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COPD management

An integrated approach

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Chronic obstructive pulmonary disease (COPD) has major impacts on quality of life and mortality in a large number of people in Australia. The Australian COPD-X guidelines advocate a stepwise approach for early diagnosis and effective management of patients with COPD involving nonpharmacological and pharmacological interventions, which are outlined in this article. This is the first in a series of articles on COPD.

Key points

- **Chronic obstructive pulmonary disease (COPD) affects about two million people in Australia, if mild disease is included, and this prevalence is expected to more than double by 2050.**
- **COPD is a clinical diagnosis confirmed by spirometric evidence of airflow limitation that is not fully reversible.**
- **A multidimensional assessment approach, including spirometry and symptom assessment, has been advocated by international guidelines and expert clinicians for assessment of COPD severity.**
- **A stepwise approach to managing patients with COPD involves risk reduction (especially smoking cessation), promotion of physical activity, optimisation of weight and nutrition, prevention of infection by vaccinations, pulmonary rehabilitation, and use of inhaled medications to treat airflow obstruction and reduce exacerbations.**
- **Addressing comorbidities and psychosocial needs, and providing self-management education and action plans, can help patients to cope better with this chronic lung disease and reduce its impact.**

Chronic obstructive pulmonary disease (COPD) is described by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) as a 'common, preventable and treatable disease characterised by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Exacerbations and comorbidities contribute to the overall severity in individual patients'.[1]

EPIDEMIOLOGY

COPD is a highly prevalent disease affecting about two million people in Australia if mild disease is included. This is expected to more than double by 2050 as a consequence of the interaction between lifetime cumulative exposures, the delay in development of tobacco-related disease, the impact of ageing and the improved outcomes in previously fatal diseases such as ischaemic heart disease and some cancers. Additionally, a proportion of patients with asthma develop significant fixed airway narrowing, which contributes to the burden of COPD. About half of patients with COPD have moderate-to-severe disease with symptoms that affect their daily lives.[2,3]

Recent prevalence estimates of COPD undertaken through standardised spirometry and questionnaires show that in over 3000 randomly tested men and women in Australia, the prevalence of COPD (defined as post-bronchodilator forced expiratory volume in

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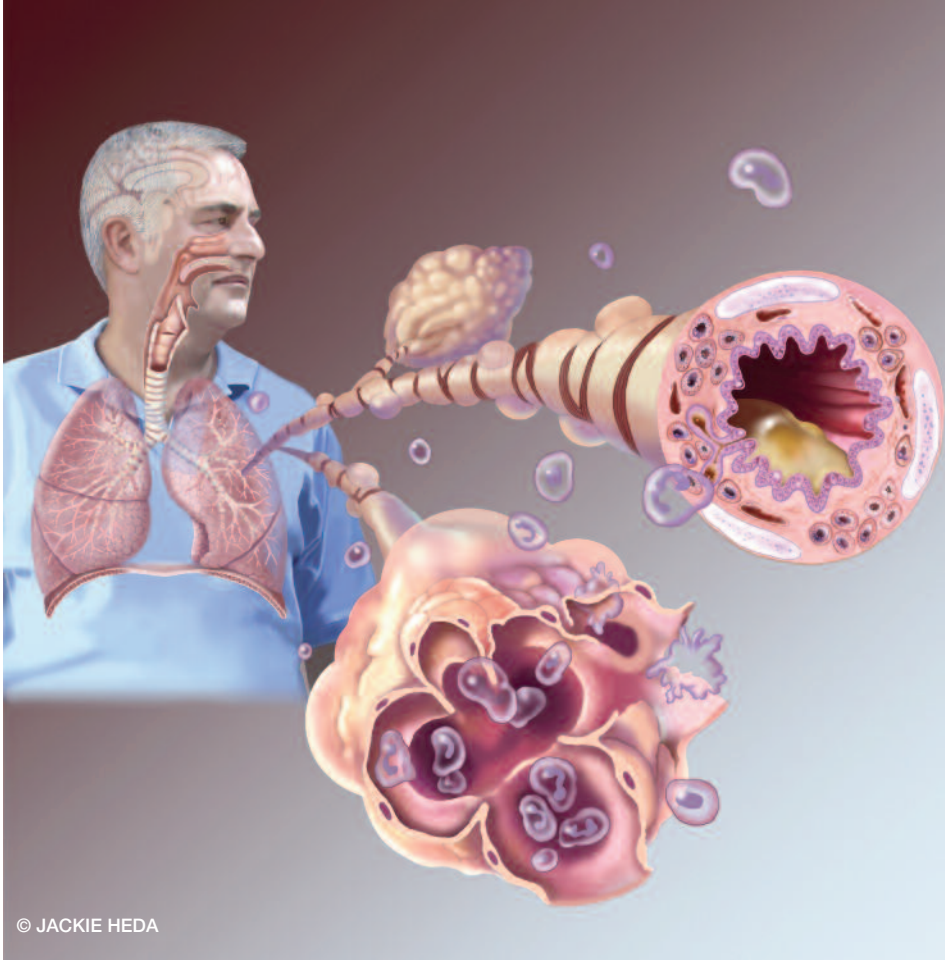


1 second [FEV_1]/forced vital capacity [FVC] ratio of less than 0.7 and FEV_1 less than 80% predicted) was 7.5% in people aged 40 years and over and 29% in those aged 75 years and over.[3] The prevalence of symptoms was significantly higher, but the many potential explanations for dyspnoea and cough make it essential to demonstrate the presence of airway obstruction and not rely on symptoms alone to diagnose COPD.

COPD costs the Australian community an estimated $8.8 billion annually in direct health costs and indirect costs such as lost productivity and lower employment.[4] COPD has major impacts on quality of life and social participation, even in people who may have infrequent exacerbations and relatively mild symptoms. It is the second leading cause of avoidable hospital admissions in Australia and is also a leading cause of death and disease burden after heart disease, stroke and cancer.

CAUSES

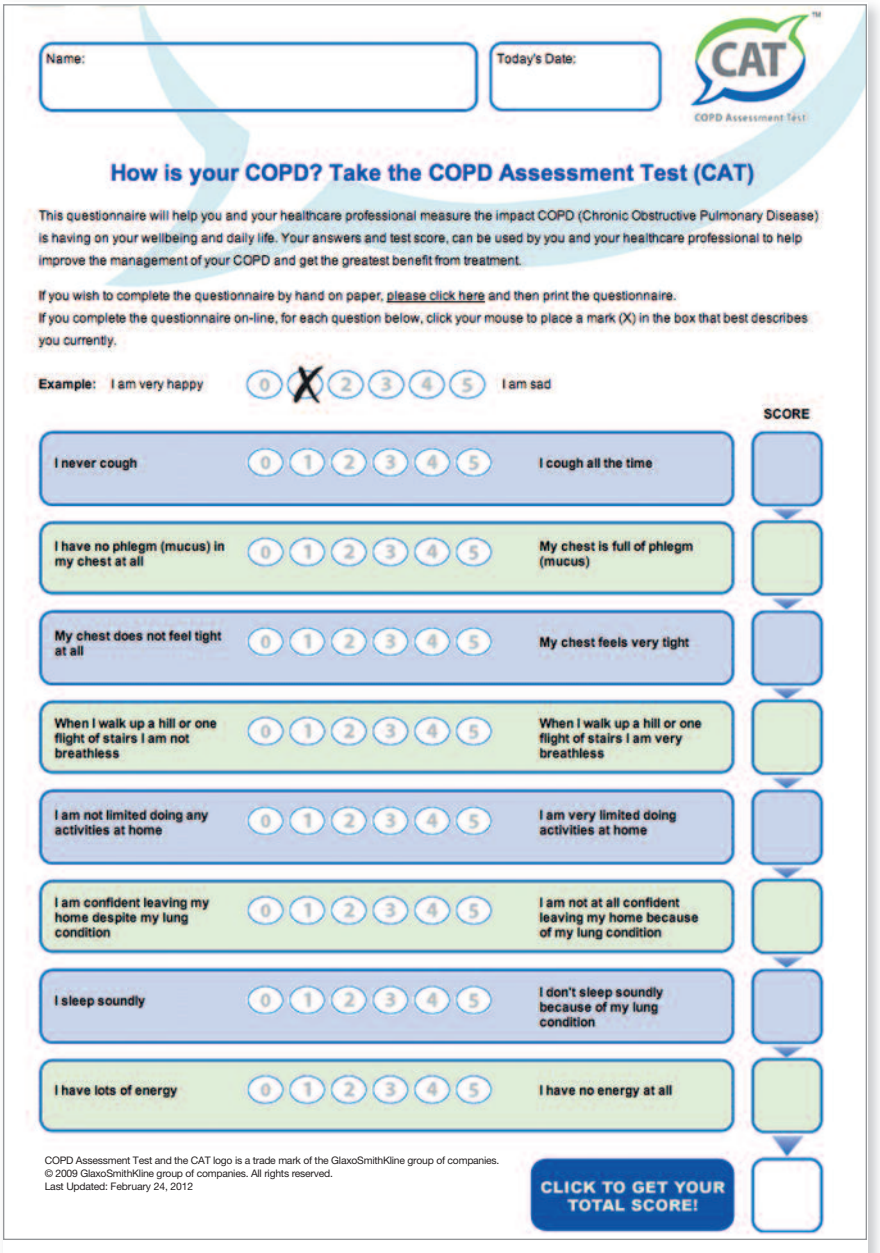
Cigarette smoking is the most important cause of COPD in most Western countries. Fortunately in Australia, smoking rates in the general population are now down to 15%, even though globally up to 45% of people with COPD smoke.[5] Many patients with COPD have been ex-smokers for over 10 years, but the interaction of previous exposures and age results in clinical expression of the disease later in life. Other dusts and fumes, particularly from biomass fuel burning, passive smoking, outdoor air pollution and occupational exposures, significantly increase the risk of developing COPD. In Australia, biological dusts and fumes in rural settings, inherited predisposition such as airway hyper-responsiveness and atopy, and environmental factors such as childhood respiratory infections, long-standing asthma and low socioeconomic status all contribute to the risk of developing COPD.

DIAGNOSIS

When patients present with breathlessness, it is essential to identify risk factors and assess the potential causes, which include chronic heart and lung disease, lack of fitness, obesity and anaemia. GPs are in the frontline to identify COPD in patients with recurrent winter bronchitis. COPD should be considered the most likely diagnosis if the patient has been a smoker and there are additional respiratory symptoms suggestive of airways disease, including exertional breathlessness, a productive cough for three months over two consecutive years, a history of exposure to any risk factors, and no features suggesting asthma (such as a history dating back to childhood, variable wheeze, atopy, a history of significant prevention of symptoms by inhaled corticosteroids [ICS]).

To confirm a clinical suspicion of COPD, spirometry should be performed. Many algorithms exist to assist clinicians in making a definite diagnosis of COPD (see the web resources box on page 16), but most importantly, COPD is a clinical diagnosis confirmed by spirometric evidence of airflow limitation that is not fully reversible. COPD is present when the FEV_1/FVC ratio is less than 0.7 after bronchodilator therapy (200 to 400 μg of salbutamol or equivalent).

In the Australian COPD-X guidelines severity is graded as mild when FEV_1 is 60 to 80% predicted, moderate if 40 to 60% predicted and severe if less than 40% predicted.[6] Much has been written about overdiagnosis of COPD based on spirometry in older people because an FEV_1/FVC ratio of less than 0.7 can be within


Name:

Today's Date:

CAT™
COPD Assessment Test

How is your COPD? Take the COPD Assessment Test (CAT)

This questionnaire will help you and your healthcare professional measure the impact COPD (Chronic Obstructive Pulmonary Disease) is having on your wellbeing and daily life. Your answers and test score, can be used by you and your healthcare professional to help improve the management of your COPD and get the greatest benefit from treatment.

If you wish to complete the questionnaire by hand on paper, please click here and then print the questionnaire.
If you complete the questionnaire on-line, for each question below, click your mouse to place a mark (X) in the box that best describes you currently.

Example: I am very happy 0 X 2 3 4 5 I am sad

		SCORE
I never cough	0 1 2 3 4 5 I cough all the time	
I have no phlegm (mucus) in my chest at all	0 1 2 3 4 5 My chest is full of phlegm (mucus)	
My chest does not feel tight at all	0 1 2 3 4 5 My chest feels very tight	
When I walk up a hill or one flight of stairs I am not breathless	0 1 2 3 4 5 When I walk up a hill or one flight of stairs I am very breathless	
I am not limited doing any activities at home	0 1 2 3 4 5 I am very limited doing activities at home	
I am confident leaving my home despite my lung condition	0 1 2 3 4 5 I am not at all confident leaving my home because of my lung condition	
I sleep soundly	0 1 2 3 4 5 I don't sleep soundly because of my lung condition	
I have lots of energy	0 1 2 3 4 5 I have no energy at all	

Last Updated: February 24, 2012

CLICK TO GET YOUR TOTAL SCORE!

Figure 1. The COPD Assessment Test (CAT). Available online at: www.catestonline.org/images/pdfs/CATest.pdf.

normal limits in people over 60 years of age. However, in Australia, spirometry is infrequently performed in primary care and overdiagnosis most frequently results from lack of spirometry and a diagnosis based on symptoms alone.

Severity assessment

Traditionally, COPD guidelines have advocated performance of spirometry and grading of severity of disease based on the FEV_1. Although the FEV_1 is strongly predictive of mortality, it correlates poorly at an individual level with functional exercise capacity, quality of life and risk of exacerbations.

More recently a multidimensional assessment approach including spirometry and symptom assessment has been advocated by international guidelines and expert clinicians. The recent GOLD strategy includes three domains:

- the current level of dyspnoea or COPD symptoms
- the severity of the spirometric abnormality
- the prior 12 months' history of exacerbations.[1]

In this model, dyspnoea is assessed by either the COPD Assessment Test (Figure 1) or the modified Medical Research Council dyspnoea scale (Table 1). The resulting assessment allocates a disease impact grade of A to D and is expressed in a schematic (Figure 2), which is linked to choice of treatment later in the guidelines. The groups can be summarised as follows:

- group A: low risk, less symptoms
- group B: low risk, more symptoms
- group C: high risk, less symptoms
- group D: high risk, more symptoms.

The GOLD strategy document advocates initially assessing COPD symptoms and then the number of exacerbations and the severity of spirometry to place the patient in one of four categories. The GOLD spirometry stages are:

- GOLD 1 (mild), $FEV_1/FVC < 0.7$; $FEV_1 \geq 80\%$ predicted
- GOLD 2 (moderate), $FEV_1/FVC < 0.7$; $50\% \leq FEV_1 < 80\%$ predicted
- GOLD 3 (severe), $FEV_1/FVC < 0.7$; $30\% \leq FEV_1 < 50\%$ predicted
- GOLD 4 (very severe), $FEV_1/FVC < 0.7$; $FEV_1 < 30\%$ predicted.

The presence of comorbidities adds additional prognostic information and may affect management. This multi-dimensional approach and particularly the link to treatment choice has not yet been tested prospectively. It is not yet included in the Australian COPD-X

TABLE 1. MODIFIED MEDICAL RESEARCH COUNCIL QUESTIONNAIRE FOR ASSESSING THE SEVERITY OF BREATHLESSNESS

Symptom description	Score
I only get breathless with strenuous exercise	0
I get short of breath when hurrying on the level or up a slight hill	1
I walk slower than people of the same age walking on the level because of breathlessness; or I have to stop for breath when walking at my own pace on the level	2
I stop for breath when walking at my own pace after a few minutes on the level or after walking 100 m	3
I am too breathless to leave the house; or I am breathless when dressing or undressing	4

guidelines,[6] but it reflects the current understanding of COPD as a disease with systemic manifestations and impact.

Evidence already supports a multifaceted assessment for people with COPD. For example, a large multinational study of over 2000 patients with COPD showed that broad categories of FEV_1 impairment correlated weakly with health status, six-minute walk distance and probability of having an exacerbation.[7] The strongest independent predictor of risk of exacerbation was exacerbation history in the previous 12 months. In addition to FEV_1, elevated total white cell count and a history of gastroesophageal reflux disease were independent risk factors for exacerbations.[7] Although it is acknowledged that the management of patients with COPD requires more than spirometry alone, more evidence is needed to support the links between patient groups A to D (Figure 2) and the recommendations about drug treatment.

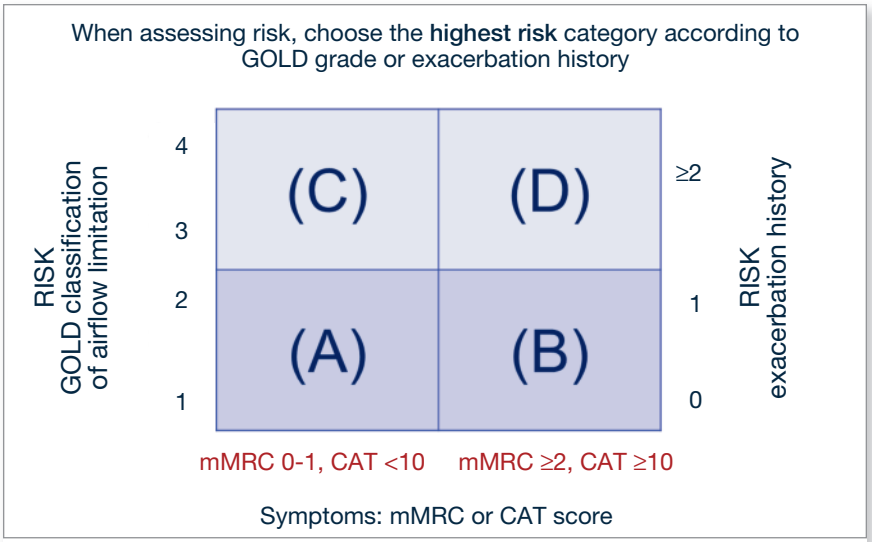


Figure 2. GOLD assessment. Association between symptoms, spirometric classification and future risk of exacerbations.

ABBREVIATIONS: CAT = COPD Assessment Test; GOLD = Global Initiative for Chronic Obstructive Lung Disease; mMRC = modified Medical Research Council.

MANAGEMENT

The Australian COPD-X guidelines advocate a stepwise approach to managing patients with COPD that involves nonpharmacological and pharmacological interventions. Nonpharmacological interventions include risk reduction by removing exposures (especially addressing ongoing cigarette smoking), promotion of physical activity, optimising weight and nutrition, prevention of infection by use of vaccinations, and addressing mood and psychosocial needs (Table 2). Pharmacological interventions include the use of inhalers, treatment of comorbidities and assessment of the requirements for long-term oxygen therapy, the topic of a future article in *Medicine Today*.

Nonpharmacological management

Smoking cessation

The most important measures to prevent COPD and slow its progression are smoking avoidance and smoking cessation. Smoking cessation can be achieved with behavioural counselling and nicotine replacement therapy,[8] or with oral pharmacological agents such as the nicotinic receptor partial agonist varenicline[9] or the non-nicotine agent bupropion (see: www.racgp.org.au/guidelines/smokingcessation). There is evidence of additive effects when multiple modalities are employed. Although cigarette smokers are undoubtedly at high risk of permanent lung damage, patients with COPD who have recently quit smoking do show improvements in lung function, respiratory symptoms, functional state and mental state within the first three months of abstinence, providing further incentive for those with COPD to quit smoking.[10]

Vaccinations

All patients with COPD should be offered yearly influenza vaccination, which reduces COPD exacerbation rates.[11] Pneumococcal vaccination is usually also recommended because it provides protection against invasive pneumococcal disease in the general population and people with chronic illness (although it does not prevent all-cause pneumonia or mortality).[12] There have been few studies of pneumococcal vaccination specifically in patients with COPD,[13] and there is currently no evidence for reduction of acute exacerbations of COPD.

Pulmonary rehabilitation

There is level 1 evidence from large randomised controlled trials showing that pulmonary rehabilitation improves exercise capacity and quality of life and reduces hospitalisations and length of stay in people with COPD.[14] Even after an acute exacerbation of COPD, pulmonary rehabilitation substantially reduces the subsequent risk of hospital admissions and mortality, and improves health-related quality of life.

In a recent Cochrane review, 57% of patients in the control group, who had no pulmonary rehabilitation, were readmitted to hospital after an exacerbation of COPD compared with 14% of patients in the pulmonary rehabilitation group.[15] The number needed to treat was 2.3 to prevent one hospital admission. As many regional and rural centres do not have access to pulmonary rehabilitation programs, The Australian Lung Foundation has developed an online module enabling health professionals to develop the skills and knowledge to implement and evaluate a program, which includes the essential components of physical activity training and education in resource poor settings.[16]

Education, self-management and action plans

Effective self-management can help patients with COPD to initiate the early use of antibiotics and oral corticosteroids, which can shorten and minimise the severity of the COPD exacerbation, also reducing the risk of hospital admission.[17,18] Patients with COPD may need repeated assistance and regular review to ensure they are using their inhaler correctly. Regular reinforcement of medication timing and appropriate use of short-acting reliever medication is important to minimise symptom burden.

Individualised written action plans, especially those that include supportive care provided by a case manager or frequent contact with a respiratory specialist unit can help reduce the impact of COPD exacerbations.[19,20] In most studies it is clear that some patients find it particularly difficult to learn these skills and are better managed by proactive care and ongoing regular clinical review. A useful action plan template is available on The Australian Lung Foundation website (http://www.lungfoundation.com.au/).

Inhaler technique and adherence

Patients with COPD often have suboptimal inhaler technique;[21] therefore, inhaler technique and adherence should be checked by direct observation at each visit.[22] Coaching by a trained practice nurse or referral to a respiratory educator can improve inhaler technique. The National Asthma Council website has useful 'how-to videos' to demonstrate inhaler technique (see: www.nationalasthma.org.au/).

TABLE 2. AUSTRALIAN LUNG FOUNDATION STEPWISE MANAGEMENT PLAN: NONPHARMACOLOGICAL INTERVENTIONS

Intervention	Specific items and comments
Risk reduction	Check smoking status, support smoking cessation, recommend annual influenza and pneumococcal vaccination according to *The Australian Immunisation Handbook*
Optimise function	Encourage physical activity, review nutrition, provide education, develop GP management plan and initiate regular review
Consider comorbidities	Especially osteoporosis, coronary disease, lung cancer, anxiety and depression
Refer for pulmonary rehabilitation	Also consider psychosocial needs, agree on a written action plan
Consider oxygen therapy	At this stage of the disease, also consider surgery, palliative care and advanced care directives

Pharmacological management

Respiratory symptoms in people with COPD are mainly due to chronic airflow limitation (from small airway obstruction and loss of elastic recoil) and chronic airway inflammation. Hence, bronchodilators are useful for reducing breathlessness across all stages of COPD severity and, in more severe patients, inhaled corticosteroids are potentially useful as anti-inflammatory agents.

Bronchodilators

Short-acting bronchodilators

Salbutamol and terbutaline are short-acting β_2-agonists used as relievers at any stage of COPD. Ipratropium is a short-acting anticholinergic bronchodilator given as needed or on a regular basis. Ipratropium is now less commonly used than the once daily long-acting

WEB RESOURCES ON COPD

Patient resources

- Patient educational material: Better Living with COPD booklet http://www.lungnet.org.au/lung- information/patient-educational-material
- LungNet patient resource group – contacts and practice nurse online training http://www.lung foundation.com.au/get-involved/events/about-world-copd-day/copd-patient-support-lungnet

Health professional resources

Useful resources from the Australian Lung Foundation http://www.lungfoundation.com.au/ include:

- COPD-X complete http://www.lungfoundation.com.au/professional-resources/guidelines/copd-x-plan
- Stepwise management of COPD http://www.lungnet.org.au/professional-resources/general-practice/stepwise-management-of-stable-copd
- GP toolkit for screening and to assess lung age http://www.lungfoundation.com.au/professional-resources/general-practice/primary-care-respiratory-toolkit/about

muscarinic antagonist tiotropium, which provides more sustained bronchodilation.[23] Ipratropium and tiotropium should not be used together because both are anticholinergics.

Long-acting bronchodilators

Salmeterol and eformoterol are long-acting β_2-agonists (LABA) with a duration of action of 12 hours and indacaterol is an ultra-LABA with 24 hours' duration of action. These long-acting bronchodilators improve lung function, reduce the risk of exacerbations, [24,25] and can be used at any stage of COPD. Indacaterol is not licensed for use in people with asthma. Side effects of β_2-agonists include tremor and tachycardia, although these do not usually trouble patients.

Tiotropium is a once-daily, long-acting muscarinic antagonist that can be commenced at any stage of COPD. As an anticholinergic with a 24-hour duration of action, it reduces dyspnoea, improves quality of life and decreases risk of exacerbations.[26,27] In patients with moderate COPD, tiotropium has been shown to slow the rate of decline of lung function to a small extent and possibly reduce mortality.[28,29] It can cause dry mouth and urinary retention[30] and should not be used in people with narrow-angle glaucoma. A meta-analysis concluded that anticholinergic inhalers may increase cardiovascular events.[31] However, tiotropium delivered in a Handihaler did not appear to increase cardiac complications in a large randomised controlled trial.[26] Use of a LABA with tiotropium provides small improvements in quality of life and bronchodilation compared with use of tiotropium alone.[32]

Inhaled corticosteroids

People with COPD are less responsive to corticosteroids than people with asthma.[33] However, a Cochrane systematic review has shown that ICS, when used alone without a LABA, can reduce the risk of exacerbations and slow the rate of decline of quality of life.[34] On a cautionary note, use of ICS may increase risk of pneumonia in patients with COPD.[34] Their anti-inflammatory actions (reduced rate of exacerbations) should be weighed up against their potential to promote infection (increased risk of pneumonia). ICS alone (as a monocomponent inhaler) is not available on the PBS for people with COPD, but is available with a LABA in a combination inhaler (see below).

Combination inhalers

ICS/LABA combination inhalers (fluticasone/salmeterol, budesonide/eformoterol) have been shown in placebo-controlled randomised controlled trials to reduce exacerbations, slow the rate of decline of quality of life, potentially slow the rate of decline of lung function and possibly reduce mortality.[35-37] In several large randomised controlled trials, combination inhalers have been shown to be more effective than either of the ICS or LABA monocomponents alone.[38]

ICS/LABA combinations are available on the PBS for use in symptomatic patients with moderate-to-severe COPD (FEV_1 <50% predicted) who have a history of repeated exacerbations with significant symptoms despite regular β_2-agonist bronchodilator therapy.

Triple therapy

Each inhaled therapy individually has at best a modest benefit in patients with COPD because of the chronic damage in the lungs. Although it has slightly smaller magnitude of effect on COPD exacerbations, tiotropium appears to be similar in overall benefit to salmeterol/fluticasone.[39,40] Tiotropium in conjunction with an ICS/LABA combination inhaler (triple therapy) appears to be more beneficial than the individual treatments alone,[41,42] and is commonly used in clinical practice for patients with moderate-to-severe COPD with repeated exacerbations.

Emerging treatments

Roflumilast

Roflumilast is an oral anti-inflammatory agent (phosphodiesterase-4 inhibitor), which reduces exacerbations and improves symptoms.[43] Roflumilast is not yet available in Australia.

Azithromycin

A 12-month randomised controlled trial showed that azithromycin reduced exacerbation rates and improved quality of life in some patients with COPD.[44] However,

hearing decrements were more common in the azithromycin than in the placebo group, as were macrolide-resistant organisms. Azithromycin is not indicated on the PBS for long-term use in COPD.

Lung volume reduction

Lung volume reduction surgery[45,46] is now less commonly used in Australia, although new methods of bronchoscopic lung volume reduction are emerging using valves, stents or steam.[47,48] Selected patients with very severe emphysema may be referred for consideration for lung transplantation.

Other treatments

Theophylline is an oral bronchodilator[49] that is now infrequently prescribed due to its side effects. An NHMRC-funded randomised controlled trial of low-dose theophylline and low-dose oral corticosteroids is currently underway.

Support network and multidisciplinary team

Systems for integrated care may be beneficial for patients with severe COPD.[19,20] Important components include self-management education, appropriate use of decision support systems, co-ordinated care and access to community resources.[50]

Significant reductions in emergency department visits and admissions can be achieved by programs that involve self-management education and information about COPD, and access to a readily available case manager or nurse practitioner. Integrated care programs combining self-management education and case management can decrease rates of COPD-related hospital admissions.[17-19,50] Integrated self-management programs should include having a supply of oral corticosteroids and/or antibiotics to start at the beginning of an exacerbation and access to medical help when needed.

Over time most patients with COPD experience progressive worsening of their disease and develop deconditioning that adds to their disability. They may also experience significant anxiety and depression.[51] Their exacerbations may ultimately require assisted ventilation or intensive care admission. All such patients should be given the opportunity to discuss their future treatment and be assisted in making choices to reduce the probability of unnecessary prolongation of their lives when there is no further chance of recovery to independence or reasonable quality of life. Palliative interventions that are planned and discussed with close family and trusted friends can be initiated appropriately, especially if a plan is agreed on and written into an advance directive.[52,53]

WHEN TO REFER TO A SPECIALIST

COPD is a complex disease and although management in its initial stages may be straightforward, later in the disease comorbidities and the complications of COPD create a complex spectrum of problems that require specialist management, especially for those who experience frequent exacerbations.[53,54] Most patients will benefit from specialist review to optimise their management and ensure all complicating factors and comorbidities are being addressed.

Patients who are experiencing frequent exacerbations, persistent or recurrent infection, rapid functional decline or troublesome side effects from treatment should be referred for specialist opinion. Any patient requiring long-term oxygen should have at least one assessment by a specialist and subsequent review to ensure eligibility, appropriate adherence and benefit. The need for interventions such as endobronchial stents and valves or pulmonary resection requires a full assessment in specialist care. Referral of patients to a respiratory specialist or educator may assist with device technique and self-management.

CONCLUSION

Avoidance of cigarette smoke and other environmental exposures remains important to prevent COPD. New approaches, including multidimensional assessment of symptoms and spirometry, show great promise for improving the assessment and management of people with COPD. Although COPD often has a major impact on patients' lives, a stepwise approach to management – both nonpharmacological and pharmacological – is recommended to reduce the disease burden of COPD and improve quality of life for affected patients. MT

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References are included in the pdf version of this article available at www.medicinetoday.com.au.

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