Acute Exacerbations of COPD

See also the separate Chronic Obstructive Pulmonary Disease, Diagnosing COPD and Management of Stable COPD articles.

Exacerbations of chronic obstructive pulmonary disease (COPD) are defined as a sustained worsening of the patient's symptoms from his or her usual stable state, which is beyond normal day-to-day variations and is acute in onset. Commonly reported symptoms are worsening breathlessness, cough, increased sputum production and change in sputum colour. This change usually requires a change in medication.

Epidemiology and aetiology

The frequency of acute exacerbations tends to increase as the severity of the underlying COPD increases. Furthermore, exacerbations contribute to the progression of the condition. Some people are particularly susceptible to exacerbations; the exact reasons behind this are not fully understood.

Exacerbations of COPD are a common cause for admission, accounting for one in eight emergency admissions in the UK, making it the second most common cause for emergency hospital admission.

The trigger in most cases is a viral infection; other causes are bacterial infections, air pollutants and ambient temperature. Human rhinovirus is the most common virus isolated. Viral causes tend to the more severe, longer-lasting exacerbations which result in hospitalisation.

- Known viral causes of exacerbations of COPD include rhinoviruses, influenza, parainfluenza, coronavirus, adenovirus and respiratory syncytial virus.
- Bacterial community-acquired infections are often due to Streptococcus pneumoniae and Haemophilus influenzae and, less commonly, Moraxella catarrhalis, Staphylococcus aureus and Pseudomonas aeruginosa may also cause exacerbations of COPD.
- Common pollutants such as nitrogen dioxide, particulates, sulfur dioxide and ozone may also trigger exacerbations.

Presentation

An exacerbation of COPD causes an acute deterioration of respiratory symptoms, particularly increased breathlessness and cough, and increased sputum volume and/or a change in the colour of the sputum. Exacerbations of COPD can be associated with the following symptoms:

- Increased dyspnoea.
- Increased cough; increased sputum purulence and increased sputum volume.
- Upper airway symptoms (eg, colds and sore throats).
- Increased wheeze and chest tightness.
- Malaise.
- Reduced exercise tolerance.
- Fluid retention.
- Increased fatigue.
- Marked respiratory distress with dyspnoea and tachypnoea, acute confusion, increased cyanosis, peripheral oedema.
- Respiratory failure - may develop and may require non-invasive ventilation (NIV).

Differential diagnosis

Other causes of similar symptoms in patients with COPD are:

- Pneumonia
- Pneumothorax
- Congestive heart failure
- Pulmonary embolus
- Lung cancer
- Upper airway obstruction
- Pleural effusion
- Recurrent aspiration
- Rib fracture
- Bronchiectasis
Investigations

Lung function tests are not reliable during an exacerbation and so are not recommended as a routine investigation. In primary care, sending a sputum sample is not recommended. Assessment is clinical and involves taking a history, examining the chest and checking temperature and peripheral oxygen saturation.

In hospital:
- CXR.
- Arterial blood gases.
- FBC, renal function tests and electrolytes.
- Electrocardiogram (ECG): for comorbidities and differential diagnoses.
- Sputum cultures.
- Blood culture if there is pyrexia
- Theophylline level if the person is on theophylline treatment.

Management

Assessing the need for hospital treatment
Assessment of severity includes assessing whether the person can be managed at home or whether they need admission. The following are features suggesting the person may need hospital treatment:

- Marked dyspnoea.
- Tachypnoea.
- Pursed-lip breathing.
- Use of accessory muscles (sternomastoid and abdominal) at rest.
- Acute confusion or impaired level of consciousness.
- New-onset cyanosis.
- Worsening peripheral oedema.
- Rapid rate of onset.
- Marked reduction in activities of daily living.
- Inability to cope at home.
- Poor or deteriorating general condition.
- Already receiving home oxygen therapy.
- Oxygen saturation levels <90%.

Intermediate care: Hospital-at-Home schemes, provided by community respiratory teams, may be available in some areas and are an alternative to hospital admission.

- Hospital-at-Home and assisted-discharge schemes are safe and effective and should be used as an alternative way of managing patients with exacerbations of COPD who would otherwise need to be admitted or remain in hospital.
- There are currently insufficient data to make firm recommendations about which patients with an exacerbation are most suitable for Hospital-at-Home or early discharge.
- Patient selection for Hospital-at-Home or assisted-discharge should depend on the resources available and absence of factors associated with a worse prognosis - for example, acidosis. Patient preference should be taken into account where possible.

Management in general practice

- Most exacerbations can be managed in the community with bronchodilators, steroids usually, and sometimes antibiotics.
- Increase the dose or frequency of short-acting bronchodilators (inhaled used with a spacer device are as effective as nebulisers).
- Oral steroids:
  - Prednisolone 30 mg daily for 7-14 days (for all patients with a significant increase in breathlessness unless contra-indicated).
  - There is no advantage in more prolonged corticosteroid therapy.
  - Osteoporosis prophylaxis should be considered in patients requiring frequent courses of oral corticosteroids.
  - The National Institute for Health and Care Excellence (NICE) is currently drafting a 2019 update to the use of steroids in this situation, so advice may change.
- Antibiotics:
  - The value of antibiotics in this situation is uncertain and studies show conflicting results.
  - Many exacerbations are triggered by viral infection and will not respond to antibiotics.
  - Consider antibiotic treatment if the sputum is purulent or there are signs of consolidation. Also take into account symptom severity, history of previous exacerbations and need for hospital admission, previous sputum culture results and the risk of developing resistance with repeated courses of antibiotics.
  - When sputum has been sent for culture, the appropriateness of antibiotic treatment should be checked against laboratory culture and sensitivities when they become available.
  - If antibiotics are not given, advise about seeking help urgently if the nature of the sputum changes or if symptoms worsen.
First-line options in primary care are amoxicillin (500 mg tds for five days), doxycycline (200 mg then 100 mg od for a further four days) or clarithromycin (500 mg bd for five days).

**Oxygen therapy**: This is indicated only where oxygen saturation levels are below the individual's target levels. See the separate Use of Oxygen Therapy in COPD article.

**Monitor recovery**:
- Arrange appropriate review. Monitor oxygen saturations.
- Establish on optimal therapy.
- Arrange multidisciplinary assessment if necessary. Consider involving professionals such as a community matron, specialist respiratory nurses and physiotherapists.

**Self-management**
- Encourage people at risk of having an exacerbation to respond quickly to the symptoms of an exacerbation by:
  - Starting oral corticosteroid therapy (unless contra-indicated) if increased breathlessness interferes with activities of daily living.
  - Starting antibiotic therapy if their sputum is purulent.
  - Adjusting bronchodilator therapy to control symptoms.

- Give people at risk of exacerbations a course of antibiotic and corticosteroid tablets to keep at home. Monitor the use of these drugs and advise people to contact a healthcare professional if their symptoms do not improve. Educate with regard to the risks and benefits of medication and how and when to take them correctly.

**Hospital management**

Further management in hospital:
- Either handheld inhalers or nebulisers can be used to deliver bronchodilator therapy. If using the latter, change back to inhalers as soon as possible in order to facilitate earlier hospital discharge. If a person with COPD is hypercapnic or acidic, the nebuliser should be driven by compressed air rather than oxygen (to avoid worsening hypercapnia).
- If necessary, oxygen should be given to keep the SaO$_2$ within the individualised target range. Monitor arterial blood gases regularly.
- Use systemic corticosteroids and antibiotics as above. In addition, give antibiotics if CXR shows consolidation. If an antibiotic is indicated, use oral treatment where possible. If intravenous therapy is required, review this after 48 hours and step down where possible.
- Consider intravenous theophyllines, with appropriate monitoring, if response to nebulised bronchodilators is poor.
- Assess need for non-invasive ventilation (NIV):
  - Consider NIV for patients who are slow to wean from invasive ventilation.
  - Use NIV for persistent hypercapnic ventilatory failure despite optimal medical therapy.
  - NIV should be delivered in a dedicated setting by trained, experienced staff who are aware of its limitations.
  - Treatment on intensive care units, including invasive ventilation, should be made available where necessary.
  - Consider doxapram only if NIV is not available.

- Assess the need for intubation using age, forced expiratory volume in one second (FEV1), functional status, body mass index (BMI), requirement for oxygen when stable, comorbidities, and previous admissions to intensive care units.
- Consider physiotherapy using positive expiratory pressure devices for selected people with exacerbations of COPD, to help with clearing sputum.

**Monitor recovery**:
- Regularly assess symptoms and observe functional capacity. Do not routinely perform daily monitoring of peak expiratory flow or FEV1.
- Repeat arterial blood gas measurements regularly, according to the response to treatment.
- Use pulse oximetry to monitor recovery from non-hypercapnic, non-acidotic respiratory failure.
- Use intermittent arterial blood gas measurements to monitor recovery from hypercapnic or acidic respiratory failure until the person is stable.
- Switch to handheld inhalers when the condition is stable.

**Before discharge**:
- Check oximetry or arterial blood gas results are satisfactory in people who experienced respiratory failure.
- Perform spirometry.
- Re-establish on optimal maintenance therapy and assess routine care.
- Arrange follow-up and home care.
- Give clear instructions about correct use of medications (including oxygen) and stopping corticosteroid treatment. Ensure patients are aware of the optimum duration of treatment and the adverse effects of prolonged oral corticosteroid therapy.
- Formally assess daily living activities if concerns remain about how the person will cope at home.
Prognosis

- Exacerbations of COPD are associated with increased mortality, an accelerated decline in lung function, and impaired quality of life.[7]
- Exacerbations of COPD requiring hospital admission are associated with an inpatient mortality rate of 3-4%, which increases to 11-24% for people who require treatment in an intensive care unit.[8] The UK National Confidential Enquiry into Patient Outcome and Death 2015 enquiry showed over 25% of patients receiving acute NIV for exacerbation of COPD died in hospital.[9]
- Baseline pulmonary function is the best predictor of mortality and repeat admission.[9]
- Recurrent exacerbations cause an accelerated decline in lung function[10].
- During a COPD exacerbation symptoms usually last 7-10 days but may last longer.[2] At eight weeks, 20% have not returned to their pre-exacerbation state.
- One review of over 73,000 patients in Canada found that fewer than half of patients hospitalised for an exacerbation survived for a further five years.[11]

Prevention[12]

Frequency of exacerbations can be reduced by:

- Smoking cessation.
- Pulmonary rehabilitation - may address those risk factors which can be modified and reduce the frequency of exacerbations. Although study results are mixed, on balance they support the use of pulmonary rehabilitation.
- Appropriate influenza vaccination and pneumococcal vaccination.
- Optimal control of stable COPD. Bronchodilator treatment with a long-acting muscarinic antagonist (LAMA), long-acting beta2 agonist (LABA), or a combination of both, has been shown to reduce the risk of severe exacerbations significantly. See the separate Management of Stable COPD article.
- Monitoring patients who have frequent exacerbations.[13] This however has to be balanced with the risks of resistance (both to the individual and society as a whole) and adverse effects.
- Optimal control of relevant comorbidities (e.g. diabetes mellitus, coronary heart disease).
- The use of continuous prophylactic antibiotics results in a clinically significant benefit in reducing exacerbations in COPD in patients who have frequent exacerbations.[13] This however has to be balanced with the risks of resistance (both to the individual and society as a whole) and adverse effects.

The impact of exacerbations may be minimised by:

- Giving self-management plans, including advice on responding promptly to the symptoms of an exacerbation.
- Starting appropriate treatment with oral steroids and/or antibiotics.
- Use of NIV when indicated (i.e. persistent hypercapnic respiratory failure despite optimal medical treatment including oxygen therapy).
- Use of Hospital-at-Home or assisted-discharge schemes.

Further reading & references

- British Thoracic Society
- Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease 2019 Report
- Chronic obstructive pulmonary disease (COPD) and smoking: guidelines for stopping smoking 2019
- Chronic obstructive pulmonary disease (COPD); NICE Guidance (December 2018)
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