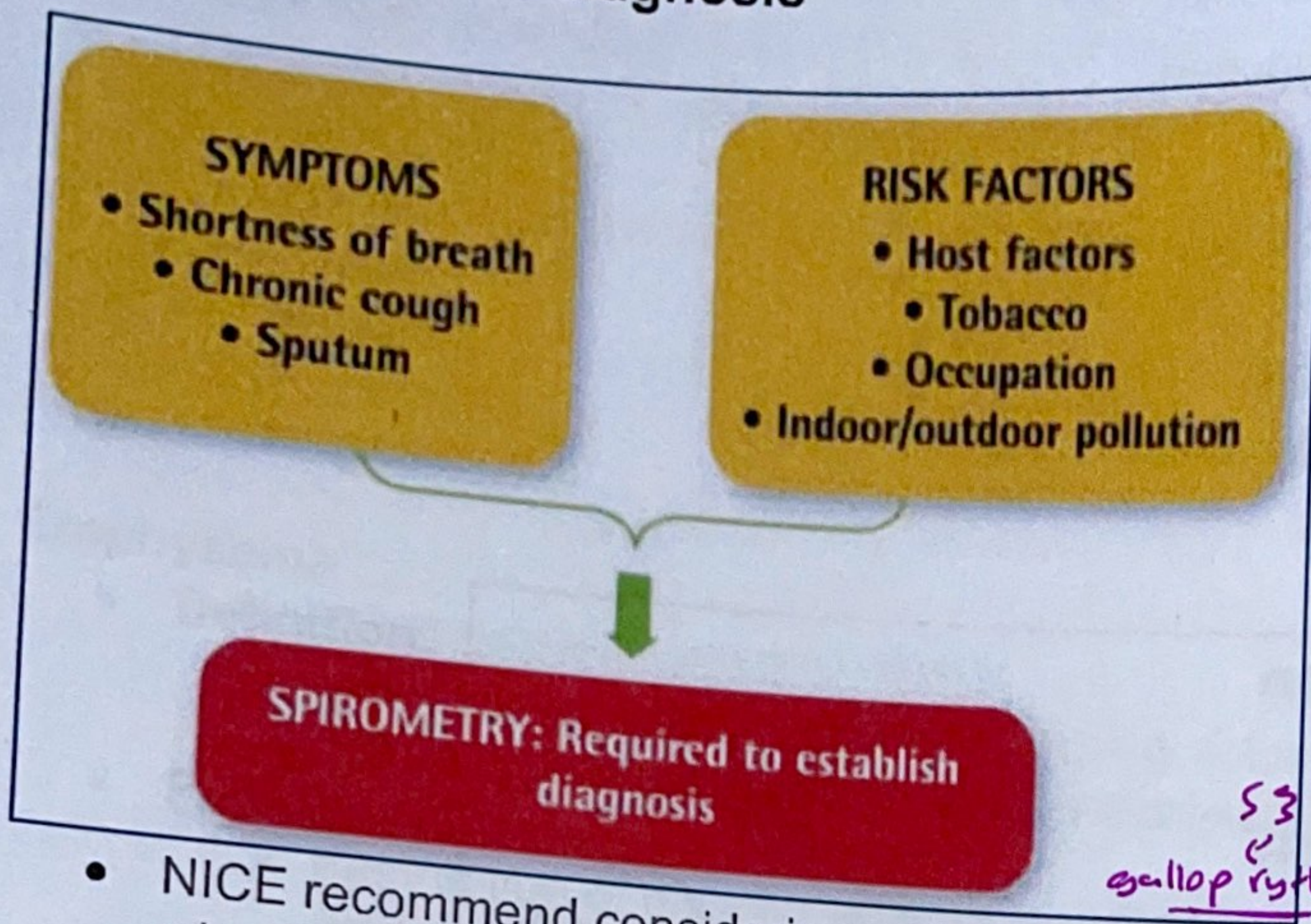
- These changes are responsible for decreased airflow, hypersecretion, and chronic cough. In both conditions, changes are progressive and usually not reversible.
- **Increased airway resistance** is the physiological definition of COPD.
 - Decreased elastic recoil, fibrotic changes in lung parenchyma, and luminal obstruction of airways by secretions all contribute to increased airways resistance.
- Progressive hypoxia causes vascular smooth muscle thickening with subsequent pulmonary hypertension → lead to cor pulmonale
- **Which mechanism is most likely responsible for the increased mean arterial pulmonary pressure in COPD?**
 - **Hypoxic induced pulmonary vasoconstriction**

Causes

- Smoking → (90%)
- Alpha-1 antitrypsin deficiency

Pulmonology

Investigation and diagnosis *Complication of COPD as 1st finger* *history, physical exam* *barrel chest, thoracoabdominal in male*



shifted trachea
cor pulmonale

harsh vesicular

intensity

** cases where and late inspiratory fine crackle*

COPD + congestion or fibrosis

gallop rhythm *exacerbation* *if congestion* *قد يتغير* *مظهر*

- NICE recommend considering a diagnosis of COPD in patients over 35 years of age who are smokers or ex-smokers and have symptoms such as exertional breathlessness, chronic cough or regular sputum production.
- The following investigations are recommended in patients with suspected COPD:
 - Post-bronchodilator spirometry to demonstrate airflow obstruction: FEV1/FVC ratio less than 70%
 - Chest x-ray: hyperinflation, bullae, flat hemidiaphragm. Also important to exclude lung cancer *more straight ribs, wide intercostal space,*
 - Full blood count: exclude secondary polycythaemia *leucocytosis*
 - Body mass index (BMI) calculation
- Measuring peak expiratory flow is of limited value in COPD, as it may underestimate the degree of airflow obstruction.
- A methacholine challenge is useful in differentiating between asthma and chronic obstructive pulmonary disease (COPD).
 - methacholine utilizes the M3 receptor for bronchoconstriction.
- In long standing COPD the bicarbonate is likely to be normal, or raised if the patient has chronic hypercapnia. (a low pH, low pO₂, high pCO₂ and a high HCO₃)
- Peripheral oedema may be present as a dependent oedema, as patients with COPD may have limited mobility due to dyspnoea, and therefore does not necessarily indicate heart failure.

Chemistry: liver function test, potassium *atypical* *α1 antitrypsin* *hypok*

pneumonia *hypoxemia*

legionella *بكتيريا*

Pulmonology

- Doxapram is a respiratory stimulant, which can be effective at improving ventilation.
- Its use has been superseded by non-invasive ventilation (NIV), but it might be useful in situations where NIV is unavailable.

COPD: stable management

COPD - reason for using inhaled corticosteroids - reduced exacerbations

COPD - still breathless despite using inhalers as required?

- FEV1 > 50%: LABA or LAMA
- FEV1 < 50%: LABA + ICS or LAMA

COPD - LTOT if 2 measurements of $pO_2 < 7.3$ kPa

↳ long term O₂ therapy

NICE guidance (2010)

General management

- smoking cessation advice
- annual influenza vaccination
- one-off pneumococcal vaccination → every 5 years

* بعض I.V steroid حالة vomiting OR malabsorption.

Bronchodilator therapy

- a short-acting beta2-agonist (SABA) or short-acting muscarinic antagonist (SAMA) first-line treatment

بعض ما يكون بسبب hypersecretion مفضل أكثر.

for patients who remain breathless or have exacerbations despite using short-acting bronchodilators the next step is determined by the FEV1

- FEV1 > 50%
 - long-acting beta2-agonist (LABA), for example salmeterol, or:
 - long-acting muscarinic antagonist (LAMA), for example tiotropium
- FEV1 < 50%
 - LABA + inhaled corticosteroid (ICS) in a combination inhaler, or:
 - LAMA

For patients with persistent exacerbations or breathlessness

- if taking a LABA then switch to a LABA + ICS combination inhaler
- otherwise give a LAMA and a LABA + ICS combination inhaler

Oral theophylline

- NICE only recommends theophylline after trials of short and long-acting bronchodilators or to people who cannot use inhaled therapy
- the dose should be reduced if macrolide or fluoroquinolone antibiotics are co-prescribed

Mucolytics

- should be 'considered' in patients with a chronic productive cough and continued if symptoms improve

Cor pulmonale

Pulmonology

- features include peripheral oedema, raised jugular venous pressure, systolic parasternal heave, loud P2
- use a loop diuretic for oedema, consider long-term oxygen therapy
- ACE-inhibitors, calcium channel blockers and alpha blockers are not recommended by NICE

Factors, which may improve survival in patients with stable COPD

- **smoking cessation - the single most important intervention in patients who are still smoking**

- **long term oxygen therapy** in patients who fit criteria

- lung volume reduction surgery in selected patients

LTOT should be offered to patients with a pO_2 of < 7.3 kPa or to those with a pO_2 of $7.3 - 8$ kPa and one of the following:

- secondary polycythaemia
- nocturnal hypoxaemia
- peripheral oedema
- pulmonary hypertension

Inhaled steroids have been shown to improve quality of life and reduce hospitalisation rates by reducing the number of exacerbations, but they do not slow the rate of decline of FEV_1 (hence **do not affect prognosis**).

Roflumilast should be used in COPD for patients who are losing control on triple inhaled therapy

- * Roflumilast is a selective long-acting phosphodiesterase-4 inhibitor.
- * recommended by NICE for patients who have suffered two or more exacerbations in a year, despite triple inhaled therapy, where FEV_1 is less than 50% of predicted.
- * It is orally administered.

Management of side effect of steroid inhaler (oro-pharyngeal and oesophageal candidiasis):

- the patient should be taught adequate inhaler technique. **Advise him to rinse his mouth each time he uses his inhaler and use a spacer device and review him in a month.**
- Resistant symptoms can be managed with oral nystatin or a course of fluconazole.

Pulmonary rehabilitation → physiotherapy → asthma و COPD → asthma wheeze by ref و asthma wheeze ↑ intensity

- This is a programme of aerobic lower-extremity training combined with education.
- Patients with very limited exercise tolerances may benefit from pulmonary rehabilitation and in the most severely limited patients chair-based exercises can be taught.
- **It leads to improvements in exercise capacity (walking distance should improve after the rehabilitation programme)**
- Pulmonary rehabilitation **does not improve lung function.**
- The improvement in walking distance would **not be a long-lasting improvement**
 - Decline in exercise tolerance and health status tends to occur 6–12 months after the completion of a course.

Oxygen therapy

- When managing patients with COPD, once the pCO_2 is known to be normal the target oxygen saturations should be 94-98%.
- Patients with (COPD) should not in general receive more than 24-28% oxygen without arterial blood gas monitoring.
- In patients who are critically ill (anaphylaxis, shock etc) oxygen should initially be given via a reservoir mask at 15 l/min. Hypoxia kills.

Oxygen saturation targets

- acutely ill patients: 94-98%
- patients at risk of hypercapnia (e.g. COPD patients): 88-92% (see below)
- oxygen should be reduced in stable patients with satisfactory oxygen saturation

Management of COPD patients

- prior to availability of blood gases, use a 28% Venturi mask at 4 l/min and aim for an oxygen saturation of 88-92% for patients with risk factors for hypercapnia but no prior history of respiratory acidosis
- adjust target range to 94-98% if the pCO_2 is normal
- Oxygen should be given to maintain SpO_2 within the patient's individual target range, available (COPD patients are being given cards with this information, so always ask) the individual target is not known, saturations should be maintained at 88-92%.
- Hudson face masks are less precise than venturi masks, so do not use if hypercapnic type II respiratory failure. Risk of CO_2 accumulation if flow rate < 5 L/min due to rebreathing of CO_2 .

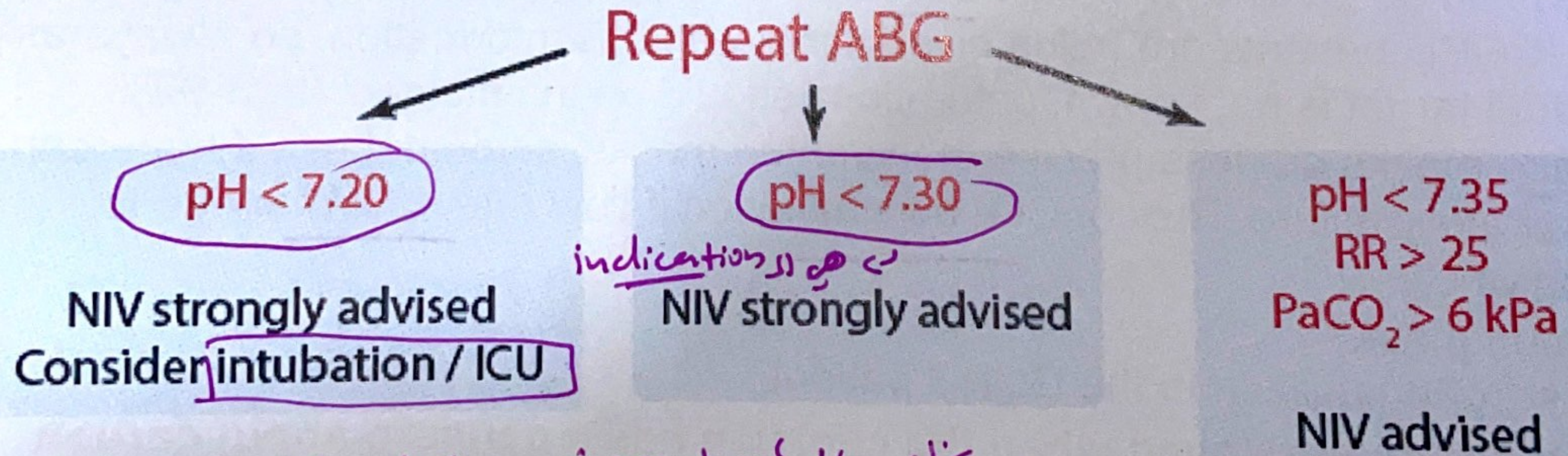
➤ Venturi mask

- often utilized in the COPD patient
- **often employed when the clinician has a concern about carbon dioxide retention** or when respiratory drive is inconsistent.
- mixes oxygen with room air, creating high-flow oxygen

Non-invasive ventilation (NIV)

Patient presenting with acute exacerbation of COPD

Institute standard medical therapy. Once O_2 sats $> 92\%$, change non-re-breathing reservoir O_2 supply to controlled oxygen therapy - either using a 24% or 28% Venturi oxygen mask or nasal cannulae and a flow rate targeted to keep an oxygen saturation 88 to 92%



نخاف لا نعط صرف ventilator
Pneumothorax.

Long-term oxygen therapy (LTOT)

بجملہ ABG حریثہ بعد →
اسیوکیہ انتانیہ الاول طرزا لافیت ال ۲۵۲ اقل ۷۵ ۳۵

D - LTOT if 2 measurements of $pO_2 < 7.3$ kPa

Which patients should be assessed for and offered (LTOT)? (2010 NICE guideline)

Assess patients if any of the following:

- Very severe airflow obstruction ($FEV_1 < 30\%$ predicted).
 - Assessment should be 'considered' for patients with severe airflow obstruction (FEV_1 30-49% predicted)
- cyanosis
- polycythaemia
- peripheral oedema
- raised jugular venous pressure
- oxygen saturations less than or equal to 92% on room air

How to assess patient for LTOT?

Assessment is done by measuring arterial blood gases on 2 occasions at 4 weeks apart in patients with stable COPD on optimal management. Blood gases should be performed in a stable state, which should be at least

Bronchiectasis

مرضى الربو بزيادة eosinophilic green
fever consider sputum

Bronchiectasis should be suspected in a patient with chronic cough producing large amounts of sputum

P. carmenensis

Definition

- permanent dilatation of the airways secondary to chronic infection or inflammation.

• (biphasic crackles) *
سعال

Causes

- Post-infective: (i.e., bacterial, viral, fungal)
 - adenoviral, influenza.
 - tuberculosis, measles, pertussis, pneumonia
 - **A history of previous whooping cough suggests bronchiectasis.**
- Disorders of secretion clearance or mucous plugging
 - Cystic fibrosis

→ severe
affect upper more

➤ Primary ciliary dyskinesia

- Kartagener's syndrome (situs inversus and sinusitis associated with motile cilia),
- Young's syndrome (a combination of bronchiectasis, rhinosinusitis, infertility)

➤ Allergic bronchopulmonary aspergillosis (ABPA) (مفوض)

- proximal bronchiectasis (centrally dilated thickened airways with 'rings') (مفوض) رعدا asthma
- raised IgE is most useful for confirming the diagnosis

• Bronchial obstruction e.g.

- lung cancer/foreign body
- Patients with longstanding chronic obstructive pulmonary disease (COPD)
 - **Patients with longstanding COPD often develop localised areas of bronchiectasis because of progressive damage to the lung tissue.**
 - ❖ **HRCT is the most useful investigation in establishing the diagnosis.**

• longstanding interstitial lung disease

• Immune deficiency

- selective IgA
- hypogammaglobulinaemia

▪ **Hypogammaglobulinaemia in ataxia telangiectasia**

- common variable immunodeficiency,
- HIV

• Chronic inflammatory diseases

- Inflammatory bowel disease
- Rheumatoid arthritis (3-4% of RA developed bronchiectasis).

• yellow nail syndrome

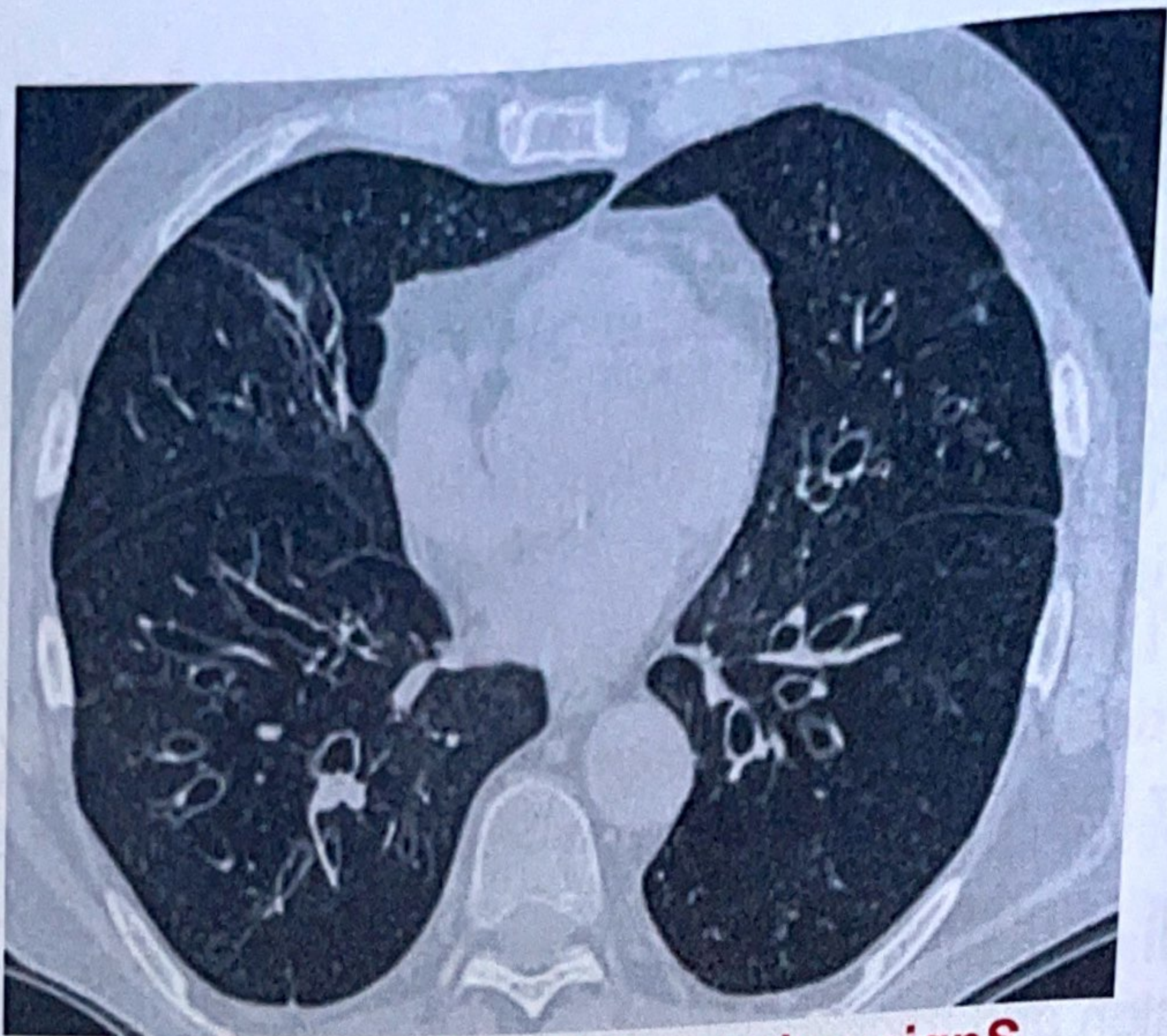
في بيت ال thick wall لأنه هو أولًا dilated فكيه هيج ال wheezes ونكه بيبي ال الشعب وال suppurative infection
Features: The most common findings on examination are crackles (75%) and wheezes.
و عشاء
ميد
بعض
! ICS
Clubbing is only found in 2%.

- chronic productive cough, with copious amounts of sputum (expectorating phlegm most days)
- Dyspnea
- frequent chest infections
- haemoptysis
- Post nasal drip - common (chronic sinusitis in around 30%)
- tiredness - many patients find this more troublesome than the productive cough
- Low Ventilation perfusion ratio leading to hypercapnia → Respiratory acidosis, the body compensate by increasing heart rate and vasodilatation.

Diagnosis

- Chest X-ray
 - the best initial test
 - can be normal in 50% of patients

▪ **Bronchiectasis cannot be ruled out with a chest X-ray**



severe haemoptysis

السبب الـ Vascularity

14 pulmonary a.

low pressure bronchial c.
cotton stock

الضغط العالي

فَنُفِثَ كَأَنَّهُ رَاحِلٌ

ligation of artery

الأوعية الدموية
Principal arteries

CT chest showing widespread tram-track and signet ring signs

Management

Symptom control in non-CF bronchiectasis → inspiratory muscle training + postural drainage

The mainstay of therapy for bronchiectasis is antibiotics and chest physiotherapy.

After assessing for treatable causes (e.g. immune deficiency) management is as follows:

- physical training (e.g. inspiratory muscle training) - has a good evidence base for patients with non-cystic fibrosis bronchiectasis
- postural drainage : يوم بعد يوم إلى شهر
- antibiotics for exacerbations + long-term rotating antibiotics in severe cases
- bronchodilators in selected cases
- Immunisations: Influenza and pneumococcal vaccinations are strongly recommended
- surgery in selected cases (e.g. Localised disease that fails to resolve after I.V antibiotics) : في حالة فشل العلاج في حالة من حالات المرض

Most common organisms isolated from patients with bronchiectasis:

Bronchiectasis: most common organism → *Haemophilus influenzae*

- ***Haemophilus influenzae*** (most common)
- *Pseudomonas aeruginosa*
- *Klebsiella* spp.
- *Streptococcus pneumoniae*

Prevention

- Primary prevention:
 - antibiotic control of bronchial and pulmonary infections in predisposed individuals
- Secondary prevention:
 - long-term low-dose macrolide treatment (e.g., azithromycin) in patients with two or more bronchiectasis exacerbations within one year.