

# How best to recognise and manage exacerbation of chronic obstructive pulmonary disease

In the second article of this series Nicola Harker helps us to brush up our knowledge of chronic obstructive pulmonary disease and explains how to recognise and manage exacerbations

## Learning outcomes

After reading through the following case study and associated questions about chronic obstructive airways disease (COPD) you should expect to be able to:

- evaluate which evidence-based pharmacological and non-pharmacological treatments should be offered to patients who are admitted to hospital with an exacerbation of COPD
- describe the role of the pharmacist in the management of patients admitted to hospital with an exacerbation of COPD.

## Case

A 68-year-old man is admitted to hospital with a two-day history of increasing shortness of breath at rest, an increase in sputum volume, a cough productive of green sputum, wheeze, confusion and pleuritic pain on exertion.

He is a current smoker (having 20 cigarettes per day, which he has done for 40 years) and he lives alone. He is usually able to walk 20–30 yards, but his mobility is limited by acute shortness of breath.

He has had three previous admissions to hospital with an exacerbation of COPD and has received four courses of corticosteroids from his GP in the last 12 months for mild exacerbations. His previous medical history includes: COPD, hypertension and hypercholesterolaemia.

## Drugs on admission

The medicines he was taking on admission to hospital were:

- Bendroflumethiazide 2.5mg om
- Lisinopril 20mg om
- Tiotropium inhaler 18microgram om
- Seretide 500 Accuhaler 1 dose bd
- Simvastatin 40mg on
- Salbutamol inhaler 2 puffs prn.

He has no known drug allergies.



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On admission his oxygen saturation was 89% while he was receiving 24% oxygen. His arterial blood gases indicate that he is in Type II respiratory failure — low oxygen, with high carbon dioxide — and he is started on non-invasive ventilation (NIV — see Question 6 where this is described fully).

**Question 1:** *What symptoms does the patient display on admission to indicate that he may be presenting with an exacerbation of COPD?*

An exacerbation of COPD is a sustained worsening of respiratory symptoms that is acute in onset and usually requires a patient to seek medical help. The deterioration

must be more severe than the usual daily variation experienced.<sup>1</sup>

This patient is displaying three cardinal symptoms associated with an exacerbation<sup>2</sup> — increased shortness of breath, increased sputum volume and increased sputum purulence (a change in colour of sputum — such as from clear to green/yellow or rust colour, which is associated with infection). He is also presenting with wheeze, pleuritic pain and confusion. This is often caused by retention of carbon dioxide, which occurs in Type II respiratory failure.

Other symptoms that patients may present with include upper airways symptoms such as colds and sore throats; chest tightness; reduced exercise tolerance; fluid retention and fatigue.

Some exacerbations are mild and self-limiting, and can be managed by patients at home without consulting health care professionals. Other exacerbations are severe and require hospitalisation. The following signs are features of a severe exacerbation:

- marked dyspnoea
- tachypnoea
- purse-lip breathing
- use of accessory muscles at rest
- acute confusion
- new onset of cyanosis
- new onset peripheral oedema
- marked reduction in activities of daily living.<sup>3</sup>

## Learning points

**Question 2:** *What other diagnoses could be considered for a patient presenting with these symptoms?*

Patients presenting with an exacerbation of COPD may display similar symptoms to patients with other conditions including pneumonia, pneumothorax, left ventricular failure, pulmonary oedema, pulmonary embolism, upper airways obstruction, lung cancer and pleural effusion.

To diagnose an exacerbation of COPD (and to exclude differential diagnoses) all patients referred to hospital with an exacerbation should have a chest X-ray taken, arterial blood gases measured and the inspired oxygen concentration recorded, an ECG carried out, a full blood count performed, urea and electrolytes measured, a plasma theophylline level measured (if taking theophylline on admission), a sputum sample sent for microscopy and culture if sputum is purulent, and blood cultures taken if patient is pyrexial.<sup>3</sup>

**Question 3:** *What are the main causes of an exacerbation of COPD?*

Bacteria can be cultured from the sputum of patients with stable COPD and these same bacteria can also be responsible for exacerbations. Common bacteria that may cause an exacerbation include *Haemophilus influenzae*, *Streptococcus pneumoniae*, *Moraxella catarrhalis*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*.

Viruses can also cause an exacerbation of COPD. Common examples are rhinoviruses, influenza, adenovirus and respiratory syncytial virus. Pollutants in the air may also cause an exacerbation. In about 30% of cases a cause for the exacerbation cannot be identified.<sup>3</sup>

**Question 4:** *What pharmacological treatment should be given to the patient on admission to hospital?*

Short-acting, inhaled beta-2 agonists — at higher doses and increased frequencies to those used at home — are the preferred bronchodilators for treatment of exacerbations of COPD because they reduce symptoms and improve airflow obstruction.<sup>4</sup> If a prompt response to these

medicines does not occur, the short-acting anticholinergic, ipratropium, may be given concomitantly although the data to support any additional benefit in the management of acute exacerbations is scant.<sup>2</sup>

Nebulised bronchodilators are often used when patients are first admitted to hospital with exacerbations of COPD. Although hand-held inhalers (with spacer devices) and nebulisers are equally effective in achieving bronchodilation patients are often distressed when admitted so administering bronchodilators via a nebuliser has the advantage of being independent of any effort or breathing pattern from the patient. Breathless patients are also less likely to be able to inspire slowly or breath-hold for optimum lung deposition from an inhaler.<sup>3</sup>

In the absence of any specific contraindications, oral corticosteroids should be started as early as possible in all patients admitted to hospital with an exacerbation of COPD.<sup>3</sup> The recommended choice of corticosteroid is prednisolone. NICE recommends a dose of 30mg daily for 7–14 days<sup>3</sup> while the Global Initiative for Chronic Obstructive Lung Disease (GOLD) recommends 30–40mg daily for 7–10 days.<sup>4</sup> There is no benefit in continuing the course of prednisolone beyond 14 days.<sup>3</sup>

When corticosteroids are given to patients with an exacerbation of COPD a significant effect (over placebo) on improvement in FEV<sub>1</sub> (forced expiratory volume in 1 second) at day 3 compared to day 1 of treatment has been found.<sup>2</sup> Another review found that patients with severe exacerbations who received oral corticosteroids had a significantly reduced relapse rate (compared with placebo) at 30 days (27% vs 43%).<sup>3</sup> Compared with placebo, post bronchodilator FEV<sub>1</sub> improved without differences in hospital admission rates or mortality.<sup>5</sup>

Antibiotics are most effective in patients with more severe exacerbations and hence should be prescribed for patients who have an increase in purulent sputum. Alternatively they should be prescribed for

those patients without an increase in purulent sputum, but whose chest X-ray shows consolidation, or those who have clinical signs of pneumonia.<sup>3</sup>

Common antibiotics used to treat an exacerbation of COPD include amoxicillin, doxycycline or co-amoxiclav. However, local antimicrobial guidelines should always be followed and if sputum cultures have been sent they should always be followed-up for sensitivities.

This patient in our case study is displaying symptoms of a bacterial infection because he is producing purulent sputum. This is sufficient indication for starting empirical antibiotic treatment.

**Question 5:** *Is there a role for methylxanthines and respiratory stimulants in the management of exacerbations of COPD?*

Although methylxanthines (aminophylline and theophylline) exert bronchodilatory effects, the use of intravenous aminophylline in conjunction with conventional treatment does not appear to offer any advantage over placebo in terms of lung function, symptoms or hospital stay. For this reason NICE only recommends adding it to treatment if there is an inadequate response to nebulised bronchodilators.<sup>3</sup>



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Pharmacists should also be aware of the potential for drug interactions when patients are started on intravenous aminophylline and the risk of potential toxicity if patients were taking oral theophylline immediately before their admission.

Doxapram is a respiratory stimulant, given by continuous intravenous infusion.

This stimulates both respiratory and non-respiratory muscles. Since the introduction of NIV, which is more effective in the management of respiratory failure, the use of doxapram is no longer recommended except where NIV is either unavailable or considered inappropriate.<sup>3</sup>

**Question 6:** *How does NIV benefit patients admitted to hospital with an exacerbation of COPD in respiratory failure?*

Patients admitted to hospital with an exacerbation of COPD in Type II respiratory failure who do not respond to conventional treatment may be given NIV. (Type II respiratory failure is defined by a PaO<sub>2</sub> of <8kPa and a PaCO<sub>2</sub> of >6kPa and occurs when alveolar ventilation is insufficient to excrete the CO<sub>2</sub> being produced by tissue metabolism<sup>6</sup>). Traditionally, invasive ventilation has been used but tracheal intubation and assisted ventilation is associated with high morbidity and difficulty in weaning patients from the ventilator.<sup>7</sup>

NIV involves using on the patient a close fitting facemask connected to a portable ventilator, which allows a non-invasive method of providing respiratory support to a spontaneously breathing patient. It has the advantage (over invasive ventilation) that it can be used in any ward setting — providing experienced physiotherapists, doctors and nurses are available to monitor treatment. The use of NIV also allows the patient to eat, drink and communicate; it avoids the use of sedatives and reduces the risk of ventilator-associated pneumonia.<sup>8</sup>

A review of trials on NIV use has shown that the length of hospital stay is reduced by more than three days compared with standard treatment, and the number of complications associated with treatment is significantly reduced. Early correction of respiratory acidosis is an essential goal of treatment and NIV has been shown to significantly improve pH and reduce CO<sub>2</sub> levels within the first hour.<sup>7</sup> It is therefore recommended that a trial of NIV be considered early in the course of respiratory failure before severe acidosis occurs to avoid mechanical ventilation and reduce mortality.

**Question 7:** *What issues will need to be reviewed by the pharmacist with the patient once his condition improves?*

In the acute stages of an exacerbation of COPD pharmacists have a role in ensuring that antibiotic use is appropriate according to local guidelines (if they are indicated depending on severity of exacerbation). They also must ensure that bronchodilators and corticosteroids are used according to evidence-based guidelines.

Once the patient starts to improve there are a number of areas where pharmacists can have an input into the patient's management. For instance, the pharmacist should ensure that the patient is taking the correct treatment according to the severity of their COPD. This patient is currently taking Seretide 500 Accuhaler one puff twice daily and Tiotropium inhaler 18 microgram in the morning. Because the patient has had more than two exacerbations in the previous year he should definitely be using an inhaled corticosteroid.<sup>3</sup> NICE also recommend that patients who have had more than two exacerbations in one year should use a long-acting bronchodilator.<sup>3</sup>

Once the patient is improving spirometry can be performed to gauge the severity of their COPD compared to previous readings. Spirometry is not useful if performed when patients are acutely unwell.

The pharmacist has a role in ensuring that the patient's inhaler technique is good. If patients are struggling to use their inhaler the pharmacist should suggest alternative inhaler devices to improve lung deposition of the inhaled medication. Encouraging patients with COPD who are smokers to stop is vital because this will help prevent further decline in lung function.

This patient has had three admissions to hospital with exacerbations of COPD and four courses of corticosteroids from his GP in the past 12 months. Given the frequency of steroid administration he may be a candidate for osteoporosis prophylaxis<sup>3</sup> and this should be discussed with the doctors. If it is agreed that he should receive

prophylaxis he should be started on a bisphosphonate with calcium and vitamin D supplementation. He should receive counselling from the pharmacist on how to take the bisphosphonate.

The patient should be reminded of the importance of receiving the yearly influenza vaccination and a once-only pneumococcal vaccination — providing they are not contra-indicated.

Pharmacists can also have a role in pulmonary rehabilitation, which many hospitals offer. Pulmonary rehabilitation is a multidisciplinary programme of care for patients with chronic respiratory impairment, which has been shown to lead to statistically significant and clinically meaningful improvements in health-related quality of life and exercise capacity.<sup>9</sup> Pharmacists are able to participate in the educational process of pulmonary rehabilitation by talking to patients about their medication and how to get the most benefit from their treatment. ❀

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### References

1. Currie GP, Wedzicha JA. ABC of chronic pulmonary disease. Acute exacerbations. *BMJ* 2006; **333**: 87–9.
2. Rodriguez-Roisin R. COPD exacerbations. 5: Management. *Thorax* 2006; **61**: 535–44.
3. National Collaborating Centre for Chronic Conditions. Chronic obstructive pulmonary disease. National clinical guideline on management of chronic obstructive pulmonary disease in adults in primary and secondary care. *Thorax* 2004; **59** (suppl 1): 1–232.
4. Global Initiative for Chronic Obstructive Lung Disease. Executive summary: Global strategy for the diagnosis, management, and prevention of COPD. Available at [www.goldcopd.com](http://www.goldcopd.com). Last accessed on May 9 2007.
5. Aaron SD *et al.* Outpatient prednisolone after emergency treatment of chronic pulmonary disease. *N Eng J Med* 2003; **348**: 2618–25.
6. British Thoracic Society Standards of Care Committee. BTS Guideline. Non-invasive ventilation in acute respiratory failure. *Thorax* 2002; **57**: 192–211.
7. Lightowler JV *et al.* Non-invasive positive pressure ventilation to treat respiratory failure resulting from exacerbations of chronic obstructive pulmonary disease: Cochrane systematic review and meta-analysis. *BMJ* 2003; **326**: 185–9.
8. Christie G *et al.* ABC of chronic pulmonary disease. Ventilatory support. *BMJ* 2006; **333**: 138–40.
9. Man W *et al.* Community pulmonary rehabilitation after hospitalisation for acute exacerbations of chronic obstructive pulmonary disease: randomised controlled study. *BMJ* 2004; **329**: 1209–13.