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- greater than 20% diurnal variation is considered significant

COPD: stable management

NICE updated it's guidelines on the management of chronic obstructive pulmonary disease (COPD) in 2010.

General management

- smoking cessation advice
- annual influenza vaccination
- one-off pneumococcal vaccination

Bronchodilator therapy

- a short-acting beta2-agonist (SABA) or short-acting muscarinic antagonist (SAMA) is first-line treatment
- for patients who remain breathless or have exacerbations despite using short-acting bronchodilators the next step is determined by the FEV1

FEV1 > 50%

- long-acting beta2-agonist (LABA), for example salmeterol, or:
- long-acting muscarinic antagonist (LAMA), for example tiotropium

FEV1 < 50%

- LABA + inhaled corticosteroid (ICS) in a combination inhaler, or:
- LAMA

For patients with persistent exacerbations or breathlessness

- if taking a LABA then switch to a LABA + ICS combination inhaler
- otherwise give a LAMA and a LABA + ICS combination inhaler

Oral theophylline

- NICE only recommends theophylline after trials of short an long-acting bronchodilators or to people who cannot used inhaled therapy
- the dose should be reduced if macrolide or fluoroquinolone antibiotics are co-prescribed

Mucolytics

- should be 'considered' in patients with a chronic productive cough and continued if symptoms improve

Cor pulmonale

- features include peripheral oedema, raised jugular venous pressure, systolic parasternal heave, loud P2

- use a loop diuretic for oedema, consider long-term oxygen therapy
- ACE-inhibitors, calcium channel blockers and alpha blockers are not recommended by NICE

Factors which may improve survival in patients with stable COPD

- smoking cessation - the single most important intervention in patients who are still smoking
- long term oxygen therapy in patients who fit criteria
- lung volume reduction surgery in selected patients

Asthma: stepwise management in adults

The management of stable asthma is now well established with a step-wise approach:

Step 1 Inhaled short-acting B2 agonist as required

Step 2 Add inhaled steroid at 200-800 mcg/day*

400 mcg is an appropriate starting dose for many patients. Start at dose of inhaled steroid appropriate to severity of disease

Step 3 1. Add inhaled long-acting B2 agonist (LABA)

2. Assess control of asthma:
   - good response to LABA - continue LABA
   - benefit from LABA but control still inadequate: continue LABA and increase inhaled steroid dose to 800 mcg/day* (if not already on this dose)
   - no response to LABA: stop LABA and increase inhaled steroid to 800 mcg/ day.* If control still inadequate, institute trial of other therapies, leukotriene receptor antagonist or SR theophylline

Step 4 Consider trials of:
   - increasing inhaled steroid up to 2000 mcg/day*
   - addition of a fourth drug e.g. Leukotriene receptor antagonist, SR theophylline, B2 agonist tablet

Step 5 Use daily steroid tablet in lowest dose providing adequate control. Consider other treatments to minimise the use of steroid tablets

Maintain high dose inhaled steroid at 2000 mcg/day*

Refer patient for specialist care

*beclometasone dipropionate or equivalent

Additional notes

Leukotriene receptor antagonists

- e.g. Montelukast, zafirlukast
- have both anti-inflammatory and bronchodilatory properties
- should be used when patients are poorly controlled on high-dose inhaled corticosteroids and a long-acting b2-agonist
- particularly useful in aspirin-induced asthma
- associated with the development of Churg-Strauss syndrome

Fluticasone is more lipophilic and has a longer duration of action than beclometasone

Hydrofluoroalkane is now replacing chlorofluorocarbon as the propellant of choice. Only half the usually dose is needed with hydrofluoroalkane due to the smaller size of the particles

Long acting B2-agonists acts as bronchodilators but also inhibit mediator release from mast cells. Recent meta-analysis showed adding salmeterol improved symptoms compared to doubling the inhaled steroid dose

Respiratory pathogens

The table below lists the more common respiratory pathogens:

Pathogen	**Associated condition**
Respiratory syncytial virus	Bronchiolitis
Parainfluenza virus	Croup
Rhinovirus	Common cold
Influenza virus	Flu
Streptococcus pneumoniae	The most common cause of community-acquired pneumonia
Haemophilus influenzae	Community-acquired pneumonia Most common cause of bronchiectasis exacerbations
Staphylococcus aureus	Pneumonia, particularly following influenza
Mycoplasma pneumoniae	Atypical pneumonia Flu-like symptoms classically precede a dry cough. Complications include haemolytic anaemia and erythema multiforme
Legionella pneumophilia	Atypical pneumonia Classically spread by air-conditioning systems, causes dry cough. Lymphopenia, deranged liver function tests and hyponatraemia may be seen
Pneumocystis jiroveci	Common cause of pneumonia in HIV patients. Typically patients have few chest signs and develop exertional dyspnoea
Mycobacterium	Causes tuberculosis. A wide range of presentations from asymptomatic to

tuberculosis	disseminated disease are possible. Cough, night sweats and weight loss may be seen

COPD: investigation and diagnosis

NICE recommend considering a diagnosis of COPD in patients over 35 years of age who are smokers or ex-smokers and have symptoms such as exertional breathlessness, chronic cough or regular sputum production.

The following investigations are recommended in patients with suspected COPD:

- post-bronchodilator spirometry to demonstrate airflow obstruction: FEV1/FVC ratio less than 70%
- chest x-ray: hyperinflation, bullae, flat hemidiaphragm. Also important to exclude lung cancer
- full blood count: exclude secondary polycythaemia
- body mass index (BMI) calculation

The severity of COPD is categorised using the FEV1*:

Post-bronchodilator FEV1/FVC	FEV1 (of predicted)	Severity
< 0.7	> 80%	Stage 1 - Mild**
< 0.7	50-79%	Stage 2 - Moderate
< 0.7	30-49%	Stage 3 - Severe
< 0.7	< 30%	Stage 4 - Very severe

Measuring peak expiratory flow is of limited value in COPD, as it may underestimate the degree of airflow obstruction.

*note that the grading system has changed following the 2010 NICE guidelines. If the FEV1 is greater than 80% predicted but the post-bronchodilator FEV1/FVC is < 0.7 then this is classified as Stage 1 - mild

**symptoms should be present to diagnose COPD in these patients

Haemoptysis

The table below lists the main characteristics of the most important causes of haemoptysis:

Lung cancer	History of smoking Symptoms of malignancy: weight loss, anorexia
Pulmonary oedema	Dyspnoea Bibasal crackles and S3 are the most reliable signs
Tuberculosis	Fever, night sweats, anorexia, weight loss
Pulmonary embolism	Pleuritic chest pain Tachycardia, tachypnoea

Lower respiratory tract infection	Usually acute history of purulent cough
Bronchiectasis	Usually long history of cough and daily purulent sputum production
Mitral stenosis	Dyspnoea Atrial fibrillation Malar flush on cheeks Mid-diastolic murmur
Aspergilloma	Often past history of tuberculosis. Haemoptysis may be severe Chest x-ray shows rounded opacity
Wegener's granulomatosis	Upper respiratory tract: epistaxis, sinusitis, nasal crusting Lower respiratory tract: dyspnoea, haemoptysis Glomerulonephritis Saddle-shape nose deformity
Goodpasture's syndrome	Haemoptysis Systemically unwell: fever, nausea Glomerulonephritis

COPD: long-term oxygen therapy

The 2010 NICE guidelines on COPD clearly define which patients should be assessed for and offered long-term oxygen therapy (LTOT). Patients who receive LTOT should breathe supplementary oxygen for at least 15 hours a day. Oxygen concentrators are used to provide a fixed supply for LTOT.

Assess patients if any of the following:

- very severe airflow obstruction (FEV1 < 30% predicted). Assessment should be 'considered' for patients with severe airflow obstruction (FEV1 30-49% predicted)
- cyanosis
- polycythaemia
- peripheral oedema
- raised jugular venous pressure
- oxygen saturations less than or equal to 92% on room air

Assessment is done by measuring arterial blood gases on 2 occasions at least 3 weeks apart in patients with stable COPD on optimal management.

Offer LTOT to patients with a pO2 of < 7.3 kPa or to those with a pO2 of 7.3 - 8 kPa and one of the following:

- secondary polycythaemia
- nocturnal hypoxaemia
- peripheral oedema
- pulmonary hypertension

Bronchiectasis: management

Bronchiectasis describes a permanent dilatation of the airways secondary to chronic infection or inflammation. After assessing for treatable causes (e.g. immune deficiency) management is as follows:

- physical training (e.g. inspiratory muscle training) - has a good evidence base for patients with non-cystic fibrosis bronchiectasis
- postural drainage
- antibiotics for exacerbations + long-term rotating antibiotics in severe cases
- bronchodilators in selected cases
- immunisations
- surgery in selected cases (e.g. Localised disease)

Most common organisms isolated from patients with bronchiectasis:

- *Haemophilus influenzae* (most common)
- *Pseudomonas aeruginosa*
- Klebsiella spp.
- *Streptococcus pneumonia*

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Interestingly, NICE do not view smoking as an absolute contraindication to LTOT, despite the obvious safety issues. It states 'If they smoke, warn them about the risk of fire and explosion'.

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Pulmonary embolism: management

The NICE guidelines of 2012 provided some clarity on how long patients should be anticoagulated for after a pulmonary embolism (PE). Selected points are listed below.

Low molecular weight heparin (LMWH) or fondaparinux should be given initially after a PE is diagnosed. An exception to this is for patients with a massive PE where thrombolysis is being considered. In such a situation unfractionated heparin should be used.

- a vitamin K antagonist (i.e. warfarin) should be given within 24 hours of the diagnosis
- the LMWH or fondaparinux should be continued for at least 5 days or until the international normalised ratio (INR) is 2.0 or above for at least 24 hours, whichever is longer, i.e. LMWH or fondaparinux is given at the same time as warfarin until the INR is in the therapeutic range
- warfarin should be continued for at least 3 months. At 3 months, NICE advise that clinicians should 'assess the risks and benefits of extending treatment'
- NICE advise extending warfarin beyond 3 months for patients with *unprovoked* PE. This essentially means that if there was no obvious cause or provoking factor (surgery, trauma,

significant immobility) it may imply the patient has a tendency to thrombosis and should be given treatment longer than the norm of 3 months

- for patients with active cancer NICE recommend using LMWH for 6 months

Thrombolysis

- thrombolysis is now recommended as the first-line treatment for massive PE where there is circulatory failure (e.g. hypotension). Other invasive approaches should be considered where appropriate facilities exist

Cystic fibrosis

Cystic fibrosis (CF) is an autosomal recessive disorder causing increased viscosity of secretions (e.g. lungs and pancreas). It is due to a defect in the cystic fibrosis transmembrane conductance regulator gene (CFTR), which codes a cAMP-regulated chloride channel

In the UK 80% of CF cases are due to delta F508 on the long arm of chromosome 7. Cystic fibrosis affects 1 per 2500 births, and the carrier rate is c. 1 in 25

Organisms which may colonise CF patients

- Staph aureus
- *Pseudomonas aeruginosa*
- Burkholderia cepacia*
- Aspergillus

*previously known as *Pseudomonas* cepacia