COPD-X Australian and New Zealand guidelines for the diagnosis and management of chronic obstructive pulmonary disease: 2017 update

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Abstract

Introduction: Chronic obstructive pulmonary disease (COPD) is characterised by persistent respiratory symptoms and chronic airflow limitation, and is associated with exacerbations and comorbidities. Advances in the management of COPD are updated quarterly in the national COPD guidelines, the COPD-X plan, published by Lung Foundation Australia in conjunction with the Thoracic Society of Australia and New Zealand and available at http://copdx.org.au.

Main recommendations:

- Spirometry detects persistent airflow limitation (post-bronchodilator $FEV_1/FVC < 0.7$) and must be used to confirm the diagnosis.
- Non-pharmacological and pharmacological therapies should be considered as they optimise function (ie, improve symptoms and quality of life) and prevent deterioration (ie, prevent exacerbations and reduce decline).
- Pulmonary rehabilitation and regular exercise are highly beneficial and should be provided to all symptomatic COPD patients.
- Short- and long-acting inhaled bronchodilators and, in more severe disease, anti-inflammatory agents (inhaled corticosteroids) should be considered in a stepwise approach.
- Given the wide range of inhaler devices available, inhaler technique and adherence should be checked regularly.
- Smoking cessation is essential, and influenza and pneumococcal vaccinations reduce the risk of exacerbations.
- A plan of care should be developed with the multidisciplinary team. COPD action plans reduce hospitalisations and are recommended as part of COPD self-management.
- Exacerbations should be managed promptly with bronchodilators, corticosteroids and antibiotics as appropriate to prevent hospital admission and delay COPD progression.
- Comorbidities of COPD require identification and appropriate management.
- Supportive, palliative and end-of-life care are beneficial for patients with advanced disease.
- Education of patients, carers and clinicians, and a strong partnership between primary and tertiary care, facilitate evidence-based management of COPD.

Changes in management as result of the guideline: Spirometry remains the gold standard for diagnosing airflow obstruction and COPD. Non-pharmacological and pharmacological treatment should be used in a stepwise fashion to control symptoms and reduce exacerbation risk.

Chronic obstructive pulmonary disease (COPD) is a chronic lung disease characterised by persistent respiratory symptoms and airflow limitation. It is caused mainly by exposure to inhaled irritants, especially cigarette smoking,[1] while other aetiologies include air pollutants, occupational dusts and fumes, chronic asthma, impaired lung growth, and genetic predisposition (α_1-antitrypsin deficiency). The Burden of Obstructive Lung Disease (BOLD) study found a COPD prevalence of 7.5% in people aged $\geq$ 40 years in six cities in Australia.[2]

COPD is heterogeneous, with multiple clinical features and comorbidities.[1] For this reason, patients, carers, clinicians and policy makers face many challenges when aiming to tailor health care around an individual's lifestyle, environment and molecular profiling to achieve precision medicine. This 2017 update from the COPD-X guidelines, *The COPD-X plan: Australian and New Zealand guidelines for the management of chronic obstructive pulmonary disease*, highlights the evidence for key clinical recommendations in the diagnosis and management of COPD, and describes the progress made since the 2006 update in the Journal.[3]

Methods

COPD-X is produced by the Lung Foundation Australia's COPD Guidelines Committee, a multidisciplinary group that meets to evaluate the current literature and undertake quarterly updates of the guidelines for the Australian and New Zealand context. A medical librarian performs a systematic literature search for new articles on COPD, emphysema and chronic bronchitis, encompassing systematic reviews, clinical trials, cohort, and case–control studies. Relevant articles are selected for review and are critically appraised by a committee member with expertise in that area. At the full committee meeting, a decision about whether to cite an article is made by consensus, and wording for incorporation is discussed. Following an approval process, which invites review from the Thoracic Society of Australia and New Zealand and consumer representatives, the updated guidelines are uploaded quarterly to the COPD-X website (http://copdx.org.au). This summary is based on COPD-X version 2.50, June 2017.

Recommendations

C: Confirm diagnosis

Clinical features. COPD should be considered in all current and former smokers aged > 35 years with symptoms such as breathlessness, cough and sputum production.[4] People with COPD often limit physical activity to avoid breathlessness. COPD may present as recurrent episodes of chest infection requiring antibiotics. In people with COPD, there is a close relationship between the amount of tobacco smoked and the rate of decline in forced expiratory volume in one second (FEV_1), although individual susceptibility to tobacco smoke varies greatly.

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Podcast available at https://www.mja.com.au/podcasts

Spirometry. COPD cannot be diagnosed reliably on clinical features or chest x-ray findings alone. The diagnosis of COPD requires spirometry, as it is the most reproducible and objective measurement of airflow limitation. Pre- and post-bronchodilator spirometry should be performed using techniques that meet published standards. COPD is characterised by airflow limitation that is not fully reversible (post-bronchodilator FEV_1/FVC [forced vital capacity] ratio < 0.7, and FEV_1 < 80% predicted). With spirometry, there is some risk of overdiagnosis in older people or underdiagnosis in younger people, especially when the FEV_1/FVC ratio is close to 0.7, so borderline results should be interpreted with caution. Many patients with COPD have some reversibility of airflow limitation with bronchodilators. An FEV_1 increase of $\geq$ 12% and $\geq$ 200 mL constitutes a positive bronchodilator response. An FEV_1 increase of > 400 mL suggests underlying asthma, or coexisting asthma and COPD.[5]

Investigations. Investigations to confirm or exclude other conditions with a similar presentation to COPD (eg, bronchiectasis, lung cancer, heart failure and anaemia) include chest x-ray, haematology and biochemistry, complex lung function tests, exercise stress testing, and electrocardiography and echocardiography. Investigations to assess gas exchange include oximetry and arterial blood gases (if the arterial oxygen saturation measured by pulse oximeter [SpO_2] is < 92% when stable or if hypercapnia is suspected).

Severity. Assessing the severity of COPD should take into account lung function, history of exacerbations and comorbid conditions (Box 1). The COPD Assessment Test (CAT) can determine the impact of COPD symptoms on wellbeing and daily life.[6]

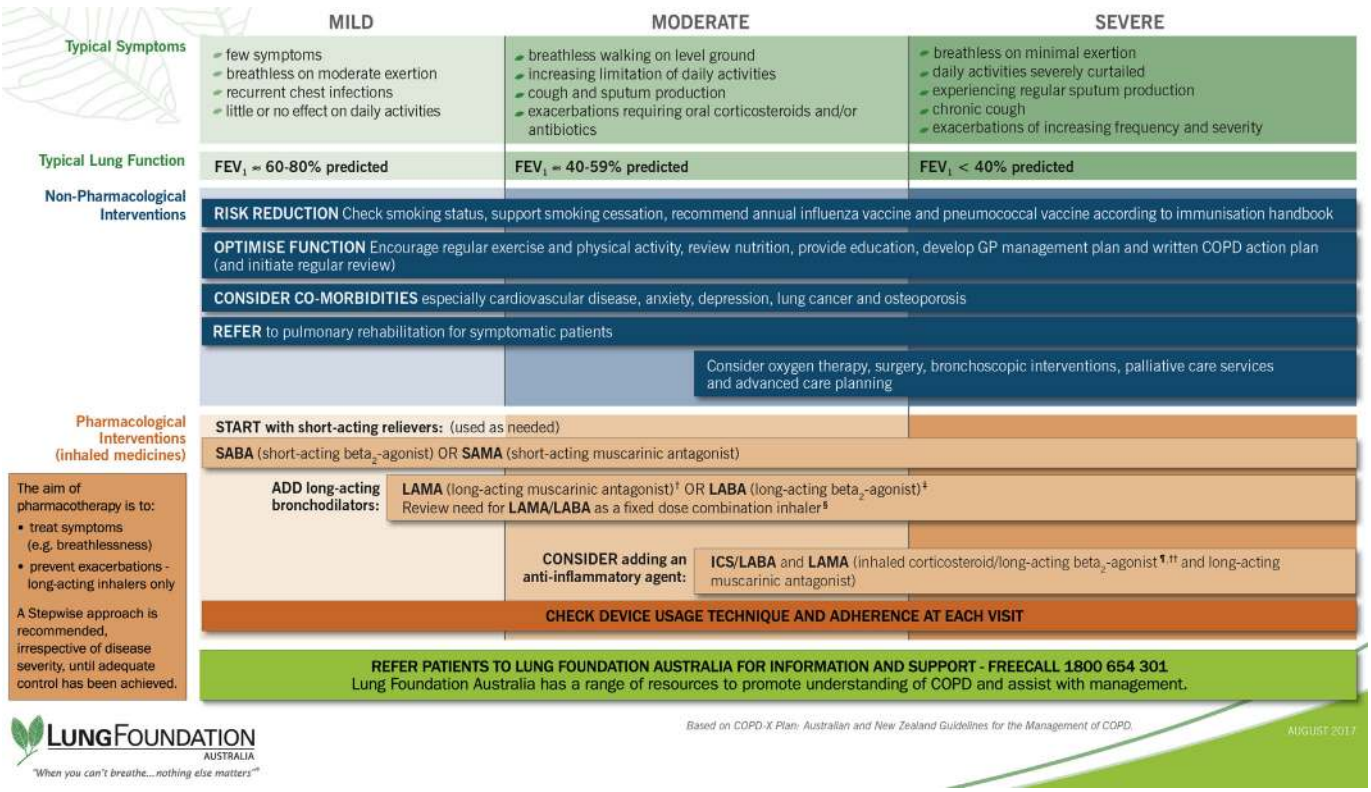
O: Optimise function

Non-pharmacological strategies. There is strong evidence for the benefits of pulmonary rehabilitation that involves supervised exercise training alone or in conjunction with patient education or other non-pharmacological interventions (eg, behaviour change, nutritional intervention and psychosocial support) (Box 2). Programs can be provided in hospital outpatient departments or in the community (ie, health care and non-health care facilities, or home settings).[7-9] Benefits are evident both in those with stable COPD and in individuals who commence rehabilitation after an exacerbation.[7,8,10] In the absence of instruction from a specialist exercise professional (eg, physiotherapist or exercise physiologist), individuals with COPD should be encouraged to be physically active (Box 2), as inactivity is associated with increased mortality and exacerbations.[12]

Pharmacological strategies. Pharmacological therapies aim to reduce symptoms, prevent exacerbations and improve health status, by targeting the pathophysiology of COPD. It is recommended that a stepwise approach to pharmacotherapy be used, until adequate control is achieved (Box 1).

- **Bronchodilators.** Short-acting bronchodilators (β_2-agonists) are used as needed for short term symptom relief. If these are insufficient, then long-acting bronchodilators should be added. Long-acting muscarinic antagonists (LAMAs) and long-acting β_2-agonists (LABAs) reduce breathlessness, improve quality of life, and decrease the risk of exacerbations.[13,14] If breathlessness or exacerbations persist with

1 Stepwise management of stable chronic obstructive pulmonary disease (COPD)*



FEV_1 = forced expiratory volume in one second. * Figure reproduced with permission from Lung Foundation Australia (www.lungfoundation.com.au). † Once a LAMA is commenced, ipratropium (a short-acting muscarinic antagonist, SAMA) should be discontinued. ‡ Before initiating LABA monotherapy, an assessment should be undertaken to exclude asthma or check if asthma and COPD coexist. LABA monotherapy should not be used when asthma and COPD coexist. § If starting a LAMA/LABA inhaler, discontinue existing inhalers containing LAMA or LABA (online Appendix, Figure 1) Pharmaceutical Benefits Scheme (PBS) authority (streamlined) required for LAMA/LABA, based on clinical criteria of: COPD — patient must have been stabilised on a combination of a long-acting muscarinic antagonist and long-acting $beta_2$-agonist. ¶ Include inhaled steroids if the patient has coexisting asthma. †† If starting an ICS/LABA inhaler, discontinue existing inhalers containing a LABA (online Appendix, Figure 1). PBS indication: COPD — patient must have FEV_1 < 50% predicted and history of repeated exacerbations with significant symptoms despite regular $beta_2$-agonist bronchodilator therapy and the therapy must be for symptomatic treatment. ◆

2 Pulmonary rehabilitation and physical activity: benefits and recommendations*

Pulmonary rehabilitation[7-10] (evidence level I, II; strong recommendation)†

Reduction	Improvements
Symptoms (dyspnoea and fatigue)	Exercise capacity
Anxiety and depression	Quality of life
Hospitalisations for exacerbations	Peripheral muscle function Sense of control over lung condition

Recommendations:

- pulmonary rehabilitation has few adverse effects and is cost-effective; and
- pulmonary rehabilitation should be offered to all people with COPD who are limited by breathlessness on activity

Physical activity[11] (evidence level III-2; weak recommendation)†

Duration and type of exercise	Intensity
150 minutes walking/week (30 minutes/day, 5 days/week)	Moderate — rating of 3–4 on the Borg Dyspnoea scale (ie, moderate to moderately severe levels of dyspnoea) — taking rests as required to manage breathlessness and then continue walking when able

Recommendation:

- participate in activities of daily living that require muscle strength (eg, lifting or squatting for gardening), as well as activities such as bowls, golf, swimming and Tai Chi

COPD = chronic obstructive pulmonary disease. * A list of pulmonary rehabilitation programs known to Lung Foundation Australia can be accessed at https://lungfoundation.com.au/patient-support/living-with-a-lung-condition/pulmonary-rehabilitation-2/pulmonary-rehabilitation-programs-2. The individual contact details can be obtained by calling the Lung Foundation's Information and Support Centre (free-call, 1800 654 301). † National Health and Medical Research Council additional levels of evidence and grades for recommendations for developers of guidelines (https://www.nhmrc.gov.au/_files_nhmrc/file/guidelines/developers/nhmrc_levels_grades_evidence_120423.pdf). ◆

monotherapy, a fixed dose combination LAMA/LABA inhaler is recommended.[15]

- **Anti-inflammatory agents.** An inhaled corticosteroid/LABA (ICS/LABA) combination inhaler may be considered in cases of more severe COPD (FEV_1 < 50% predicted, with a history of repeated exacerbations), although ICS may increase the risk of pneumonia.[16] While combination LAMA/LABA inhalers appear to be more beneficial than ICS/LABA inhalers in reducing exacerbations,[17] the use of an ICS/LABA inhaler together with a LAMA inhaler remains an option for patients with moderate to severe COPD who require additional treatment.[18] Further studies of triple therapy combination inhalers are awaited.

Inhaler technique. A lack of proficiency with inhaler technique continues to be common, with studies reporting handling errors in 50–100% of patients.[19] These reports are concerning, as poor technique is associated with worse outcome.[20] Moreover, inhaler device polypharmacy is an increasing problem, and with an increment in the number of different devices used, there is an associated increase in error rate.[21]

At initiation of therapy, education involving instruction, visual demonstration and patient observation is recommended. The treatment choice should consider the patient's ability to use the device proficiently. Once commenced on inhaler therapy, the technique should be reviewed and reinforced regularly. The current inhaled medicines for COPD are shown in the online Appendix, Figure 1.

Comorbidities. COPD is associated with many comorbidities.[22,23] Anxiety and depression are major contributors to hospital bed usage and readmissions, and should be optimally managed. Mortality from COPD is more associated with cardiac events than respiratory failure,[24] and the importance of avoiding prolonged overuse of β_2-agonists is becoming increasingly recognised.[25]

Osteoporotic fractures are a common problem in COPD due to risk factors, including smoking, physical inactivity, malnutrition, systemic inflammation, frequent use of corticosteroids, low body mass index, hypogonadism, and vitamin D deficiency.[26] Vertebral fractures can be associated with coughing, leading to considerable pain. Bone mineral density testing is important for prevention and monitoring response to therapy.

Hypoxaemia can lead to pulmonary hypertension and eventually right heart failure, particularly if there is coexisting obstructive sleep apnoea.[27] When suspected clinically, arterial blood gases or a sleep study should be considered, with a view to oxygen therapy or continuous positive airway pressure. COPD increases the risk of developing lung cancer.[28]

Lung volume reduction. Lung volume reduction by either surgery or bronchoscopically placed valves is an option for highly selected patients with severe emphysema, hyperinflation and ongoing symptoms despite maximal medical management and pulmonary rehabilitation. Surgery is associated with increased short term mortality but reduced long term mortality,[29] while endobronchial techniques are associated with high short term morbidity (especially pneumothorax) but improved health outcomes at 12 months.[30] Such therapies should only be considered in specialised centres.[31]

P: Prevent deterioration

Smoking cessation. Tobacco smoking is a key risk factor in the development of COPD, and smoking cessation is the most important intervention to slow decline in lung function. People with COPD who continue to smoke often have coexisting anxiety and depression. Smoking cessation advice from health professionals helps to motivate quit attempts and to increase long term quit rates. Hospital admission represents an opportunity to initiate smoking cessation, but support needs to continue after discharge. A comprehensive approach to supporting smoking cessation involves behavioural support and treatment of nicotine dependence.[32] Counselling may be structured using the 5-As strategy:

- ask and identify smokers at every health care visit;
- assess nicotine dependence and the motivation to quit;
- advise about the risks of smoking and benefits of quitting;
- assist cessation; and
- arrange follow-up within one week of the quit date and one month after.

If time is short, advice to quit and referral to the Quitline (13 78 48) is an alternative option. Nicotine dependence may be treated with nicotine replacement therapy, varenicline or bupropion. The most effective forms of pharmacotherapy are either combination nicotine replacement therapy (ie, a patch combined with a rapid-acting form of nicotine replacement therapy) or varenicline.[33] Longer courses of treatment may reduce relapse.

Vaccinations. Inactivated influenza vaccine reduces exacerbations due to influenza in patients with COPD, especially in epidemic years.[34] Adverse effects are mild, local, transient and

self-limiting; there is no increase in early exacerbations before immunity has developed. Annual influenza vaccination is highly cost-effective, particularly in more severe COPD cases.[34]

Patients aged ≥ 50 years who are immunised with polysaccharide pneumococcal vaccine, along with revaccination 5 years later,[35] will have protection against community-acquired pneumonia and a reduced likelihood of COPD exacerbations.[36] When added to annual influenza immunisation, pneumococcal immunisation has additive beneficial effect on COPD exacerbations.[37]

Long term oxygen therapy. Correction of severe hypoxaemia improves survival in COPD, and greater benefits are seen in patients who use supplemental oxygen for longer periods.[38] At least 18 hours per day is generally recommended for patients with an arterial partial pressure of oxygen (Pa_{O_2}) of ≤ 55 mmHg, or ≤ 59 mmHg in the presence of pulmonary hypertension, right heart failure or polycythaemia.[38] There is no indication for continuous oxygen therapy in patients with moderate hypoxaemia (Sp_{O_2} 89–93%).[39] Ambulatory oxygen may be of occasional benefit in individuals who desaturate with exertion. Assessment should evaluate improvement in dyspnoea and exercise capacity on a standardised exercise test. As the relationship between demonstrated benefit during a clinic or laboratory assessment and long term benefit is unclear, review with assessment of oxygen usage, determination of benefit and need for continued use are important.

Palliative care services. In patients with advanced COPD, palliative care services improve symptom control and manage psychosocial and spiritual concerns.[40] Supportive care principles are important for end-of-life care. Discussion regarding advanced care directives should be undertaken as part of usual management at a suitable time in the disease course.

D: Develop a plan of care

Chronic disease management and self-management. Chronic disease management can be defined as comprehensive strategies for improving overall health status and reducing health care costs. Self-management support is the systematic provision of education and supportive interventions by health care staff to increase patients' skills and confidence in managing their health problems.[41] Self-management programs frequently include emotional support, problem solving and decision making, development of therapeutic partnerships, goal setting and action planning. In

3 Referral to specialist respiratory services and indications for hospitalisation

Reason prompting referral	Purpose of referral
Diagnostic uncertainty and exclusion of asthma	Establish diagnosis and optimise treatment Obtain more detailed lung function testing
Unusual symptoms such as haemoptysis	Investigate cause urgently, including exclusion of malignancy
Rapid decline in functional performance	Optimise management and exclude other conditions
Persistent symptoms	Optimise management and exclude other conditions
Frequent chest infections (ie, more than annually)	Assess preventable factors and rule out coexisting bronchiectasis, optimise treatment
Onset of ankle oedema	Assess for cor pulmonale and optimise treatment
Sp_{O_2} < 92% when stable	Optimise management, measure arterial blood gases and prescribe oxygen therapy if needed
Assessing suitability for pulmonary rehabilitation, if uncertain	Optimise treatment and refer to specialist or community-based rehabilitation service
Bullous lung disease on CXR or CT	Confirm diagnosis and refer to medical or surgical units for bullectomy if needed
Patient with COPD aged < 40 years	Establish diagnosis and exclude α_1-antitrypsin deficiency
Persistent dyspnoea, marked hyperinflation, severe airflow limitation or emphysema (refer for assessment for lung transplantation, or bronchoscopic or surgical lung volume reduction procedures)	Identify criteria for referral to transplant, thoracic surgery or interventional bronchoscopy centres
Dyspnoea associated with chest tightness, anxiety or dizziness (refer for consideration of dysfunctional breathing*)	Establish diagnosis and refer for further investigation to exclude other causes of these symptoms
Daytime sleepiness, complaints by partner of heavy snoring	Assess for sleep disordered breathing and refer for sleep studies if needed
Indications for hospitalisation of patients with COPD	Marked increase in intensity of symptoms Patient has an exacerbation characterised by increased dyspnoea, cough or sputum production, plus one or more of the following: • inadequate response to appropriate community-based management; • inability to walk between rooms when previously mobile; • inability to eat or sleep because of dyspnoea; • cannot manage at home even with homecare resources; • high-risk comorbid condition (pulmonary or non-pulmonary); • altered mental status suggestive of hypercapnia; • worsening hypoxaemia or cor pulmonale; • newly occurring arrhythmia; or • newly occurring hypoxaemia (Sp_{O_2} < 92%)

COPD = chronic obstructive pulmonary disease. CT = computed tomography. CXR = chest x-ray. Sp_{O_2} = arterial oxygen saturation measured by pulse oximeter. * Imprecise term covering breathlessness, hyperventilation, chest tightness, paraesthesiae, anxiety or dizziness. ◆

4 Key clinical recommendations from the *COPD-X Concise Guide for Primary Care*

	NHMRC level of evidence*	Strength of recommendation†
Case finding and confirm diagnosis		
Smoking is the most important risk factor in COPD development	I	Strong
A thorough history and examination is the first step in COPD diagnosis	III-2	Strong
COPD is confirmed by the presence of persistent airflow limitation (post-bronchodilator $FEV_1/FVC < 0.7$)	III-2	Strong
If FEV_1 increases > 400 mL following bronchodilator, consider asthma, or coexisting asthma and COPD	III-2	Strong
Further investigations may help confirm or exclude other conditions (either coexisting or with similar symptoms to COPD) and assess the severity of COPD	III-2	Strong
Diagnosis of COPD should be accompanied by regular assessment of severity	III-2	Strong
Optimise function		
Assessment is the first step to optimising function	III-2	Strong
Non-pharmacological strategies (eg, pulmonary rehabilitation and regular exercise) should be provided to all patients with COPD	I	Strong
Optimise pharmacotherapy using a stepwise approach	I	Strong
Adherence and inhaler technique need to be checked on a regular basis	I	Strong
Comorbid conditions are common in patients with COPD	III-2	Strong
Referral to specialist respiratory services may be required	III-2	Strong
Prevent deterioration		
Smoking cessation is the most important intervention to prevent worsening of COPD	II	Strong
Preventing exacerbations has a key role in preventing deterioration	III-2	Strong
Vaccination reduces the risks associated with influenza and pneumococcal infection	I	Strong
Mucolytics may benefit certain patients with COPD	I	Strong
Long term oxygen therapy has survival benefits for COPD patients with hypoxaemia	I	Strong
Develop a plan of care		
Good chronic disease care anticipates the wide range of needs in patients with COPD	I	Strong
Clinical support teams working with the primary health care team can help enhance quality of life and reduce disability for patients with COPD	III-2	Weak
Patients may benefit from self-management support	I	Strong
Patients may benefit from support groups and other community services	III-2	Weak
Accurate assessment of approaching end of life is difficult	III-2	Weak
Manage exacerbations		
A COPD exacerbation is characterised by a change in the patient's baseline dyspnoea, cough or sputum that is beyond normal day-to-day variations, is acute in onset, and may warrant a change in regular medication or hospital admission	III-2	Strong
Early diagnosis and treatment of exacerbations may prevent hospital admission and delay COPD progression	III-2	Strong
Multidisciplinary care may assist home management of some patients with an exacerbation	I	Weak
Inhaled bronchodilators are effective for initial treatment of exacerbations	I	Strong
Systemic corticosteroids reduce the severity of and shorten recovery from exacerbations	I	Strong
Exacerbations with clinical features of infection (fever or increased volume and change in colour of sputum) benefit from antibiotic therapy	II	Strong
Controlled oxygen delivery (0.5–2.0 L/min) is indicated for hypoxaemia in patients with exacerbations	II	Strong
NIV is effective for patients with rising $Paco_2$ levels	I	Strong
Consider pulmonary rehabilitation at any time, including during the recovery phase following an exacerbation	I	Strong
Patients with COPD discharged from hospital following an exacerbation should receive comprehensive follow-up led by the primary health care team	I	Strong

COPD = chronic obstructive pulmonary disease. FEV_1 = forced expiratory volume in one second. FVC = forced vital capacity. NHMRC = National Health and Medical Research Council. NIV = non-invasive ventilation. min = minute. $Paco_2$ = arterial partial pressure of carbon dioxide. * NHMRC additional levels of evidence and grades for recommendations for developers of guidelines (https://www.nhmrc.gov.au/_files_nhmrc/file/guidelines/developers/nhmrc_levels_grades_evidence_120423.pdf). † The GRADE (Grading of Recommendations Assessment, Development and Evaluation) system was used to grade the strength of recommendations.[60,61] ◆

COPD, interventions focus on exacerbation management, adherence to pharmacological and non-pharmacological strategies, smoking cessation, physical activity, exercise and management strategies for psychological dysfunction.

Self-management programs in COPD consistently lead to improved outcomes, particularly health status.[42,43] However, the impact on health care use has been inconsistent. Some systematic reviews have shown lower risk of respiratory-related hospitalisation[44] and urgent health care use,[45] whereas others have found no reduction in hospitalisations.[42] As the randomised controlled trials have been heterogeneous, firm recommendations about the type and duration of self-management program, as well as subgroups most likely to respond, are not yet possible.

Multidisciplinary team. Delivery of COPD self-management programs requires a multidisciplinary team. Key disciplines involved in COPD management include the general practitioner, specialist physician (Box 3), respiratory and primary care nurses, physiotherapists, psychologists, nutritionists, occupational therapists, social workers and pharmacists.

COPD action plan. Exacerbation avoidance and management in COPD is an important goal. A Cochrane review of seven randomised controlled trials concluded that COPD exacerbation action plans that are prescribed and delivered within a single short educational program, with ongoing support directed at the use of the action plan, reduce in-hospital health care use and increase the initiation of corticosteroids and antibiotics for COPD exacerbations.[46] Hence, COPD action plans are recommended as part of COPD self-management.

X: Manage exacerbations

Manage exacerbations. A COPD exacerbation is characterised by an increase in dyspnoea, cough and sputum, is acute in onset and typically warrants a change in medication or hospital admission. A past history of exacerbations is the best predictor of future exacerbations, and patients with more severe COPD (based on FEV_1) are more likely to exacerbate.[47] Hospitalisation for an exacerbation of COPD is a sentinel event (Box 3). Twelve-month mortality rates following a hospitalisation for COPD are about 25%.[48] Triggers for exacerbations include viral or bacterial respiratory infection, left ventricular failure, psychosocial stressors and air pollution. Pulmonary embolism should be considered in patients presenting with an exacerbation of COPD when signs of an infection are absent.[49]

Early recognition and management of exacerbations improve recovery and quality of life, reduce hospitalisation and may prevent progressive functional deterioration.[50] A COPD action plan serves to help patients and carers recognise and respond to the early signs of an exacerbation and prevents hospitalisation.[46]

Pharmacological management of exacerbations. Increased doses of salbutamol (short-acting bronchodilator), 4–8 puffs (400–800 μg) via a metered dose inhaler and spacer every 3–4 hours, should be used. This formulation is as effective as via nebuliser.[51] A morning dose of oral prednisolone 30–50 mg should be taken for 5 days; tapering the dose is rarely necessary.[52] Intravenous corticosteroids are not superior to oral corticosteroids.[53]

Exacerbations with signs and symptoms of infection (increased volume and change in colour of sputum or fever) benefit from antibiotics. First-line agents include oral amoxicillin or doxycycline for 5 days.[54] In patients requiring admission or when pneumonia is suspected, a chest x-ray should be performed and pneumonia treatment should follow guidelines.[54]

Discharge planning. Early hospital discharge may be appropriate with the use of a hospital in the home program. Such programs facilitate early discharge within 48 hours and allow patients to be managed at home with involvement of multidisciplinary teams assisting general practitioners. These programs lead to a reduction in readmission rates with no increase in mortality.[55]

Oxygen therapy and non-invasive ventilation. If hypoxaemia is present, the Spo_2 target range should be 88–92%. This can usually be achieved by the administration of oxygen via nasal cannula at a rate of 0.5–2 L/min.[56] High flow oxygen can significantly increase mortality in patients with COPD.[57] It is important that patients with COPD presenting to hospital with a severe exacerbation be assessed with an arterial blood gas measurement. Patients with hypercapnic respiratory failure (arterial partial pressure of carbon dioxide [$Paco_2$] > 45 mmHg and blood pH < 7.35) should be treated in hospital with non-invasive ventilation, which reduces mortality and need for endotracheal intubation and shortens hospital length of stay.[58]

Post-discharge pulmonary rehabilitation. The discharge plan should be promptly shared with the primary care team; patients should receive self-management education. As pulmonary rehabilitation reduces readmission rates and improves quality of life,[59] the patient should be referred to pulmonary rehabilitation as soon as the acute instability has resolved.

Evidence base and resources

For full details of the evidence base, references and quarterly updates, please refer to the COPD-X guidelines at http://copdx.org.au. The key changes since the publication of the 2006 clinical practice update in the Journal[3] are summarised in the online Appendix, table 1. COPD resources are available from Lung Foundation Australia (www.lungfoundation.com.au), including the *COPD-X Concise Guide for Primary Care*, which contains clinical recommendations (Box 4) and practice tips for busy health professionals in primary care.

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Provenance: Commissioned; externally peer reviewed. ■

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