Chronic Obstructive Pulmonary Disease (COPD) Management

- Diagnosis of COPD should be considered in patients over the age of 35 who have a risk factor (generally smoking) presenting with exertional breathlessness, chronic cough, regular sputum production, frequent winter ‘bronchitis’ or wheeze.

- There is no single diagnostic test for COPD. Making a diagnosis relies on clinical judgement based on a combination of history, physical examination and confirmation of the presence of airflow obstruction using post bronchodilator spirometry.

- Smoking cessation remains the most important intervention for COPD management.

- Pulmonary rehabilitation should be made available to all appropriate patients with COPD (usually MRC 3, 4 and 5) including those who have had a recent hospitalisation for an acute exacerbation, who are considered a priority to access pulmonary rehabilitation due to its impact on reducing readmission to hospital. A Cochrane review, 2015 highlights that pulmonary rehabilitation improves the health-related quality of life of people with COPD.

- Before stepping up treatment to the next stage in the therapeutic management of COPD, the patient’s inhaler technique, compliance with administration instructions and tolerance of the current device should be checked.

- Pneumococcal vaccination and an annual influenza vaccination should be offered to all patients with COPD.

- The management of COPD with triple therapy is the most expensive therapeutic strategy. Its use should be restricted for severe disease only in the presence of persistent exacerbations despite other treatments.

- Nebulisers are considered for patients when large doses of inhaled drugs are needed to gain an improvement in symptoms, or when the patients are too ill or otherwise unable to use hand held inhalers. See local Nebuliser guideline for further details.

- If oxygen saturation ≤ 92% on 2 occasions (2-3 weeks apart), refer to oxygen assessment service for LTOT assessment. Further information on LTOT can be found in local Oxygen guideline.
<table>
<thead>
<tr>
<th>Document Update</th>
<th>Date updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHRA warning regarding tiotropium and CV risk added to p10</td>
<td>June 2017</td>
</tr>
<tr>
<td>Soltel added as cost effective salmeterol preparation (p15)</td>
<td>June 2017</td>
</tr>
<tr>
<td>TLC of Ultibro changed to Green 1st line LABA/LAMA (p.11 &amp; p16)</td>
<td>July 2017</td>
</tr>
<tr>
<td>Trimbow (triple combination) included p9 and p16</td>
<td>Oct 2017</td>
</tr>
</tbody>
</table>
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1. **Definition**

Chronic obstructive pulmonary disease (COPD) is a chronic slowly progressive disorder, characterised by airflow obstruction, which does not change markedly over several months. The impairment in lung function is largely fixed, but may be partially reversible by bronchodilators or other therapy. Most cases are caused by tobacco smoking, though lifelong non-smokers may develop COPD probably related to occupation.

The following is used as a definition of COPD:

- Airflow obstruction is defined as a reduced FEV\textsubscript{1}/FVC ratio (where FEV\textsubscript{1} is forced expired volume in 1 second and FVC is forced vital capacity), such that FEV\textsubscript{1}/FVC is less than 0.7.

- If FEV\textsubscript{1} is ≥ 80% predicted normal a diagnosis of COPD should only be made in the presence of respiratory symptoms, for example breathlessness or cough. *(NICE CG101)*

2. **Diagnosis**

Diagnosis of COPD should be considered for:

- Patients >35 years
- Smokers
- And patients who present with one or more of the following:
  - Exertional breathlessness
  - Chronic cough
  - Regular sputum production
  - Frequent winter ‘bronchitis’ or wheeze

Confirm diagnosis with spirometry. Airflow obstruction is confirmed by performing post-bronchodilator spirometry defined as FEV\textsubscript{1}/FVC <0.7

COPD is classified according to the severity of airflow obstruction *(NICE CG 101, 2010)*

<table>
<thead>
<tr>
<th>Post-bronchodilator FEV\textsubscript{1}/FVC</th>
<th>FEV\textsubscript{1} % predicted</th>
<th>Severity of airflow obstruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.7</td>
<td>≥ 80%</td>
<td>Stage 1 – mild</td>
</tr>
<tr>
<td>&lt;0.7</td>
<td>50 - 79%</td>
<td>Stage 2 – moderate</td>
</tr>
<tr>
<td>&lt;0.7</td>
<td>30 – 49%</td>
<td>Stage 3 – severe</td>
</tr>
<tr>
<td>&lt;0.7</td>
<td>&lt;30%</td>
<td>Stage 4 – very severe</td>
</tr>
</tbody>
</table>

**Medical Research Council (MRC) dyspnoea scale**

One of the primary symptoms of COPD is breathlessness. Evaluation of breathlessness is undertaken using Medical Research Council (MRC) dyspnoea scale.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Degree of breathlessness related to activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not troubled by breathlessness except on strenuous exercise</td>
</tr>
<tr>
<td>2</td>
<td>Short of breath when hurrying or walking up a slight hill</td>
</tr>
<tr>
<td>3</td>
<td>Walks slower that contemporaries on level ground because of breathlessness, or has to stop for breath when walking at own pace</td>
</tr>
<tr>
<td>4</td>
<td>Stops for breath after walking about 100 m or after a few minutes on level ground</td>
</tr>
<tr>
<td>5</td>
<td>Too breathless to leave the house, or breathless when dressing or undressing</td>
</tr>
</tbody>
</table>

3. Most effective interventions

a. Smoking cessation

Smoking cessation is the single most effective intervention for reducing the risk of developing COPD and slowing its progression. For all patients with COPD

- Record a smoking history, including pack-years smoked
- Encourage patients who smoke to stop and provide help at every opportunity

Further smoking cessation advice can be found at live life better Derbyshire (helpline number 0800 085 2299) or live well derby (helpline number 01332 641 254).

b. Pulmonary rehabilitation

Pulmonary rehabilitation should be made available for all patients with COPD (usually MRC 3, 4 and 5) and in those who consider themselves functionally disabled including those with recent hospitalisation for acute exacerbation, who are considered a priority to access pulmonary rehabilitation due to its impact on reducing readmission to hospital.

Pulmonary rehabilitation is a multidisciplinary programme that is individually designed and tailored to optimise a patient’s physical and social performance and autonomy. It can offer statistically significant and clinically meaningful improvements in quality of life, exercise capacity and dyspnoea and has been shown to be cost effective intervention.

A Cochrane review, 2015 highlights that pulmonary rehabilitation improves the health-related quality of life of people with COPD, relieving dyspnoea and fatigue, improving emotional function and enhancing the sense of control that individuals have over their condition. These improvements are moderately large and clinically significant.

Spirometry is one of the essential lung function investigations in the diagnosis, severity assessment and monitoring of COPD. It should be performed to a high standard, quality assured and only performed and interpreted by professionals assessed as competent against ARTP standards. Once certified healthcare professionals should record their qualification on National Register of certified professionals and operators which is a new framework being implemented Nationally over four years from 1st April 2017 to 31st March 2021.

Patients can be referred for pulmonary rehabilitation to the following centres:

**North Derbyshire**
Pulmonary Rehabilitation Service, Welbeck Suite, Walton Hospital, Whitecoates Lane, Chesterfield, S40 3HW
Phone: 01246 253 067 Email: DCHST.Respiratory@nhs.net

**South Derbyshire**
"Breathe Ability" pulmonary rehabilitation programmes are available at London Road Community Hospital, Babington Hospital and Swadlincote Health Centre. (Only available up to March 2018)

Contact Details: Referrals should be sent to: Breathe Ability (Pulmonary Rehabilitation service), London Road Community Hospital, London Road, Derby, DE1 2QY
Tel: 01332 254 604 Email: DCHST.Respiratory@nhs.net

**Erewash locality**
Erewash Community Respiratory Team, Ilkeston Community Hospital, Heanor Road, Ilkeston, Derbyshire, DE7 8LN.
Phone: 0115 951 2440 Fax: 0115 9512411 Email: DCHST.Respiratory@nhs.net

or Community Respiratory Nurse Specialist, Erewash Community (DCHS), Fran Redfern, Long Eaton Health Centre, contact number - 0115 951 2440

A new referral form is available through DCHS sharepoint.
c. Vaccinations
Pneumococcal vaccination and annual influenza vaccination should be offered to all patients. These reduce the rates of hospital admissions and risk of death from pneumonia and influenza.

d. Respiratory action plans (RAP)
Respiratory action plans (RAP) allow patients to adapt their lifestyles and acquire skills to successfully identify the first signs of an exacerbation and respond appropriately. NICE recommends that patients who are at risk of exacerbation should be given a RAP that encourages them to respond promptly to the symptoms of an exacerbation. (For further details regarding management of exacerbations see p12.)

The read codes for primary care use, for the RAPs are as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>SystmOne</th>
<th>EMIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPD self-management plan given</td>
<td>XalUt</td>
<td>66YI</td>
</tr>
<tr>
<td>COPD self-management plan reviewed</td>
<td>XaYZO</td>
<td>661N3</td>
</tr>
</tbody>
</table>

The local respiratory teams educate and support patient's knowledge and understanding of their respiratory condition through provision of self-management strategies and action planning. Details of the teams are included below:

The Adult Respiratory Team (ART) - Southern Derbyshire CCG/Erewash patients
Coleman Health Centre, contact number 01332 861 189, option 1

Community Respiratory Team - Northern Derbyshire CCG/Hardwick CCG
Walton Hospital, Chesterfield, contact number 01246 253 067

![COPD value pyramid](image)

Adapted from London Respiratory Network.
4. Medicine’s Management of stable COPD

Non-pharmacological interventions: Remember to check the patients smoking status and offer smoking cessation advice. Offer pulmonary rehabilitation if MRC score 3–5 and on optimal medication. Offer pneumococcal and annual influenza vaccination to all patients. Patients at risk of exacerbations should be given a respiratory action plan.

Check inhaler technique and compliance with particular device using In-check DIAL at annual review. If a patient is unable to use a particular device satisfactorily, then an alternative device should be sought.

If the patient has exacerbations consider treatment with oral steroid + antibiotic (doxycycline or amoxicillin)

Symptoms of exacerbations include:
- Quantity of sputum or
- change in colour or
- more breathless

Persistent exacerbations or breathlessness

N.B *If tiotropium is not tolerated or contra-indicated, see table1 p.10 for alternative LAMAs. *Fostair Nexthaler is licenced in COPD.

All prices are annual costs obtained from MIMs online. (pa = per annum)

Key
COPD: chronic obstructive pulmonary disease
SABA: Short-acting beta2 agonist
SAMA: Short-acting muscarinic antagonist
LABA: Long-acting beta2 agonist
LAMA: Long-acting muscarinic antagonist
ICS: Inhaled corticosteroid
FEV1: Forced expiratory volume in 1 Second
FVC: Forced vital capacity

Chronic cough & sputum production

Consider trial of carboceisteine capsules /sachets. 750mg TDS for 6-8 weeks then 750mg BD if improvement in sputum production and reduction in viscosity. Stop if no improvement

If no improvement, review diagnosis and consider referring to local COPD clinic.

- Annual review - for mild/moderate/severe (stage 1, 2 and 3)
- 6 monthly review - for very severe (stage 4)

Check inhaler technique
Consider adherence to therapy

FEV1 ≤ 50%

LABA + LAMA
Indacaterol/glycopyrronium (Ultibro) (£390/pa)
Choice of combination preparation should be driven patient choice and device acceptability. LABA + ICS combination may be an option in patients where LAMA ineffective

If FEV1 ≥ 50%

SABA
(Salbutamol MDI 100mcg 2 puffs PRN = £1.50/device)
SABA should continue through all stages of symptoms

and/or

SAMA
(Ipratropium MDI 20mcg 2 puffs PRN or QDS = £5.56/device)

Breathlessness and/or exercise limitation.

JAPC recommend LABAs as the more cost-effective option

LAMA
Tiotropium
(As Respimat (£276/pa) or Braltus £310/pa) is the preferred 1st line LAMA*
(Stop ipratropium)

Alternative if ineffective after 4 week trial

LABA + ICS
Fostair MDI or DPI* (beclometasone/formoterol 100/6) (£352/pa) - 1st line
Or
DuoResp DPI (budesonide/formoterol) (£360/pa) - 2nd line
(Option if COPD + Asthma overlap)

LAMA + LABA + ICS in a combination inhaler
Key Message 1
Is the treatment working?
1. Has your treatment made a difference to you?
2. Is your breathing easier?
3. Is the inhaler device appropriate for the patient?

If there is no benefit from a new treatment – it should be stopped after an adequate trial period.

If the treatment is not working after checking adherence, compliance and inhaler technique - Review the diagnosis
FEV1/FVC ratio:
- <70% obstructive
- >80% restrictive

The effectiveness of bronchodilator therapy should not be assessed by lung function alone but should include a variety of other measures such as improvement in symptoms, activities of daily living, exercise capacity, and rapidity of symptom relief.

Key Message 2
Frequent exacerbators
Check for co morbidities
- Cardiac failure / IHD; Consider beta blockers in this case as they reduce death rates by 30% in COPD
- Check for Acid-Fast Bacillus (AFB), Pseudomonas

Consider unusual organism:
- FEV1 / FVC <70%
- Bronchiectasis
- Cardiac failure

COPD is a progressive disease with usual decline 40ml/year.

Key Message 3
Actions
- Offer vaccinations: flu vaccine (annually), pneumococcal vaccine
- Nutrition: offer lifestyle advice (e.g. exercise, nutrition, measure BMI, <20 increased mortality – nutritional advice, >35 consider also sleep apnoea)
- Screen for anxiety and depression
- Provide education - give self-management and action plans for responding promptly to symptoms
- Record oxygen saturation for all patients with moderate to severe COPD <92% oxygen saturation, refer for oxygen assessment
- Use COPD assessment tool to assess the clinical response to changes in the treatment.

Key Message 4
The following maintenance therapy should be offered to patients with stable COPD who remain breathless or have exacerbations despite the use of SABA on a PRN basis:
- FEV1≥50% predicted offer LABA or a LAMA
- FEV1 <50% predicted offer either LABA + ICS or LAMA (see management algorithm on p5)

For a small cohort of patients with FEV1≥50% if a LABA or LAMA alone has not shown an acceptable improvement in symptoms:
- Check inhaler technique and adherence/compliance to the device.
- Swap the device if patient not compliant with 1st line choice.

If acceptable improvements in symptoms have still not been achieved the following should be considered:

1. LAMA or LABA
   - In patients with FEV1 ≥50% there is no difference between a LAMA and LABA with regards to prevention of exacerbation or hospitalisation (based on very low quality evidence).
   - LABA is preferred option. Formoterol Easyhaler is the preferred cost effective option.
Key Message 4 – Continued.

2. LABA + LAMA combination
   - Evidence suggests the addition of a second long-acting bronchodilator is an effective strategy compared to monotherapy with LABA or LAMA in patients with moderate to severe COPD.
   - LABA/LAMA combinations are more effective than LABA/ICS in preventing COPD exacerbation in patients with a history of exacerbation during the previous year.\(^1,2\).
   - Lower exacerbation rates were reported with indacaterol/glycopyrronium (ultibro Breezhaler) Vs salmeterol/fluticasone (Seretide Accuhaler) over 52 weeks.\(^3\).
   - LABA/LAMA combination offer advantage of steroid-sparing side-effects.
   - Based on the body of evidence, indacaterol/glycopyrronium (ultibro) is the LABA/LAMA of choice. There is no difference in cost for the current four available LABA/LAMA combinations.

3. LABA + ICS fixed dose combination inhalers
   The aim of addition of an ICS to LABA is to reduce the exacerbations and slow decline in health status, supported by low quality evidence. *Consider the addition of an ICS to a LABA, remember:
   - The evidence suggests that a LABA+ICS reduces moderate exacerbations (low quality evidence).
   - This regimen is associated with a known risk of non-fatal pneumonia (low quality evidence).
   - It is unclear if mortality is reduced (very low quality evidence).
   - Consider the risks vs the benefits before commencing therapy (see appendix 1 for ICS side effects).
   - For some patients initial therapy with LABA/ICS maybe first choice over LAMA for example in those patients that have a history and/or findings suggestive of asthma-COPD overlap.
   - Patients on higher doses of ICS (>1000mcg BDP/day) should be given an ICS safety warning card.
   - Consider stepping down treatment with an ICS in COPD.

LABA + LAMA + ICS (triple therapy)
   - Triple therapy is reserved for exceptional use only.
   - It remains unclear whether there is a benefit from using the triple combination. Use only in severe disease in the presence of persistent exacerbations despite other treatment.
   - The quality adjusted life years for triple therapy ranges from £35,000 to £130,000, rendering triple therapy as the least cost effective intervention.
     - Beclometasone 87mcg (=100mcg)/formoterol 5mcg (=6mcg)/glycopyrronium 9mcg (=12.5mcg) (Trimbow)
       - Presents as a metered dose inhaler (extrafine formulation) – maybe used with an AeroChamber
       - Classified as BROWN.
       - Use of this combination product is cheaper than using the separate components.

*Consider - Defined as an intervention which will do more good than harm for most patients and be cost effective, but other options may be similarly cost effective

### 5. Table 1: LAMA inhalers

Before commencing tiotropium ensure where appropriate:
1. An adequate trial of a LABA has been undertaken.
2. Check inhaler technique/ compliance / adherence.
3. Swap the patient to a different device (e.g. MDI or turbohaler) if not compliant with the chosen device

Tiotropium (Respimat or Braltus) remains the preferred LAMA based on its greater body of evidence in moderate to severe COPD and in patients with a history of exacerbations.

<table>
<thead>
<tr>
<th>Tiotropium</th>
<th>Glycopyrronium</th>
<th>Acclidinium</th>
<th>Umeclidinium</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green 1st line LAMA</strong></td>
<td><strong>GREEN alternative 1st line LAMA (choice driven by device)</strong></td>
<td><strong>BROWN 2nd line LAMA</strong></td>
<td><strong>BROWN 2nd line LAMA</strong></td>
</tr>
<tr>
<td><strong>Spiriva Respimat</strong></td>
<td><strong>Braltus Zonda inhaler</strong></td>
<td><strong>Seebr Breezhaler inhalation powder, hard capsules</strong></td>
<td><strong>Eklira Genuair Breath-actuated dry powder inhaler</strong></td>
</tr>
<tr>
<td></td>
<td>The braltus Zonda device requires insertion of the braltus capsule into the zonda before inhalation. Note: advise the patient to never place a capsule directly into the mouthpiece.</td>
<td></td>
<td>The Genuair inhaler is equipped with a dose indicator to show the patient approximately how many doses are left in the inhaler. The dose indicator moves down slowly, displaying intervals of 10 (60, 50, 40, 30, 20, 10, 0)</td>
</tr>
<tr>
<td><strong>Patient factors</strong></td>
<td><strong>Patient factors</strong></td>
<td><strong>Patient factors</strong></td>
<td><strong>Patient factors</strong></td>
</tr>
<tr>
<td>Dosage: • Respimat – 2 inhalations (5mcg) once daily</td>
<td>Dosage: • Braltus via Zonda inhaler - 1 inhalation (10mcg) once daily</td>
<td>Dosage: • 1 inhalation once daily</td>
<td>Dosage: • 1 inhalation twice a day</td>
</tr>
</tbody>
</table>

**MHRA, 2015** - When using tiotropium for COPD: take the risk of CV side effects into account for patients with conditions that may be affected by the anticholinergic action of tiotropium, including:
- myocardial infarction in the last 6 months
- unstable or life threatening cardiac arrhythmia
- cardiac arrhythmia requiring intervention or a change in drug therapy in the past year
- hospitalisation for heart failure (NYHA Class III or IV) within the past year
Prescribers are reminded to tell these patients to report any worsening of cardiac symptoms after starting tiotropium
**Table 2: LABA/LAMA combination inhaler options**

- As there is no difference in cost of the current four LABA/LAMA combination inhalers, choice between LABA/LAMA combination inhaler after 1st line choice of ultibro, should be based on patient ability to tolerate and use the inhaler device.
- Before steeping up treatment, the patients inhaler technique, compliance with administration instructions and tolerance of the current device should be checked.

<table>
<thead>
<tr>
<th>LABA/LAMA Combination</th>
<th>1st line</th>
<th>2nd line</th>
<th>2nd line</th>
<th>2nd line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultibro Breezhaler and caps</td>
<td>Indacaterol 110mcg /Glycopyrronium 50mcg</td>
<td><strong>BROWN</strong> 2nd</td>
<td>Anoro Ellipta</td>
<td>Vialterol 22mcg /umeclidinium 55mcg</td>
</tr>
<tr>
<td>Duaklir Genuair</td>
<td>Formoterol 12mcg /aclidinium 340mcg</td>
<td></td>
<td>Spiolto Respimat</td>
<td>Olodaterol 2.5mcg /tiotropium 2.5 mcg</td>
</tr>
<tr>
<td><strong>GREEN</strong> 1st</td>
<td><strong>BROWN</strong> 2nd</td>
<td><strong>BROWN</strong> 2nd</td>
<td><strong>BROWN</strong> 2nd</td>
<td></td>
</tr>
<tr>
<td>Dosage: 1 inhalation OD</td>
<td>Dosage: 1 inhalation BD</td>
<td>Dosage: 1 inhalation OD</td>
<td>Dosage: 2 inhalations OD</td>
<td></td>
</tr>
</tbody>
</table>

**Patient factors**

- **Ultibro Breezhaler and caps**
  - Requires the patient to insert a capsule into the device prior to use.
  - Auditory feedback signals the device has been used correctly.
  - Patients may experience a sweet flavour as the medicine goes into the lungs.

- **Duaklir Genuair**
  - Auditory feedback signals the device has been used correctly.
  - The duaklir genuair device has a dose indicator (counts down) which lets the patient know how much medication is left.

- **Anoro Ellipta**
  - Patient receives auditory feedback signalling the device is ready to use.
  - Patients need to remember to write a discard date for new devices (6 weeks from date of opening)
  - The Anoro ellipta device has a dose indicator (counts down) which lets the patient know how much medication is left.

- **Spiolto Respimat**
  - Requires loading of the multi-dose cartridge.
  - A dose indicator shows approximately how much medication is left.
6. Managing exacerbations
An exacerbation is a sustained worsening of the patient’s symptoms from their 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. Change in these symptoms often necessitates a change in medication.

NICE recommends people who have had an exacerbation of COPD are provided with individualised written advice on early recognition of future exacerbations, management strategies (including appropriate provision of antibiotics and corticosteroids for self-treatment at home) and a named contact. (Contact the ART or Community Respiratory team for advice)

Give patients to keep at home and encourage patients to respond to an exacerbation by:

- Increasing bronchodilator therapy to control symptoms
- Short course of oral **prednisolone 30mg daily 7-14 days** – if significant increase in breathlessness which interferes with daily activities.
- A 5 day course of **doxycycline 200mg stat, then 100mg daily** or amoxicillin 500mg – 1g tds (if tetracycline not suitable)

**NB:** Practices should have mechanisms in place to identify patients frequently requesting these anticipatory drugs, are reviewed to optimise their treatment.

7. Osteoprotection
Patients on or commencing high dose corticosteroid long-term (≥15mg per day of prednisolone or its equivalent for 3 months or more) should be offered bone protection with bisphosphonate. Patients taking lower doses of oral corticosteroids long-term should be considered for risk fracture assessment. See [osteoporosis](#) guidance for details.

8. Other therapies
   a. Mucolytics (e.g. carbocisteine)
      Mucolytic drug therapy should be considered in patients with a chronic cough productive of sputum and continued if there is symptomatic improvement (for example, reduction in frequency of cough and sputum production).
      Do not routinely use mucolytic to prevent exacerbations in people with stable COPD. Mucolytic therapy should be **stopped** if there is no benefit after a 4 week trial.
   b. Theophylline
      Offer only after inhaler therapy has been optimised. (See UKMI drug monitoring guidance for theophylline monitoring).

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Dr Deepak Subramanian, Respiratory Consultant, Derby Teaching Hospital Foundation NHS Trust
Derbyshire Medicines Management Shared Care and Guideline Group
Appendix 1: Inhaled corticosteroids

Local side effects

<table>
<thead>
<tr>
<th>Local side effects of inhaled corticosteroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral candidiasis</td>
</tr>
<tr>
<td>Cough at time of inhalation</td>
</tr>
<tr>
<td>Hoarse voice</td>
</tr>
<tr>
<td>Dysphonia (disorder of the voice)</td>
</tr>
</tbody>
</table>

Cough is a local irritant effect and can usually be overcome by a change in the delivery device. For instance, when using metered dose inhaler (MDI), the addition of a large volume spacer will reduce the cough.

Oral candidiasis is dose-related and can be prevented by gargling, washing and spitting out after using the inhaler.

Hoarse voice and dysphonia are caused by the inhaled steroid being deposited on the vocal chords. These effects tend to be worse with dry powder inhaler than MDIs, where the effect can be decreased by using a large volume spacer. Hoarse voice and dysphonia are dose-related and are not usually a problem at low doses (except in those who use their voice professionally such as actors or singers).

Systemic side effects

<table>
<thead>
<tr>
<th>Potential systemic side effects of inhaled corticosteroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adrenocortical suppression</td>
</tr>
<tr>
<td>Increased osteoporosis and bone fractures</td>
</tr>
<tr>
<td>Skin thinning and purpura</td>
</tr>
<tr>
<td>Weight gain</td>
</tr>
<tr>
<td>Cataracts</td>
</tr>
<tr>
<td>Glaucoma</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>Increased pulmonary infections (pneumonia)</td>
</tr>
<tr>
<td>Growth retardation in children</td>
</tr>
</tbody>
</table>

Be aware of the potential risk of developing side-effects (including non-fatal pneumonia) in people with COPD treated with high of inhaled corticosteroid dose (particularly with 2000mcg beclometasone or equivalent dose) and discuss these with the patient.

Appendix 2: Spirometry

Spirometry is essential for making a correct diagnosis and determining the severity of COPD in conjunction with a detailed history and examination and should never be used solely in determining diagnosis. Spirometry is a reliable and effective tool if used correctly. The spirometer should be accurate, reliable and produce a copy of the graph with a volume/time plot. It should also include the following readings: Slow vital capacity (VC), Forced vital capacity (FVC), Forced expiratory capacity in one second (FEV1) and FEV1/FVC ratio (i.e <0.7). This is mandatory to meet specifications within the COPD guidelines for the management of the disease.

Other aspects which need to be taken into consideration are user friendliness and portability. You may also wish to consider a memory facility to store traces. Many electronic spirometers also display a flow volume curve. You do not need this information to calculate FEV1 and FVC values. However as you become more experienced you may want to have this facility.
Training
Training is important for health professionals responsible for performing spirometry. At least one member of staff from each practice should attend an accredited course which includes professional tuition on the practical application of spirometry and the correct interpretation of the results. Health care professionals who perform spirometry should have completed an approved competency based training course in spirometry and will be expected to keep their skills up to date.

Training courses available are as follows:

- Association for Respiratory Technology and Physiology (ARTP) - [www.artp.org.uk](http://www.artp.org.uk).
  - Two day certificate courses on COPD and Spirometry

- Education for Health - The Athenaeum, 10 Church Street, Warwick CV34 4AB [www.educationforhealth.org.uk](http://www.educationforhealth.org.uk), Tel: 01926 493313 Fax: 01923 493224
  - A range of one day workshops to identify learning needs and four to six month distance learning degree course. Spirometry workshop for HCAs.

- Respiratory Education UK - [www.respiratoryeduk.com](http://www.respiratoryeduk.com).
  - One day workshops and 2 day diploma courses

The following organisations provide training in the use of spirometers:

- ARTP/BTS certificate in spirometry The ARTP/BTS Consortium, c/o Dr SL Hill, Honorary Chairman ARTP/BTS Liaison Committee, Lung investigation Unit, The Queen Elizabeth Hospital, Edgbaston, Birmingham B15 2TH. Telephone 0121 607 8339 Fax 0121 627 2012

- Education for Health, The Athenaeum, 10 Church Street, Warwick CV34 4AB Tel: 01926 493313 Fax: 01926 493224

- North Nottingham Respiratory Education Centre, The Kings Mill Centre, Mansfield Road, Sutton-in-Ashfield, Nottinghamshire NG17 4JL Tel: 01623 559568 Fax: 01623 556251

- Respiratory Education UK, University Hospital Aintree, Lower Lane, Liverpool L9 7AL Tel: 0151 529 2598 Fax: 0151 529 3943

For further advice locally contact:
- North Derbyshire - Community Respiratory Team at Walton Hospital, Chesterfield on 01246 253 067
- Southern Derbyshire & Derby City - ART Team at Coleman Street of 01332 861 189 Option 1 or Royal Derby Hospital on 01332 785 058

There is a [National Register of certified professionals and operators](#) for all healthcare professionals who have completed the training

**Appendix 3: Oxygen therapy**
Oxygen therapy should only be given to patients who have proven hypoxaemia (\(\text{SaO}_2<92\%\), \(\text{PaO}_2<7.3\text{ kPa}\)).

Record oxygen saturation on all patients with moderate to severe COPD.

**Long Term Oxygen Therapy (LTOT)**
If oxygen saturation ≤ 92% on 2 occasions (2-3 weeks apart), refer to oxygen assessment service for LTOT assessment. Further information on LTOT can be found in local [Oxygen guidance](#).
### Appendix 4: Cost comparison *(Doses given do not imply therapeutic equivalence)*

<table>
<thead>
<tr>
<th>Drug</th>
<th>Brand name</th>
<th>Device</th>
<th>Traffic light classification</th>
<th>Daily dose range</th>
<th>30 day cost</th>
<th>Annual cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LABA Inhalers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formoterol DPI 12mcg</td>
<td>Easyhaler 12mcg</td>
<td>DPI Breath actuated</td>
<td>GREEN 1&lt;sup&gt;st&lt;/sup&gt; line</td>
<td>12mcg bd</td>
<td>£11.88 (60 dose)</td>
<td>£143</td>
</tr>
<tr>
<td>Formoterol MDI 12mcg</td>
<td>Atimos 12mcg</td>
<td>MDI</td>
<td>GREEN</td>
<td>12mcg bd</td>
<td>£18.04 (60 dose)</td>
<td>£216</td>
</tr>
<tr>
<td>Formoterol turbohaler 12mcg</td>
<td>Oxis 12mcg</td>
<td>DPI Breath actuated</td>
<td>GREEN</td>
<td>12mcg od - bd</td>
<td>£24.80 (60 dose)</td>
<td>£298</td>
</tr>
<tr>
<td>Salmeterol accuhaler 50mcg</td>
<td>Serevent 50 accuhaler</td>
<td>DPI Breath actuated</td>
<td>GREEN</td>
<td>50mcg bd</td>
<td>£35.11 (60 dose)</td>
<td>£421</td>
</tr>
<tr>
<td>Salmeterol MDI 25mcg</td>
<td>Soltei&lt;sup&gt;®&lt;/sup&gt; MDI 25mcg</td>
<td>MDI</td>
<td>GREEN</td>
<td>50mcg bd</td>
<td>£19.95 (120 dose)</td>
<td>£239</td>
</tr>
<tr>
<td>Indacaterol 150mcg</td>
<td>Onbrez breezhaler</td>
<td>DPI Breath actuated</td>
<td>BROWN</td>
<td>150mcg od - 300mcg od</td>
<td>£32.19 (30 dose)</td>
<td>£386</td>
</tr>
<tr>
<td>Olodaterol respimat 2.5mcg</td>
<td>Striverdi respimat</td>
<td>Multi-dose solution for inhalation</td>
<td>BLACK</td>
<td>5mcg (2 puffs) od</td>
<td>£26.35 (60 dose)</td>
<td>£316</td>
</tr>
<tr>
<td><strong>LAMA inhalers</strong></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Tiotropium Respimat</td>
<td>Spiriva Respimat 2.5mcg</td>
<td>Multi-dose solution for inhalation</td>
<td>GREEN alternative 1&lt;sup&gt;st&lt;/sup&gt; line LAMA</td>
<td>5mcg (2 puffs) od</td>
<td>£23 (60 dose)</td>
<td>£276</td>
</tr>
<tr>
<td>Tiotropium Braltus</td>
<td>Braltus 10mcg</td>
<td>DPI Breath actuated</td>
<td>GREEN alternative 1&lt;sup&gt;st&lt;/sup&gt; line LAMA</td>
<td>10mcg od</td>
<td>£25.80 (30 dose) (&amp; Zonda haler)</td>
<td>£310</td>
</tr>
<tr>
<td>Glycopyrronium 44mcg</td>
<td>Seebri Breezhaler &amp; caps</td>
<td>DPI Breath actuated</td>
<td>BROWN 2&lt;sup&gt;nd&lt;/sup&gt; line LAMA</td>
<td>1 inhalation od</td>
<td>£27.50 (30 dose)</td>
<td>£330</td>
</tr>
<tr>
<td>Aclidinium 322mcg</td>
<td>Eklira Genuair</td>
<td>DPI Breath actuated</td>
<td>BROWN 2&lt;sup&gt;nd&lt;/sup&gt; line LAMA</td>
<td>1 inhalation bd</td>
<td>£28.60 (60 dose)</td>
<td>£343</td>
</tr>
<tr>
<td>Umeclidinium 55mcg</td>
<td>Incruse Ellipta</td>
<td>DPI Breath actuated</td>
<td>BROWN 2&lt;sup&gt;nd&lt;/sup&gt; line LAMA</td>
<td>55mcg od</td>
<td>£27.50 (30 dose)</td>
<td>£330</td>
</tr>
<tr>
<td><strong>LABA/ICS Combination inhalers</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beclomethasone 100mcg /formoterol 6mcg</td>
<td>Fostair 100/6 (MDI)</td>
<td>MDI</td>
<td>GREEN</td>
<td>2 puffs bd</td>
<td>£29.32 (120 dose)</td>
<td>£352</td>
</tr>
<tr>
<td>Beclomethasone 100mcg /formoterol 6mcg</td>
<td>Fostair NEXThaler100/6 (DPI)</td>
<td>DPI Breath actuated</td>
<td>GREEN</td>
<td>2 puffs bd</td>
<td>£29.32 (120 dose)</td>
<td>£352</td>
</tr>
<tr>
<td>budesonide 200mcg /formoterol 6mcg</td>
<td>DuoResp spiromax 160/4.5</td>
<td>DPI Breath actuated</td>
<td>GREEN 2&lt;sup&gt;nd&lt;/sup&gt; line</td>
<td>2 puff bd</td>
<td>£29.97 (120 dose)</td>
<td>£360</td>
</tr>
<tr>
<td>Combination</td>
<td>Brand/Model</td>
<td>Route of Administration</td>
<td>Line of Therapy</td>
<td>Price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------</td>
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</tr>
<tr>
<td>Budesonide 400mcg /formoterol 12mcg</td>
<td>DuoResp spiromax 320/9</td>
<td>DPI Breath actuated</td>
<td>GREEN 2nd line</td>
<td>£29.97 (60 dose) £360</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Budesonide 200mcg /formoterol 6 mcg</td>
<td>Symbicort 200/6 MDI</td>
<td>MDI</td>
<td>GREEN 3rd line</td>
<td>£32.74 (60 doses) £393</td>
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<td></td>
</tr>
<tr>
<td>*Fluticasone 500mcg /salmeterol 50mcg</td>
<td>AirFluSal Forspiro</td>
<td>DPI Breath actuated</td>
<td>GREEN 3rd line</td>
<td>£38 (120 dose) £456</td>
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<td></td>
</tr>
<tr>
<td>Budesonide 400mcg /formoterol 12 mcg</td>
<td>Symbicort 400/12</td>
<td>DPI Breath actuated</td>
<td>GREEN 3rd line</td>
<td>£40.92 (60 dose) £491</td>
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<td></td>
</tr>
<tr>
<td>*Fluticasone 500mcg /salmeterol 50mcg</td>
<td>Seretide accuhaler 500</td>
<td>DPI Breath actuated</td>
<td>GREEN 3rd line</td>
<td>£22 (30 dose) £264</td>
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<td></td>
</tr>
<tr>
<td>Fluticasone 92mcg /Vilanterol 22mcg</td>
<td>Relvar Ellipta</td>
<td>DPI Breath actuated</td>
<td>BROWN</td>
<td>£32.50 (30 dose) £390</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indacaterol 110mcg /Glycopyronium 50mcg</td>
<td>Ultibro Breezhaler and caps</td>
<td>DPI Breath actuated</td>
<td>GREEN 1st line</td>
<td>£32.50 (60 dose) £390</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formoterol 12mcg /aclidinium 340mcg</td>
<td>Duaklir Genuair</td>
<td>DPI Breath actuated</td>
<td>BROWN 2nd line</td>
<td>£32.50 (30 dose) £390</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vilanterol 22mcg /umeclidinium 55mcg</td>
<td>Anoro Ellipta</td>
<td>DPI Breath actuated</td>
<td>BROWN 2nd line</td>
<td>£32.50 (30 dose) £390</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Olopatadine 2.5mcg /tiotropium 2.5 mcg</td>
<td>Spiolto Respimat</td>
<td>Multi-dose solution for inhalation</td>
<td>BROWN 2nd line</td>
<td>£32.50 (60 dose) £390</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beclometasone 87mcg/ Formoterol 5mcg/ glycopyronium 9 mcg</td>
<td>Trimbow (Extrafine)</td>
<td>MDI</td>
<td>BROWN</td>
<td>£44.50 (120 dose) £534</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LABA/LAMA combination inhaler (choice after 1st line should be driven by patient choice and device acceptability)

<table>
<thead>
<tr>
<th>Combination</th>
<th>Brand/Model</th>
<th>Route of Administration</th>
<th>Line of Therapy</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beclometasone 87mcg/ Formoterol 5mcg/ glycopyronium 9 mcg</td>
<td>Trimbow (Extrafine)</td>
<td>MDI</td>
<td>BROWN</td>
<td>£44.50 (120 dose) £534</td>
</tr>
</tbody>
</table>

(All cost obtained from MIMs online April 2017, *prescribe these combinations by brand*).

* Soltel CFC-free Inhaler 25 micrograms contains soya lecithin and is contraindicated in patients who have peanut or soya allergies. If the patient has a soya and nut allergy then prescribe salmeterol by brand name – severe.