Module 3.6

Managing COPD and asthma
WHAT’S INSIDE

- Introduction
- Learning outcomes
- Topics covered
- Competency
- Teaching and learning activities
- Additional information
INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a progressive life-threatening lung disease that causes breathlessness (initially with exertion) and predisposes a person to exacerbations and serious illness. The Global Burden of Disease study reports 251 million cases of COPD globally in 2016. Globally, it is estimated that 3.17 million deaths were caused by the disease in 2015 (that is, 5% of all deaths globally in that year). More than 90% of COPD deaths occur in low and middle-income countries. In 2012, nearly 1.5 million people died due to chronic respiratory disease in the South-East Asia Region (SEA Region). Chronic respiratory disease causes 10.8% of total deaths and 18% of noncommunicable disease (NCD) deaths in the SEA Region. This module has been prepared for primary health care providers to be able to diagnose and manage asthma and COPD.

LEARNING OUTCOMES

At the end of the session, participants will be able to do the following:

- Explain the burden, risk factors, pathophysiology, signs and symptoms of COPD and asthma.
- Describe the differential diagnosis of COPD and bronchial asthma, and overlap symptoms.
- Provide treatment and self-care advice to COPD and asthma patients.

TOPICS COVERED

- Pathophysiology, signs and symptoms of COPD and asthma.
- Approach to a patient with chronic cough, wheezing, chest tightness and difficulty in breathing.
- COPD and asthma overlap (ACOS) symptoms.
- Management of COPD and asthma in adults and children.
- Use of peak expiratory flowmeter.
- Use of metered-dose inhalers and other aerosol delivery equipment (nebulizers).
- Self-care in COPD and asthma.

COMPETENCY

- Ability to diagnose and manage COPD and asthma using the evidence-based guidelines and communicate effectively with patients to enable self-care.
TEACHING AND LEARNING ACTIVITIES

Total session time: 180 minutes

Activity 1. Burden, pathophysiology, signs and symptoms of COPD and asthma: 20 minutes

Step 1. Ask participants the following questions and write their responses on a flipchart/whiteboard.

- How do you approach a patient with chronic cough, wheezing, chest tightness and/or breathlessness or difficulty in breathing in your clinical practice?
- How do you investigate, diagnose and treat such a patient?
- What services are provided at your health facility to manage COPD and asthma?
- How can COPD and asthma services be improved in your health facility?
- What can you do to reduce or prevent COPD and asthma in the health facility catchment area?

Step 2. Present the powerpoint slides with the following contents.

- Burden and risk factors of chronic respiratory diseases (COPD and asthma)
- Approach to the assessment of patients with cough, wheezing, chest tightness, difficulty in breathing and breathlessness
- Pathophysiology, signs and symptoms of COPD, asthma, and asthma COPD overlap symptoms (ACOS)
- History-taking and diagnosis of COPD and asthma
- Management of COPD and asthma (stable and exacerbations).

Step 3. Demonstrate breath sounds using a video (if possible, examine a real patient with COPD and asthma and identify hyperinflation, rhonchi/crepitations).

Key message: The hyperinflation features will include low-placed diaphragm, absent cardiac dullness, hyperresonant notes on percussion and diminished air entry. Explain about rhonchi (continuous musical sound) and crepitations (interrupted sounds as if air is passing through water or rubbing-of-hair sounds). If training occurs in clinic settings show a real patient with these findings.
**Activity 2. Use of a peak flowmeter:** 10 minutes

*Step 1.* Present the powerpoint slides that describe the steps in using a peak flowmeter.

*Step 2.* Ask participants to practise the use of a peak flowmeter in groups.

*Step 3.* Observe the pitfalls in the process and explain how to improve them.

**Activity 3. Bronchodilator reversibility test:** 10 minutes

*Step 1.* Present the powerpoint slides that describe the steps to conduct a bronchodilator reversibility test and its interpretation.

*Step 2.* Refer to the workbook for case studies.

Case study 1. Mr Thapa undergoes peak flowmetry. His pre-bronchodilator value was 120 L/min; after 15 minutes of inhaling two puffs of salbutamol the value was 160 L/min. Calculate and comment on its reversibility.

   Answer: Increase in PEFR = (160–120) = 40 L/min.
   Increase in % = 40/120 X 100 = 33%
   It is reversible and the probable diagnosis is bronchial asthma (not COPD).

Case study 2. Mr Hussain undergoes peak flowmetry. His pre-bronchodilator value was 120 L/min; after 15 minutes of inhaling two puffs of salbutamol the value was 130 L/min. Calculate and comment on its reversibility.

   Answer: Increase in PEFR = (130–120) = 10 L/min.
   Increase in % is =10/120 X 100 = 8%
   It is irreversible and the probable diagnosis is COPD.
Activity 4. Diagnosis of COPD and asthma: 25 minutes

Step 1. Start with the following statement.

We have already discussed about COPD and asthma, their burden, pathophysiology and various symptoms. Since COPD and asthma will have almost similar symptoms and they are two different diseases, it is important for participants to be able to distinguish between the two. However, there are other conditions that can produce similar symptoms. Can anybody name some of the other chest diseases that can produce such symptoms and hence can be confused with COPD/asthma?

*Note down participants’ responses on a flipchart/whiteboard.*

Talk about the differential diagnosis and explain to the participants how to distinguish/exclude them.

Chronic cough can be due to:

- COPD
- Asthma
- Lung cancer
- Tuberculosis
- Bronchiectasis
- Left ventricular failure
- Interstitial lung diseases
- Cystic fibrosis
- Idiopathic cough
- Chronic allergic rhinitis
- Upper airways cough syndrome
- Postnasal drip
- Gastro-oesophageal reflux
- Drugs like ACE inhibitors

Step 2. Refer to the workbook for COPD and asthma protocol and discuss the protocol in groups.

Step 3. Ask the groups to come forward and explain the key messages of the protocol.

Emphasize that tuberculosis must always be excluded when there is a history of cough for more than two weeks by two sputum smear examinations or other tests as per the national TB diagnostic guidelines.
### ASK

*Asthma and COPD can both present with cough, difficulty in breathing, tightness in the chest and/or wheezing. Therefore, ask about these symptoms.*

### DIAGNOSIS

<table>
<thead>
<tr>
<th>The following features make a diagnosis of asthma more likely:</th>
<th>The following features make a diagnosis of COPD more likely:</th>
</tr>
</thead>
<tbody>
<tr>
<td>◦ previous diagnosis of asthma;</td>
<td>◦ previous diagnosis of COPD;</td>
</tr>
<tr>
<td>◦ symptoms since childhood or early adulthood;</td>
<td>◦ history of heavy smoking, i.e. &gt;20 cigarettes per day for &gt;15 years;</td>
</tr>
<tr>
<td>◦ history of hay fever, eczema and/or allergies;</td>
<td>◦ history of heavy and prolonged exposure to burning fossil fuels in an enclosed space, or high exposure to dust in an occupational setting;</td>
</tr>
<tr>
<td>◦ intermittent symptoms with asymptomatic periods in between;</td>
<td>◦ symptoms started in middle age or later (usually after the age of 40 years);</td>
</tr>
<tr>
<td>◦ symptoms worse at night or early morning;</td>
<td>◦ symptoms worsened slowly over a long period of time;</td>
</tr>
<tr>
<td>◦ symptoms triggered by respiratory infection, exercise, weather changes or stress; and</td>
<td>◦ long history of daily or frequent cough and sputum production, often starting before shortness of breath; and</td>
</tr>
<tr>
<td>◦ symptoms respond to salbutamol.</td>
<td>◦ symptoms that are persistent with little day-to-day variation.</td>
</tr>
</tbody>
</table>

### TEST

<table>
<thead>
<tr>
<th>Measure peak expiratory flow rate (PEFR) (details described in activity 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>◦ Give two puffs of salbutamol and measure again in 15 minutes.</td>
</tr>
<tr>
<td>◦ If the PEFR improves by 20%, a diagnosis of asthma is very probable.</td>
</tr>
<tr>
<td>◦ A smaller response makes a diagnosis of COPD more likely.</td>
</tr>
<tr>
<td>◦ Do an ECG, if available (especially if the diagnosis is uncertain/possibility of cardiac cause).</td>
</tr>
</tbody>
</table>
Step 4. Ask participants to go through the case study in the workbook.

Ms Raina, aged 22 years, presented to the clinic with a history of cough during change of seasons over the past 5 years. The cough lasts for a few days and subsides on its own. She also has whistling sounds in her chest, sneezing, running nose and blocked nose with each change of season. On further enquiry she says that her older brother also has similar symptoms and he uses inhalers. She is a non-smoker. What will be your clinical diagnosis? And what are the next steps?

Answer

Diagnosis: bronchial asthma. Depending on the response, which will be interactive, ask the participants giving the correct answer why they think it is asthma. During the interaction, emphasize the points supporting the diagnosis of asthma and not COPD.

Next steps: a clinical examination of the chest may reveal rhonchi. However, its absence will not rule out asthma as the case may be in remission (normal). It is important to measure PEFR and demonstrate reversibility to support the diagnosis.

Activity 5. Assessment of severity of asthma and management: 20 minutes

Step 1. Start with following statement.

Once you have listened to the history of and clinically examined the patient, found a low PEFR that shows reversibility, a diagnosis of asthma can be confirmed. However, before prescribing medicines, the severity of the asthma should be assessed as the choice of drug depends on severity.

Step 2. Present the powerpoint slide on assessment of asthma severity. Ask participants to refer to the workbook for the asthma severity protocol.

WHO PEN protocol 3.1 of Asthma severity

<table>
<thead>
<tr>
<th>ASK</th>
<th>Is asthma well controlled or uncontrolled?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Asthma is considered to be well controlled if the patient has:</td>
</tr>
<tr>
<td></td>
<td>- daytime asthma symptoms and uses a beta-agonist two or fewer times per week;</td>
</tr>
<tr>
<td></td>
<td>- night-time asthma symptoms two or fewer times per month;</td>
</tr>
<tr>
<td></td>
<td>- no or minimal limitation of daily activities;</td>
</tr>
<tr>
<td></td>
<td>- no severe exacerbation (i.e. requiring oral steroids or admission to hospital) within a month;</td>
</tr>
<tr>
<td></td>
<td>- PEFR, if available, above 80% predicted.</td>
</tr>
<tr>
<td></td>
<td>If any of these markers are exceeded, the patient is considered to have uncontrolled asthma.</td>
</tr>
</tbody>
</table>
After the diagnosis and severity of asthma are confirmed, the next step is to decide about management.

Step 3. Divide the participants into convenient groups and ask each group to go through the protocol in the workbook.

Step 4. Ask the groups to explain the key messages of the protocol.

Management of asthma

<table>
<thead>
<tr>
<th>TREAT</th>
<th>Increase or decrease treatment according to how well asthma is controlled using a step-wise approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1.</td>
<td>Inhaled salbutamol prn (as needed)</td>
</tr>
<tr>
<td>Step 2.</td>
<td>Inhaled salbutamol prn (as needed) plus low-dose inhaled beclometasone, starting with 100 µg twice daily for adults and 100 µg once or twice daily for children. (Budesonide in doses as shown in the chart below can replace beclometasone.)</td>
</tr>
<tr>
<td>Step 3.</td>
<td>Same as Step 2, but give higher doses of inhaled beclometasone, 200 µg or 400 µg twice daily. (Budesonide in doses as shown below can replace beclometasone.)</td>
</tr>
<tr>
<td>Step 4.</td>
<td>Add low-dose oral theophylline to Step 3 treatment (assuming long-acting beta-agonists and leukotriene antagonists are not available) + LABA (fermoterol and budesonide combination).</td>
</tr>
<tr>
<td>Step 5.</td>
<td>Add oral prednisolone, but in the lowest dose possible to control symptoms (nearly always less than 10 mg daily).</td>
</tr>
</tbody>
</table>

At each step, check the patient’s adherence to treatment and observe their inhaler technique.

<table>
<thead>
<tr>
<th>REFER</th>
<th>Review asthma control every 3–6 months and more frequently when treatment has been changed or asthma is not well controlled.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refer to a specialist:</td>
<td></td>
</tr>
<tr>
<td>☐ when asthma remains poorly controlled;</td>
<td></td>
</tr>
<tr>
<td>☐ when the diagnosis of asthma is uncertain;</td>
<td></td>
</tr>
<tr>
<td>☐ when regular oral prednisolone is required to maintain control.</td>
<td></td>
</tr>
</tbody>
</table>

Note: (i) Budesonide can replace beclomethasone and vice versa. If LABA can be feasible, it should get a place in the management.
Management of COPD

<table>
<thead>
<tr>
<th>ASSESS</th>
<th>Assess severity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Moderate – if breathless with normal activity</td>
</tr>
<tr>
<td></td>
<td>Severe – if breathless at rest</td>
</tr>
<tr>
<td></td>
<td>Measure PEFR and oxygen saturation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TREAT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inhaled salbutamol, two puffs as required, up to 4 times daily;</td>
</tr>
<tr>
<td></td>
<td>If symptoms are still troublesome, consider low-dose oral theophylline;</td>
</tr>
<tr>
<td></td>
<td>If ipratropium inhalers are available, they can be used instead of, or added to, salbutamol, but they are more expensive.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ADVICE</th>
<th>COPD – Advice to patients and families</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Ensure that they understand that smoking and indoor air pollution are the major risk factors for COPD – therefore, patients with COPD must stop smoking and avoid dust and tobacco smoke.</td>
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<td>Keep the area where meals are cooked well ventilated by opening windows and doors.</td>
</tr>
<tr>
<td></td>
<td>Cook with wood or carbon outside the house, if possible, or build an oven in the kitchen with a chimney that vents the smoke outside.</td>
</tr>
<tr>
<td></td>
<td>Avoid working in areas with occupational dust or high air pollution – using a mask may help, but it needs to have an appropriate design and provide adequate respiratory protection.</td>
</tr>
</tbody>
</table>

Activity 6. Side-effects of commonly used drugs: 15 minutes

Step 1. Ask participants to discuss the common side effect of the commonly used medicines for COPD and asthma. Invite few participants to share to the whole group.

Facilitator's explanatory notes

<table>
<thead>
<tr>
<th>Drug</th>
<th>Possible side-effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salbutamol</td>
<td>Tremor, tachycardia</td>
</tr>
<tr>
<td>Theophylline</td>
<td>Nausea, vomiting, tachycardia</td>
</tr>
<tr>
<td>Prednisolone</td>
<td>Gastritis, high blood glucose, high blood pressure, swelling of face and obesity</td>
</tr>
<tr>
<td>Inhaled steroids (beclomethasone or budesonide)</td>
<td>Oral thrush, hoarseness</td>
</tr>
</tbody>
</table>
**Activity 7. Childhood asthma: 15 minutes**

**Step 1. Ask the participants about their experiences in diagnosing and managing childhood asthma.**

**Step 2. Summarize their responses and highlight the symptoms and management of childhood asthma below:**

- recurrent wheezing or cough, including during sleep or with triggers such as activity, laughing, crying or exposure to tobacco smoke or air pollution;
- shortness of breath with exercise, laughing or crying;
- not running, playing or laughing at the same intensity as other children; tires earlier during walks (wants to be carried);
- past or family history of allergic disease (atopic dermatitis or allergic rhinitis); asthma in first-degree relatives;
- prolonged cough in infancy, and cough without cold symptoms is associated with later parent-reported physician-diagnosed asthma, independent of infant wheeze;
- clinical improvement during 2–3 months of treatment and worsening when treatment is stopped.

**Key points to consider in the management of childhood asthma:**

- Inhaled short-acting beta-agonists (SABAs) may not be effective in all children who experience wheezing episodes.
- Oral bronchodilator therapy is not recommended (slower onset of action, more side-effects). For children with intermittent viral-induced wheeze and no interval symptoms, if as-needed SABA is not sufficient, consider intermittent inhaled corticosteroids (ICS).
- Due to the risk of side-effects, ICS should be considered only if the physician is confident that the treatment will be used appropriately.
- Those who have more symptoms may be given regular inhalers and inhaled corticosteroids. Leukotriene antagonists such as montelukast may also be helpful.
- The basic principles of asthma management are similar to that in adults, such as proper use of inhalers and referral to specialists.
Activity 8. Managing acute exacerbation of bronchial asthma: 20 minutes

Step 1. While the above-mentioned management protocol is suitable for stable asthma, in case of frequent exacerbations the approach will be different.

Step 2. Refer to the workbook for the protocol and discuss it in groups.

WHO PEN protocol 3.1 Management of exacerbation of asthma

<table>
<thead>
<tr>
<th>ASSESS</th>
<th>Assess severity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Severe:</strong></td>
</tr>
<tr>
<td></td>
<td>○ Inability to complete sentences in one breath</td>
</tr>
<tr>
<td></td>
<td>○ Respiratory rate more than 25 breaths/minute (adult)</td>
</tr>
<tr>
<td></td>
<td>○ Heart rate ≥110 beats/minute (adult)</td>
</tr>
<tr>
<td></td>
<td>○ PEFR 33–50% best or predicted</td>
</tr>
<tr>
<td></td>
<td><strong>Very severe:</strong></td>
</tr>
<tr>
<td></td>
<td>○ Altered consciousness level, exhaustion, arrhythmia, hypotension, cyanosis, silent chest, poor respiratory effort</td>
</tr>
<tr>
<td></td>
<td>○ SpO2 &lt;92%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TREAT</th>
<th>First-line treatment</th>
<th>Second-line treatment to be considered if the patient is not responding to first-line treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○ Prednisolone 30–40 mg for 5 days for adults and 1 mg per kg for 3 days for children or longer if necessary until they have recovered;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Salbutamol in high doses by metered dose inhaler (MDI) and spacer (e.g. four puffs every 20 minutes for 1 hour) or by nebulizer;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Oxygen, if available, and if oxygen saturation levels are low (below 90%) Reassess at intervals depending on severity.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Increase frequency of dosing via MDI and spacer or by nebulizer, or give salbutamol by continuous nebulization at 5–10 mg per hour if appropriate nebulizer available;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>For children, nebulized ipratropium, if available, can be added to nebulized salbutamol.</td>
<td></td>
</tr>
</tbody>
</table>
Management of an exacerbation of COPD

**TREAT**
- Antibiotics should be given for all exacerbations.
- For severe exacerbations, give oral prednisolone 30–40 mg for around 7 days.
- Give high doses of inhaled salbutamol by nebulizer or metered doses inhaler with spacer (e.g. four puffs every 20 minutes for 1 hour) or by nebulizer.
- Oxygen, if available, should be given by a mask that limits the concentration to 24–28%.

**Things to remember**

**Exacerbation of COPD**
- An exacerbation of COPD is defined as an acute worsening of respiratory symptoms that will require additional therapy.
- Exacerbations of COPD can be precipitated by several factors. The most common cause is respiratory tract infection.
- The goal for the treatment of exacerbations of COPD is to minimize the negative impact of the current exacerbation and to prevent subsequent events.
- Short-acting inhaled beta2-agonists, with or without short-acting anticholinergics, are recommended as the initial bronchodilators to treat an acute exacerbation.

The exacerbations can be

1. **Mild, no respiratory failure:** respiratory rate: 20–30 breaths per minute; no use of accessory respiratory muscles; no changes in mental status; hypoxaemia improved with supplemental oxygen given via Venturi mask 28–35% inspired oxygen (FiO₂); no increase in PaCO₂ (partial pressure of carbon dioxide).
2. **Moderate, acute respiratory failure – non-life-threatening:** respiratory rate: >30 breaths per minute; use of accessory respiratory muscles; no change in mental status; hypoxaemia improved with supplemental oxygen via Venturi mask 25–30% FiO₂; hypercarbia, i.e. PaCO₂ increased compared with baseline or elevated 50–60 mmHg.
3. **Severe, acute respiratory failure – life-threatening:** respiratory rate: >30 breaths per minute; use of accessory respiratory muscles; acute changes in mental status; hypoxaemia not improved with supplemental oxygen via Venturi mask or requiring FiO₂ > 40%; hypercarbia, i.e. PaCO₂ increased compared with baseline or elevated > 60 mmHg or the presence of acidosis (pH < 7.25).

**Management of exacerbations**
- Short-acting inhaled beta2-agonists (salbutamol), with or without short-acting anticholinergics (ipratropium bromide) are the initial bronchodilators for acute treatment of a COPD exacerbation. They can be given by nebulization.
Maintenance therapy with long-acting bronchodilators should be initiated as soon as possible before hospital discharge.

Systemic corticosteroids can improve lung function (FEV1), oxygenation and shorten recovery time and duration of hospitalization. Duration of therapy should not be more than 5–7 days in a dose of 30 mg per day.

Antibiotics can shorten recovery time, reduce the risk of early relapse, treatment failure, and duration of hospitalization. Duration of therapy should be 5–7 days. Amoxycillin is the first drug of choice in a dose of 500 mg thrice daily.

Methylxanthines (theophyllines) are not recommended due to poor side-effect profiles.

If the patient has severe exacerbation (moderate with acute respiratory failure) or severe form of the disease, refer to a higher centre for further management with non-invasive ventilation.

Complications of COPD

Respiratory failure and cor pulmonale with right heart failure are important complications of COPD.

Respiratory failure: look for blue discoloration of the fingers, lips or tongue. Flapping tremors, headache, altered mentation – patient will need oxygen therapy and if not improving, refer to a higher centre. High-flow oxygen may be harmful; hence low concentration of oxygen (28–32%) should be given carefully.

Right heart failure: look for swelling of the ankles, raised neck veins, tender hepatomegaly, loud second heart sound (S2) and cardiac murmurs. Give oxygen and diuretics (frusemide 40 mg daily).

Pneumothorax: air sacs may rupture and air may collect in the pleural space. The patient will complain of sudden-onset chest pain and breathlessness. Confirm by chest X-ray. Insertion of a chest tube is needed.

Activity 9. Prevention and other interventions: 10 minutes

Step 1. Refer to the workbook for the prevention protocol and discuss prevention strategies.

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Managing COPD and asthma

**ADVICE**

### Asthma – Advice to patients and families/caregivers

**Regarding prevention:**
- Avoid cigarette smoke and trigger factors for asthma, if known.
- Avoid dusty and smoke-filled rooms.
- Avoid occupations that involve agents capable of causing occupational asthma.
- Reduce dust as far as possible by using damp cloths to clean the furniture.
- Sprinkle the floor with water before sweeping or cleaning the blades of fans.
- Regularly minimize the number of soft toys in the sleeping area.
- It may help to eliminate cockroaches from the house (when the patient is away) and shake and expose mattresses, pillows, blankets, etc. to sunlight.

**Regarding treatment,** ensure that the patient or parent:
- knows what to do if the asthma deteriorates
- understands the benefit of using inhalers rather than tablets, and why
- knows that adding a spacer is helpful
- is aware that inhaled steroids take several days or even weeks to be fully effective.

### Additional interventions strategies include:
- patient education about the disease, chronicity, causes, need for medications
- physical activity
- influenza vaccination to all patients with COPD
- pneumococcal vaccination (PCV13 and PPSV23) for all patients >65 years of age and younger patients with significant comorbid conditions, including chronic heart and lung disease
- good nutrition in patients
- end-of-life and palliative care approach
- inhaled steroids take several days or even weeks to be fully effective and gargle after the use of inhalers.
Activity 10. Demonstration of metered dose inhaler/or other aerosol delivery equipment: 10 minutes

Step 1. Show a video on the use of a metered dose inhaler or live demonstration.

- Explain the mechanism of functioning of aerosol delivery: metered dose inhaler, spacers and nebulizers.

- **Other precautions**
  - Avoid the use of different types of inhaler devices if possible.
  - Check the technique at every opportunity – “Can you show me how you use your inhaler at present?”
  - Shake the inhaler before use.
  - Identify errors in inhaler use technique.
    - Give a physical demonstration to show how to use the inhaler correctly.
    - Check again (up to 2–3 times).
  - Recheck the inhaler technique frequently, as errors often recur within 4–6 weeks.
  - Confirm by asking
    - Can you demonstrate the correct technique for the inhalers you prescribe?
    - Brief inhaler technique training improves asthma control.
  - If the patient is not able to use a metered dose inhaler properly despite repeated demonstrations, consider using a spacer.
  - Check for the expiry date and that the inhaler device is not empty.
  - Ask the patient to rinse the mouth after using each steroid inhaler to prevent oral fungal infection (if not using a spacer).

- **Many patients often use the inhaler incorrectly leading to poor control. Thus, emphasize that the correct technique of use of inhalers is very important.**

Activity 11. Case studies: 20 minutes

Step 1. Ask participants to refer to the workbook for the following case studies and write the diagnosis, potential cause and treatment based on the protocol.
Step 2. Invite a volunteer to present the case study.

Case study 1

A 25-year-old female with known asthma for 10 years is on inhaler treatment.
- She has a history of a running nose and sneezing with blocked nose for 12 years.
- She takes one puff of the inhaler twice daily.
- Despite that she continues to wheeze and cough.
- She reported to the emergency twice during the past one month.
- The cough increases at night and she has disturbed sleep almost daily.
- She has to take salbutamol inhaler four times per week.
- Measurement of PEFR is less than 50% of her personal best.

Diagnosis: A case of uncontrolled asthma

Justification:
- she has night symptoms almost daily
- requires salbutamol more often
- continues to be symptomatic despite inhalers
- reported to emergency twice
- lung function less than normal despite therapy.

Potential cause of her uncontrolled asthma

- The inhalation technique is inadequate – check it*.
- The dose may be inadequate (she is taking only one puff twice daily).
- She may need additional medication.
- She is not taking any medication for allergic rhinitis.
- She may have a complication like ABPA (allergic bronchopulmonary aspergillosis).

*For all patients, ask them to take inhalers in front of the health-care provider to assess the correctness of the technique.

Case study 2

A 22-year-female, known asthmatic for 10 years with allergic rhinitis for 13 years, mother is a known asthmatic.
- taking inhaled long-acting bronchodilator plus inhaled corticosteroid combination in adequate doses two puffs twice daily
- inhalation techniques checked during each visit by the nurse
- also takes monteleukast 10 mg daily
no nasal symptoms
had taken salbutamol 200 micrograms once in past week
PEFR is 400 L/min
no night awakening; no other chest symptom
no emergency visit, continues her daily routine activities.

Diagnosis: a case of adult controlled asthma

Justification:
- adequate doses two puffs twice daily
- inhalation techniques checked during each visit by the nurse
- also takes monteleukast 10 mg daily, no nasal symptom
- had taken rescue salbutamol 200 micrograms only once during past one week.
- PEFR is 400 L/min – normal for her
- no night awakening; no other chest symptom
- no emergency visit, continues her daily routine activities.

Case study 3

A 24-year-old female, known asthmatic for 8 years, was on combination (LABA+ steroid) inhaler therapy with adequate control (no symptoms, normal daily activities, no night symptoms).
- developed acute viral upper respiratory tract infection (URTI) (fever, sore throat, cough, yellow sputum, sneezing, running nose, headache and myalgia) for 3 days
- cough and wheeze reappeared, night symptoms increased, no relief despite taking 12 puffs of salbutamol inhaler and the above steroid and LABA inhaler eight doses
- patient reported to emergency.
- On examination: tachypnoea (increased respiratory rate of 32/min); tachycardia (increased heart rate 132/min), accessory muscles of respiration are working, severely breathless, pulsus paradoxus of 26 mmHg; unable to complete sentences, mild blue discoloration of fingers and tongue
- chest had bilateral wheeze, oxygen saturation of 87%; PEFR 60 L/min.

Diagnosis: a case of exacerbated asthma

Management of the case

The patient should be nebulized with one respule of salbutamol continuously for three doses and then 6-hourly; oxygen inhalation, encouraged to drink enough liquids, oral prednisolone 40 mg/day. Within the next 24 hours she improved gradually and during the next 5 days her chest became normal. Her respiratory rate and heart rate settled down to normal, oxygen saturation was 96% and
chest was clear. She completed 5 days of oral corticosteroids and inhalers were continued. During the next few weeks her inhalers were reduced to one puff twice daily.

**Case study 4**

Patient is a 55-year-old male smoker smoking 12 hand-rolled cigarettes per day for the past 23 years.
- complained of gradually progressive breathlessness and productive cough of 4 years
- these symptoms occurred during the winter seasons
- he had increased purulence of sputum twice during the past 1 year.
- On examination the chest was hyperinflated and there were bilateral basal crepitations.

Diagnosis: a case of COPD. Discuss why it is not bronchial asthma and what investigations should be done?

**Case study 5**

A 36-year-old female with history of wheezing, cough with expectoration for the past 5 years.
- She was using cowdung cake as fuel for her household cooking and heating.
- She was a non-smoker and a homemaker.
- On clinical examination, she had bilateral rhonchi and bilateral basal crepitations.
- She had no significant relief on inhaled bronchodilators and anti-inflammatory drugs.

Diagnosis: a case of asthma–COPD overlap syndrome.

Justification: it has features of both COPD and asthma.

Case management: she will need both short-acting bronchodilators (salbutamol and ipratropium combination) as and when needed. She will need also a combination of LABA + steroid inhalers. Additional tiotropium bromide will also be required.

**Case study 6**

A 35-year-old male had a history of childhood pneumonia.
- Since then he had repeated attacks of cough with copious mucopurulent expectoration of about 1–2 cups.
- It increases on lying down on the left side.
- He has coarse crepitation on auscultation.
- Chest X-ray showed cystic dilatations on both sides – more on the right side
Diagnosis: a case of bronchiectasis

Pre- and post-tests

1. **What are the differences between asthma and COPD?**
   
   (a) Asthma is reversible and COPD is irreversible.
   (b) COPD is reversible and asthma is irreversible.
   (c) Wheeze is not heard in asthma.
   (d) COPD symptoms are more during the night and early morning.

2. **What precautions should be used in inhaler technique?**
   
   (a) Check for the expiry date and check that the inhaler device is not empty.
   (b) Rinse your mouth after the use of a steroid inhaler.
   (c) Breathe out completely before taking the inhaler.
   (d) You should breathe in fast after the puff.

3. **Which of the following is not true for peak flowmeter?**
   
   (a) It is used to test the reversibility.
   (b) It should be done in lying position and should be done only once.
   (c) Marker should be moved to the bottom of the numbered scale before the test.
   (d) It can be used to monitor the response to the treatment.

4. **Which of the following is true about the reversibility test?**
   
   (a) It is done to monitor bronchial obstruction.
   (b) If the increase in PEFR is 20% or more after salbutamol it is a case of COPD.
   (c) One puff of salbutamol is enough to conduct the test.
   (d) Inhaler can be used before 8 hours of the test.
**ADDITIONAL INFORMATION**

**Other tests for COPD**

- Do a blood test (blood sugar, lipid profile) and a chest X-ray to rule out other causes of symptoms.
- Do a sputum examination to rule out tuberculosis if there is a history of cough for 2 weeks or more and expectoration or blood in the sputum.
- Calculate the body mass index (BMI) to find out if the patient has a healthy weight for the height. This is important because COPD could be managed better if the patient is not underweight or overweight.

Other information required to give a better picture of the severity of COPD severity:

- how often the symptoms flare up or there is chest infection
- how short of breath the patient feels during everyday activities
- whether the oxygen level is significantly lower

**Spirometry**

Lung function is assessed by spirometry. This involves blowing hard into a machine which measures lung capacity and how quickly the patient can empty the lungs. This is called the forced expiratory volume in one second, often shortened to FEV1.

Your doctor will use a spirometer to measure how narrow your airways are. But this only covers one aspect. Someone with slightly narrowed airways can be more breathless than someone with very narrow airways, depending on their level of fitness and the exact way in which COPD has damaged their lungs.

**Spirometers – past and present**
Managing COPD and asthma

Unacceptable

Normal Tracing of Spirometry

Flow

Volume

Flow volume Tracing

Normal

Asthma (after BD)

Asthma (before BD)

Volume
Managing COPD and asthma

Activity 1: Step 2

Burden of CRD (asthma and COPD)

- Chronic Respiratory Diseases (CRDs) include chronic obstructive pulmonary disease (COPD), bronchial asthma, bronchiectasis, occupational lung disorders, interstitial lung diseases, post-tubercular sequel and others.
- Global burden of COPD and asthma is about 500 million and have greatest public health significance.
- No standard National Guidelines are available in most countries of the region except in one or two.
- High burden of tuberculosis is another important issue of the region which needs to be excluded in each of these case.
Risk Factors of CRD (asthma and COPD)

- For COPD:
  - Smoking, and air pollution (both indoor and ambient)
  - Occupations, particularly dusty environments, mining, agriculture
- For asthma:
  - Genetic factors
  - Family history
  - Allergens,
  - Maternal smoking
  - Pollution

What is asthma?

- Asthma is an obstructive airways disease when there is limitation to the airflow.
- Common symptoms are wheezing, shortness of breath, chest tightness and cough that vary over time (Intermittent).
- The characteristic feature of the disease is the variability of the airway obstruction that becomes normal either spontaneously or with treatment – The obstruction is reversible.
- Saying: “Not all that wheezes is asthma. And not all asthmatics wheeze”.

Some asthma triggers

- GERD (reflux from esophagus)
- Post nasal drip (due to allergies)
- Down feathered comforters/down
- Pollens, mold, house dust mite
- Pets (in bedroom)
- Isocyanides
- Cotton dust/wood dust
- Solvents
- Aspirin sensitivity (rarely) known as Samter’s triad
Pathology of asthma

What is COPD?

- Chronic obstructive pulmonary disease, or COPD, describes a group of lung conditions that make it difficult to empty air out of the lungs because your airways have been narrowed.
- COPD includes two conditions — chronic bronchitis and emphysema.
- Most common symptoms include dyspnea, cough and/or sputum production.
- COPD may be punctuated by periods of acute worsening of respiratory symptoms, called exacerbations.

Pathology of COPD
Pathology of COPD

COPDs and bronchial asthma

• COPDs (Emphysema and bronchitis):
  o Have damaged air sacs in their lungs, which can lead to hyperinflation, or the inability of the lungs to return to their normal shape after expelling air.
• Bronchial asthma:
  o Asthma is a respiratory condition that comes with spasms in the bronchi of the lungs that make it difficult to breathe.

What is ACO (asthma-COPD overlap)?

• Many patients with symptoms of chronic airways disease have features of both asthma and COPD. This has been called asthma-COPD overlap (ACO).
• It is characterized by persistent airflow limitation with several features usually associated with asthma and several features usually associated with COPD.
What’s the difference between COPD and asthma?

- To differentiate asthma and COPD recall some basic pathophysiology
- Both COPD and asthma have a level of expiratory air flow obstruction
- Asthma: reversible expiratory air flow
- COPD: Irreversible expiratory air flow.

### Difference between asthma and COPD

<table>
<thead>
<tr>
<th>History</th>
<th>Asthma</th>
<th>COPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous history</td>
<td>Diagnosis of asthma known</td>
<td>Diagnosis of COPD known</td>
</tr>
<tr>
<td>Onset of symptoms</td>
<td>Since childhood or early adulthood</td>
<td>Onset in middle age (40-60) or later</td>
</tr>
<tr>
<td>History</td>
<td>Seasonal allergies, known triggers of symptoms</td>
<td>History of heavy smoking for more than 15 years, exposure to indoor air pollution, exposure to occupational dust</td>
</tr>
<tr>
<td>Symptoms</td>
<td>Intermittent symptoms with asymptomatic periods in between, worse at night, early morning, triggered by exercise, weather changes, seasonal allergies, respond to salbutamol or other bronchodilators</td>
<td>Worsened over a long period of time, long history of frequent cough and sputum production before shortness of breath, persistent with little day-to-day variation</td>
</tr>
<tr>
<td>Examination</td>
<td>Usually normal, if between exacerbations</td>
<td>Decreased breath sounds, hyperresonance, cyanosis, barrel chest, pursed lip breathing</td>
</tr>
<tr>
<td>FEV1/FVC</td>
<td></td>
<td>Persistently abnormal spirometry</td>
</tr>
<tr>
<td>Improvement following bronchodilator</td>
<td>Improvement following bronchodilator</td>
<td>Minimal improvement following bronchodilator can be present</td>
</tr>
<tr>
<td>Spirometry often normal or near normal between attacks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### History and examination

- Ask if breathlessness is brought on by anything, how the daily life is affected and other questions about general health.
- Ask how frequently there are exacerbations/hospitalizations.
- Ask about history of smoking, type of product, quantity, duration,
- Whether the patient is exposed to dust, fumes or chemicals.
- Clinical examination of the chest (respiratory system) to see evidence of hyperinflation, crepitations.
Activity 2: Step 1

Demonstration of PEFR using peak flow meter

- Spirometer is the better option for measurement of lung function which measures both FVC, and FEV1 and calculate their ratio.
- PEFR although not a replacement of spirometer, can be used to assess reversibility.
- A peak flow meter is a small device that helps to monitor respiratory conditions such as asthma by measuring maximum.
- Airflow out of your lungs. Peak flow meters are most helpful in assessing moderate to severe persistent asthma.

Purpose of measure of PEFR

- To demonstrate the obstruction
- Reversibility
- To monitor the response to therapy
- Demonstration of variability between morning and evening
- Warn about impending exacerbation during test.
Activity 3: Step 1

Bronchodilator reversibility test
- Ask the patient not to take any bronchodilator drug/inhalers for at least 8 hrs
- In the morning ask him to take light breakfast
- Take Base-line PEFR (highest value of three readings)
- Give 2 puffs of salbutamol (each puff of 200 µg)
- Repeat PEFR after 15 minutes and calculate the increase in % as below:
  - \( \frac{(Observed\ value - baseline\ value) \times 100}{Baseline\ value} \)

Diagnosis of COPD
- In addition to the pattern of symptoms, a lung function test (spirometry) is used for diagnosis and regular check ups
- Gold standard, but not always available at PHC level
- Measures FEV1 and FVC
  - FEV1: forced expiratory volume in 1 sec: Normal: 4 L
  - FVC: forced vital capacity: Normal: 5L
- FEV1/FVC ratio is calculated to diagnose obstruction:
  - FEV1/FVC = 4L/5L = 0.8 Normal
  - FEV1/FVC = 1.8L/3.2L = .56 Obstructive disease

Managing COPD and asthma
Assess degree of airflow limitation for COPD with spirometry tests (based on post bronchodilator FEV1)

Patients with FEV1/FVC < 0.70

*Mild COPD:* FEV1 ≥ 80% predicted

*Moderate:* 50% ≤ FEV1 < 80% predicted

*Severe:* 30% ≤ FEV1 < 50% predicted

*Very severe:* FEV1 ≤ 30% predicted

---

**Asthma severity assessment**

<table>
<thead>
<tr>
<th>Components</th>
<th>Inadequately controlled (any one)</th>
<th>Adequately controlled (all should be present)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day time symptoms or use of rescue medication</td>
<td>More than twice a week</td>
<td>Twice or less in a week</td>
</tr>
<tr>
<td>Night time symptoms/awakening</td>
<td>Any</td>
<td>None</td>
</tr>
<tr>
<td>Limitation of activities</td>
<td>Any</td>
<td>None</td>
</tr>
<tr>
<td>Pulmonary function (if available)</td>
<td>FEV1 &lt; 80% of predicted or PEF &lt; 80% of personal best</td>
<td>FEV1 &gt; 80% of predicted or PEF &gt; 80% of personal best</td>
</tr>
</tbody>
</table>

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**Symptoms and signs of acute exacerbation of asthma**

- Severely breathless,
- Accessory muscles of respiration are working (neck muscles, chest and abdominal muscles),
- Pulsus paradoxus (if you know how to measure it)
- PEFR 33-50% of best or predicted
- Respiratory rate > 25 breaths/minute (adult)
- Inability to complete sentences in one breath
- Exhaustion, hypotension, cyanosis (blue colouration of lips, tongue and finger tips), silent chest, poor respiratory effort, altered conscious level
Assess severity of acute exacerbation of asthma

<table>
<thead>
<tr>
<th>Mild or moderate</th>
<th>Severe</th>
<th>Life-threatening</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Talks in phrases, prefers sitting to lying, not agitated</td>
<td>• Talks in words, sits hunched forwards, agitated</td>
<td>• Drowsy, confused, silent chest (Any one of the above)</td>
</tr>
<tr>
<td>• Respiratory rate increased</td>
<td>• Respiratory rate &gt;30/min</td>
<td></td>
</tr>
<tr>
<td>• Accessory muscles not used</td>
<td>• Accessory muscles in use</td>
<td></td>
</tr>
<tr>
<td>• Pulse rate 100–120 bpm</td>
<td>• Pulse rate &gt;120 bpm</td>
<td></td>
</tr>
<tr>
<td>• O₂ saturation (on air) 90–95%</td>
<td>• O₂ saturation (on air) &lt;90%</td>
<td></td>
</tr>
<tr>
<td>• PEF ≤50% predicted or best</td>
<td>• PEF ≤50% predicted or best</td>
<td></td>
</tr>
</tbody>
</table>

Approach to patient with asthma/COPD

Patient presenting with dyspnea, wheezing, chest tightness, cough and/or sputum production

Features suggesting another alternative diagnosis

Evaluate and treat/refer

Detailed history on symptoms, risk factors and triggers, relevant physical examination

Probable asthma/COPD

Spirometry

Assess asthma control or COPD severity

Initiate empirical therapy
Patient education
Schedule follow-up visit

If cough/sputum for >2 weeks, test sputum for acid-fast bacilli

Tuberculosis

Negative

Positive

Managing COPD and asthma