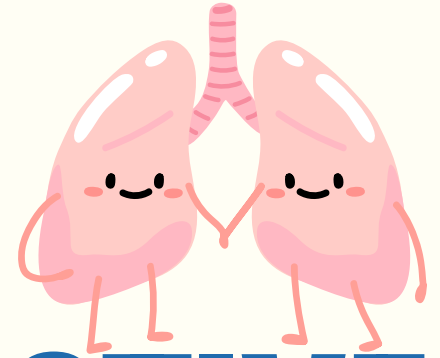
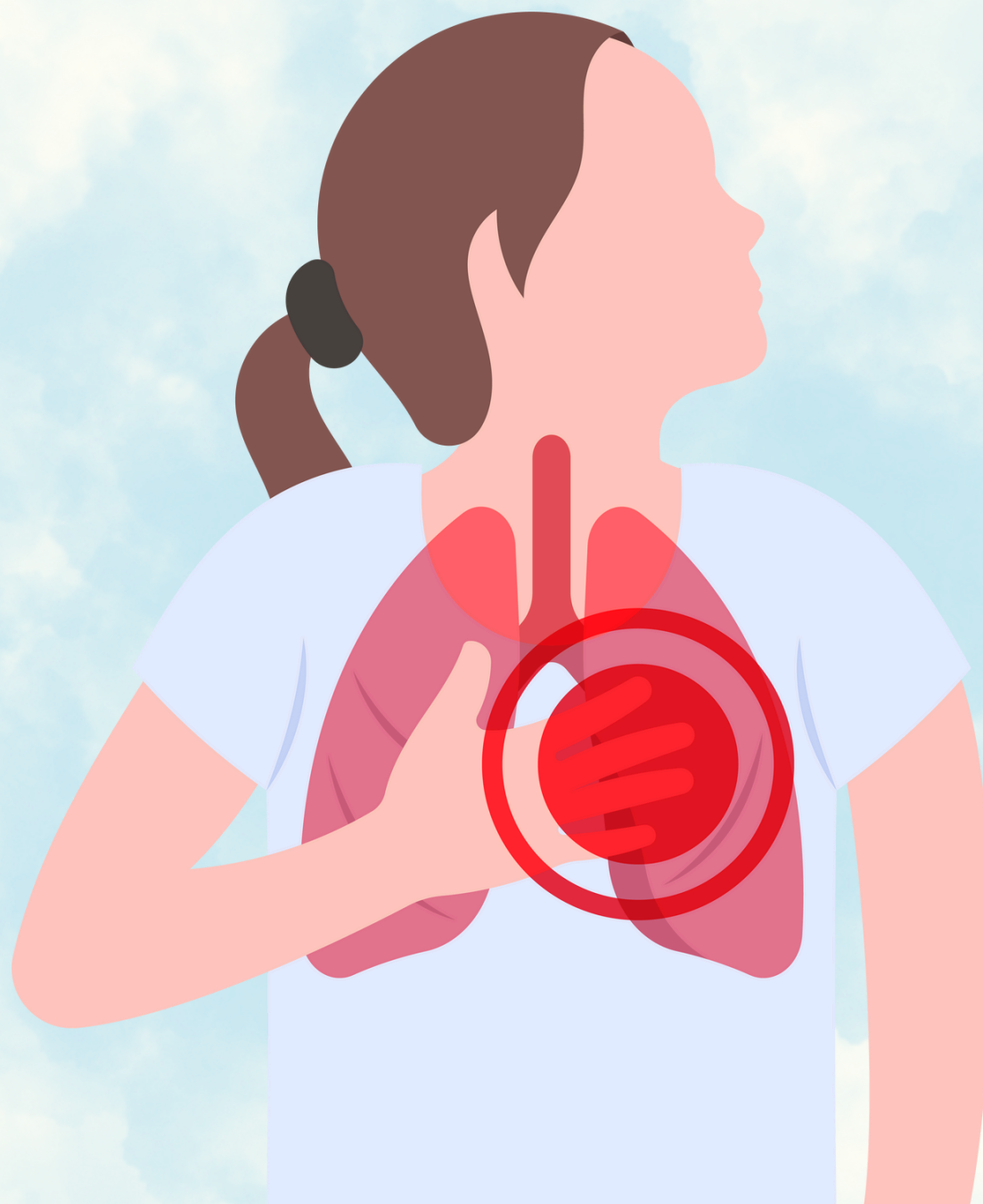


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CHRONIC OBSTRUCTIVE PULMONARY DISEASE

[PART 1: DEFINITION, RISK FACTORS & CLINICAL FEATURES]



MUM
IM'S



INTRODUCTION

Chronic Obstructive Pulmonary Disease is defined as a heterogeneous lung condition characterised by **chronic respiratory symptoms** due to **abnormalities of the airway** and/or **alveoli** that cause persistent and often **progressive, airflow obstruction**.

Chronic Bronchitis

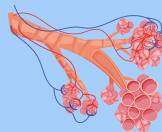
- Productive cough lasting for at least **three months in each of two successive years**
- May precede or follow development of airflow limitation.

Emphysema

- **Enlargement of the airspaces** distal to the terminal bronchioles that is accompanied by destruction of airspace walls.

Centriacinar Emphysema

Features



Panacinar Emphysema

More common



Incidence

Less common

Cigarette smoking

Causes

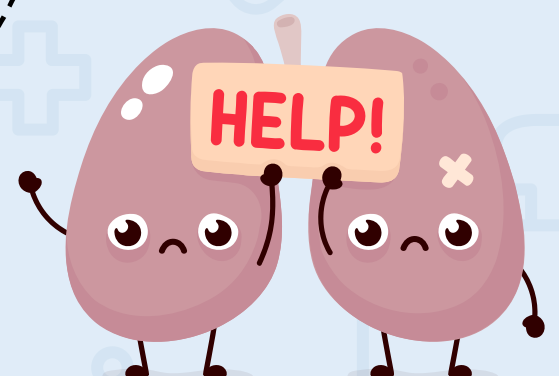
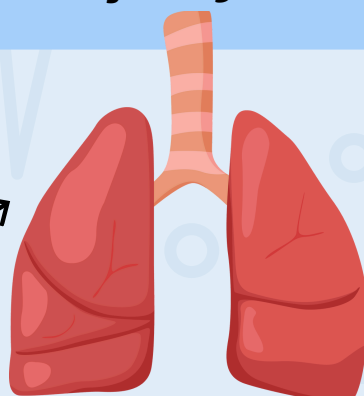


A-1 antitrypsin deficiency

Upper lobe

Part of lung involved

Lower lobe



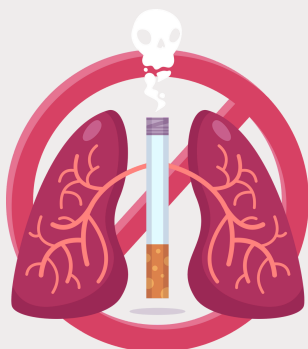


RISK FACTORS



1

Smoking



2

Exposure to second-hand smoke



3

Exposure to air pollution (E.g. biomass fuels, dusts)



4

Occupational exposures (E.g. coal dust, silica)



5

Host factors

- Genetic factors (E.g. Alpha-1 antitrypsin deficiency)
- Childhood respiratory infections



CLINICAL FEATURES (SYMPTOMS & SIGNS)



Cardinal symptoms of COPD:

- Chronic dyspnoea
- Productive cough with white or clear sputum is present in up to 30% of patients
- Wheeze and breathlessness, usually following many years of a smoker's cough



Blue Bloater



Chronic, productive cough

Mild dyspnoea initially

Haemoptysis



Purulent sputum



Prolonged expiration

Peripheral oedema
(Due to cor pulmonale)

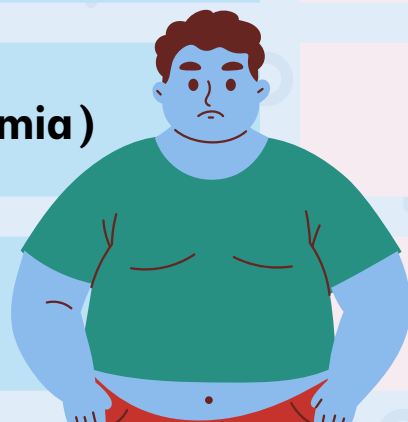


Crackles and wheezes



Cyanosis (Due to hypoxaemia)

Obese



Pink Puffer

Minimal cough



Dyspnoea



Tachypnoea

Accessory muscle use



Decreased breath sounds



Increased minute ventilation



Hyperinflation and barrel chest

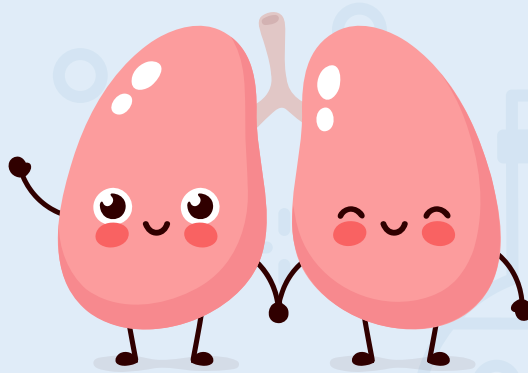
Pink skin with pursed lip breathing



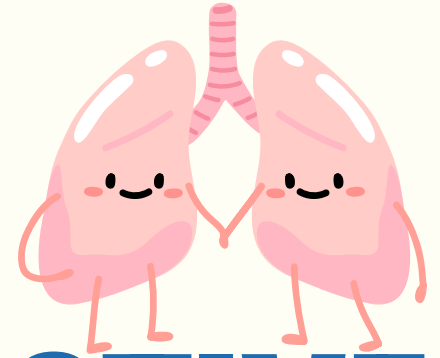
Cachexia

REFERENCES

1. Kumar and Clark's Clinical Medicine 9th Edition
2. <https://www.threads.net/@hafizahhoshni/post/C8UGca8SD1Y/media?hl=zh-tw>
3. <https://x.com/medcomic/status/910670999993159680>
4. Global Initiative for Chronic Obstructive Lung Disease: 2023 Pocket Guide (https://goldcopd.org/wp-content/uploads/2023/03/POCKET-GUIDE-GOLD-2023-ver-1.2-17Feb2023_WMV.pdf)
5. eTG
6. Up-to-date: https://www.uptodate.com/contents/search?search=acute%20exacerbation%20of%20copd&sp=0&searchType=PLAIN_TEXT&source=USER_INPUT&searchControl=TOP_PULLDOWN&autoComplete=true
7. <https://radiopaedia.org/articles/lung-hyperinflation-1>
8. https://www.radiologymasterclass.co.uk/gallery/chest/pulmonary-disease/chest_xray_copd#top_1st_img
9. <https://www.moh.gov.my/moh/attachments/3963.pdf>
10. <https://copdx.org.au/copd-x-plan/x-manage-exacerbations/x2-copd-acute-exacerbation-plan/x22-optimize-treatment/>
11. <https://app-tg-org-au.ap1.proxy.openathens.net/viewTopic?etgAccess=true&guidelinePage=Respiratory&topicfile=chronic-obstructive-pulmonary-disease-exacerbations>
12. https://app-tg-org-au.ap1.proxy.openathens.net/viewTopic?etgAccess=true&guidelinePage=Antibiotic&topicfile=bartonella-infections&guidelinename=auto§ionId=c_ABG_Antibiotic-management-of-chronic-obstructive-pulmonary-disease-COPD-exacerbations_topic_5#c_ABG_Antibiotic-management-of-chronic-obstructive-pulmonary-disease-COPD-exacerbations_topic_5

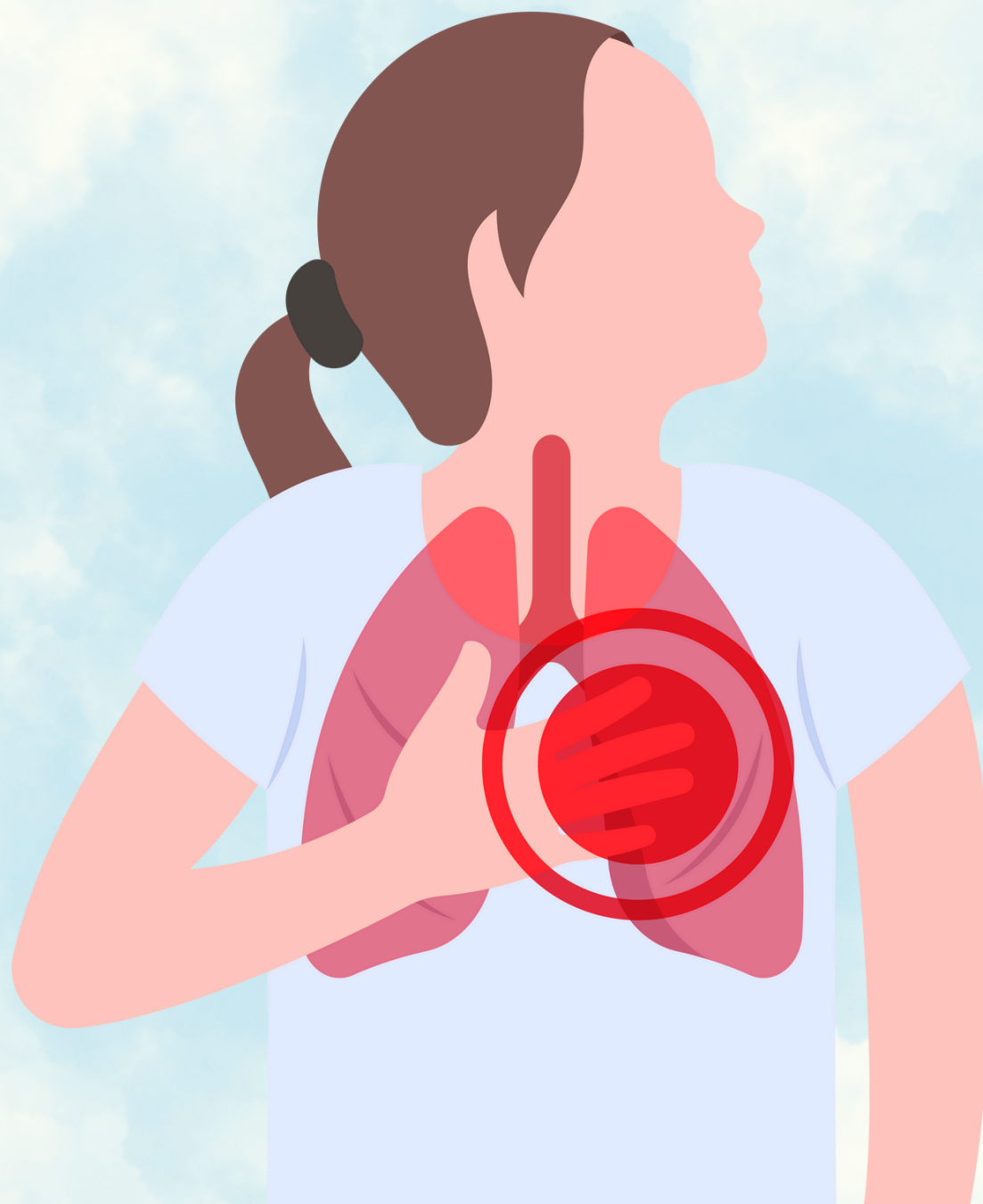


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CHRONIC OBSTRUCTIVE PULMONARY DISEASE

[PART 2: INVESTIGATIONS & GRADING SEVERITY]



MUM
IM'S



INVESTIGATIONS



BEDSIDE TESTS



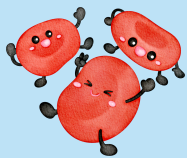
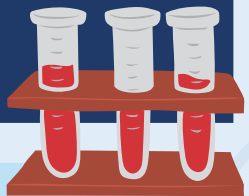
Lung Function Tests (Spirometry)



How to **confirm COPD diagnosis**?

- Post-bronchodilator **FEV₁/FVC ratio < 0.7**
- Reduced **FEV₁**: typically **< 80% predicted**
- **Limited reversibility**: **<12% improvement in FEV₁ after bronchodilator** suggests non-reversible obstruction, supporting COPD over asthma

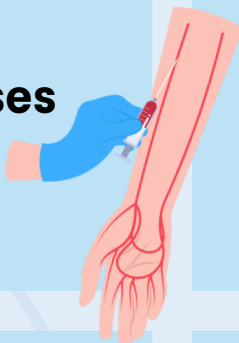
LABORATORY TESTS



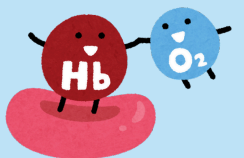
FBC

- ↓ **Hb** → **anaemia**
- ↑ **Hb, haematocrit, RBC** → **secondary polycythaemia** (as a result of persistent hypoxaemia)

Blood Gases



- Often normal at rest
- Obtain in patients with **SaO₂ < 92%** or with clinical signs of respiratory failure
- In more advanced cases, there will be resting hypoxaemia +/- hypercapnia

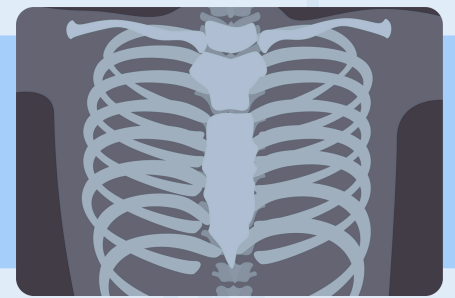


Serum A1-antitrypsin level

Should be performed in young COPD patients (<45 years old) or those with a strong family history of emphysema



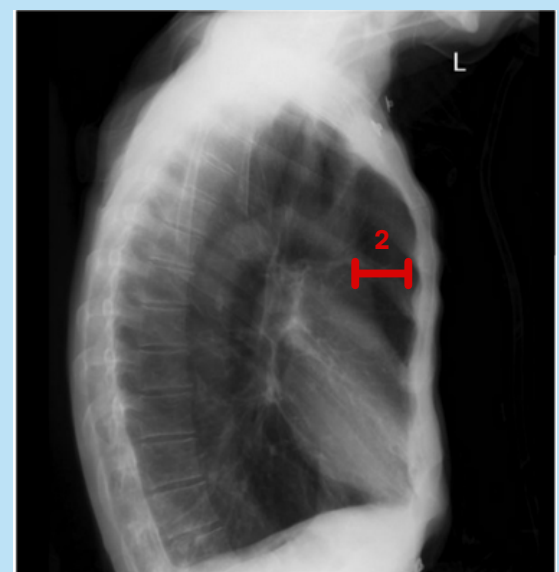
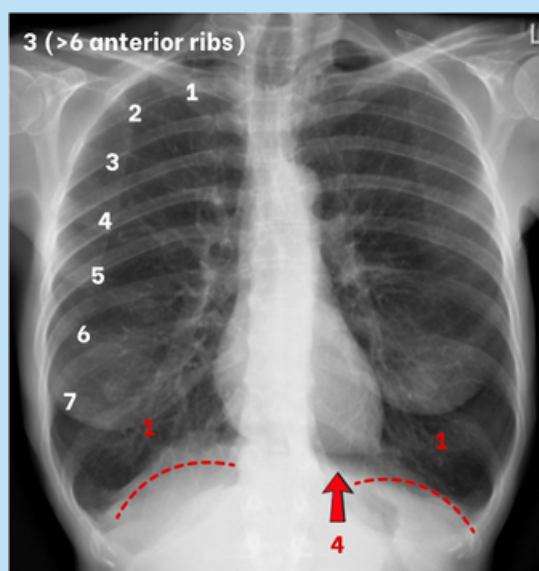
INVESTIGATIONS



IMAGING TESTS

Chest X-Ray

Classic features



Hyperinflation of the lungs

1. Flattened diaphragms
2. Increased retrosternal space
3. Ribs: >6 anterior OR >10 posterior ribs above diagram level on MCL
4. Presence of air below the heart (floating heart)
5. Hyperlucent lungs (less bronchovascular markings)

Bullae in bullous emphysema

- Areas of low density (black) with thinning of the pulmonary vessels usually in upper zone
- Discreetly outlined holes
- Large bullae (multiple alveoli merge)

Swipe to learn more!

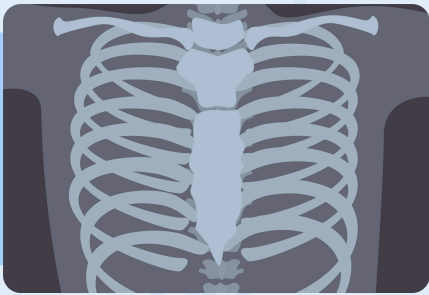


High Resolution CT scans (HRCT)

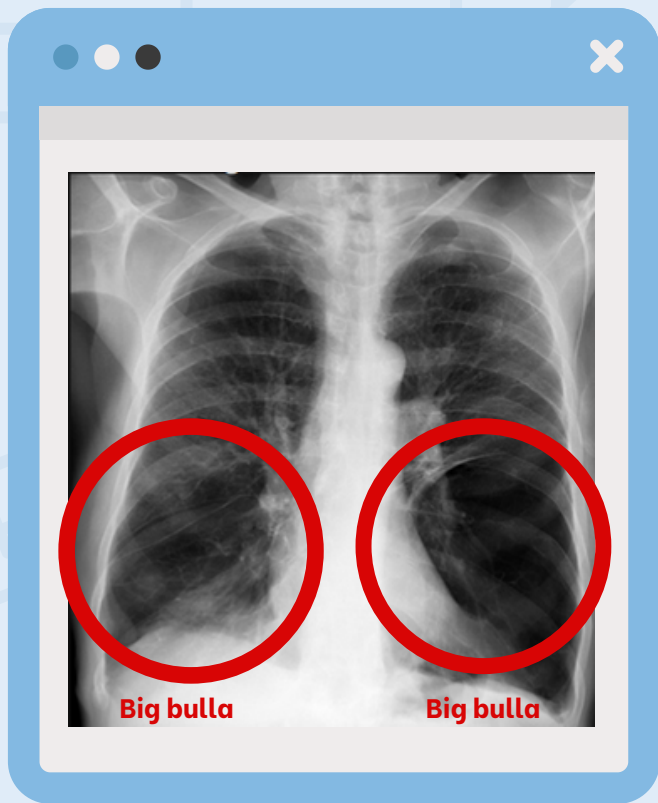
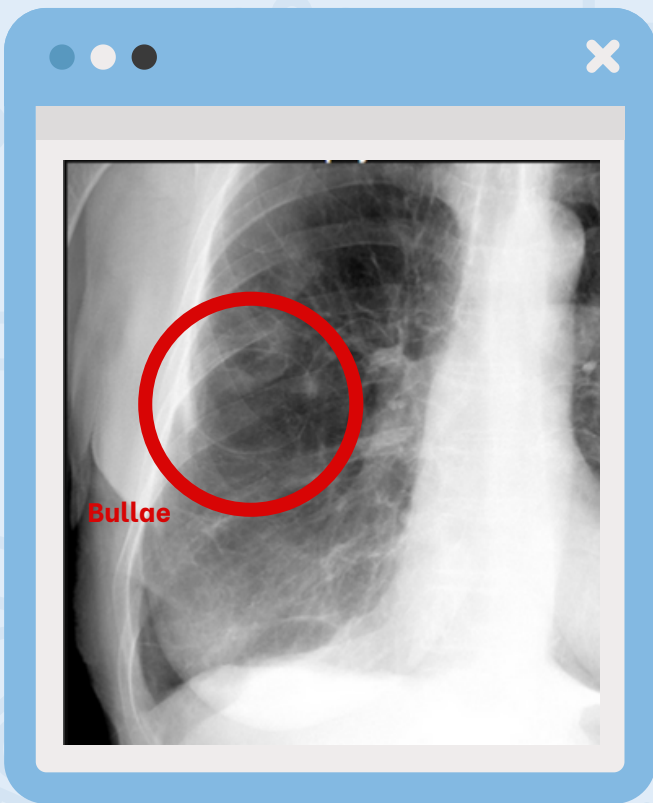
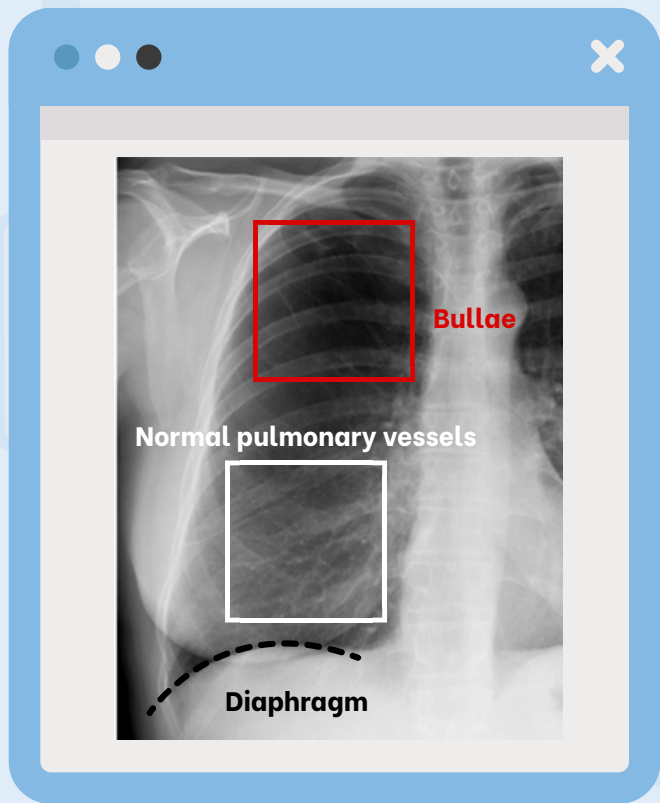
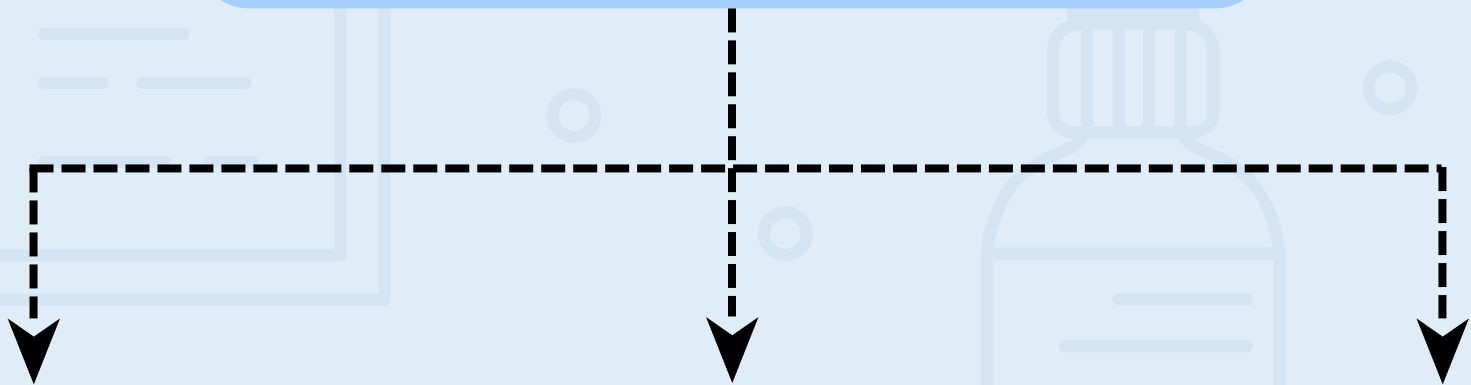
Useful, especially when plain CXR is normal



INVESTIGATIONS



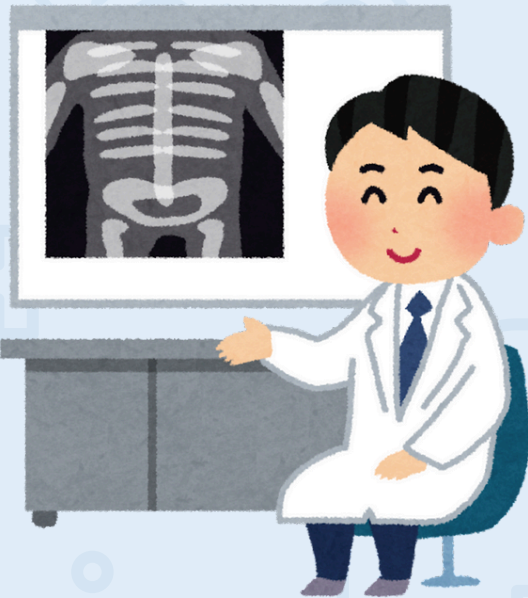
Bullae in bullous emphysema



Areas of low density (black) with thinning of the pulmonary vessels usually in upper zone

Discreetly outlined holes

Large bullae (multiple alveoli merge)





SEVERITY ASSESSMENT



Modified MRC Dyspnoea Scale

A patient-reported outcome (PRO) that measures the effect of breathlessness on daily activities

Global Initiative for Chronic Obstructive Lung Disease (GOLD) 

mMRC Grade	Description	
0	Only on strenuous exercise → breathless	
1	↑ Walking uphill / hurrying on level → breathless	
2	2 same aged people walking → one feels breathless	
3	 metres → stops for breath (3 digits) 	
4	Forced (4) to stay at home because of breathlessness on: • Leaving house • Dressing / undressing	



SEVERITY ASSESSMENT

COPD Assessment Test (CAT) Assessment

An 8-item questionnaire that assesses health status and severity of symptoms in patients with COPD and score ranges from 0-40

Example: I am very happy	0-5	I am very sad	Score
I never cough	0-5	I cough all the time	☐
I have no phlegm (mucous) in my chest at all		My chest is completely full of phlegm (mucous)	☐
My chest does not feel tight at all		My chest feels very tight	☐
When I walk up a hill or one flight of stairs, I am not breathless		When I walk up a hill or one flight of stairs, I am very breathless	☐
I am not limited doing any activities at home		I am very limited doing activities at home	☐
I am confident leaving my home despite my lung condition		I am not confident at all leaving my home because of my lung condition	☐
I sleep soundly		I don't sleep soundly because of my lung condition	☐
I have lots of energy		I have no energy at all	☐
Total score:			



GOLD ABE ASSESSMENT TOOL

GOLD ABE Assessment Tool

is used to guide initial pharmacological management after a spirometrically confirmed diagnosis of $FEV_1/FVC < 70\%$ by combining:

- Airflow limitation severity (GOLD grades 1-4)
- Symptom burden (mMRC or CAT)
- History of exacerbations



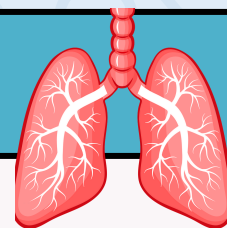
Global Initiative for Chronic Obstructive Lung Disease (GOLD) 

GOLD	SEVERITY	FEV ₁
GOLD 1	MILD	≥ 80% predicted
GOLD 2	MODERATE	50% -79% predicted
GOLD 3	SEVERE	30% - 49 % predicted
GOLD 4	VERY SEVERE	< 30% predicted

Initial Pharmacological Treatment



Exacerbation History (Per year)		
≥ 2 moderate exacerbations or ≥ 1 leading to hospitalization	GROUP E: LABA + LAMA +/- ICS (if blood eos ≥ 300 cells per μ L)	
0-1 moderate exacerbations (Not leading to hospitalization)	GROUP A: BRONCHODILATOR	GROUP B: LABA + LAMA



mMRC 0-1, CAT <10

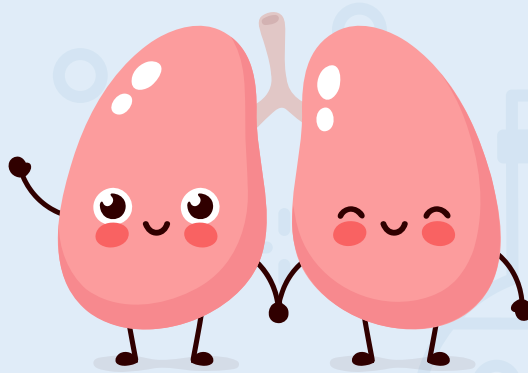
mMRC ≥2, CAT ≥10

SYMPTOMS

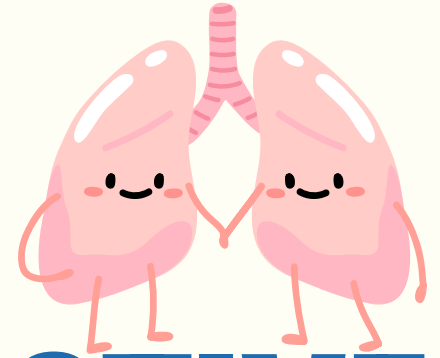


REFERENCES

1. Kumar and Clark's Clinical Medicine 9th Edition
2. <https://www.threads.net/@hafizahhoshni/post/C8UGca8SD1Y/media?hl=zh-tw>
3. <https://x.com/medcomic/status/910670999993159680>
4. Global Initiative for Chronic Obstructive Lung Disease: 2023 Pocket Guide (https://goldcopd.org/wp-content/uploads/2023/03/POCKET-GUIDE-GOLD-2023-ver-1.2-17Feb2023_WMV.pdf)
5. eTG
6. Up-to-date: https://www.uptodate.com/contents/search?search=acute%20exacerbation%20of%20copd&sp=0&searchType=PLAIN_TEXT&source=USER_INPUT&searchControl=TOP_PULLDOWN&autoComplete=true
7. <https://radiopaedia.org/articles/lung-hyperinflation-1>
8. https://www.radiologymasterclass.co.uk/gallery/chest/pulmonary-disease/chest_xray_copd#top_1st_img
9. <https://www.moh.gov.my/moh/attachments/3963.pdf>
10. <https://copdx.org.au/copd-x-plan/x-manage-exacerbations/x2-copd-acute-exacerbation-plan/x22-optimize-treatment/>
11. <https://app-tg-org-au.ap1.proxy.openathens.net/viewTopic?etgAccess=true&guidelinePage=Respiratory&topicfile=chronic-obstructive-pulmonary-disease-exacerbations>
12. https://app-tg-org-au.ap1.proxy.openathens.net/viewTopic?etgAccess=true&guidelinePage=Antibiotic&topicfile=bartonella-infections&guidelinename=auto§ionId=c_ABG_Antibiotic-management-of-chronic-obstructive-pulmonary-disease-COPD-exacerbations_topic_5#c_ABG_Antibiotic-management-of-chronic-obstructive-pulmonary-disease-COPD-exacerbations_topic_5

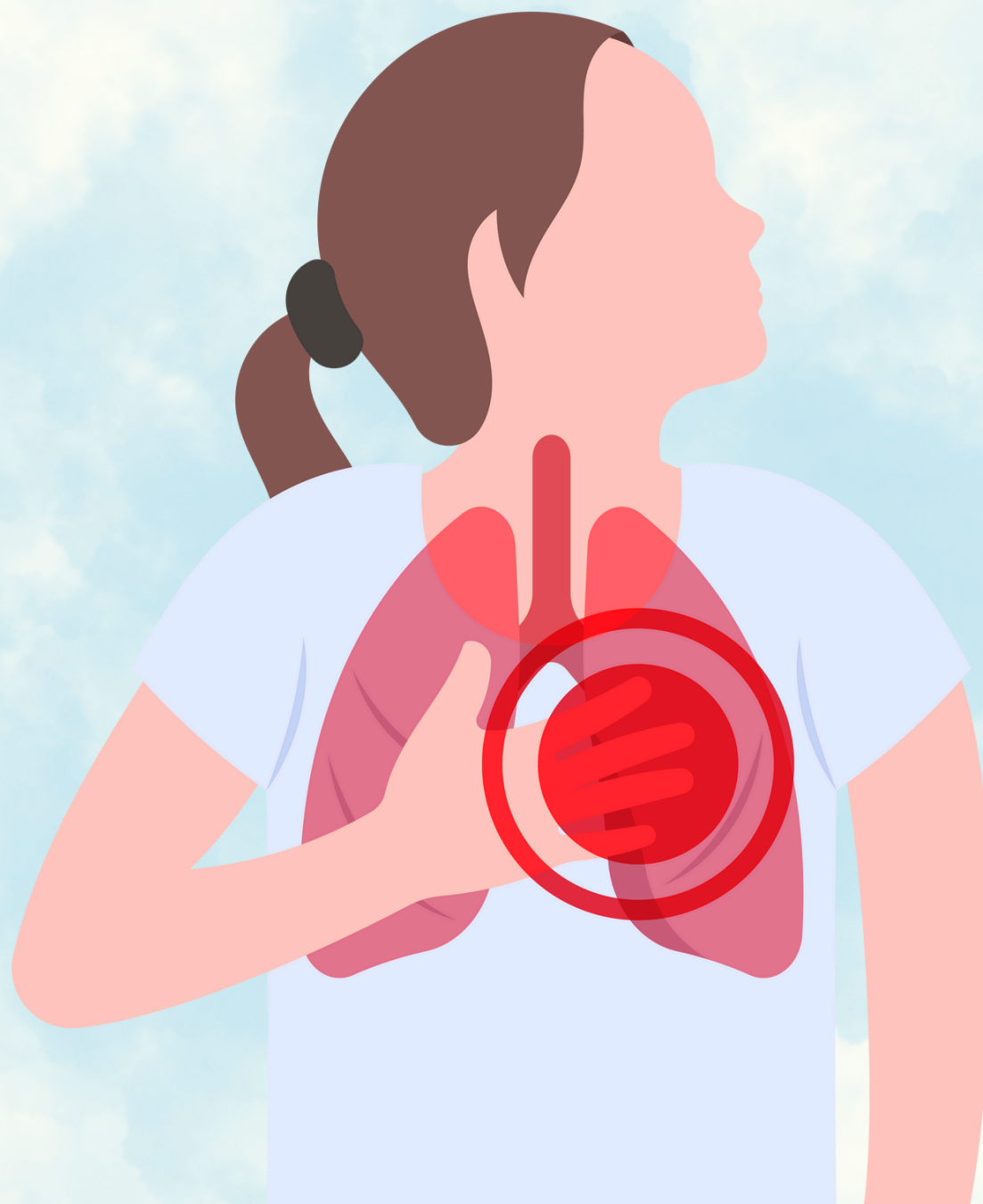


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CHRONIC OBSTRUCTIVE PULMONARY DISEASE

[PART 3: MANAGEMENT]

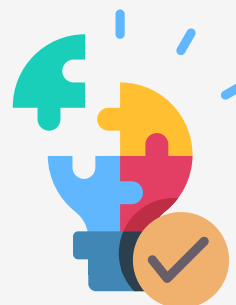


MUM
IM'S

PHARMACOLOGICAL MANAGEMENT

Principles of management :

- Optimise function
- Prevent deterioration
- Develop plan of care



Stepwise management pathway for stable COPD

MILD

MODERATE

SEVERE

Start with as-needed short-acting bronchodilator therapy

Start regular long-acting bronchodilator monotherapy (with a LAMA or LABA)
Consider LAMA/LABA combination depending on symptomatic response

Stepwise drug management



Consider regular LAMA, LABA and ICS triple therapy

- Patient had ≥ 1 severe exacerbation (requiring hospitalisation) OR ≥ 2 moderate exacerbations in the past 12 months

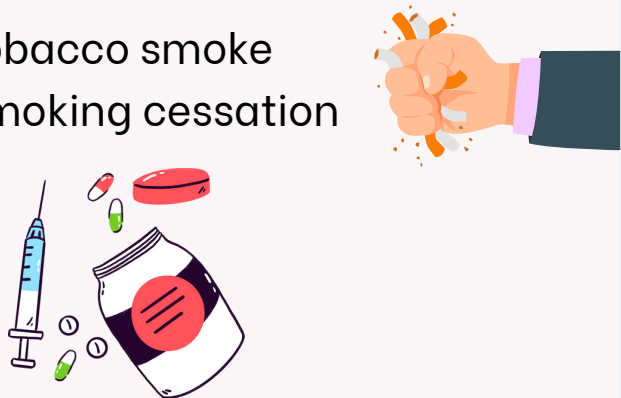
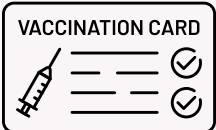
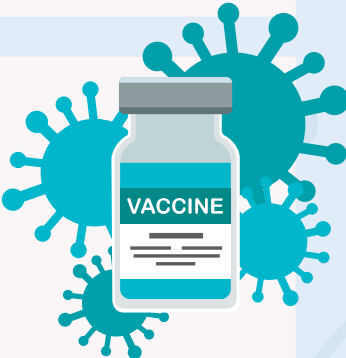
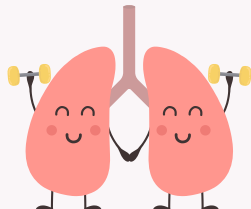
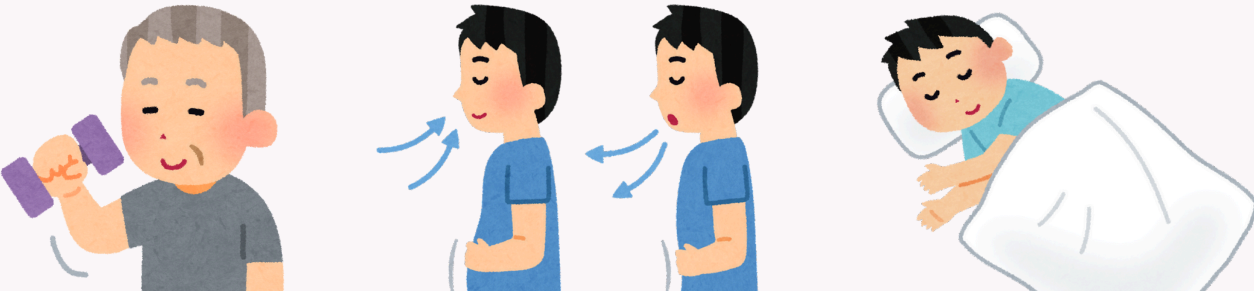
AND

- Significant symptoms despite dual therapy with a LAMA/LABA or ICS/LABA

Assess and optimise inhaler device technique at each visit



NON-PHARMACOLOGICAL MANAGEMENT

MANAGEMENT	DETAILS
 Smoking cessation	• Avoid exposure to air pollution & tobacco smoke • Behavioural counselling: 5A's of smoking cessation • Pharmacology: ○ Nicotine replacement therapy ○ Varenicline ○ Bupropion 
 Vaccination 	✓ <i>Pneumococcal vaccination</i> ✓ <i>Influenza vaccination</i> ✓ <i>COVID vaccination</i>  Vaccinations reduce the risk of respiratory infections and complications in patients with COPD
 Optimise function	• Regular exercise & physical activity • Recommend maintenance of a healthy nutritional diet 
Pulmonary rehabilitation 	1. Helpful for symptomatic patients 2. Aerobic and strength training exercises 3. Breathing technique & positioning to help with dyspnea 

NON-PHARMACOLOGICAL MANAGEMENT

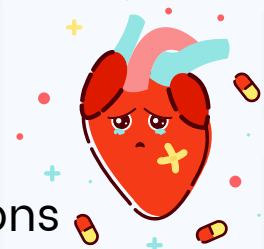


Additional therapies for COPD



▶ Long-term domiciliary oxygen therapy (LTOT)

- For stable COPD patient (stopped smoking for ≥ 1 month) with hypoxaemia
- If $\text{SpO}_2 \leq 90\%$ → ABG on room air:
LTOT indicated if:
 - $\text{PaO}_2 \leq 55\text{mmHg}$ OR
 - PaO_2 56–59 mmHg with evidence of hypoxia complications (polycythemia, pulmonary hypertension, right sided heart failure)
- Duration: at least 15 hours/day at 2L/min



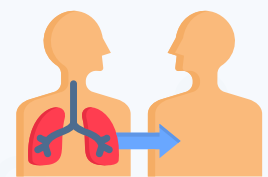
▶ Long-term noninvasive ventilation

- Used in patients with severe chronic hypercapnia



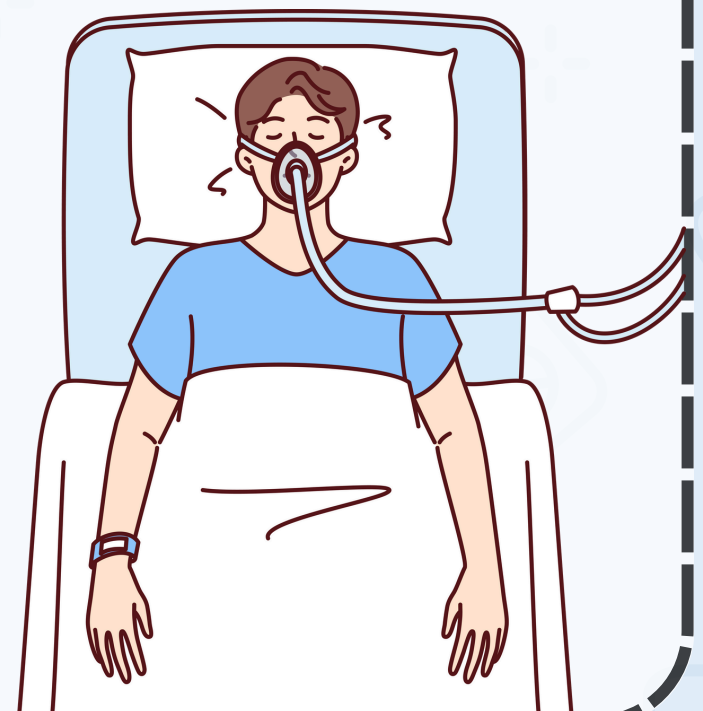
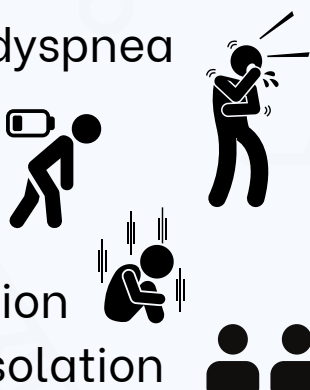
▶ Surgery or interventional procedures

- Indications: Patients incapacitated by dyspnoea despite optimal treatment
 - Lung transplantation
 - Lung volume reduction surgery (LVRS)



▶ Palliative care services - for late stages:

- Severe dyspnea
- Cough
- Fatigue
- Anxiety
- Depression
- Social isolation



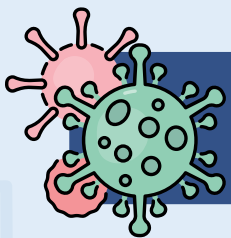
ACUTE EXACERBATION OF COPD

Definition

A COPD exacerbation is characterized by dyspnoea and/or cough and sputum that worsens over ≤ 14 days

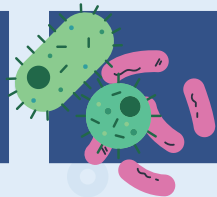
Causes

- Upper Respiratory Tract Infection
- Inhalation of pollutants



COMMON VIRUSES

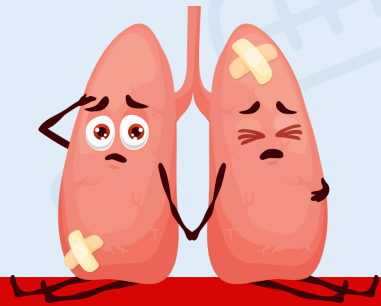
- Rhinovirus (most common)
- Others: SARS-CoV-2, influenza, RSV, parainfluenza, adenovirus



COMMON BACTERIA

- Haemophilus influenzae
- Moraxella catarrhalis
- Streptococcus pneumoniae

Causative agents are similar to those of bacterial pneumonia



Management of AECOPD



1

**Primary Survey +
Bedside Investigations**

2

**ABCO Mnemonic –
First-Line Medical
Management (eTG)**



3

**Ventilatory Support
(if needed!)**

ACUTE EXACERBATION OF COPD

★ Management of AECOPD

1 Primary Survey + Bedside Investigations

ASSESSMENT

DETAILS

A (Airway)

Ensure airway is patent; look for obstruction



B (Breathing)

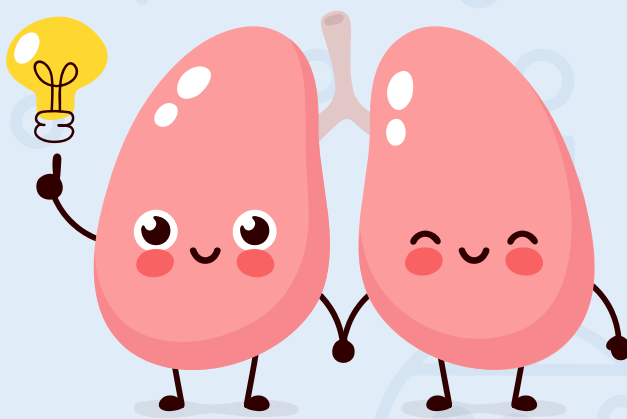
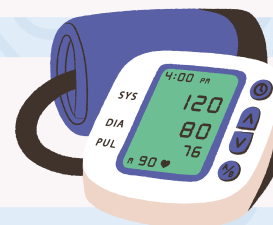


- Check RR, use of accessory muscles
- **Auscultation:** Wheeze/Rhonchi, decreased breath sounds
- **Pulse oximetry:** Assess oxygen saturation (target 88–92%)
- **ABG (Arterial Blood Gas):**
 - Indicated if $\text{SpO}_2 < 92\%$, altered mental status, or signs of severe exacerbation
 - Look for **hypoxia**, **hypercapnia**, and **respiratory acidosis**



C (Circulation)

Monitor: Capillary refill (perfusion), HR, BP



ACUTE EXACERBATION OF COPD



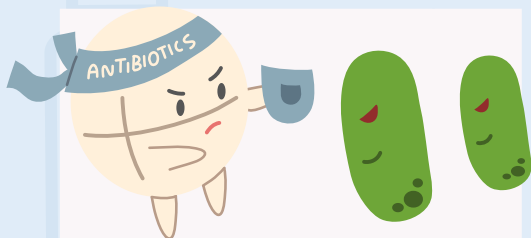
Management of AECOPD

2

ABCO Mnemonic – First-Line Medical Management (eTG)

MANAGEMENT

DETAILS



A (Antibiotics - not routinely given)

Indications: exacerbations associated with bacterial infection

Agents:

Initial antibiotic therapy:

- Amoxicillin OR Doxycycline (5 days)



IF **NO RESPONSE** AFTER 48–72 hours & **bacterial infection is still the likely cause** of exacerbation:



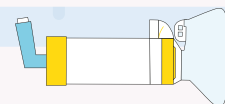
Then,

- Amoxicillin/Clavulanate (5 days)
- Ciprofloxacin (5 days) for identified *P. aeruginosa* in sputum



B (Bronchodilators)

SABA ± SAMA given either by pressurised MDI with spacer or nebuliser



C (Corticosteroids)

Indications: symptoms do not resolve quickly after inhaled bronchodilators

- Prednisolone 30–50 mg OD (5 days)

If oral medication not tolerated:

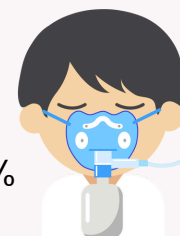
- IV Hydrocortisone 50 mg, 6-hourly until oral intake tolerated (5 days, oral & IV)

O (Oxygen)



Indications: **hypoxaemic patients (SpO₂ < 88%)**

- **Maintain SaO₂ between 88–92%**
- Nasal prongs at 1.0 –2.0 L/minute or Venturi mask at FiO₂ 24% or 28%

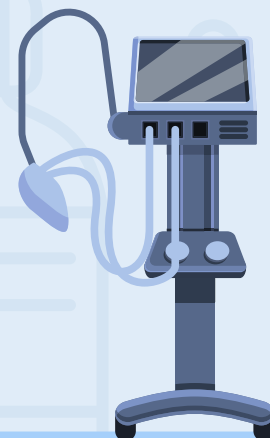


ACUTE EXACERBATION OF COPD

★ Management of AECOPD

3

*Ventilatory Support
(if needed!)*



MANAGEMENT

DETAILS

Noninvasive ventilation (NIV)

Indications: Patients with **acidosis** ($\text{pH} < 7.35$) and **hypercapnia** ($\text{PaCO}_2 > 45 \text{ mmHg}$) despite optimal therapy (including O_2 therapy)

BiPAP is most commonly used

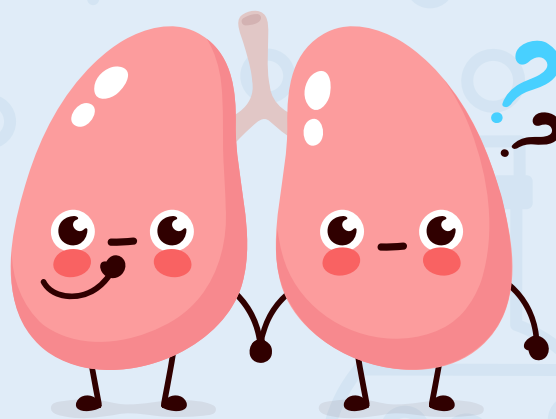
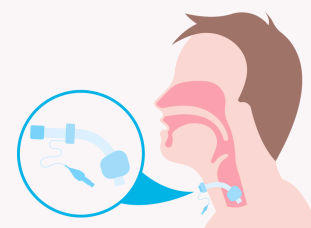


Invasive mechanical ventilation

Indications:

Patients who remain hypercapnic despite:

- Appropriate oxygen delivery
- Optimised noninvasive ventilation (NIV) machine settings



REFERENCES

1. Kumar and Clark's Clinical Medicine 9th Edition
2. <https://www.threads.net/@hafizahhoshni/post/C8UGca8SD1Y/media?hl=zh-tw>
3. <https://x.com/medcomic/status/910670999993159680>
4. Global Initiative for Chronic Obstructive Lung Disease: 2023 Pocket Guide (https://goldcopd.org/wp-content/uploads/2023/03/POCKET-GUIDE-GOLD-2023-ver-1.2-17Feb2023_WMV.pdf)
5. eTG
6. Up-to-date: https://www.uptodate.com/contents/search?search=acute%20exacerbation%20of%20copd&sp=0&searchType=PLAIN_TEXT&source=USER_INPUT&searchControl=TOP_PULLDOWN&autoComplete=true
7. <https://radiopaedia.org/articles/lung-hyperinflation-1>
8. https://www.radiologymasterclass.co.uk/gallery/chest/pulmonary-disease/chest_xray_copd#top_1st_img
9. <https://www.moh.gov.my/moh/attachments/3963.pdf>
10. <https://copdx.org.au/copd-x-plan/x-manage-exacerbations/x2-copd-acute-exacerbation-plan/x22-optimize-treatment/>
11. <https://app-tg-org-au.ap1.proxy.openathens.net/viewTopic?etgAccess=true&guidelinePage=Respiratory&topicfile=chronic-obstructive-pulmonary-disease-exacerbations>
12. https://app-tg-org-au.ap1.proxy.openathens.net/viewTopic?etgAccess=true&guidelinePage=Antibiotic&topicfile=bartonella-infections&guidelinename=auto§ionId=c_ABG_Antibiotic-management-of-chronic-obstructive-pulmonary-disease-COPD-exacerbations_topic_5#c_ABG_Antibiotic-management-of-chronic-obstructive-pulmonary-disease-COPD-exacerbations_topic_5

