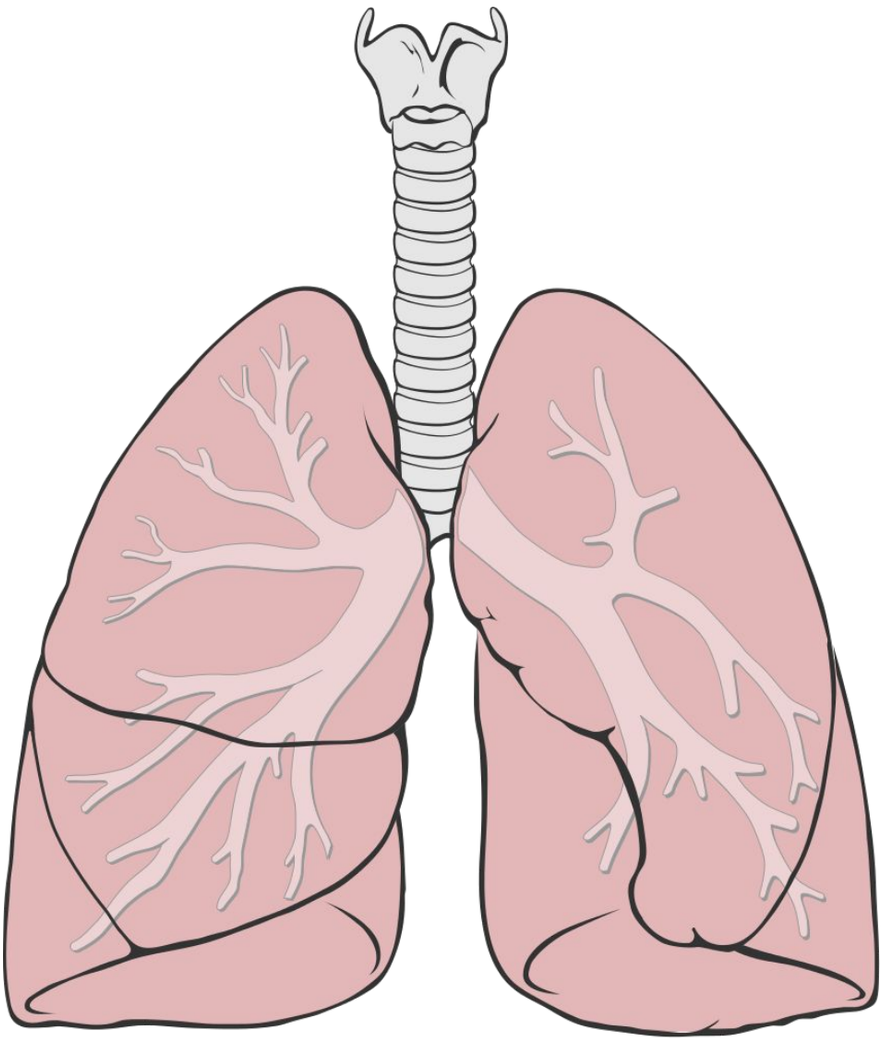
PLABABLE

GEMS

VERSION 6.2

RESPIRATORY MEDICINE

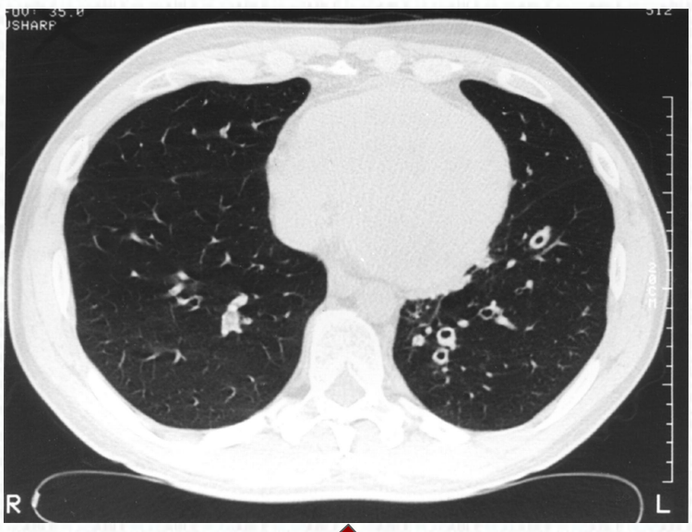


Bronchiectasis

'Irreversible dilatation of small and medium size bronchi'

Features

- Chronic persistent cough
- **Copious sputum**
- Recurrent respiratory tract infection
- Finger clubbing (Drumstick-shaped fingers)
  → Not always present and not specific
- Chest X-ray shows **tramlines**
- Cysts or ring opacities



bronchial wall thickening in left lower lobe

Use High Resolution CT scan to confirm diagnosis

Bronchiectasis

The connection between cystic fibrosis and bronchiectasis

Bronchiectasis is the permanent dilatation and thickening of airways. Amongst many conditions that can result in bronchiectasis, cystic fibrosis is one of them. Patients with cystic fibrosis have recurrent infections as a child which results in chronic inflammation leading to airway dilatation and destruction.

Around 0.6% to 2.7% adults with diagnosed bronchiectasis have cystic fibrosis. All people (children and adults) up to age 40 with bronchiectasis should be investigated for cystic fibrosis.

Side Effects of β-adrenoreceptors Medications

β-Blocker → **Bronchospasm**

e.g. Wheezing, SOB, heavy chest

✖ Asthma ✖

β-Agonist → **Tachycardia**

e.g. Palpitation, muscle twitching, tremors

✖ Severe cardiac diseases ✖

REMEMBER

Both salmeterol (long acting) and salbutamol (short acting) are β-agonists, both have same side effects

Salbutamol are used on when required basis

↓

Higher risk of overused

Higher risk of side effect! e.g palpitation, tachycardia

NSAIDs and aspirin can also aggravate asthma

Bronchial Carcinoma Mesothelioma

Features:

- Shortness of breath
- Chest pain
- ± Weight loss
- Finger clubbing
- Recurrent pleural effusion
- History of consistent exposure to asbestos

Remember that 80% of cases of malignant mesothelioma are associated with previous **asbestos** exposure

Blue-collar workers

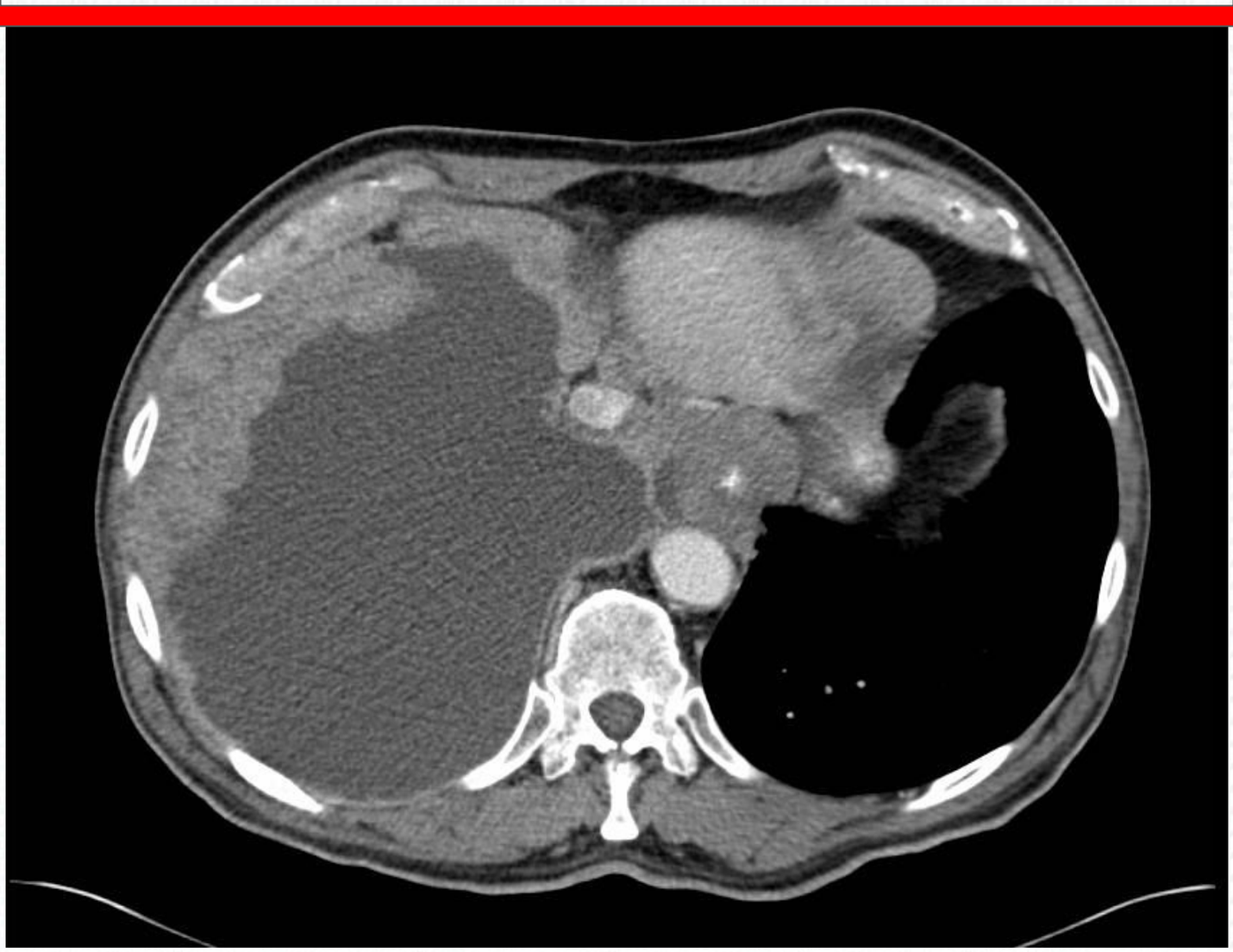
Eg. Fire fighter, construction workers (builders), power plant workers, shipyard workers and others

Veterans

Those who served in the royal navy, marines, air force and British army

Diagnosis Of Mesothelioma

Pleural biopsy to confirm diagnosis, not cytology



It is considered as an industrial disease, leading to ‘unnatural death’

IMPORTANT

Deaths of mesothelioma should be reported to a **coroner** as compensation is often available.

Mesothelioma

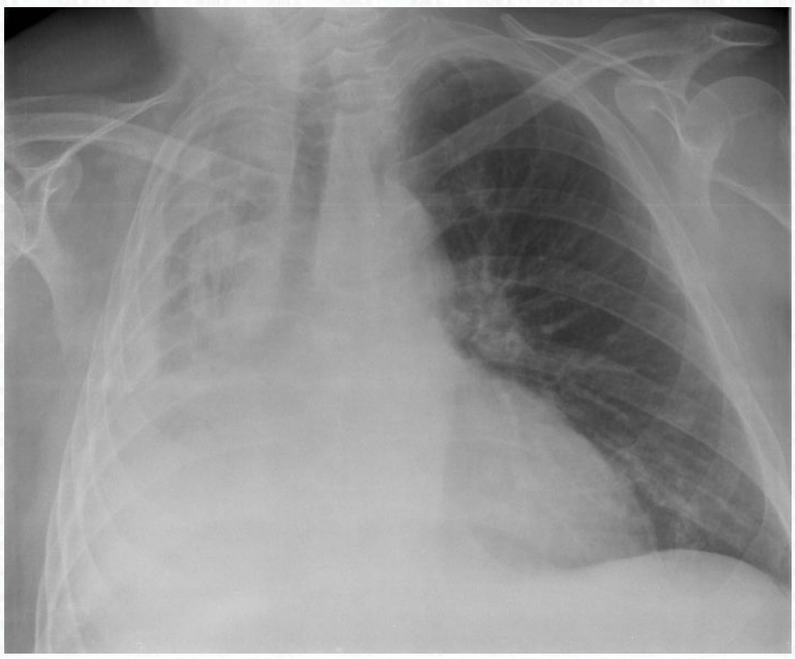
Brain trainer :

A 67 year old lady known to have mesothelioma is admitted to the ward with complaints of chest pain and shortness of breath. Chest x-ray shows bilateral pleural effusion. What is the most appropriate management?

➔ **Indwelling pleural drain**

This patient requires symptomatic relief from her malignant pleural effusion. An indwelling pleural drain is most useful in this scenario.

Atelectasis



Common postoperative complication

Basal alveolar collapse →Respiratory difficulty

Airways obstructed by bronchial secretion

Features:

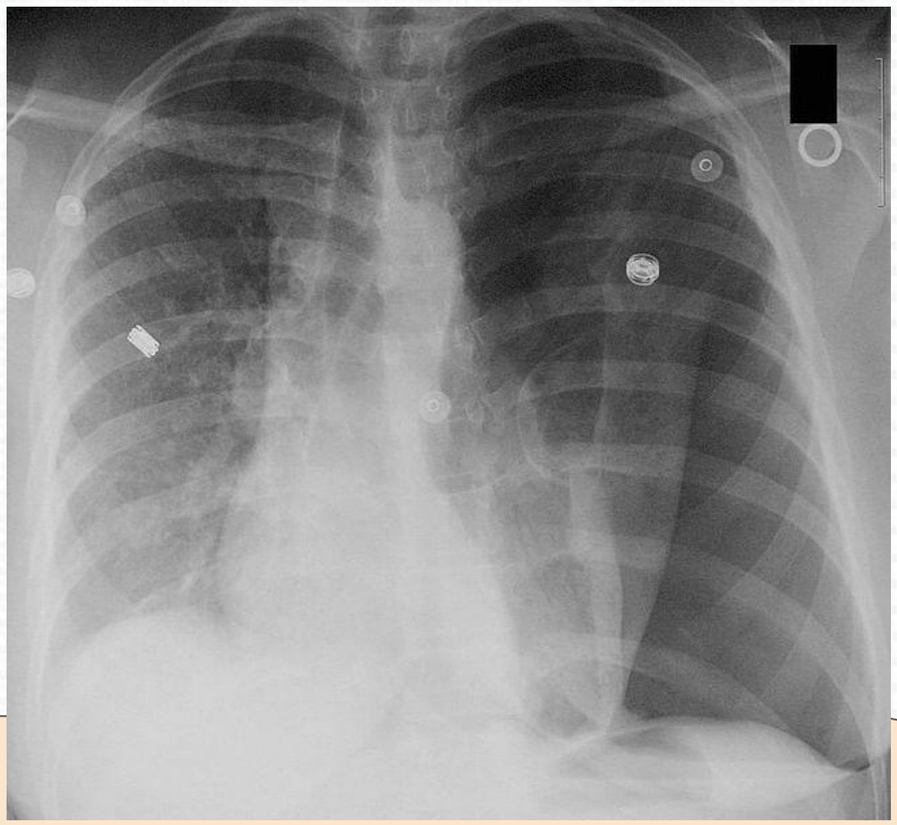
- Within 72 hours post-operation
- Dyspnoea
- Tachycardia
- Hypoxaemia

Management

↓

Chest physiotherapy

Pneumothorax (Collapsed lungs)



Features:

- Acute respiratory distress: tachypnea, desaturation
- ↑ Jugular venous pressure
- Hypotension
- Hyperresonance on percussion
- ↓ Air entry = no breathing sound
- Trachea/mediastinum deviation to opposite side → Common in tension pneumothorax rather than simple pneumothorax

Tension pneumothorax may occur after thoracic trauma

Types Of Pneumothorax

Primary spontaneous pneumothorax

→ No previous lung diseases
→ **Tall and young males** with no apparent reason
→ Dyspnoea

Secondary spontaneous pneumothorax

→ With an underlying lung diseases
e.g. Asthma or COPD

Tension pneumothorax

→ Occurs after incident e.g. car incidents, stabbing or post interventional radiology into chest

Types Of Pneumothorax

Management

Primary spontaneous pneumothorax

- Erect chest X-ray to confirm diagnosis
- ≤ 2 cm → Conservative management (give supplementary oxygen)
- > 2 cm (or distressed) → Aspirate with needle

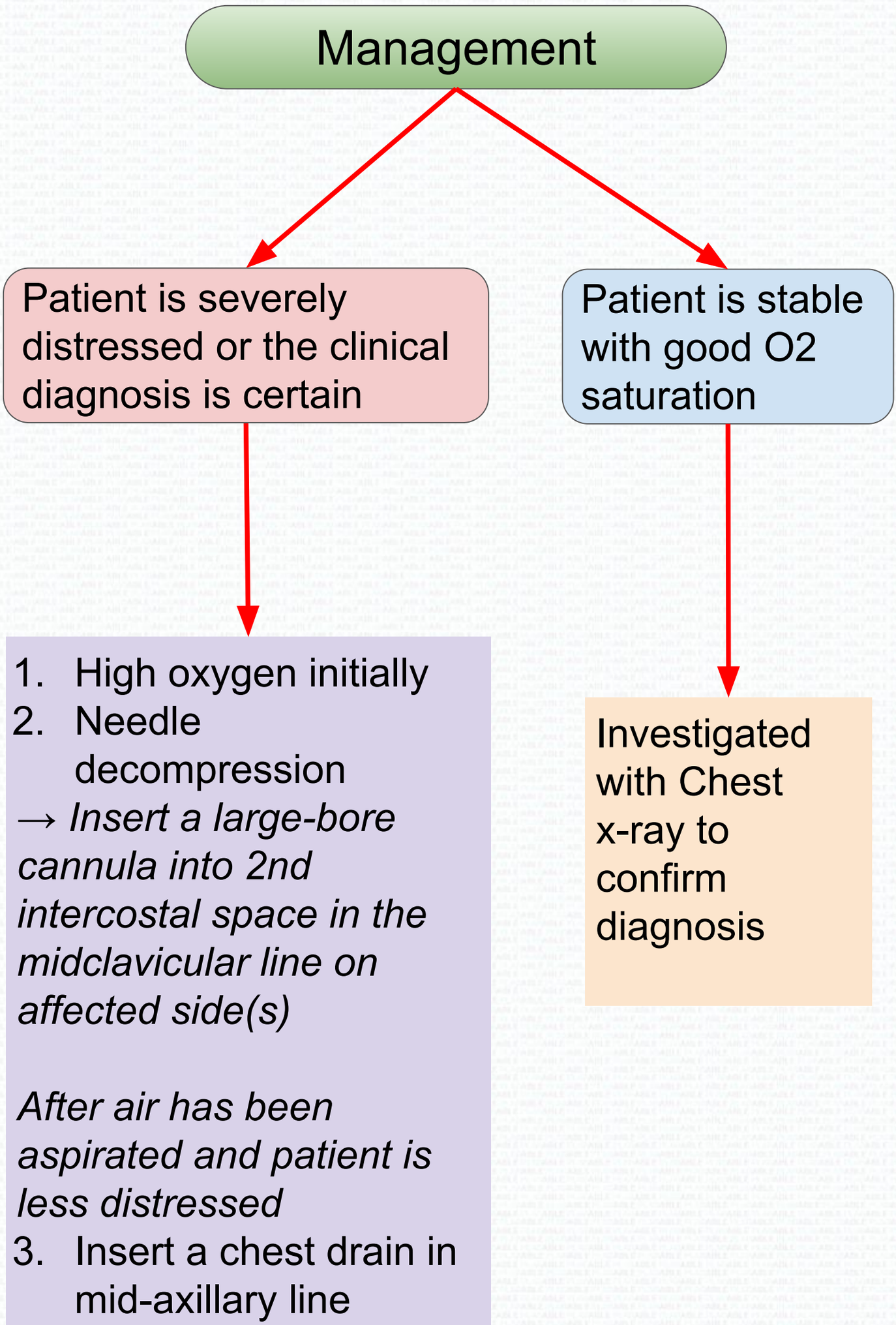
Secondary spontaneous pneumothorax

- < 1 cm → Conservative management (give supplementary oxygen)
- 1-2 cm → Aspirate with needle
- > 2 cm → Chest drain

Tension pneumothorax

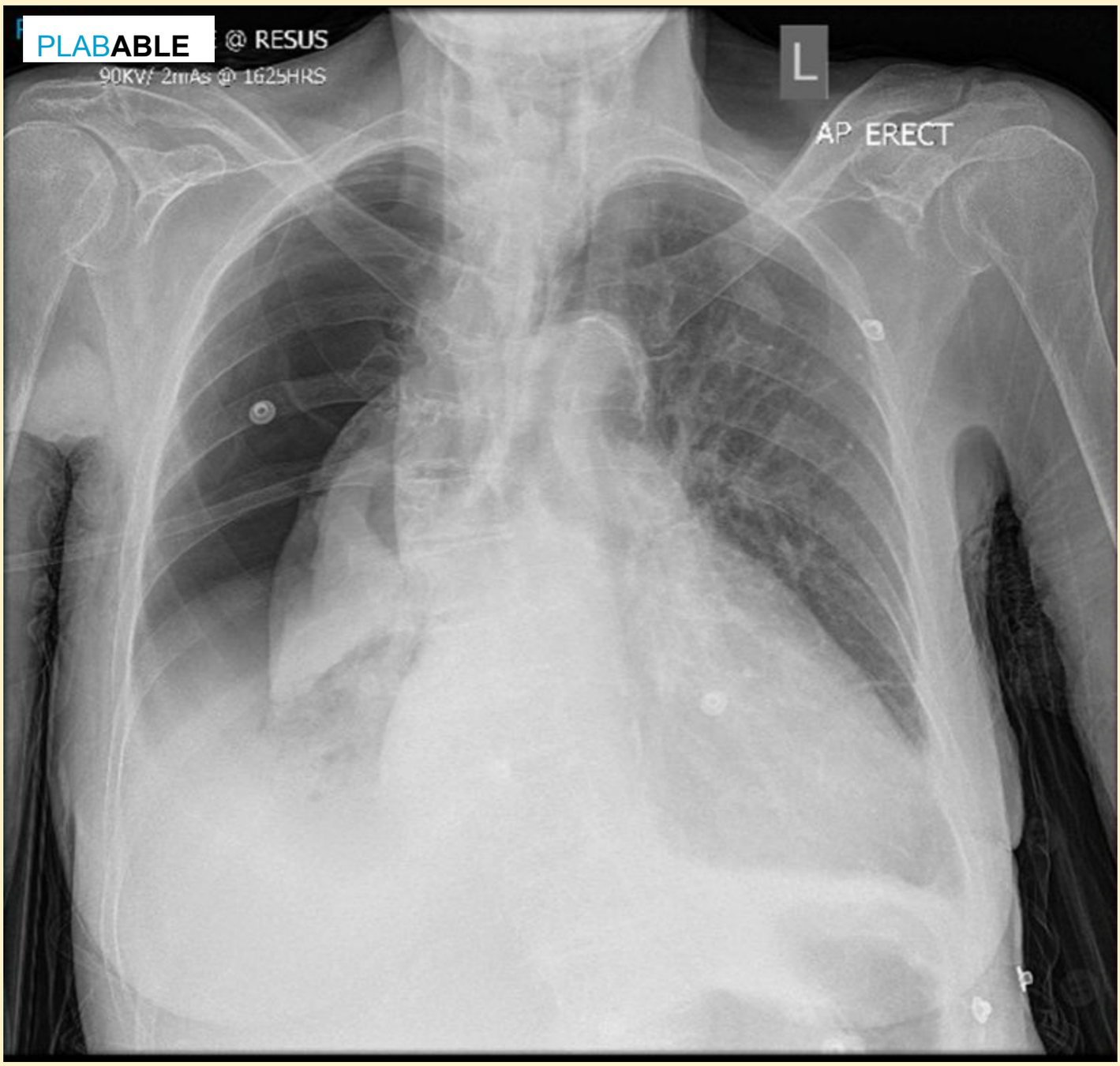
- Needle decompression

Management Of Pneumothorax (Collapsed lungs)



Pneumothorax

Brain trainer:



The above patient has right sided scoliosis, mediastinal shift to the left and pneumothorax. What is an easy finding to confirm the diagnosis?

➔ **Absence of lung markings on the right field**

Pneumothorax

Brain trainer:

A young man with suspicion of pneumothorax has oxygen saturations of 88% on air. What is the most appropriate INITIAL action?

➔ **Administer oxygen**

Pneumothorax

Brain trainer:

A man with COPD and 1 cm pneumothorax presents to the emergency department. What is the most appropriate management?

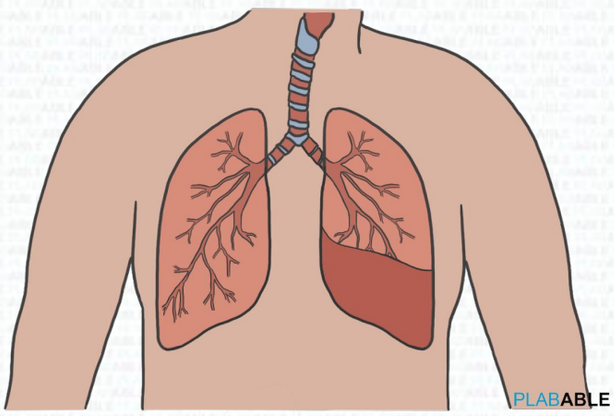
➔ **Needle aspiration and admission**

Remember that patients with pre-existing lung disease will not tolerate a pneumothorax as well as a person with no pre-existing lung disease. As such it is generally better to admit the patient in these cases.

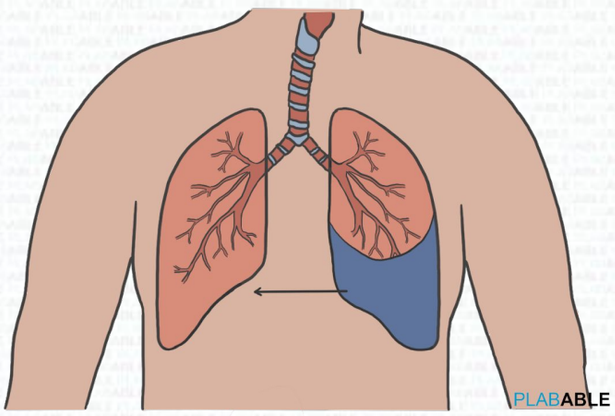
If this patient had no pre-existing disease he could be managed conservatively with supplemental oxygen.

Localised Lung Disease

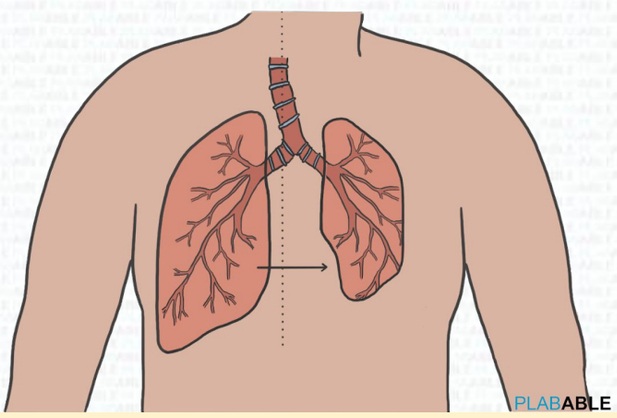
Consolidation
(E.g. Lobar Pneumonia)



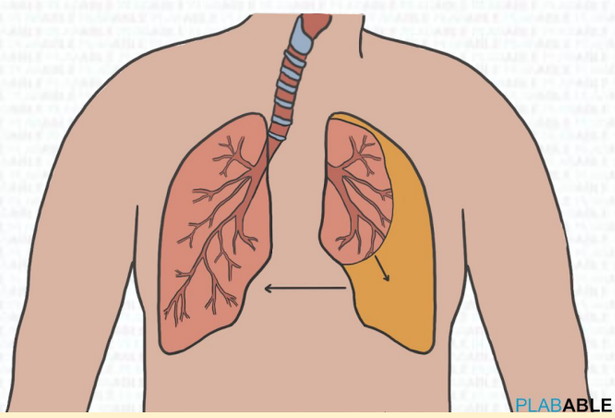
Pleural Effusion



Collapsed Lung
(Atelectasis)



Tension Pneumothorax



Consolidation → Percussion is dull, crackles are heard

Pleural effusion → Trachea can be displace away from effusion when effusion is large, percussion is dull, breath sounds diminished

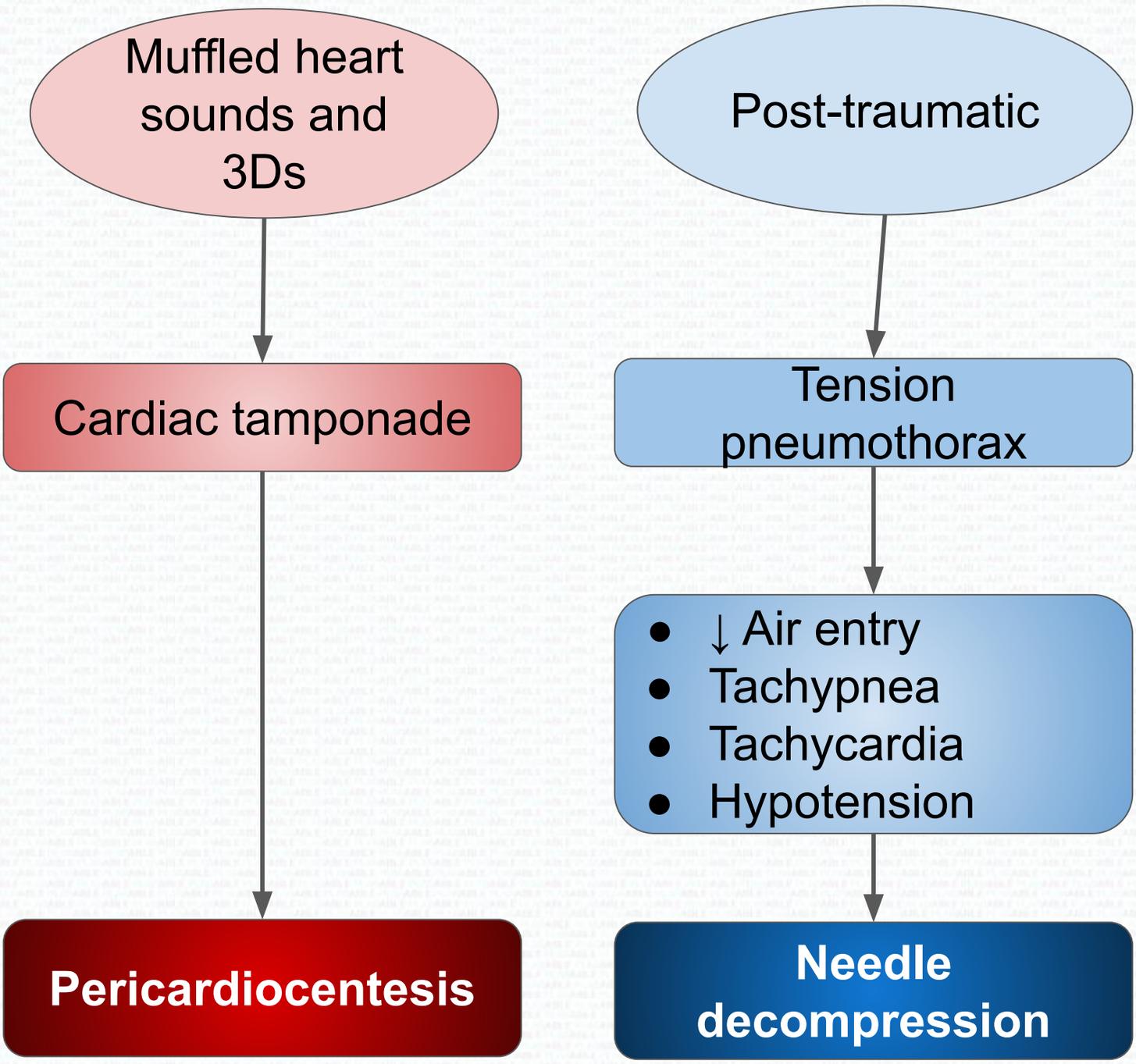
Collapsed lung → Trachea can be displaced towards side of collapse, breath sounds diminished

Tension pneumothorax → Trachea displaced away from affected side, percussion is hyperresonant, breath sounds reduced

Cardiac Tamponade vs Pneumothorax

A stem would give a case of desaturating patient and history of smoking or COPD but instead of giving you the other features (e.g. shifted trachea), it would give you an apparent chest x-ray

Cardiac Tamponade vs Pneumothorax



Hemothorax
= No engorged neck veins

Cardiac Tamponade

DO NOT confused with pneumothorax

Features

Beck's Triad (3Ds)

→ Decreased arterial pressure (Hypotension)
→ Distant heart sound (Muffled heart sound)
→ Distended jugular veins (High JVP)

To confirm diagnosis

- Echo

Treatment

- Urgent pericardiocentesis

If Chest X-ray shows enlarged globular heart 💗 indicates either:

- Pericardial effusion
- Or cardiac tamponade

Pneumonia

Features

- Fever
- Productive cough
- Auscultation
  → Basal crackles
- Chest X-ray
  → Lobar consolidation
- High WBC and CRP
- ± Chest pain ↑ with inspiration (Pleuritic chest pain)

If pneumonia does not improve with antibiotic ± there are night sweating, weight loss or new pleural effusion

Think of empyema

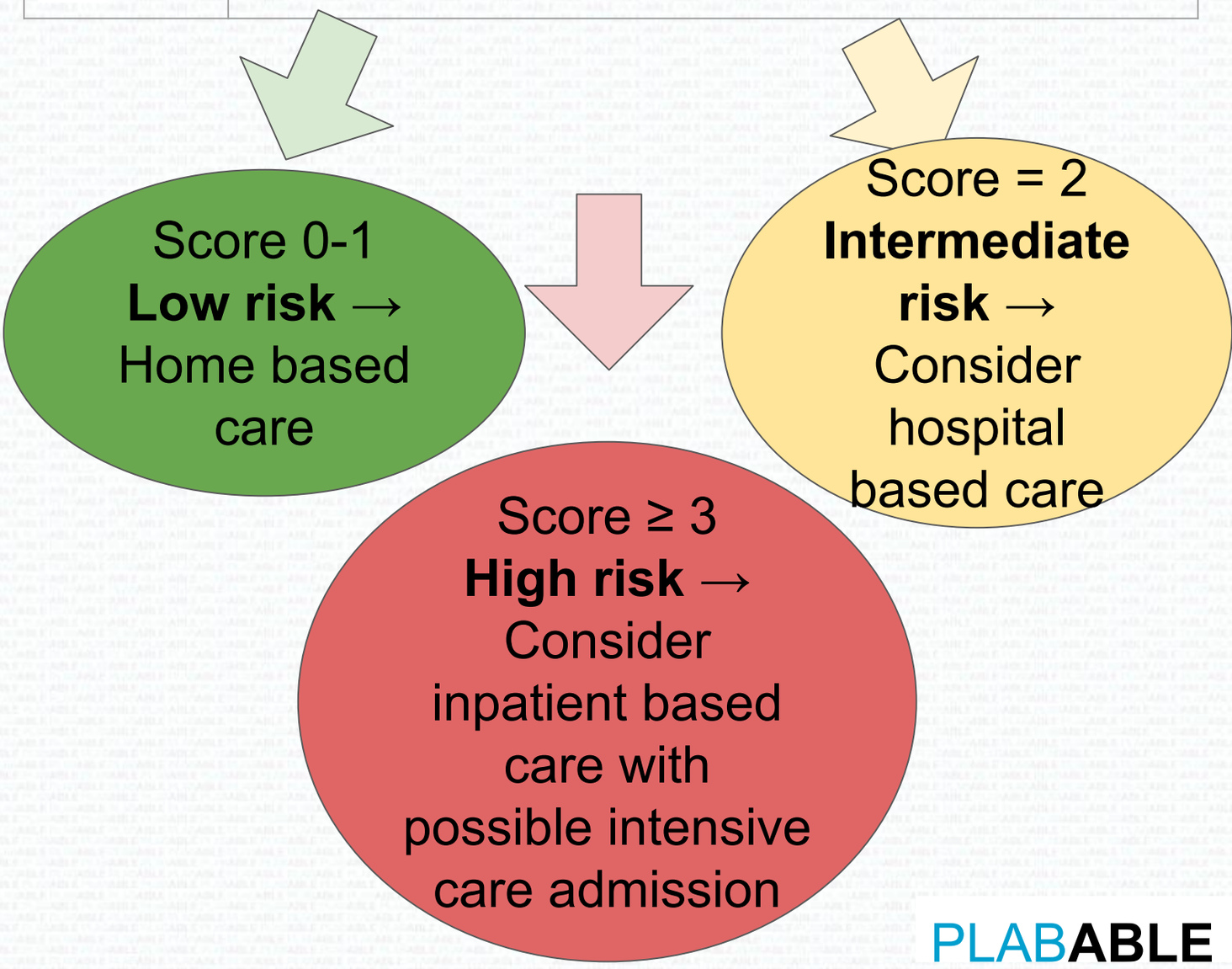
Perform pleural aspiration

- **Pleural aspirates** for **culture and microscopy**
- Treated with **chest drain**

CURB-65 Score

To decide on **inpatient or outpatient treatment** for **community acquired pneumonia**

C	Confusion (abbreviated mental test score ≤ 8/10)
U	Urea > 7 mmol/L
R	Respiratory Rate ≥ 30/min
B	Blood pressure: Systolic ≤ 90 mmHg or diastolic ≤ 60 mmHg
65	Age ≥ 65



CURB calculation

Brain trainer:

A 60 year old man has a productive cough for the past 7 days. He feels unwell and complains of mild shortness of breath. He has a temperature of 38.9° C, a respiratory rate of 31 breaths/minute, heart rate of 90 beats/minute, and a blood pressure of 100/70 mmHg. What is his CURB score?

➔ **1**

➔ **Discharge with antibiotics**

Types Of Pneumonia

Pneumococcal streptococcal	Herpes labialis
Mycoplasma	• Erythema multiforme • Atypical features: Young adult, dry cough, bilateral consolidation
Pneumocystis jirovecii	HIV with CD4 < 200 ± desaturation on exercise
Staph. aureus	Pneumonia developed after influenza (flu)
Legionella pneumophila	• Pneumonia developed after exposure to water, staying in hotel • Low sodium • Low lymphocytes • Macrolides/tetracyclines are the usual choice of treatment

In suspected pneumonia (fever, cough, dullness on percussion)→ **chest X-ray**

Follow up with chest X-ray to rule out malignancy, especially with **smoker ± weight loss**

Pneumonia Treatment

Community acquired pneumonia (mild)	**Amoxicillin**
Community acquired pneumonia (moderate)	**Amoxicillin** **+ Clarithromycin**
Community acquired pneumonia (severe)	**Co-amoxiclav** (amoxicillin + clavulanic acid) **+ Clarithromycin**
Pneumocystis jirovecii '*P. Carinii*'	**Co-Trimoxazole** (trimethoprim + sulfamethoxazole)

Pneumonia Antibiotics Cases

Severe penicillin allergies?

DO NOT USE
amoxicillin or co-amoxiclav

DO NOT USE
cephalosporins due to 10% cross-sensitivity with penicillin

Patient on statin?

DO NOT USE
clarithromycin due to risk of rhabdomyolysis

Use **doxycycline**

Patient on methadone?

DO NOT USE
clarithromycin due to risk of prolonged QT syndrome

Use **doxycycline**

Follow Up Investigation

Brain trainer:

A man with pneumonia is ready to be discharged from the hospital. He is a smoker and has recently unintentionally lost weight. What is the most appropriate follow up investigation to schedule?

➔ **Chest X-ray**

Pneumonia

Brain trainer:

A man with suspected bacterial pneumonia has a history of severe allergy to penicillin and is taking a statin. What is the most appropriate antibiotic for this patient?

➔ **Doxycycline**

Legionella

Brain trainer:

A man with pneumonia has a history of a 3 day stay in a hotel, hyponatremia and lymphocytopenia. What is the most appropriate antibiotic for this patient?

➔ **Clarithromycin**

Management

Brain trainers:

Community acquired pneumonia needing antibiotics + penicillin allergic + taking warfarin

➔ **Doxycycline or clarithromycin**

Community acquired pneumonia needing antibiotics + penicillin allergic + taking warfarin + taking statins

➔ **Doxycycline**

Note: Doxycycline and clarithromycin can increase the anticoagulation effect of warfarin so manufacturer advises monitor INR.

Hospital Acquired Pneumonia

- Develops 48 hours or more after hospital admission and was not incubating at hospital admission
- Clinical features are similar to community acquired pneumonia
- Causative organisms :
  <5 days - Streptococcus pneumoniae
  >5 days - H. influenzae, Pseudomonas aeruginosa and MRSA

- Diagnosis confirmed by chest x-ray
- Treatment depends on severity of disease

Non severe - requires oral drugs
First choice → Co-amoxiclav
Alternative (penicillin allergy) → Doxycycline

Severe - requires IV drugs
First choice → Piperacillin + tazobactam
Alternatives → Ceftriaxone or meropenem

MRSA confirmed → Vancomycin

Pneumonia and HIV

- **HIV + dry cough + exertional dyspnoea**
  → Pneumocystis jirovecii

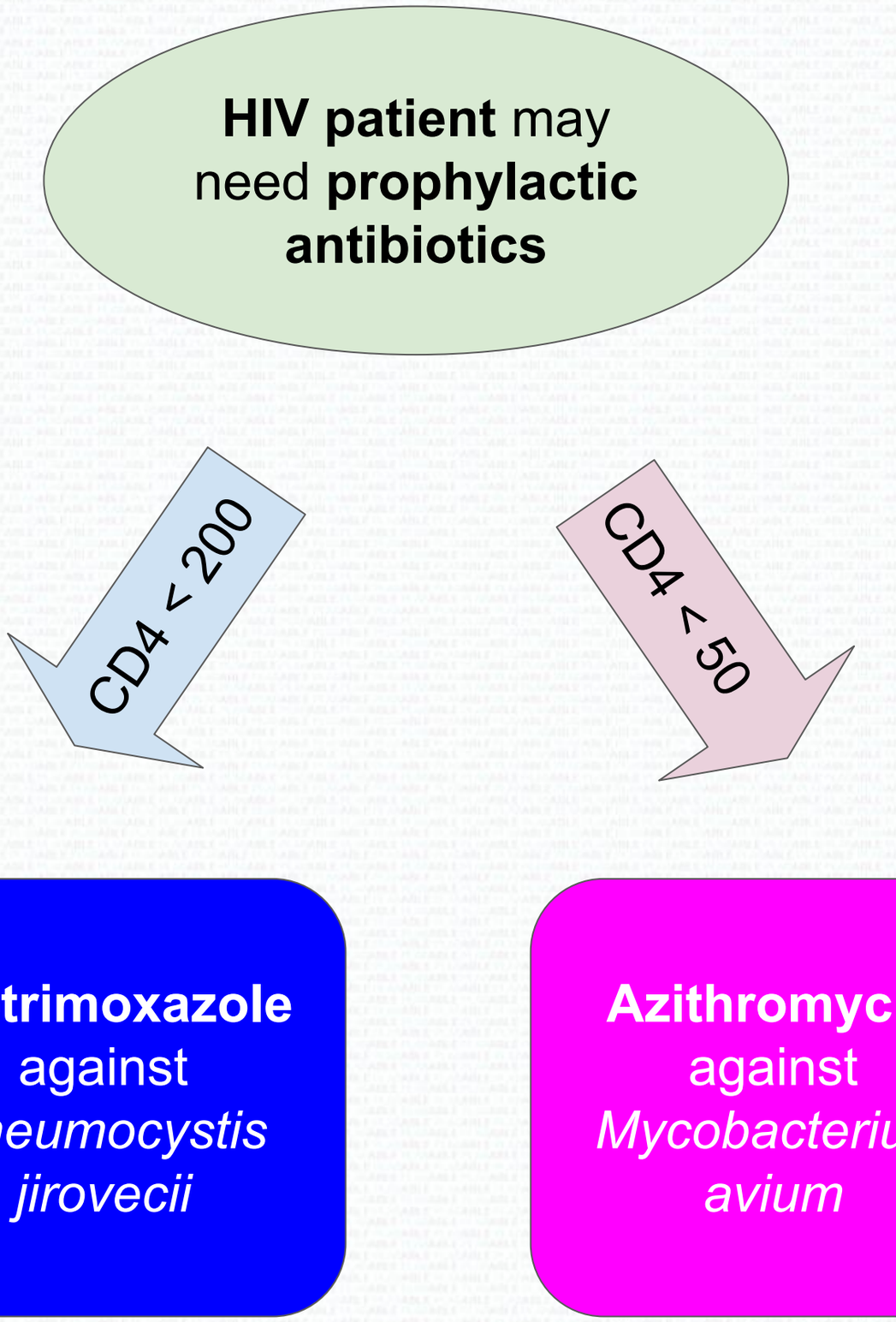
- **HIV + productive cough**
  → Mycobacterium tuberculosis

- Initial investigation
  → Chest x-ray

- Definitive investigation for P.jirovecii
  → bronchoscopy with bronchoalveolar lavage

- Definitive investigation for TB
  → Sputum sample for culture and microscopy

Pneumonia and HIV



Common Chest X-ray Findings

Features	Causative organism
Lobar consolidation	Streptococcus pneumonia (most common cause of community acquired pneumonia)
Bilateral cavitation + pneumatoceles	Staphylococcus aureus
Hotel stay + bibasal consolidation	Legionella
Patchy consolidation + perihilar shadowing + young adult (usually)	Mycoplasma
Perihilar shadowing + HIV	Pneumocystis jirovecii

Empyema

Defined as pus collection in pleural space

Causes:

- A complication of pneumonia
- Penetrating chest trauma
- Oesophageal rupture
- Complication from lung surgery
- Inoculation of the pleural cavity after thoracentesis or chest tube replacement

If patient has other condition and pneumonia, **always treat pneumonia with antibiotic first**

Management Of Empyema

History, examination and chest x-ray suggestive of pleural effusion and infection

Start antibiotics and perform diagnostic pleural aspiration under ultrasound guidance

Pus?

Yes

Insert chest tube
Perform post procedure chest x-ray to check position

No
Send fluid pH, microscopy and culture

Gram stain &/or culture positive &/or pH <7.2

Oral thrush (Oral candidiasis)

Causes

- Immunosuppression
- Smoking
- Using inhaled or oral corticosteroids

Features

- Thick white marks
- Can be rubbed out

Treatment:

- Stop smoking
- Good inhaler techniques
- Use of spacer device
- Rinse mouth with water after inhaler use
- 1st line: oral miconazole gel
- Oral fluconazole 50mg OD for 7 days in severe case

Oral thrush

Brain trainer:

A man with COPD develops oral thrush. He claims to rinse his mouth after the use of a steroid inhaler. What is the most appropriate action?

➔ **Check spacer technique with his inhaled corticosteroid**

Asthma

- A chronic inflammatory disorder of airway secondary to type 1 hypersensitivity
- Paroxysmal and reversible obstruction of airways

Symptoms

- Cough
  → Often worse at night and early morning
- Dyspnoea
- Wheezing
- Chest tightness

Signs

- Expiratory wheeze on auscultation
- Reduce peak expiratory flow rate (PEFR)

Look out for keywords in the stem:

- Variability (day and night)
- Episodic
- Triggers - Cold/exercise/pets
- Atopy history (family or personal)

Asthma

Risk factors and aetiology:

- Personal or family history of **atopy**
  → IgE-mediated condition e.g. eczema, allergic
- Smoking around child
- Exposure to **high concentration of allergens**
  (e.g. Pollen, pets, cold air, perfumes, house dust mites)
- **Aggravating drugs (Beta-blocker, Aspirin, NSAIDs) =** *think of* ***BAN*** **!!**

Asthma

Diagnosis:

- FeNO test (Fractional exhaled nitric oxide)
- Spirometry - Bronchodilator reversibility spirometer
- Peak expiratory flow variability

FeNO measures airways inflammation

Spirometry is a test which measures the amount (volume) and speed (flow) of air during expiration and inspiration.

It helps to distinguish respiratory disorder into obstructive (e.g. Bronchospasm-obstructing airflow) and restrictive (Lung fibrosis-restriction to lungs).

Asthma

In an asthmatic:

- **FEV1** (Forced expiratory volume - air exhaled at 1st second of expiration) **is reduced**
- **FVC** (Forced vital capacity - volume of air exhaled after maximal expiration) **is normal**
- **FEV1/FVC (%) is < 70%** (**reversible and improve after bronchodilation**)
  → *In COPD, it remains < 70% post-bronchodilation*
- **FeNO > 40 part per billions (adult) or >35 part per billions (child) is +ve**

Use peak flow rate diary to determine appropriate time for the use of bronchodilator

Diagnosis

Brain trainer:

A 35 year old non-smoking man has a chronic cough. All investigations (including spirometry) are unremarkable. A 6-week course of inhaled corticosteroids has improved his symptoms. What is the most likely diagnosis?

➔ **Asthma**

Long term Management Of Asthma in Adults

NICE Guidance

If Asthma uncontrolled in 4 to 8 weeks

Short-acting β2 agonists (SABA)
e.g. Salbutamol
+ Low dose ICS
e.g. Beclomethasone
Only a small minority would be prescribed a SABA alone (e.g. very infrequent short-lived wheeze) → Most of the time when we diagnose asthmatics, we prescribe both SABA and ICS

+ Leukotriene receptor antagonist (LTRA)

e.g. Montelukast

+ Long acting β2 agonists (LABA)

e.g. Fostair 100/6

+↑ ICS dose

+ Theophylline OR refer to specialist

BTS Guidance

SABA as required, moving to next step when using > 3x per week

Short-acting β2 agonists (SABA)
e.g. Salbutamol
+ Low dose ICS
e.g. Beclomethasone

+ Long acting β2 agonists (LABA)

e.g. Fostair 100/6

Increase ICS dose to medium dose
OR
Add leukotriene receptor antagonist
STOP LABA if no response

Refer to specialist advice

Treat exercise induced asthma as per NICE guidance

Long term Management Of Asthma in Children

For the purpose of the exam, we want you to focus on children >5 years old, and only focus on the first few steps that we have attached here

NICE Guidance

If Asthma uncontrolled in 4 to 8 weeks

Short-acting β2 agonists (SABA)
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+ Leukotriene receptor antagonist (LTRA)

e.g. Montelukast

+ Long acting β2 agonists (LABA) AND stop LTRA

BTS Guidance

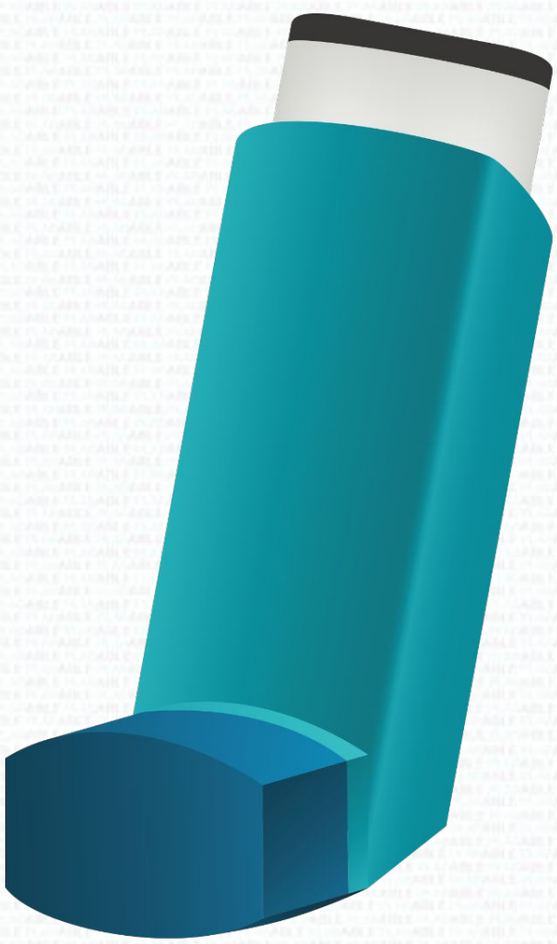
SABA as required, moving to next step when using > 3x per week

Short-acting β2 agonists (SABA)
e.g. Salbutamol
+ Low dose ICS (called very low dose ICS)
e.g. Beclomethasone

+ Long acting β2 agonists (LABA) OR
+ Leukotriene receptor antagonist (LTRA)

Long term Management Of Asthma

Remember, very rarely do we ever have patients ONLY on a SABA since the idea is to have “total control”. This means that most people newly diagnosed with asthma would be on SABA and ICS



Long term Management Of Asthma in Children

Brain trainer:

An 8 year old girl with asthma takes a low-dose inhaled corticosteroid and salbutamol inhalers as required. Her asthma is still not well controlled. Which medication should be added?

➔ **Either a LTRA or a LABA**

Remember both NICE and BTS guidelines are used. If the exam does not specify, then both guidelines would have to be taken into account.

NICE → Adds a LTRA
BTS → Adds a LTRA or a LABA

Hence, LTRA or LABA would be appropriate

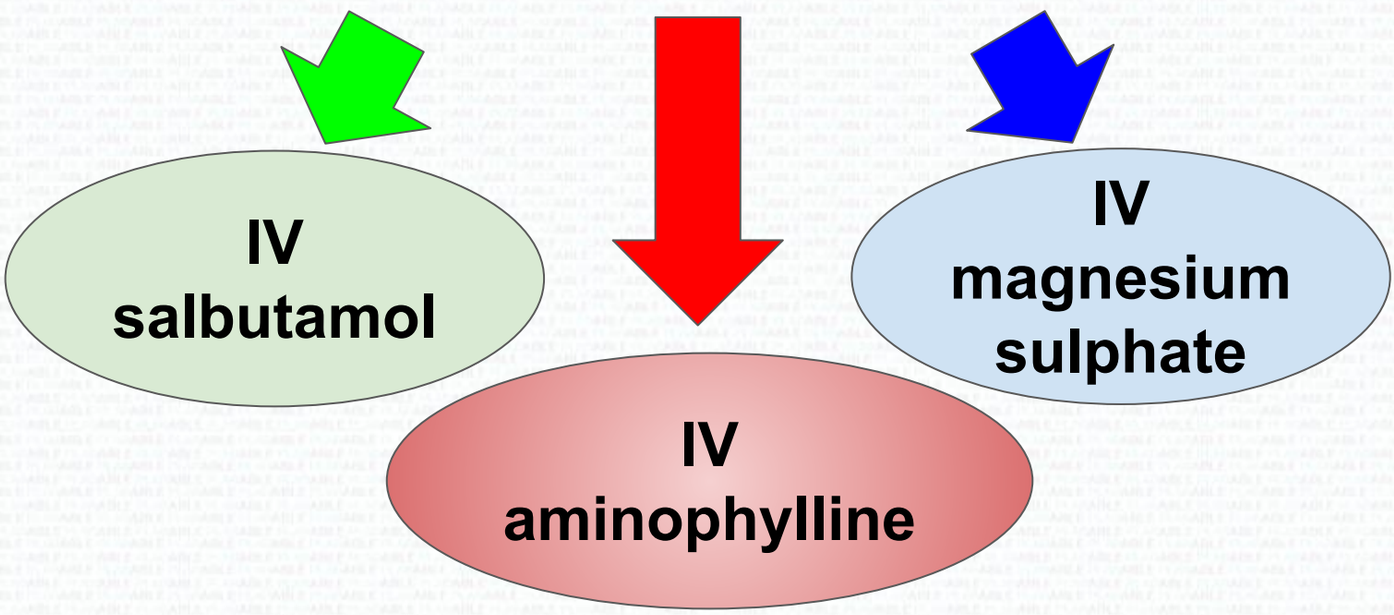
If a question has both options, e.g. LABA as option A and an LTRA as option B, the question would likely be reviewed post exam

Management Of Asthma Exacerbation In Children

1. **O2**
2. **Salbutamol nebuliser** - *could be given back to back*
3. **Add ipratropium bromide nebuliser if needed -** *salbutamol and ipratropium can be mixed in a solution and repeated*
4. **Corticosteroids** - oral prednisolone (liquid or dispersible tablets)

- Or IV hydrocortisone *if medication cannot be swallowed*

If still not better



If child develops tachypnoea, dyspnoea and drowsiness, **request arterial blood gas to rule out respiratory acidosis.**

Acute Asthma Exacerbation in Children

Brain trainer:

A 5 year old asthmatic boy presented with breathlessness. He was given oral prednisolone and back to back salbutamol and ipratropium nebulisers but he was still struggling to find relief. He was given an IV salbutamol but he continued to deteriorate. What is the next intravenous medication to be prescribed?

➔ **IV Magnesium sulphate**

Note: IV hydrocortisone is only given IF the oral prednisolone was not tolerated (ie. child vomits). IV aminophylline is given for severe to life-threatening acute asthma unresponsive to max doses of bronchodilators and corticosteroids.

Management Of Asthma Exacerbation In Adults

1. **O2**
2. **Salbutamol 5mg nebuliser or terbutaline nebuliser**
3. **Corticosteroids**
   - Oral prednisolone (40-50 mg)
   - IV Hydrocortisone 100 mg if cannot swallow

If severe/life-threatening/still no better

4. Salbutamol nebuliser every 15 mins + Ipratropium bromide 0.5 mg nebuliser (mixed)
5. Single dose of magnesium sulphate 1.2 - 2 gram IV over 20 mins

If patient is improving, give salbutamol every 4 hours and prednisolone 40-50mg for 5 days.

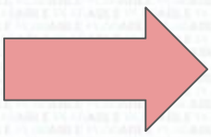
Use of magnesium sulphate

- Eclampsia 'seizures'
- Polymorphic ventricular tachycardia = Torsades de Pointes
- Refractory asthma exacerbation not respond to Step 1-4

Management Of Asthma Exacerbation In Adults

Know when to intubate!

Examples:
pH is 7.1
Breath sounds are quiet
Semi-conscious
Decompensated



Intubate and ventilate

Decompensation can be seen when respiratory rate starts to fall because of fatigue

This card applies not just for asthma but any respiratory condition

Exercise Induced Asthma

- Asthma brought on by physical exertion
- Suggestive of poor asthma control
- Drug of choice - inhaled short acting beta 2 agonist (salbutamol) immediately before exercise

If exercise remains a problem for an individual who is otherwise well controlled on SABA + inhaled steroids any of the following can be added:

- LTRA
- LABA
- Sodium cromoglicate
- Theophylline

Exercise Induced Asthma

The trick to answering questions on exercise induced asthma is to look at the BTS guidelines and follow them based on graded recommendations (A B C). “A” has the best evidence.

In a nutshell, the following can be tried for exercise induced asthma for an individual who is otherwise well controlled on SABA + inhaled steroids:

- SABA immediately prior to exercise
- LTRA
- LABA
- Sodium cromoglicate
- Theophylline

The easiest and has a graded A recommendation

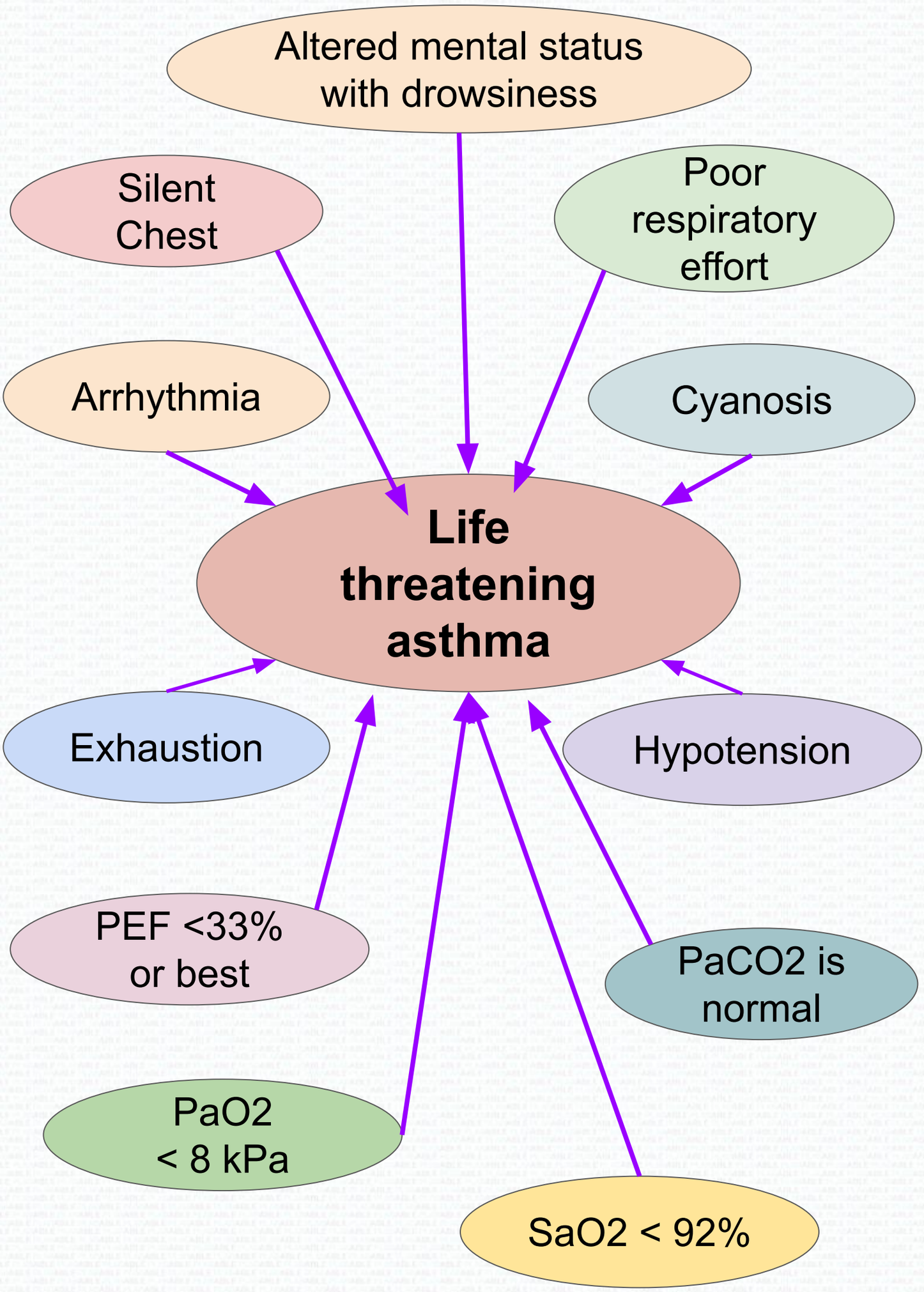
Housekeeping

Brain trainer:

What is the correct method for cleaning a spacer device?

➔ **Once a month wash with soapy water and allow to air dry**

Features Of Life-threatening Asthma



Asthma Vs COPD

- Bronchodilator reversibility in asthma (FEV1 improves after bronchodilation whereas, in COPD it remains after bronchodilation)
- COPD is more resistant to medication as compared to asthma
- Strong smoking history in COPD patients
- COPD patients are older (>40 years)
- Personal or family history of atopy in patients with asthma

Lung Cancer

Small cell lung cancer

SIADH
Syndrome of **I**nappropriate **A**nti-**D**iuretic **H**ormone

Features:

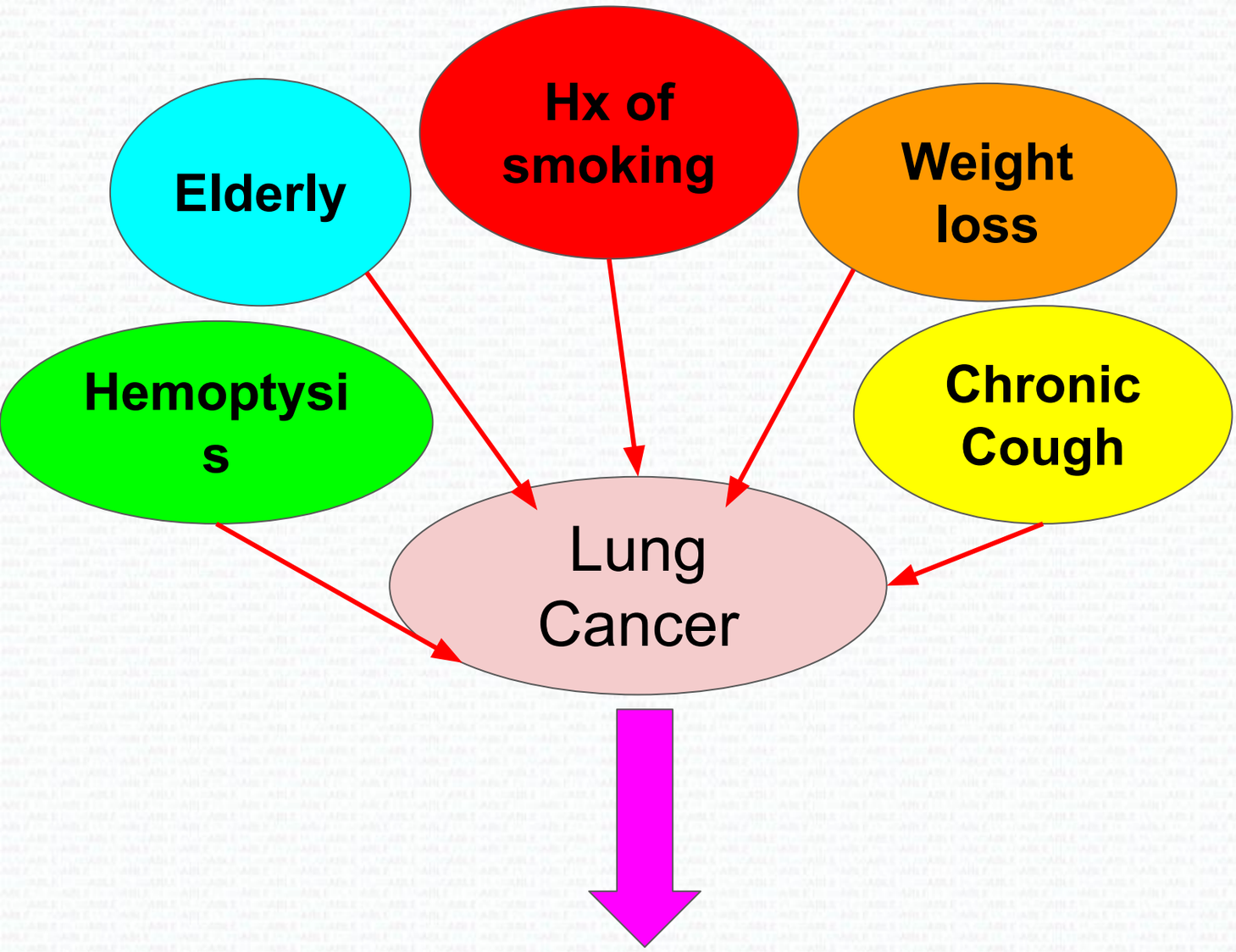
- Low serum sodium (**Hypo**natraemia)
- Low serum osmolality
- High urine osmolality

Completely **Opposite to**

Diabetes Insipidus (DI)

- High serum sodium (**Hyper**natraemia)
- High serum osmolality
- Low urine osmolality

When To Suspect Lung Cancer



Initial investigation:

Chest X-ray

Confirm diagnosis:

Bronchoscopy
→ To obtain histological and cytological specimen via biopsy

Lung Cancer

Squamous cell carcinoma

Histopathology = large polygonal cells with keratin pearls and bridges

- SCC is more common in **smokers**
- Lungs adenocarcinoma is more seen in **non-smokers**
- SCC usually present **centrally**

Paraneoplastic Syndrome In Lung Cancer

Small cell Lung cancer	Squamous cell carcinoma
• **SIADH:** Hyponatraemia • **ACTH:** 1. Not typical 2. Hypertension 3. Hyperglycaemia 4. Hypokalaemia 5. Alkalosis 6. Muscles weakness • **Lambert-Eaton syndrome:** Same presentation as myasthenia gravis **BUT** 1. Reflexes are absent and elicited after exercises 2. ↑ Strength/power of muscles after repeated test	• Hypercalcaemia • Parathyroid hormone related protein secretion • Clubbing • Hyperthyroidism due to ectopic TSH

Diagnosis

Brain trainer:

A man with lung cancer presents with a number of nonmetastatic systemic symptoms. What is the most likely explanation for this?

➔ **Paraneoplastic syndrome**

COPD

This is an umbrella term encompassing the older terms chronic bronchitis and emphysema

Features

- History of smoking (**most common cause**)
- Progressive dyspnea
  = breathlessness or shortness of breath
- FEV1/FVC ratio = < 0.7 on spirometry (**Irreversible** after bronchodilation)
- Productive cough
- Wheezing
- Hyperinflated chest on X-ray
- Noisy breath / hoarseness of voice due to chronic smoking

Investigation of COPD

Post-bronchodilation spirometry:

- FEV1/FVC ratio less than 70% (< 0.7)
- FEV1 < 80% of predicted
- ↑ Residual volume due to air trapping

Sometimes unremarkable improvement might be seen in FEV1/FVC ratio, however ratio will still remain <0.7 in COPD patients

Chest X-ray:

- Hyperinflation
- Bullae
- Flat hemidiaphragm
- >7 posterior ribs seen

Full blood count:

- Exclude secondary to polycythaemia

COPD

Brain trainer:

A man with COPD has breathlessness. Nebulised steroids are not available. What is the most appropriate agent to assist in his breathlessness?

➔ **Nebulised normal saline**

Super Summary of FEV1/FVC ratio

FEV1/FVC ratio <0.7

- Think obstructive pattern like COPD or asthma
- If FEV1 subsequently improves significantly with salbutamol, then think asthma

FEV1/FVC ratio >0.8

- Think restrictive pattern like pulmonary fibrosis

FEV1/FVC ratio between 0.7 and 0.8

- Can be normal but can also be a restrictive pattern

Chronic Bronchitis

Chronic bronchitis is a form of COPD, the answer can sometimes be chronic bronchitis if COPD is not given as an option.

Features:

- Productive cough that last for 3 months or more
- Progressive dyspnea
- Wheezing
- ± Low grade fever

Most people with chronic bronchitis have COPD diseases

Tobacco smoking is the most common cause

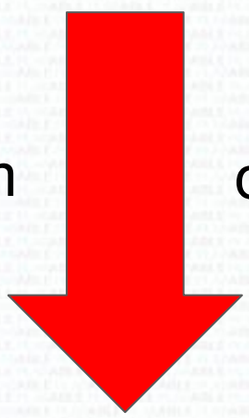
Smokers with symptoms of breathlessness or chest tightness at night or early morning

Think asthma! Especially with Hx of atopy (e.g. Eczema)

Bronchiectasis

Features

- Persistent cough
- Copious purulent sputum
- Tram track-ring opacities on x-ray



To confirm diagnosis

High resolution CT scan (HRCT)

Management of COPD

In stable condition:

Stop smoking

Short-acting β2 agonist (SABA)
Or
Short acting muscarinic antagonist (SAMA)

ADD
Long-acting β2 agonist (LABA)
And
Long-acting muscarinic antagonist (LAMA)
Or
ICS if patient has asthmatic features

Triple therapy if patient remain breathlessness or have exacerbation

LAMA + LABA + ICS

For patient who does not respond to inhaler therapy

Oral theophylline

O2 therapy in COPD management

Assess for LTOT ''Long term oxygen therapy'' if the following:

- Very severe airflow obstruction
  → FEV1 < 30% (predicted)
- Consider in severe airflow obstruction
  → FEV1 30-49% (predicted)
- Oxygen saturation ≤ 92% on room air
- Cyanosis
- Polycythaemia
- Peripheral oedema
- Raised jugular venous pressure

If patient is on 'Long Term Oxygen Therapy'' and continue breathlessness:

Add
Prednisolone ± nebulised normal saline
→ *To loosen secretions*

Patient on LTOT should be on supplementary O2 for at least 15 hours a day

Management of COPD Exacerbation In Hospital

- Use **24-28%** oxygen **NOT** 100%
- Maintain O_2 saturation between **88-92%**
- Increase dose with short-acting bronchodilator (e.g. salbutamol or ipratropium bromide) or use nebuliser if needed
- Prednisolone 30 mg stat

  Prednisolone should continue as 30 mg OD total for 7-14 days

  Or hydrocortisone 100 mg IV if cannot swallow
- **If no response**

  → IV aminophylline
- **If purulent sputum, fever and high CRP**

  → Antibiotics
- **If patient still dyspnoeic and impaired blood gas**

  → Non-invasive ventilation

Oxygen Prescription Guidance for Acute COPD exacerbations

Patients with COPD are at risk of developing hypercapnic respiratory failure

Start with 24 or 28% oxygen via Venturi mask (target sats = 88 to 92%)

pH <7.35 + PCO2>6.0 kPa **(Respiratory acidosis**)

Consider NIV

Consider intubation if NIV fails or contraindicated such as in scenarios like respiratory arrest, high aspiration risk, or impaired mental status

pH ≥7.35 + PCO2>6.0 kPa **(Hypercapnia)**

Continue with 24 or 28% oxygen via Venturi mask

PCO2<6.0 kPa **(Normal or low)**

Titrate oxygen to maintain oxygen saturation target of 94-98%

Repeat ABG in 30 to 60 minutes

COPD Exacerbation

Brain trainer:

A COPD patient with breathless and oxygen saturations of 88% has been started on 100% oxygen, however, he is still dyspnoeic. What is the most appropriate initial action?

➔ **Administer 24% oxygen**

Pulmonary Embolism

Hints and features*:*

1. Hx of prolonged immobility

   Eg. after surgery, long-haul flight
2. Risk factors

- Combined oral contraceptive pill
- Surgery
- Obesity
- Pregnancy
- Malignancy
- Previous venous thromboembolism

3. ± One or more of:

- Shortness of breath ‘dyspnea’
- Chest pain ‘often pleuritic, retrosternal’
- Cough
- Hemoptysis
- Tachycardia
- Increased respiratory rate

Pulmonary Embolism

Investigation:
Most initial → Chest X-ray
Most appropriate → CT pulmonary angiography

Why is Chest X-ray done first?
It is to rule out other causes of shortness of breath like pneumothorax or pneumonia. If pneumothorax or pneumonia is detected, then that diagnosis is likely the cause of her shortness of breath and the patient may not need a CTPA.

If suspected PE:
Treat while awaiting CTPA
First line → DOAC (apixaban or rivaroxaban)
Second line → LMWH

If patient is haemodynamically unstable
→ Start continuous UFH infusion

Pulmonary Embolism

Brain trainer:

A man develops sudden chest pain and difficulty breathing. He was treated for a left leg cellulitis 7 days ago with flucloxacillin. His left leg is swollen and he has been immobile. His vital signs are within normal limits except for a heart rate of 112 beats/minute. He has a normal full blood count and renal profile.

What is the most initial investigation?
➔ **Chest X-ray**

What is the most appropriate investigation
➔ **CTPA**

Pulmonary Embolism

Brain trainer:

A woman 2 days after hip replacement surgery presents with suspicion of pulmonary embolism. She states that she has been taking low molecular weight heparin as prescribed. What is the most appropriate action?

➔ **Prescribe a higher dose of LMWH and arrange a CT pulmonary angiogram**

Diagnosis

Brain trainer:

A woman has shortness of breath and is feeling unwell for the past 12 hours. She has a history of panic attacks. Arterial blood gases show hypoxia, hypocapnia and alkalosis. What is the most likely diagnosis?

➔ **Pulmonary embolism**

Atelectasis Vs Pulmonary Embolism

Atelectasis	Pulmonary embolism
Usually occurs after few hours post surgery	Can be an early or a late complication
Usually is associated with smokers and people who undergo abdominal or trans-thoracic procedures	Usually associated with risk factors like immobility, obesity, malignancy, COCP use and lower limb surgeries
Chest x-ray - opacity of the involved segment + mediastinal shift to the affected side	Most cases of pulmonary embolism have a normal chest x-ray
Do chest physiotherapy	DOAC is first line treatment

Pulmonary Embolism In Pregnancy

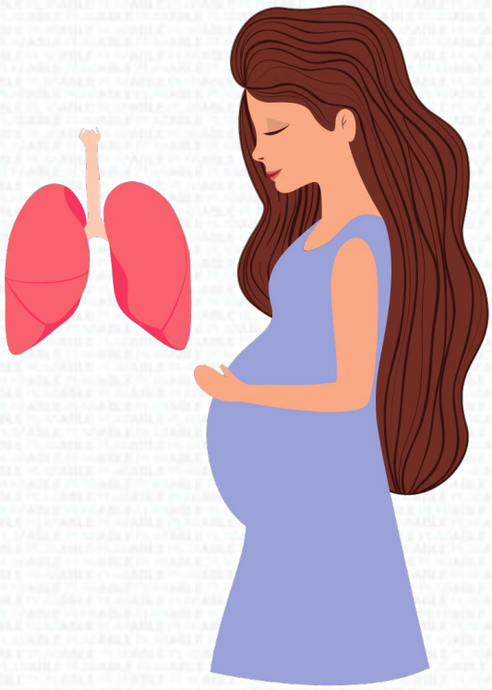
Investigations

CTPA → Better for baby, worse for mom
V/Q → Better for mom, worse for baby

CTPA has lower risk of radiation to fetus but higher radiation to maternal breast tissue (increase risk of breast cancer for mom)

V/Q has more risk of radiation to fetus but lower radiation to maternal breast tissue (increase risk of childhood cancer)

Pulmonary Embolism In Pregnancy



First investigation to perform → Chest X-ray

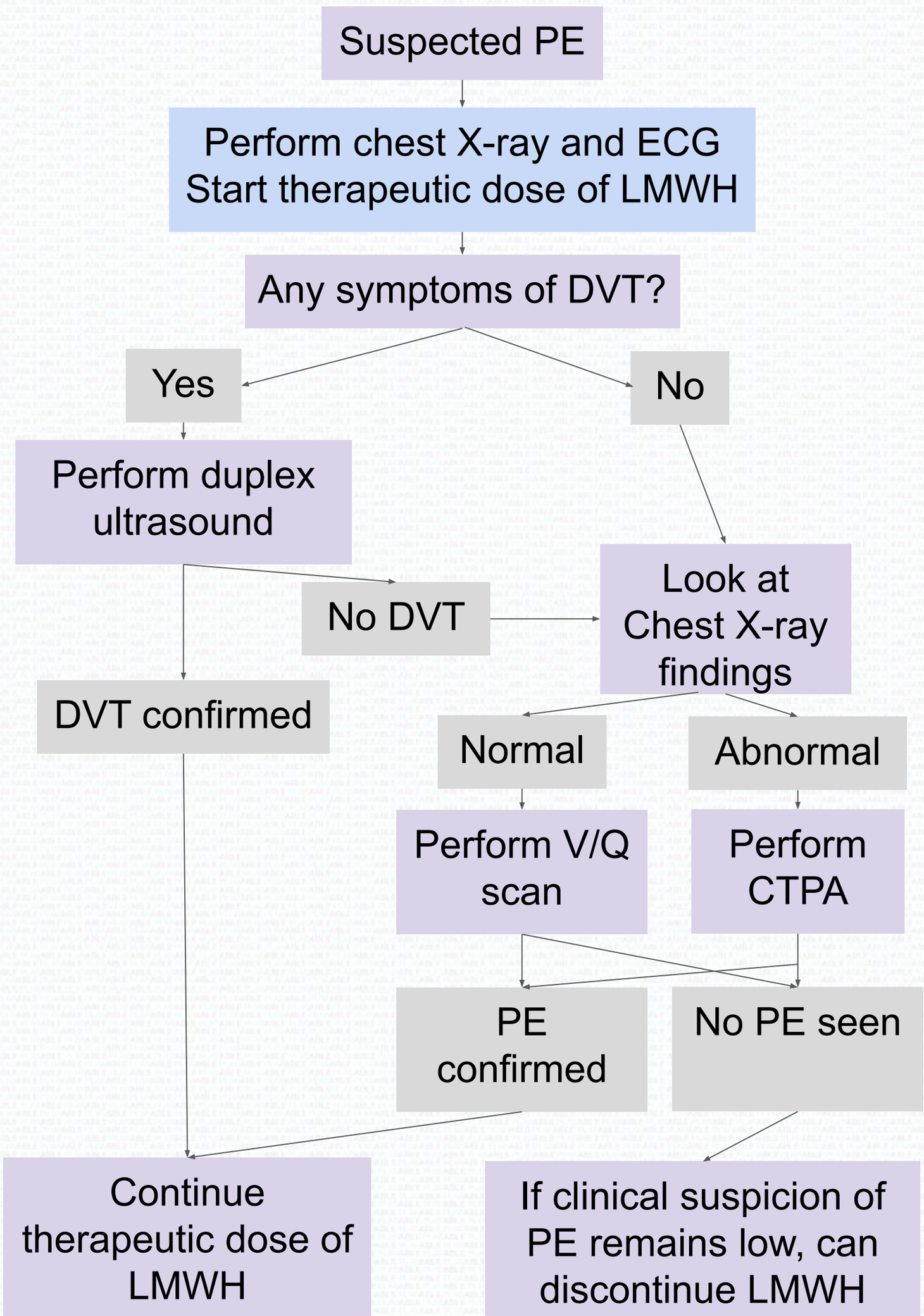
Two choices will be given in the options which are V/Q scan and CTPA.

To decide which one to pick :

- PE suspect + pregnant + abnormal chest X-ray → Perform a CTPA over V/Q scan
- PE suspect + pregnant + normal chest X-ray → Perform a V/Q scan first

Start treatment with LMWH in all pregnant patients who are suspected to have PE and continue till it has been excluded.

Pulmonary Embolism In Pregnancy



Pancoast Tumour

Features:

- A tumour of **apex** of the lung
  (Top end of left or right of the lung)
- Spread to nearby tissues ribs, vertebrae
- Causing **Horner's syndrome** by **unilateral compression of sympathetic chain**
  → Unilateral *ptosis*, *miosis* and *anhidrosis*

Always suspect in **elderly** with **history of smoking**

Pulmonary Fibrosis

Features:

- Progressive exertional dyspnoea
- Bi-basal fine end-inspiratory crepitation on auscultation
- Dry cough
- Clubbing

Diagnosis:

- Spirometry
  → Will show a restrictive picture
- FEV1 : ↓ or normal
- FVC: ↓
- FEV1/FVC: ↑ (> 0.7)

HINT

If the question mention **'working in coal mines'**

Diagnosis

Brain trainer:

A person presents with shortness of breath. Lung function tests show:

FEV1 60% of predicted

FVC 40% of predicted

FEV1/FVC ratio 0.8.

What is the most likely diagnosis?

➔ **Pulmonary fibrosis**

Obstructive vs Restrictive

	Obstructive lung disease	Restrictive lung disease
FEV1	↓ Less than 80% of predicted value	↓ Less than 80% of predicted value
FVC	Normal More than 80% of predicted value	↓ Less than 80% of predicted value
FEV1/FVC	↓ Less than 0.7	Normal (0.7-0.8) or ↑ Increased (>0.8)
Examples	**A -** asthma **B** - bronchiectasis **C** - cystic fibrosis, COPD	**P** - pulmonary fibrosis **I** - interstitial lung disease **N** - neuromuscular **T** - thoracic cage deformities

Anticipatory Medications

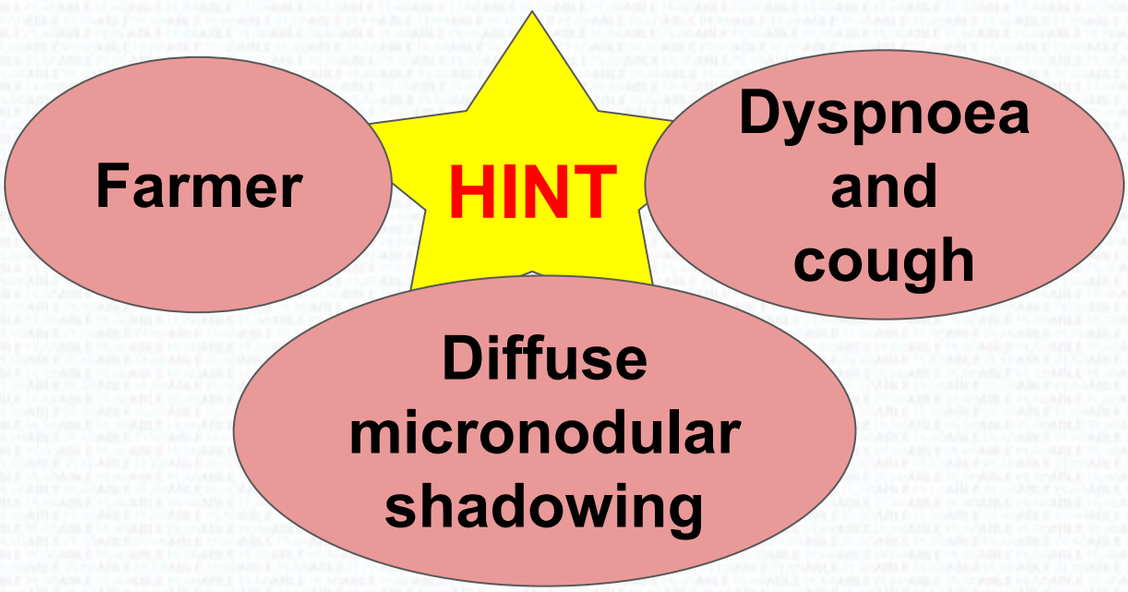
These are SOME EXAMPLES of medications that are allowed to be given to patient during the last days of life

Only given **SUBCUTANEOUSLY**

- **SC Morphine**
  → Pain and breathlessness
- **SC Haloperidol**
  → Nausea and vomiting
- **SC Midazolam**
  → Anxiety, delirium, agitation
- **SC Hyoscine butylbromide**
  → Noisy respiratory secretion
  e.g. rattling throat

Extrinsic Allergic Alveolitis

(Hypersensitivity pneumonitis)
Caused by hypersensitivity induced lung damage due to variety of inhaled organic particles



Features

Acute → SOB, dry cough fever 4-8 hours after exposure

Chronic → Continuous presenting symptoms of above

Extrinsic Allergic Alveolitis

1. Chest x-ray to confirm diagnosis
   → Diffuse micronodular shadowing
2. Bronchoalveolar lavage → Lymphocytosis
3. Blood → No eosinophilia

Avian proteins in bird fanciers	**Spore of Saccharopolyspora rectivirgula** in farmers
Aspergillus Clavatus in malt workers	**Thermophilic actinomycetes** in mushroom workers

Occupational Respiratory Disease

Occupation	Associated condition
Farmer, malt workers, mushroom workers	Extrinsic allergic alveolitis
Shipyard workers, construction workers	Mesothelioma (report death to a coroner)
Coal mine workers	Coal worker pneumoconiosis (pulmonary fibrosis)

Bronchopleural Fistula

Features

- Cough (±sputum, ±blood)
- Dyspnoea
- Haemodynamic or respiratory compromise
- Post thoracic surgery
- Pneumonectomy > lobectomy
- Right sided > Left sided

Diagnosis

- X-ray (2 required):
  1. high air-fluid level (normal)
  2. low air-fluid level (abnormal)
- CT (most accurate test)

X-Ray - a quick drop in air-fluid level is abnormal post thoracic surgery as lung should be filled with sterile liquid

Types Of Sputum

Appearance of sputum	Cause
Clear, watery, frothy or pink (serous)	• Acute pulmonary edema
Clear, greyish-white, viscous (mucoid)	• Chronic bronchitis • Asthma
Yellow-green (purulent)	• Pneumonia • Bronchiectasis • Cystic fibrosis • Lung abscess
Rusty red	• Pneumococcal pneumonia

Blood Gas Abnormality

1

Acidaemic

pH < 7.35

Alkalaemia

pH > 7.45

2

$PaCO_2$ > 6.0 kPa
Respiratory acidosis
(or respiratory compensation for metabolic alkalosis)

$PaCO_2$ < 4.7 kPa
Respiratory alkalosis
(or respiratory compensation for metabolic acidosis)

3

Bicarbonate < 22 mmol/L
Metabolic acidosis
(or renal compensation for respiratory alkalosis)

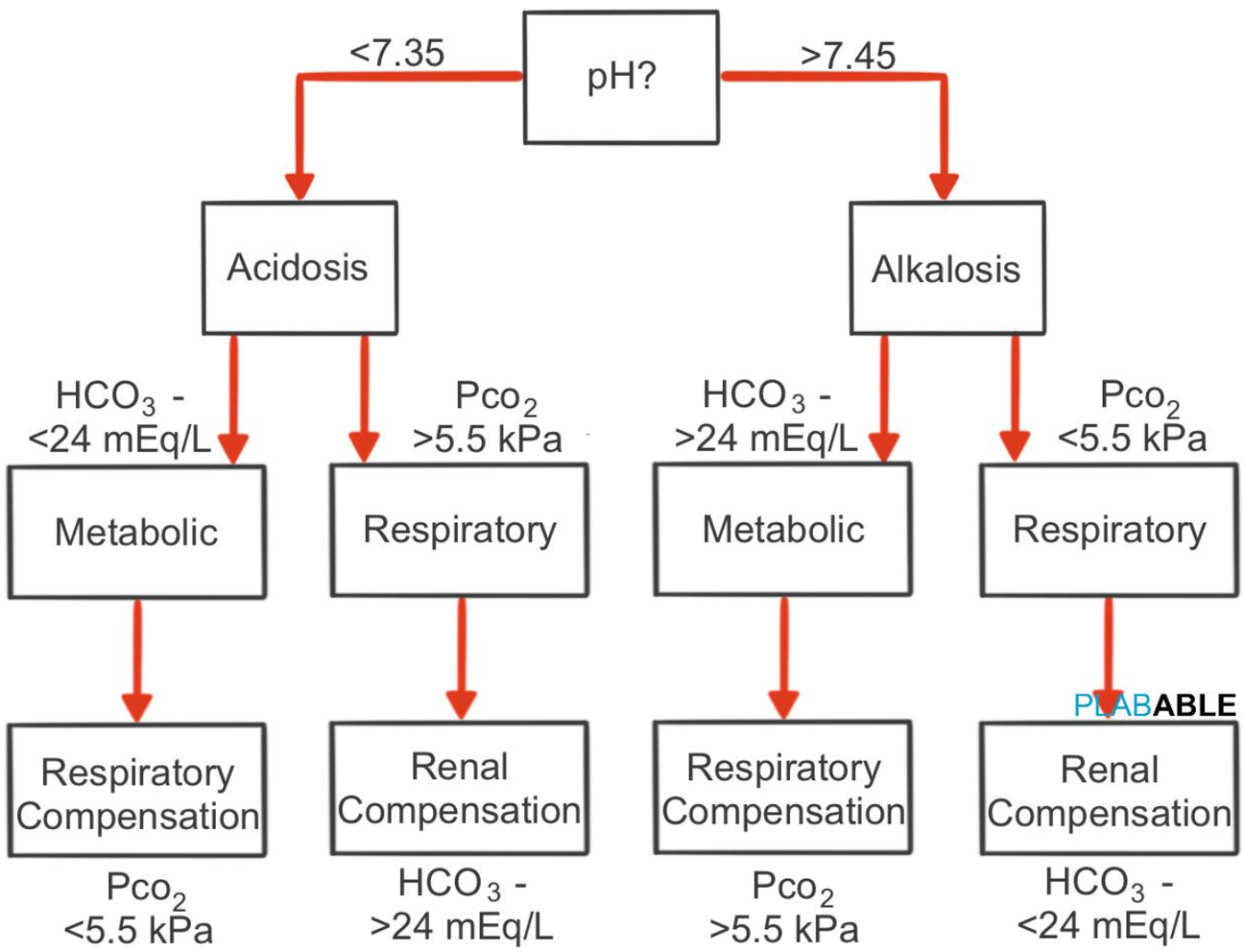
Bicarbonate > 26 mmol/L
Metabolic alkalosis
(or renal compensation for respiratory acidosis)

CO_2 is an acid. Bicarbonate is an alkali

Arterial Blood Gas (ABG)

	pH	CO2	HCO3-
Respiratory acidosis	↓	↑	↔
Respiratory alkalosis	↑	↓	↔
Respiratory acidosis with metabolic compensation	↓ / ↔	↑	↑
Respiratory alkalosis with metabolic compensation	↑ / ↔	↓	↓
Metabolic acidosis	↓	↔	↓
Metabolic alkalosis	↑	↔	↑
Metabolic acidosis with respiratory compensation	↓	↓	↓
Metabolic alkalosis with respiratory compensation	↑	↑	↑

Acid Base Balance



Acid-Base Analysis Diagram

Conditions That Aggravates Blood Gas Abnormality

Diarrhoea:
↑ loss of bicarbonate
= Metabolic acidosis

Dehydration:
↑ loss of blood volume
= AKI + impaired renal function

Pulmonary Embolism:
Low PaO_2, low $PaCO_2$ and normal bicarbonate
= Respiratory alkalosis

Panic attack:
↑ RR → ↓$PaCO_2$
= Respiratory alkalosis

Arterial Blood Gas Disturbance Causes

Metabolic acidosis	• Drugs: Iron, aspirin, metformin, alcohol, ACE-I, isoniazid, digoxin • Paracetamol (less common) • Diarrhoea • Renal insufficiency • Addison's diseases
Metabolic alkalosis	• Drugs: NSAID, diuretics. • Vomiting (loss of gastric acid) • Hypovolaemia • Hypokalaemia • Secondary hypoparathyroidism
Respiratory acidosis	• Drugs: Benzodiazepine, Organophosphates • Any cause of airway obstruction (Apnea) • COPD • Pneumothorax • Hemothorax • Ascites • ↑ Ventilation rate if patient is on one to wash out CO2
Respiratory alkalosis	• Drugs: aspirin (early in the course of poisoning • Any condition that causes Hyperventilation • Pulmonary embolism • Mechanical ventilation

Acid Base Balance

Brain trainer:

A 39 year old woman has sudden onset chest pain and shortness of breath. An arterial blood gas was taken which shows the following:
PaO2 8.5 kPa (>10)
PaCO2 3.7 kPa (4.7-6)
pH 7.50 (7.35-7.45)
Bicarbonate (HCO3–) 21 mmol/L (22-26)
What is the most appropriate term to use?

➔ **Type 1 respiratory failure**

Type 1 respiratory failure has low pO2 only (pCO2 is either normal or low)
Type 2 respiratory failure has low pO2 AND high pCO2

Method of remembering this is:
*Type **1** has **1** value which is abnormal → The pO2*
*Type 2 has **2** values which are abnormal → The pO2 AND the pCO2*

Acid Base Balance

Brain Trainer :

A 60 year old patient presented to the Emergency Department with chief complaints of shortness of breath, altered sensorium and abdominal pain. After initial assessment and management, the patient was intubated due to persistent desaturation despite oxygen supplementation. He was admitted to the ICU and an ABG was done after 10 minutes of ventilation.

pH - 7.1 (7.35- 7.55)
PaO2 - 8.0 kPa (>10)
PaCO2 - 7.5 (4.7 - 6)
Bicarbonate (HCO3-) - 22 (22-26)
What is the next step in management?

➔ **Increase ventilation**

Increasing ventilation rate will wash out CO2 thus resolving the hypercapnia and respiratory acidosis.

Postoperative Breathlessness

Causes of postoperative breathlessness (**PLATE):**

- **P**- pulmonary embolism (within hours)
- **L**- left ventricular failure (LVF)
- **A**- atelectasis (within hours) (most common cause)
- **T**- tension pneumothorax
- **E**- exacerbation of COPD

Always keep **PLATE** in mind for any question with patient experiencing postoperative breathlessness.

Panic Attacks

Young patient with episodes of acute dyspnoea + intense fear + palpitations + tingling around mouth + occurs when patient is in crowded areas

Episodes resolve after some time + well in between episodes

Likely to be a **panic attack**!

What will ABG findings show?

- **pH → Raised (>7.45)**
- **PaO2 → Normal (>10 kPa)** (hyperventilation)
- **PaCO2 → Low (<4.7 kPa)** (hyperventilation → CO2 washout)
- **HCO3- → Usually normal** as compensation takes time and panic attacks resolve spontaneously **(22-26 mmol/L)**

ABG interpretation → **Uncompensated respiratory alkalosis without hypoxaemia**

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