Acute Exacerbations of COPD

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.[1]

Epidemiology

The frequency of acute exacerbations tends to increase as the severity of the underlying COPD increases.

- Most community-acquired infections are due to *Streptococcus pneumoniae* and *Haemophilus influenzae* and, less commonly, *Moraxella catarrhalis*.
- *Staphylococcus aureus* may be the cause during the influenza season. Infection with *Pseudomonas aeruginosa* may also cause exacerbations of COPD.
- Known viral causes of exacerbations of COPD include rhinoviruses, influenza, parainfluenza, coronavirus, adenovirus and respiratory syncytial virus.
- 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 purulence. Exacerbations of COPD can be associated with the following symptoms:[1]

- 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:[1]

- Pneumonia
- Pneumothorax
- Left ventricular failure/pulmonary oedema
- Pulmonary embolus
- Lung cancer
- Upper airway obstruction
- Pleural effusion
- Recurrent aspiration
- Rib fracture
- Bronchiectasis

Assessment

The following signs are features of a severe exacerbation:[1]

- Marked dyspnoea.
- Tachypnoea.
- Pursed lip breathing.
- Use of accessory muscles (sternomastoid and abdominal) at rest.
- Acute confusion.
- New-onset cyanosis.
- New-onset peripheral oedema.
- Marked reduction in activities of daily living.
Investigations
Lung function tests are not reliable during an exacerbation and so are not recommended as a routine investigation.

- FBC, renal function tests and electrolytes.
- Electrocardiogram (ECG): may show right ventricular hypertrophy, arrhythmias, ischaemia.
- Cultures: sputum cultures.
- CXR: to identify any other cause.
- Further investigations in secondary care include arterial blood gases (respiratory failure) and blood cultures (if the patient is pyrexial).

Management[1]

- The frequency of exacerbations should be reduced by appropriate use of inhaled corticosteroids and bronchodilators, and vaccinations.
- The impact of exacerbations should be minimised by:
  - Giving self-management advice on responding promptly to the symptoms of an exacerbation.
  - Starting appropriate treatment with oral steroids and/or antibiotics.
  - Use of NIV when indicated (ie persistent hypercapnic respiratory failure despite optimal medical treatment including oxygen therapy).
  - Use of Hospital-at-Home or assisted-discharge schemes.

General principles

- High-dose short-acting bronchodilators (inhalers used with a spacer device are as effective as nebulisers). There is no evidence that the degree of bronchodilation achieved with ipratropium bromide is greater than that using a short-acting beta<sub>2</sub> agonist for patients with acute exacerbations of COPD.[2]
- 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.
- Antibiotics should only be used if the sputum is purulent or there are signs of consolidation. When sputum has been sent for culture, the appropriateness of antibiotic treatment should be checked against laboratory culture and sensitivities when they become available.[1]
- Oxygen therapy: see separate article on Use of Oxygen Therapy in COPD.
- Physiotherapy using positive expiratory pressure (PEP) masks should be considered for selected patients, to help with clearing sputum.
- Respiratory stimulants: doxapram should only be used when NIV is either unavailable or considered inappropriate.
- Non-invasive positive pressure ventilation (NPPV) should be used as the treatment of choice for persistent hypercapnic ventilatory failure during exacerbations despite optimal medical therapy. NPPV reduces the risk of intubation and in-hospital mortality.[3]
- Following recovery from the acute exacerbation, pulmonary rehabilitation should be arranged as appropriate.

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.

Intermediate care[1]

- 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 - eg, acidosis.

Assessing the need for hospital treatment
Indications for hospital treatment include:[4]

- Inability to cope at home, living alone.
- General condition poor or deteriorating; poor level of activity or confined to bed.
- Severe breathlessness, cyanosis, worsening peripheral oedema.
- Impaired level of consciousness, acute confusion.
- Already receiving long-term oxygen therapy (LTOT).
• Rapid rate of onset.
• Significant comorbidity (particularly cardiac disease and insulin-dependent diabetes).
• SaO$_2$ <90%, arterial pH level <7.35, arterial SaO$_2$ <7 kPa.
• Acute changes present on CXR.

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

Initial management
• Increase frequency of bronchodilator use and consider giving via a nebuliser (always specify driving gas and prescribe with compressed air if the person is hypercapnic/acidotic).
• The delivery system should reflect the patient’s ability to use it, the dosage and the resources available for supervision.
• Give oral antibiotics if sputum is purulent or there are clinical signs of pneumonia:
  • Use an aminopenicillin, a macrolide or tetracycline and/or follow local microbiology guidance.
• Review antibiotic treatment when culture results are available.
• Offer prednisolone 30 mg daily for 7-14 days (there is no advantage in prolonging therapy).

Home management
• Investigations in primary care:
  • Sputum culture is not normally recommended.
  • Use pulse oximetry if the exacerbation is severe.
• Monitor recovery:
  • Arrange appropriate review.
  • Establish on optimal therapy.
  • Arrange multidisciplinary assessment if necessary.
• Give clear instructions about correct use of medications (including oxygen) and stopping corticosteroid therapy. Ensure patients are aware of the optimum duration of treatment and the adverse effects of prolonged oral corticosteroid therapy.

Hospital management
• Investigations in hospital:
  • Arterial blood gases (or oxygen saturation if facilities are not available) and note inspired oxygen concentration.
  • CXR.
  • Electrocardiogram.
  • FBC and U&Es.
  • Theophylline level at admission (if the person is on theophylline).
  • Sputum microscopy and culture if purulent.
  • Blood cultures if pyrexial.
• Further management in hospital:
  • If necessary, oxygen should be given to keep the SaO$_2$ within the individualised target range.
  • 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. Consider doxapram if NIV is not available. 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.
  • 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.
  • Give antibiotics if CXR shows consolidation.
  • Consider physiotherapy using positive expiratory pressure (PEP) masks 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.
• Consider Hospital-at-Home or assisted-discharge scheme:
  • Select patients according to available resources and absence of factors associated with a worse prognosis.
  • The team should be experienced in managing COPD and may include nurses, physiotherapists, occupational therapists and generic health workers.
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.\(^6\)
- Studies of a cohort of patients observed in the community have shown that symptoms and peak expiratory flow rates (PEFRs) recover slowly after an exacerbation.
- The median for recovery of symptoms was seven days.
- Recovery of PEFR to baseline was complete in 75% of patients at 35 days and 93% at 91 days.\(^{[1]}\)
- A retrospective audit of 1,400 admissions to hospital in the UK with an exacerbation of COPD has shown that 34% were re-admitted and 14% had died within three months.\(^{[1]}\)
- Patients experiencing frequent exacerbations have more rapid lung function decline.\(^{[1]}\)

Prevention
- **Appropriate influenza vaccination** and **pneumococcal vaccination**.
- Optimal control of stable COPD and relevant comorbidities (eg, diabetes mellitus, ischaemic heart disease).
- Patients should have a self-management plan, which should include appropriate action at the first sign of an acute exacerbation.
- The use of continuous prophylactic antibiotics results in a clinically significant benefit in reducing exacerbations in COPD.\(^6\)

Further reading & references

1. Chronic obstructive pulmonary disease; NICE Clinical Guideline (June 2010)
4. Chronic obstructive pulmonary disease; NICE CKS, November 2010 (UK access only)

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