

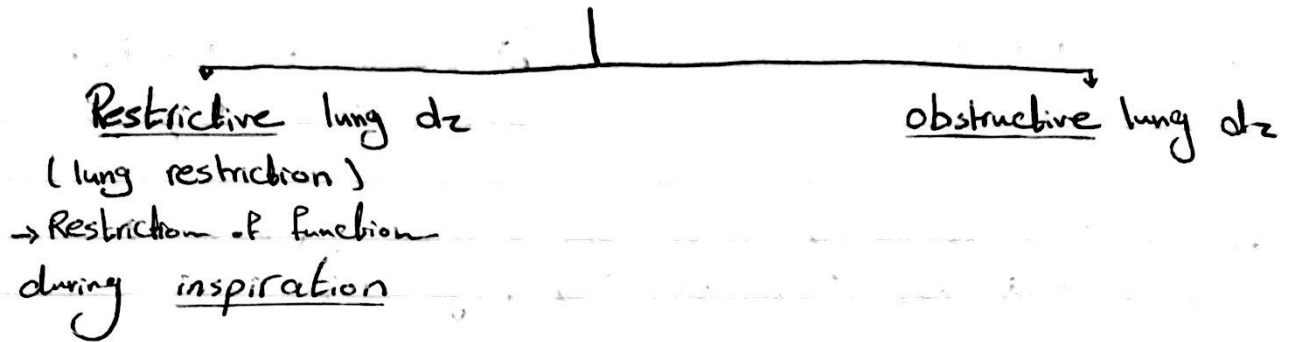


Asthma

lec 1:.

1

Vesicular Breathing	
Normal	
Inspiration	1 sec.
Expiration	2 sec.



* normally → Expiration longer than inspiration
↳ passive process
بسبب انقباض الصدر
↳ Active process
بسبب فرق الضغط (الدمج)

Eg. * ILD

* Diseases that cause Fibrosis of the lung
* obesity
* Pneumectomy or lobectomy

→ Intra-pulmonary causes.

الاسباب كثيرة وفي هذا
لست من تصنيف
بنفسه

* Problem with muscles & movement → e.g. Guillain Barre &
* Kyphoscoliosis
* Ankylosing spondylitis

→ Extra-pulmonary causes.

Obstructive lung dz → Vesicular breathing with prolonged expiration

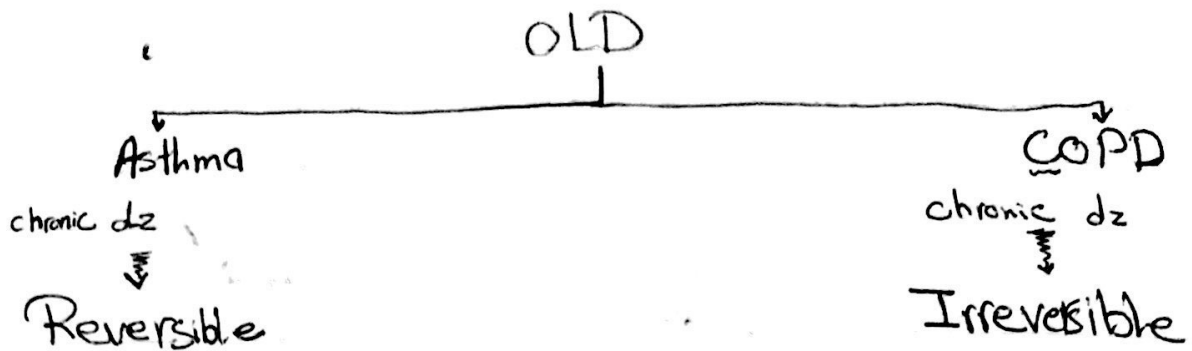
→ obstruction in airways causing obstruction of air flow during expiration.

+ In mild & moderate dz → ما بعد مشكلة في inspiration + زيادة في expiration
هناك انغلاق alveoli كما في

+ هناك انغلاق air way مشكلة في خروج هواء الرئة كل ال air وبقية
تبقى في الرئة lung وحاد ذلك في فترات طويلة

Causes:

- ✓ - Asthma
- ✓ - COPD
- Cystic Fibrosis
- Bronchiectasis
- Aspergillosis



Definition:-

* Recurrent attacks of Cough, dyspnea, wheezing

← chronic ← exacerbation ← chest lightness → expiration against partial obstruction.

asthma

* قش الحجابوا الذ مع بعضه
Cough variant asthma ← في فصل ٤
↳ Chronic Cough

Google attack $\rightarrow$ $\frac{0}{\infty}$ $\rightarrow$ Google attack $\rightarrow$ $\frac{0}{\infty}$

يكون الـ *asthma* هو الـ *Syndrome* الوصفي الذي يدل على الـ *asthma*

From which the Ptn recovers spontaneously or by treatment
↓
Reversible

Causes of wheezing:

- Asthma
- COPD
- F.B
- URTI → mucous
- Pneumonia
↳ localized edema.

4

لیکن صہارت عند ناس و ما صہارت عند تائین؟ ~~Genetic~~
سبب غیر واضح دیکھتے ہیں Genetic predisposition

A combination of :-

anti-infla-ging
Chronic, Steroids
Controller

← ال dose حسب symptoms

Acute attack $\rightarrow$ Give Bronchodilators

Salbutamol }
Albuterol } ال سي

← نفس دار drug

في البيت
(13.1 Cap)

(Metered dose Inhaler)

nebulizer

→ النسبة قليلة عكس مرض ال COPD ← شير

- ↳ Recurrent infections. (pneumonia)

↳ complication Bronchiectasis.

Etiology :- الد سباب كبريه كثيره صغرها لعقین عشان یحسوا المرضوع

I Extrinsic ~~Extrinsic~~ (Allergic, Atopic) asthma :

- Most Common 60-70 %
- Allergens ~~Extrinsic~~ ~~Extrinsic~~ ~~Extrinsic~~ trigger the attack.
- Pollen
- Hites
- Cat dander
- Dust
- Isocyanate (في العنان)

مواجم حسية

Allergens + Genetic susceptibility
 ↳ +ve family Hx of allergic dz.
 ↳ Cause Hypersensitivity reaction.

(IgE class [Type1]) produced
 ↳ Total serum IgE Concentration is elevated.

+ ~~Extrinsic~~ Mast cells. في antigen في
 ↳ اول مرة ما يعمل اتي

الحسنة انه من تانية يستشعر Pollens

Trigger
 IgE في

↳ Mast cells degranulation → Releasing mediators

Broncho spasm

Monoclonal Antibody
 (omalizumab)

- Leukotrienes, leukotrienes inhibitors
- PGs
- Bradykinin
- Histamine

* start in Early childhood

ويعتبر مع الـ Age
Bronchial tree ← شجرة القصبات

* other symptoms → Allergic Rhinitis
urticaria
eczema.

Atopy → Tendency to develop allergic diseases.

← قابلية من أكثر من حساسية

- Allergic asthma
- Allergic rhinitis
- Food allergy
- Drug allergy

* Good prognosis

2 Intrinsic or Idiosyncratic asthma :: (5-10%)

- * A bronchial reaction occurs 2nd to non-immunologic stimuli.
- * More severe, Bad prognosis
- * Adulthood
- * Not totally free between attacks.
- * $\downarrow$ طول السنين
- * No +ve Family Hx
- * No Hx of allergic rhinitis, urticaria, eczema.

Causes.

- Infections
- Irritating inhalant
- Cold air
- Exercise
- Emotional upset
- Perfumes

أي النرجين
Smoking

← وصول بس جفا على الاستقبال في صم بكونا حاشين انه مثلاً بس خطا حل
 متهمه attack ← تنفيرة

+ Cold air
 ↳

بنظام يرفوا كويس

* Exercise

↳ Exercise - induced asthma.

Exercise - induced bronchoconstriction.

بنظام قبل م كسرن مود بنا حقه.

Other types:

→ Aspirin - induced asthma

→ GERD

* Causes of acute exacerbations :-

↳ Bronchoconstriction

← بدي ارف السبب

Ventolin ← Bronchodilator ← واطي

السبب

II Infection → viral infections → Respiratory syncytial virus
 in young children
 ↳ Rhinoviruses in adults

Bacterial COPD ال و
 antibiotics ع. ليا

- 1 Cold air
- 2 Allergens.
- 3 Emotional stress
- 4 Exercise.
- 5 Catamenial (related to menstrual cycle)
- 6 Aspirin, NSAIDs, B-blockers, Histamine, tobacco smoking.
- 7 GERD

↳ Irritation of airway → Vagus nerve
 ↳ Bronchoconstriction.

N.B

① Exercise-induced bronchoconstriction (EIB)

→ The passage of high volumes of dry, cold air.

↳ Thermal changes

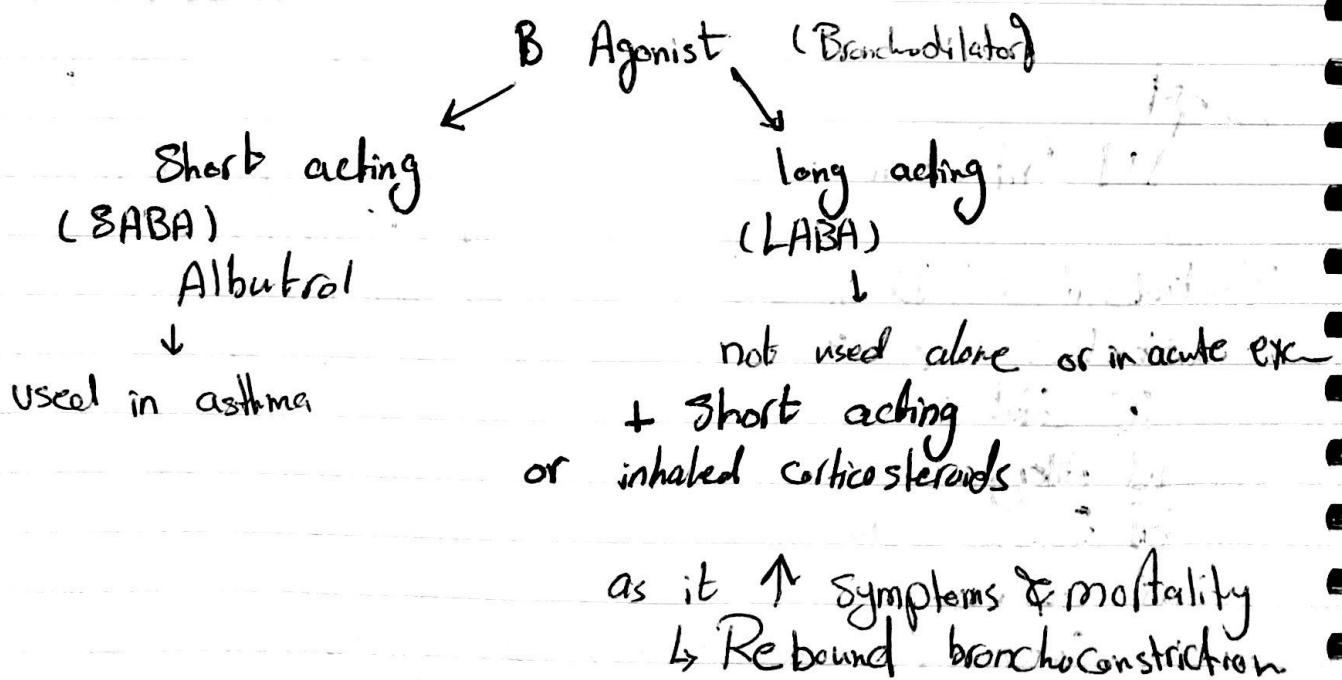
Branchoconstriction

Hist cell degranulation

↓
 β_2 -agonist ~~used~~
 10-20 min. before
 exercise.

↓
 Antileukotriene ~~used~~
 15-20 min. before
 exercise.

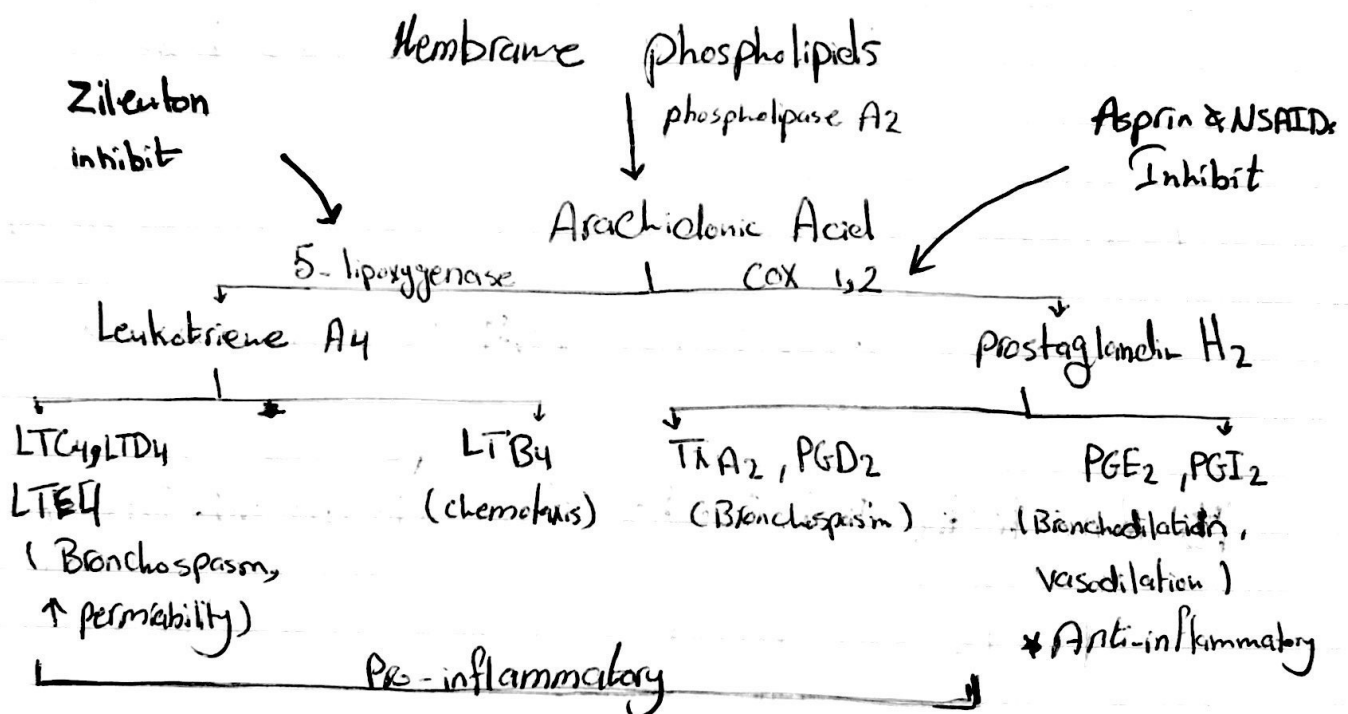
+ A combination of β_2 -agonists & Antileukotriene agents used in high performance athletes.



② Comorbid gastroesophageal reflux disease :

- Microaspiration of gastric content, lead to an increase in vagal tone and bronchial reactivity.
- Improve with (PPI)

③ Aspirin - exacerbated respiratory disease (AERD): NSAID-exacerbated respiratory disease



الطريق الـ 5-لوكسينوجينيك الـ لوكوتريين الـ كيموتاكسيس
 * اللوكوتريين الـ 5-لوكسينوجينيك الـ طريق

① Leukotriene inhibitors

↳ Zileuton

② Leukotriene Receptor antagonist
 ↳ Montelukast, Zafirlukast

Irreversible

Inhibition of Cox 1, 2 ← NSAIDs & Aspirin * بن نفی

و كل ال Arachidonic acid
lipxygenase pathway

↳ ↑ Bronchospasm

يعني زبون لسطحة أكثر

↳ في مرضى يمكن يتعاملوا ال low dose

* 10-20 % of Ptn. with asthma develop AERD

بعض الناس ما يعرفوا اذا المريف من قبل ال 10-20 % ال 8.

Give as prevention for varicel Bleeding.

☐ Nonselective Beta Blocker (propranolol, nadolol, Sotalol, timolol)

$\beta_1, \beta_2 \rightarrow$ Trigger Bronchoconstriction in Ptn with asthma.

So → Contraindicated.

Cardioselective Beta blockers (metoprolol, atenolol, Bisoprolol, nebivolol)

used for HF, AF

Safe in Ptn with mild to moderate asthma.

* If benefit out way Risk give β -Blocker.

Presentation:

I - Mild & Moderate attacks:

- * Tachypnea → lungs are trapped. air is trapped
- * Diffusion & Gas exchange ↓
- * Prolonged expirations.
- * Mild & diffuse wheezing → partial obstruction

Acute severe asthma → silent chest, hypoxia
asthma & Respiratory failure → complete obstruction

* Poor prognostic factors:-

- Fatigue.
- Diaphoresis.
- Inaudible breath sounds.
- Decreased wheezing to silent chest.
- Cyanosis
- Bradycardia.

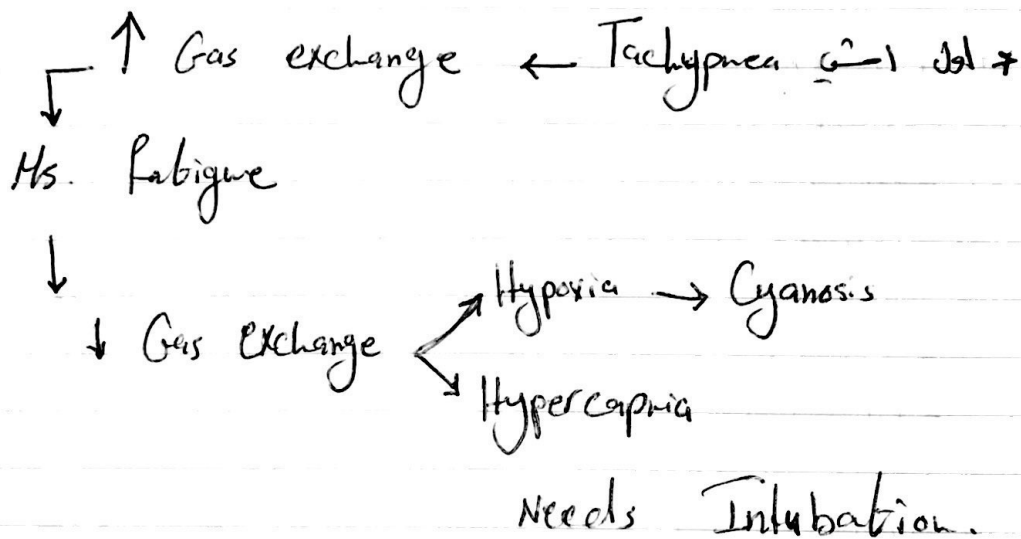
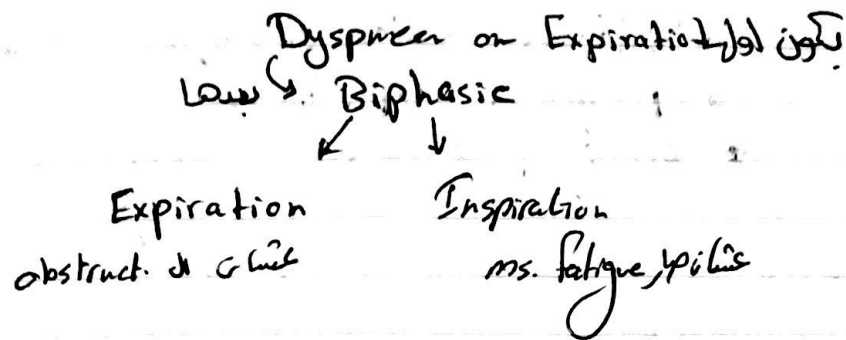
⇒ Asthma can present exclusively as a cough ↳ especially adults.
Cough variant asthma.

II - Severe acute attacks:

Hypoxia & RF

- Use of accessory ms. of respiration.
↳ at some point → ms. fatigue → Apnea
↓↓↓ gas exchange
- Diminished breath sounds

- Low wheezing
- Hyper-resonance
- unable to speak in full sentences.
- Intercostal retraction



Lung volumes & Lung capacities: → 2 volumes or more

- 1* **Residual volume (RV)** $\approx 1.2\text{ L}$ → ↑ in asthma & COPD
 Remain inside the lung after forced expiration
 باقى فى الرئة بعد الزفير القوي

Func.s.

- ① Prevent lung collapse
- ② ↓ Resistance of air flow.
- ③ To achieve blood-gas exchange during expiration

- 2* **Tidal volume (TV)** $\approx 500\text{ ml}$
 Volume during normal inspiration & expiration (at rest)

- 3* **Expiratory reserve volume (ERV)** $\approx 1\text{ L}$
 Volume expired after TV in forced expiration.

- 4* **Inspiratory reserve volume (IRV)** $\approx 3.3\text{ L}$
 Volume inspired after TV in forced inspiration.

- 1* **Inspiratory Capacity (IC)**
 $TV + IRV$

- 2* **Functional Residual capacity (FRC)**
 $RV + ERV$

- 3* **Vital capacity (VC)** عقب قبل
 $IRV + TV + ERV$

- 4* **Total lung capacity (TLC)**
 $RV + ERV + TV + IRV$

By spirometry

تقدير الحسب كل ال Volume ال TLC & FRC ال Capacities ال

* Diagnostic tests:-

II Pulmonary Function test:

هنا كتر

* Spirometry:

normally 80% ← expiration on first second

$$\textcircled{1} \frac{FEV_1}{FVC} = \frac{4}{5} = \boxed{80\%}$$

volume of expiration forced

In obstructive lung dz

$$\frac{FEV_1 \downarrow \downarrow \downarrow}{FVC \downarrow} \quad \text{e.g.} \quad \frac{2}{4} = \boxed{50\%}$$

OLD قوت also asthma also

→ Diagnosed by Reversibility with bronchodilators

* After methacholine & Histamine
↓ $FEV_1 > 20\%$
provocative challenge test
when ptn is Asymptomatic

* After use of albuterol
↑ $FEV_1 > 12\% \& 200 \text{ ml}$

* ACh & Histamine $\Rightarrow$ provoke bronchoconstriction & $\uparrow$ Bronchial secretions.

* Synthetic form (Methacholine)

* There is a Risk of 1-2% to develop status asthmaticus in provocative challenge test.

② $\uparrow$ Diffusion Capacity of the lung for Carbon monoxide ($\uparrow$ DLCO)

$\rightarrow$ CO $\rightarrow$ given to see gas exchange.

$\rightarrow$ In acute severe asthma $\rightarrow$ $\downarrow$ DLCO

Asthma dx:-

- FEV₁ $\uparrow$ 12% with albuterol.
- FEV₁ $\downarrow$ 20% with methacholine.

* For acute exacerbations:-

② Peak expiratory flow (PEF)

Flow = $\frac{\text{Volume} \rightarrow \text{litre}}{\text{Time} \rightarrow \text{sec}}$ $\downarrow$, very low

③ Arterial Blood Gas (ABG)

* mild & moderate $\downarrow$ PCO₂ , PH > 7.45
 $\downarrow$ Alkalosis

* Severe PCO₂ $N / \uparrow$ PH $N /$ Acidosis } very poor prognostic factor $\rightarrow$ ICU & Intubation

4 Chest XR

often normal in asthma
to exclude other

- ① pneumonia as a cause of exacerbation.
- ② Pneumothorax (complication)
- ③ CHF (cause of exacerbation)

5 ECG

Arrhythmias مرض ال asthma
(complication)

6 Sputum analysis

- * Eosinophils
- * Curshmann's spirals
↳ spirals في السعال
- ~~Curshmann's spirals~~

7 CBC

Eosinophil

8 Skin testing

يحقن allergens تحت الجلد
Bronchoconstriction & exacerbation

9 ↑ IgE level

↳ we use anti-IgE (omalizumab)

Monoclonal Antibody
IgG against IgE

Asthma vs COPD			
	Asthma	COPD	Late-stage COPD
FVC	Normal/↓	Normal/↓	↓↓↓
FEV1	↓	↓	↓↓
FEV1/FVC	↓	↓	↓↓
Bronchodilator response	Reversible	Partially reversible/ nonreversible	Usually nonreversible
Chest x-ray	Normal	Normal	Hyperinflation, loss of lung markings
DLCO	Normal/↑	Normal/↓	↓

COPD = chronic obstructive pulmonary disease; DLCO = diffusion capacity of the lung for carbon monoxide.

+ Treatment :-



* نقصان الرئة حسب Symptom frequency & SABA use
← الأول

Asthma severity for patients not on controller medication			
Asthma severity	Symptom frequency/ SABA use	Nighttime awakenings	Indicated therapy initiation
Intermittent	≤2 days a week	≤2 times a month	Step 1 <i>SABA as needed</i>
Mild persistent	>2 days a week but not daily	3-4 times a month	Step 2
Moderate persistent	Daily	>1 time a week but not nightly	Step 3
Severe persistent	Throughout the day	4-7 times a week	Step 4 or 5

SABA = short-acting beta-2 agonist.

* The pharmacology management guided by stepwise approach.

↑ لو نلا تصنيغه هجر ال Step (بأكثر)
 ↓ لو قل تصنيغه ~ ~ ~ (بأقل) step down

* للمق عشان اقرر هل غير ال step
 * every 3 months.

* Newly diagnosed or intermittent :
 ↳ step 1

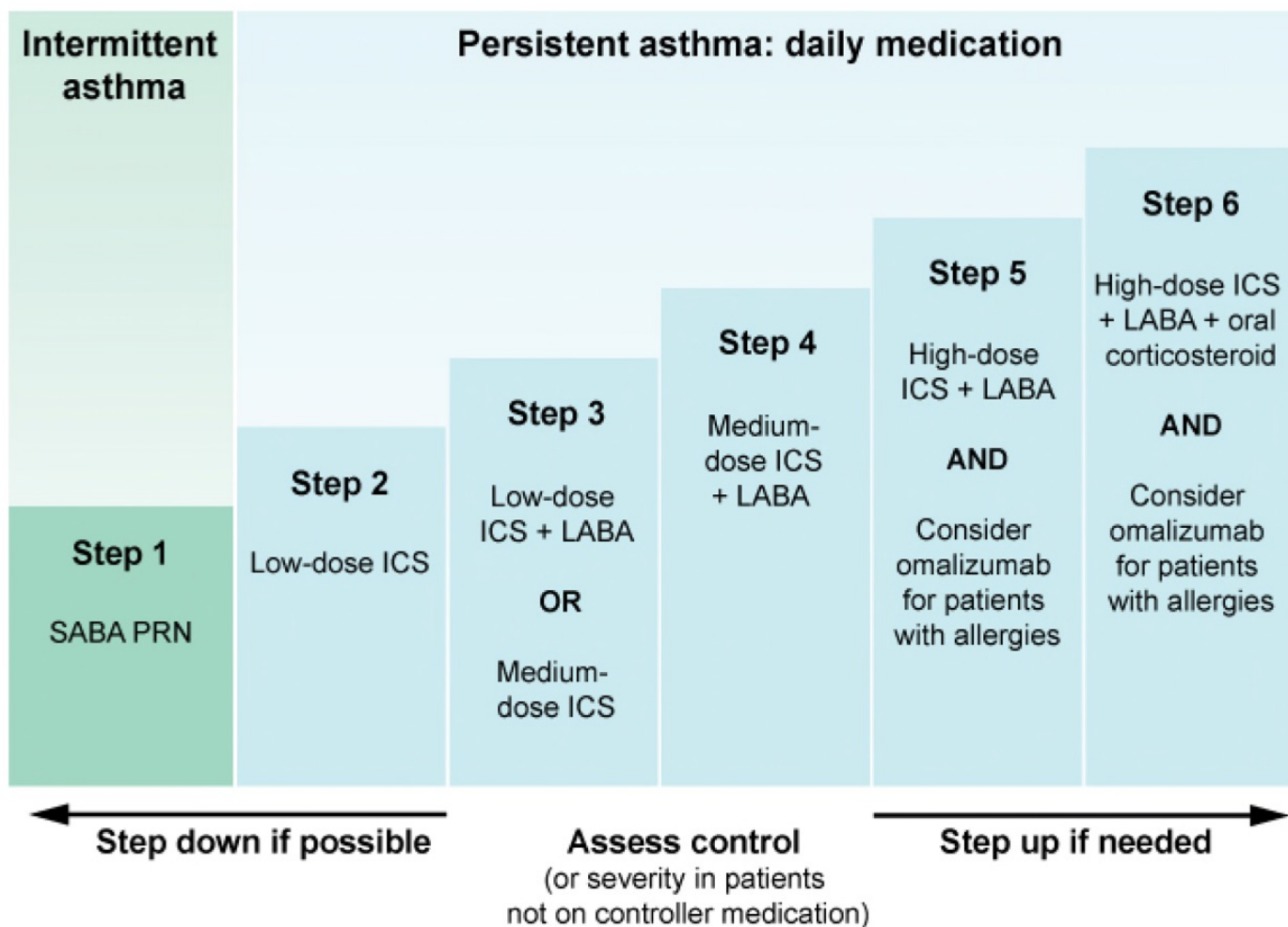
SABA → Albuterol inhaler.
 as needed.

BRN

* Pharmacology of asthma:

Reliever
 SABA

Controller
 corticosteroids



ICS = inhaled corticosteroid; LABA = long-acting beta-agonist; SABA = short-acting beta-agonist; PRN = as needed.

* Step 1 :-

Inhaled SABA as needed

↓

Albuterol

* Step 2 :-

Low dose ICS (long-term control agent)

+

SABA

↓
Beclomethasone, budesonide, Flunisolide
Fluticasone, mometasone, Triamcinolone.

systemic adverse effects, less ← oral ~~drug~~ ←

+ Most common adverse effect of ICS

↳ Oropharyngeal thrush (oral candidiasis).

- Dysphonia.

Alternative long-term control agents

+ Cromolyn & nedocromil (Mast cell inhibitors)

+ Theophylline (asthma ~~دواء~~ ^{دواء})

+ Leukotrienes modifiers:

- ~~Montelukast~~ Montelukast - Zileuton

- Zafirlukast

↓

→ Hepatotoxic

- Associated with Churg-Strauss \$

+ Step 3:-

Add LABA to SABA & ICS

or
↑ dose of ICS (medium dose)
+ SABA

LABA → - Salmeterol
- Formoterol

+ Step 4:-

↑ dose of ICS (medium dose)
+ SABA + LABA

+ Step 5:-

↑ dose of ICS (maximum dose)
+ SABA + LABA
+ Omalizumab in Ptn with ↑ IgE lvl.

+ Step 6:-

+ Oral corticosteroids.
↳ prednisone.

+ Influenza & Pneumococcal vaccine are given in all asthma Ptns.

To ↓ Risk of pneumonia

* Adverse effects of systemic corticosteroids:

- Osteoporosis.
- Cataracts.
- Adrenal suppression & fat redistribution.
- Hyperlipidemia
- Hyperglycemia.
- Acne
- Hirsutism (in women)
- Thinning of skin.
- Striae
- Easy bruising

* Anticholinergics :- → Bronchodilation effect

Ipratropium bromide and tiotropium.
Atravin

* يمكن استخدام كونس SABA

* Ventoline لا يؤثر على القلب
↓

Tachycardia لا تحدث
↓

↓ systole & Diastole
↓ coronary perfusion
↑ Risk of IHD

* Disadvantages →

* ~ 90 min to achieve maximal bronchodilation.

* Bronchodilation & ↓ secretions.

* very effective in COPD.

Acute Asthma exacerbation:

* severity $\rightarrow$ $\downarrow$ peak expiratory flow

< 33	severe
$33-50$	moderate
> 50	mild

Clinically $\rightarrow$ $\leftarrow$ تنفس السعال ونبض مزعج $\leftarrow$ PEF $\leftarrow$ عتاً تنفس

* ABG $\rightarrow$

تنسوف ال PaCO_2

- * $\uparrow$ Respiratory drive & hyperventilation.
- * $\downarrow$ PaCO_2 & Respiratory alkalosis.

PaCO_2 normal or high $\leftarrow$ tired , مريض ال فترة *
 $\hookrightarrow$ poor prognostic factor $\rightarrow$ may need ventilation.
 (ms. fatigue)

* CXR $\rightarrow$

- * To see if there is infection.
- * CHF $\rightarrow$ pulmonary edema.
- * Pneumothorax $\rightarrow$ as a complication of asthma.

+ Treatment:

1 * 1st step: brief Hx & exam
 Cough ← exam → wheez
 Tachypnea
 looks Tired

2 * Take vital signs

↓
 Oxygen Saturation
 < 90 → Give oxygen
 > 90 → no need for oxygen.

3 * Inhalers → Albuterol
 nebulizer

↓
 2-3 times a day
 3-4 times a day

{
 Tachycardia Heart disease
 ipratropium bromide

4 * Steroids →

200 mg hydrocortisone IV

1-2 hours to work.

so give them right away.

+ The best initial therapy is oxygen combined with inhaled SABA (albuterol) and a bolus of steroids.

سؤال آخر

* لو ما استجاب المريض بالحقن Magnesium Sulfate

2g in 200 cc normal saline

→ Magnesium

↳ Relieve bronchospasm

عن طريق انه يمنع ال Ca^{+2} قوت Ca Channels
 منع ال bronchi ← Constriction

+ Not effective in acute exacerbation:

- Theophylline
- Cromolyn and nedocromil
- Leukotriene modifiers.
- Omalizumab.
- LABAs

* لو ما استجاب ال Oxygen, Steroids, albuterol
 Respiratory acidosis

محتاج

Endotracheal intubation

&

Mechanical ventilation

&
ICU

* NB:-

① β_2 -agonists $\rightarrow$

* $\uparrow$ insulin $\rightarrow$ Transcellular shift of potassium
 $\downarrow$
 Hypokalemia (electrolyte imbalance)
 $\swarrow \quad \searrow$
 ms. weakness Arrhythmias & ECG changes

* Side effects $\rightarrow$

- Tremor
- Headache
- palpitation

normal or

$\rightarrow \uparrow PaCO_2$

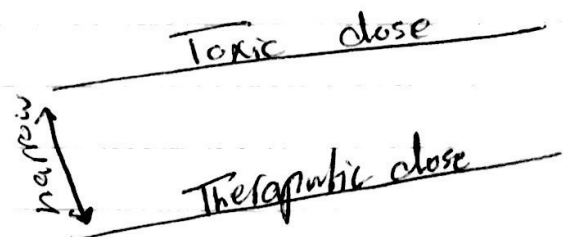
② Clinical signs of Respiratory Failure:

- Markedly decrease breath sounds
- Absent wheezing.
- Decrease mental status
- Marked hypoxia with cyanosis.

③ Theophylline $\rightarrow$

asthma is used, so

Has narrow therapeutic index and
 toxicity can occur from accumulation



* عوامل يمكن أن ترفع level

* Infection

- Drugs → Cimetidine
Ciprofloxacin
erythromycin

- Inhibition of Cytochrome oxidase system

* Cirrhosis

* Cholestasis

* Respiratory infection with fever

المسؤول عن metabolism في liver

Symptoms of toxicity :-

① CNS stimulation

- Headache

- insomnia

- Seizures

② GI disturbances

- nausea

- Vomiting

③ Cardiac toxicity

- Arrhythmia → Cause of death

* Complications of asthma :-

① Pneumonia

rare ② If recurrent pneumonias → Bronchoectasis

③ Pneumothorax

④ Acute Severe asthma → Respiratory failure type 2

⑤ Arrhythmia ← asthma
Hypokalemia

⑥ Atelectasis → Collapse of part or all the lung