is not generally effective in exacerbations of chronic obstructive pulmonary disease. Theophylline may have an additive effect when used in conjunction with small doses of beta₂ agonists; the combination may increase the risk of side-effects, including hypokalaemia.

Theophylline is given by injection as aminophylline p. 237, a mixture of theophylline with ethylenediamine, which is 20 times more soluble than theophylline alone. Aminophylline injection is needed rarely for severe acute asthma.

**Compound bronchodilator preparations**

In general, patients are best treated with single-ingredient preparations, such as a selective beta₂ agonist or ipratropium bromide p. 217, so that the dose of each drug can be adjusted. This flexibility is lost with compound bronchodilator preparations. However, a combination product may be appropriate for patients stabilised on individual components in the same proportion.

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**Chronic obstructive pulmonary disease**

Smoking cessation reduces the progressive decline in lung function in chronic obstructive pulmonary disease (COPD, chronic bronchitis, or emphysema). Infection can complicate chronic obstructive pulmonary disease and may be prevented by vaccination (pneumococcal vaccine p. 1089 and influenza vaccine p. 1085).

A trial of a high-dose inhaled corticosteroid or an oral corticosteroid is recommended for patients with moderate or severe airflow obstruction if the diagnosis is in doubt.

Symptoms of chronic obstructive pulmonary disease may be alleviated by an inhaled short-acting beta₂ agonist or a short-acting antimuscarinic bronchodilator used as required.

When the airways obstruction is more severe, regular inhaled therapy should be used. It is important to check compliance and inhaler technique before initiating a new drug.

If the Forced Expiratory Volume in 1 second (FEV₁) is 50% of predicted or more, either a long-acting antimuscarinic bronchodilator or a long-acting beta₂ agonist should be used. Short-acting antimuscarinic bronchodilators should be discontinued when a long-acting antimuscarinic bronchodilator is started. A long-acting beta₂ agonist with a corticosteroid in a combination inhaler can be used for patients who remain symptomatic despite regular treatment with a long-acting beta₂ agonist.

If FEV₁ is less than 50% of predicted, either a long-acting antimuscarinic bronchodilator or a long-acting beta₂ agonist with a corticosteroid in a combination inhaler should be used.

In any patient who remains breathless or continues to have exacerbations, triple therapy with a long-acting beta₂ agonist and a corticosteroid in a combination inhaler plus a long-acting antimuscarinic bronchodilator should be used. If an inhaled corticosteroid is not appropriate, a long-acting antimuscarinic bronchodilator can be used with a long-acting beta₂ agonist (see Use of inhaled therapies in chronic obstructive pulmonary disease algorithm, p. 215).

If symptoms persist or if the patient is unable to use an inhaler, oral modified-release aminophylline p. 237 or theophylline p. 238 can be used.

Indacaterol p. 221 is a long-acting beta₂ agonist licensed for the maintenance treatment of chronic obstructive pulmonary disease.

In patients with severe chronic obstructive pulmonary disease associated with chronic bronchitis and a history of frequent exacerbations, roflumilast p. 236 is licensed as an adjunct to existing bronchodilator treatment.

A mucolytic drug may be considered for a patient with a chronic productive cough.

Long-term oxygen therapy prolongs survival in patients with severe chronic obstructive pulmonary disease and hypoxaemia.

During an exacerbation of chronic obstructive pulmonary disease, bronchodilator therapy can be administered through a nebuliser if necessary and oxygen given if appropriate. Aminophylline can be given intravenously if response to nebulised bronchodilators is poor. A short course of oral corticosteroid, such as prednisolone for 7–14 days, should be given if increased breathlessness interferes with daily activities. Antibacterial treatment is required if sputum becomes more purulent than usual, or if there are other signs of infection.

Patients who have had an episode of hypercapnic respiratory failure should be given a 24% or 28% Venturi mask and an oxygen alert card endorsed with the oxygen saturations required during previous exacerbations. Patients and their carers should be instructed to show the card to emergency healthcare providers in the event of an exacerbation.

**Oxygen alert card based on British Thoracic Society guideline for emergency oxygen use in adult patients (October 2008)**

<table>
<thead>
<tr>
<th>Oxygen alert card</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: ____________</td>
</tr>
<tr>
<td>I am at risk of type II respiratory failure with a reduced CO₂ level.</td>
</tr>
<tr>
<td>Please use my ___% Venturi mask to achieve an oxygen saturation of ____% to ____% during exacerbations.</td>
</tr>
<tr>
<td>Use compressed air to drive nebulisers (with nasal oxygen at 2 litres/minute). If compressed air not available, limit oxygen-driven nebulisers to 6 minutes.</td>
</tr>
</tbody>
</table>

Oxygen alert card is available at [www.brit-thoracic.org.uk](http://www.brit-thoracic.org.uk).

**Oxygen**

Oxygen should be regarded as a drug. It is prescribed for hypoxaemic patients to increase alveolar oxygen tension and decrease the work of breathing. The concentration of oxygen required depends on the condition being treated; the administration of an inappropriate concentration of oxygen can have serious or even fatal consequences.

Oxygen is probably the most common drug used in medical emergencies. It should be prescribed initially to achieve a normal or near-normal oxygen saturation; in most acutely ill patients with a normal or low arterial carbon dioxide (PₐCO₂), oxygen saturation should be 94–98% oxygen saturation. However, in some clinical situations such as cardiac arrest and carbon monoxide poisoning it is more appropriate to aim for the highest possible oxygen saturation until the patient is stable. A lower target of 88–92% oxygen saturation is indicated for patients at risk of hypercapnic respiratory failure.

High concentration oxygen therapy is safe in uncomplicated cases of conditions such as pneumonia, pulmonary thromboembolism, pulmonary fibrosis, shock, severe trauma, sepsis, or anaphylaxis. In such conditions low arterial oxygen (PₐO₂) is usually associated with low or
normal arterial carbon dioxide ($P_{aCO_2}$), and therefore there is little risk of hypoventilation and carbon dioxide retention.

In acute severe asthma, the arterial carbon dioxide ($P_{aCO_2}$) is usually subnormal but as asthma deteriorates it may rise steeply (particularly in children). These patients usually require high concentrations of oxygen and if the arterial carbon dioxide ($P_{aCO_2}$) remains high despite other treatment, intermittent positive-pressure ventilation needs to be considered urgently.

Low concentration oxygen therapy (controlled oxygen therapy) is reserved for patients at risk of hypercapnic respiratory failure, which is more likely in those with:
- chronic obstructive pulmonary disease;
- advanced cystic fibrosis;
- severe non-cystic fibrosis bronchiectasis;
- severe kyphoscoliosis or severe ankylosing spondylitis;
- severe lung scarring caused by tuberculosis;
- musculoskeletal disorders with respiratory weakness, especially if on home ventilation;
- an overdose of opioids, benzodiazepines, or other drugs causing respiratory depression.

Until blood gases can be measured, initial oxygen should be given using a controlled concentration of 28% or less, titrated towards a target oxygen saturation of 88–92%. The aim is to provide the patient with enough oxygen to achieve an acceptable arterial oxygen tension without worsening carbon dioxide retention and respiratory acidosis. Patients may carry an oxygen alert card.

Domiciliary oxygen
Oxygen should only be prescribed for use in the home after careful evaluation in hospital by respiratory experts. Patients should be advised of the risks of continuing to smoke when receiving oxygen therapy, including the risk of fire. Smoking cessation therapy should be recommended before home oxygen prescription.

Air travel
Some patients with arterial hypoxaemia require supplementary oxygen for air travel. The patient’s requirement should be discussed with the airline before travel.
Long-term oxygen therapy

Long-term administration of oxygen (usually at least 15 hours daily) prolongs survival in some patients with chronic obstructive pulmonary disease. Assessment for long-term oxygen therapy requires measurement of arterial blood gas tensions. Measurements should be taken on 2 occasions at least 3 weeks apart to demonstrate clinical stability, and not sooner than 4 weeks after an acute exacerbation of the disease. Long-term oxygen therapy should be considered for patients with:

- chronic obstructive pulmonary disease with \( P_{216aO_2} \leq 7.3 \text{ kPa} \) when breathing air during a period of clinical stability;
- chronic obstructive pulmonary disease with \( P_{216aO_2} \leq 7.3 \text{ kPa} \) in the presence of secondary polycythaemia, nocturnal hypoaxemia, peripheral oedema, or evidence of pulmonary hypertension;
- severe chronic asthma with \( P_{216aO_2} < 7.3 \text{ kPa} \) or persistent disabling breathlessness;
- interstitial lung disease with \( P_{216aO_2} < 8 \text{ kPa} \) and in patients with \( P_{216aO_2} > 8 \text{ kPa} \) with disabling dyspnoea;
- cystic fibrosis when \( P_{216aO_2} < 7.3 \text{ kPa} \) or if \( P_{216aO_2} > 7.3 \text{–} 8 \text{ kPa} \) in the presence of secondary polycythaemia, nocturnal hypoaxemia, pulmonary hypertension, or peripheral oedema;
- pulmonary hypertension, without parenchymal lung involvement when \( P_{216aO_2} < 8 \text{ kPa} \);
- neuromuscular or skeletal disorders, after specialist assessment;
- obstructive sleep apnoea despite continuous positive airways pressure therapy, after specialist assessment;
- pulmonary malignancy or other terminal disease with disabling dyspnoea;
- heart failure with daytime \( P_{216aO_2} < 7.3 \text{ kPa} \) when breathing air or with nocturnal hypoaxemia;
- paediatric respiratory disease, after specialist assessment.

Increased respiratory depression is seldom a problem in patients with stable respiratory failure treated with low concentrations of oxygen although it may occur during exacerbations; patients and relatives should be warned to call for medical help if drowsiness or confusion occur.

Short-burst oxygen therapy

Oxygen is occasionally prescribed for short-burst (intermittent) use for episodes of breathlessness not relieved by other treatment in patients with severe chronic obstructive pulmonary disease, interstitial lung disease, heart failure, and in palliative care. It is important, however, that the patient does not rely on oxygen instead of obtaining medical help or taking more specific treatment.

Short-burst oxygen therapy can be used to improve exercise capacity and recovery; it should only be continued if there is proven improvement in breathlessness or exercise tolerance.

Ambulatory oxygen therapy

Ambulatory oxygen is prescribed for patients on long-term oxygen therapy who need to be away from home on a regular basis. Patients who are not on long-term oxygen therapy can be considered for ambulatory oxygen therapy if there is evidence of exercise-induced oxygen desaturation and of improvement in blood oxygen saturation and exercise capacity with oxygen. Ambulatory oxygen therapy is not recommended for patients with heart failure or those who smoke.

Oxygen therapy equipment

Under the NHS oxygen may be supplied as oxygen cylinders. Oxygen flow can be adjusted as the cylinders are equipped with an oxygen flow meter with ‘medium’ (2 litres/minute) and ‘high’ (4 litres/minute) settings.

Oxygen delivered from a cylinder should be passed through a humidifier if used for long periods.

Oxygen concentrators are more economical for patients who require oxygen for long periods, and in England and Wales can be ordered on the NHS on a regional tendering basis. A concentrator is recommended for a patient who requires oxygen for more than 8 hours a day (or 21 cylinders per month). Exceptionally, if a higher concentration of oxygen is required the output of 2 oxygen concentrators can be combined using a ‘Y’ connection.

A nasal cannula is usually preferred for long-term oxygen therapy from an oxygen concentrator. It can, however, produce dermatitis and mucosal drying in sensitive individuals.

Giving oxygen by nasal cannula allows the patient to talk, eat, and drink, but the concentration of oxygen is not controlled; this may not be appropriate for acute respiratory failure. When oxygen is given through a nasal cannula at a rate of 1–2 litres/minute the inspiratory oxygen concentration is usually low, but it varies with ventilation and can be high if the patient is underventilating.

Arrangements for supplying oxygen

The following oxygen services may be ordered in England and Wales:

- emergency oxygen;
- short-burst (intermittent) oxygen therapy;
- long-term oxygen therapy;
- ambulatory oxygen.

The type of oxygen service (or combination of services) should be ordered on a Home Oxygen Order Form (HOOF); the amount of oxygen required (hours per day) and flow rate should be specified. The clinician will determine the appropriate equipment to be provided. Special needs or preferences should be specified on the HOOF.

The clinician should obtain the patient or carer’s consent, to pass on the patient’s details to the supplier, the fire brigade, and other relevant organisations. The supplier will contact the patient to make arrangements for delivery, installation, and maintenance of the equipment. The supplier will also train the patient or carer to use the equipment.

The clinician should send the HOOF to the supplier who will continue to provide the service until a revised HOOF is received, or until notified that the patient no longer requires the home oxygen service.

- East of England, North East: BOC Medical:
  - Tel: 0800 136 603 Fax: 0800 169 9989
- South West: Air Liquide:
  - Tel: 0808 202 2229 Fax: 0191 497 4340
- London, East Midlands, North West: Air Liquide:
  - Tel: 0500 823 773 Fax: 0800 781 4610
- Yorkshire and Humberside, West Midlands, Wales: Air Products:
  - Tel: 0800 373 580 Fax: 0800 214 709
- South East Coast, South Central: Dolby Vivisol:
  - Tel: 08443 814 402 Fax: 0800 781 4610

In Scotland refer the patient for assessment by a respiratory consultant. If the need for a concentrator is confirmed the consultant will arrange for the provision of a concentrator through the Common Services Agency. In Northern Ireland oxygen concentrators and cylinders should be prescribed on form HS21; oxygen concentrators are supplied by a local contractor. In Scotland and Northern Ireland prescriptions for oxygen cylinders and accessories can be dispensed by pharmacists contracted to provide domiciliary oxygen services.
Antimuscarinics (inhaled)

**CAUTIONS** Bladder outflow obstruction • prostatic hyperplasia • susceptibility to angle-closure glaucoma

**INTERACTIONS** See Appendix 1 (antimuscarinics).

However, note that interactions do not generally apply to antimuscarinics used by inhalation.

**SIDE-EFFECTS**

- **Common or very common** Constipation • cough • diarrhoea • dry mouth • gastro-intestinal motility disorder • headache

- **Uncommon** Angle-closure glaucoma • atrial fibrillation • blurred vision • bronchospasm • dysphagia • dysphonia • gastro-oesophageal reflux disease • mydriasis • nasopharyngitis • nausea • palpitation • paradoxical bronchospasm • pharyngitis • tachycardia • throat irritation • urinary retention

- **Rare** Dental caries • dry skin

**INDICATIONS AND DOSE**

Maintenance treatment of chronic obstructive pulmonary disease

**BY INHALATION OF POWDER**

- **Adult:** 375 micrograms twice daily

**Dose equivalence and conversion**

Each 375 microgram inhalation of aclidinium bromide delivers 322 micrograms of aclidinium.

**CAUTIONS** Hospitalisation with moderate or severe heart failure within last 12 months • myocardial infarction within last 6 months • newly diagnosed arrhythmia within last 3 months • unstable angina

**SIDE-EFFECTS** Sinusitis

**PREGNANCY** Manufacturer advises use only if potential benefit outweighs risk.

**BREAST FEEDING** Manufacturer advises avoid.

**PATIENT AND CARER ADVICE** Patients or carers should be given advice on how to administer aclidinium bromide powder inhalation.

**MEDICINAL FORMS**

There can be variation in the licensing of different medicines containing the same drug.

**Inhalation powder**

- **Eklira** (AstraZeneca UK Ltd)

  Aclidinium bromide 375 microgram per 1 dose Eklira

  322micrograms/dose Genusair | 60 dose pack £28.60

**Glycopyrronium bromide** (Glycopyrrolate)

**INDICATIONS AND DOSE**

Maintenance treatment of chronic obstructive pulmonary disease

**BY INHALATION OF POWDER**

- **Adult:** 50 micrograms once daily

**Dose equivalence and conversion**

For inhalation of powder, each 50 microgram capsule of glycopyrronium delivers 44 micrograms of glycopyrronium.

**CAUTIONS**

- **Arrhythmia** (excluding chronic stable atrial fibrillation) • history of myocardial infarction • history of QT-interval prolongation • left ventricular failure • unstable ischaemic heart disease

**PREGNANCY** Manufacturer advises use only if potential benefit outweighs risk.

**BREAST FEEDING** Manufacturer advises use only if potential benefit outweighs risk.

**RENAI IMPAIRMENT** Use with caution if eGFR less than 30 mL/minute/1.73 m².

**PATIENT AND CARER ADVICE** Patients or carers should be given advice on how to administer glycopyrronium for inhalation.

**MEDICINAL FORMS**

There can be variation in the licensing of different medicines containing the same drug.

**Inhalation powder**

- **Seebri Breezhaler** (Novartis Pharmaceuticals UK Ltd)

  Glycopyrronium bromide 55 microgram Seebri Breezhaler

  44microgram inhalation powder capsules with device | 6 capsule pack £5.50 | 30 capsule pack £27.50

**IPRATROPNIUM BROMIDE**

**INDICATIONS AND DOSE**

Reversible airways obstruction

**BY INHALATION OF AEROSOL**

- **Child 1 month–5 years:** 20 micrograms 3 times a day

- **Child 6–11 years:** 20–40 micrograms 3 times a day

- **Child 12–17 years:** 20–40 micrograms 3–4 times a day

Reversible airways obstruction, particularly in chronic obstructive pulmonary disease

**BY INHALATION OF AEROSOL**

- **Adult:** 20–40 micrograms 3–4 times a day

**Acute bronchospasm**

**BY INHALATION OF NEBULISED SOLUTION**

- **Child 1 month–4 years:** 125–250 micrograms as required; maximum 1 mg per day

- **Child 6–11 years:** 250 micrograms as required; maximum 1 mg per day

- **Child 12–17 years:** 500 micrograms as required

- **Adult:** 500 micrograms as required

**Severe or life-threatening acute asthma**

**BY INHALATION OF NEBULISED SOLUTION**

- **Child 1 month–11 years:** 250 micrograms every 20–30 minutes for the first 2 hours, then 250 micrograms every 4–6 hours as required

- **Child 12–17 years:** 500 micrograms every 4–6 hours as required

- **Adult:** 500 micrograms every 4–6 hours as required

**PHARMACOKINETICS**

The maximal effect of inhaled ipratropium occurs 30–60 minutes after use; its duration of action is 3 to 6 hours and bronchodilation can usually be maintained with treatment 3 times a day.

**CAUTIONS**

- **Cystic fibrosis**

**CAUTIONS, FURTHER INFORMATION**

Glaucoma **Acute angle-closure glaucoma** has been reported with nebulised ipratropium, particularly when given with nebulised salbutamol (and possibly other beta, agonists); care needed to protect the patient’s eyes from nebulised drug or from drug powder.

**SIDE-EFFECTS**

- **Common or very common** Dizziness • nausea (in children)

- **Uncommon** Laryngospasm • pharyngeal oedema (in children) • pruritus • stomatitis • vomiting

- **Rare** Atrial fibrillation (in children) • ocular accommodation disorder (in children)
Inhaled drugs for asthma can be taken as normal during pregnancy.

BREAST FEEDING
Inhaled drugs for asthma can be taken as normal during breast-feeding.

DIRECTIONS FOR ADMINISTRATION
If dilution of ipratropium bromide nebuliser solution is necessary use only sterile sodium chloride 0.9%.

PATIENT AND CARER ADVICE
Advise patient not to exceed prescriber dose and to follow manufacturer’s directions.

MEDICINAL FORMS
There can be variation in the licensing of different medicines containing the same drug.

Pressurised inhalation

- **IPRATROPIUM BROMIDE (Non-proprietary)**
  - Ipratropium bromide 20 microgram per 1 dose
  - Ipratropium bromide 200 micrograms/dose inhaler CFC free | 200 dose (POM) £5.56 DT price = £4.56
  - Atrovent (Boehringer Ingelheim Ltd)
  - Ipratropium bromide 20 microgram per 1 dose
  - Atrovent 20 micrograms/dose inhaler CFC free | 200 dose (POM) £5.56 DT price = £4.56

Nebuliser liquid

- **IPRATROPIUM BROMIDE (Non-proprietary)**
  - Ipratropium bromide 250 microgram per 1 ml
  - Ipratropium bromide 250 micrograms/1ml nebuliser liquid Steri-Neb unit dose vials | 20 unit dose (POM) £14.99 DT price = £4.39
  - Ipratropium bromide 500 micrograms/2ml nebuliser liquid Steri-Neb unit dose vials | 20 unit dose (POM) £19.59 DT price = £4.39
  - Ipratropium bromide 500 micrograms/2ml nebuliser liquid unit dose vials | 20 unit dose (POM) £6.00 DT price = £5.23
  - Atrovent UDV (Boehringer Ingelheim Ltd)
  - Ipratropium bromide 250 microgram per 1 ml
  - Atrovent 500 micrograms/2ml nebuliser liquid UDVs | 20 unit dose (POM) £4.67 DT price = £5.23 | 60 unit dose (POM) £14.59
  - Atrovent 250 micrograms/1ml nebuliser liquid UDVs | 20 unit dose (POM) £4.14 DT price = £4.39 | 60 unit dose (POM) £12.44
  - Brands may include Respontin

### Ipratropium with salbutamol

The properties listed below are those particular to the combination only. For the properties of the components please consider, salbutamol p. 222, ipratropium bromide p. 217.

INDICATIONS AND DOSE

Bronchospasm in chronic obstructive pulmonary disease
BY INHALATION OF NEBULISED SOLUTION
- Adult: 0.5/2.5 mg 3–4 times a day

PRESCRIBING AND DISPENSING INFORMATION
A mixture of ipratropium bromide and salbutamol (as sulphate); the proportions are expressed in the form x/y where x and y are the strengths in milligrams of ipratropium and salbutamol respectively.

LESS SUITABLE FOR PRESCRIBING
Ipratropium bromide with salbutamol nebuliser solution is considered less suitable for prescribing.

MEDICINAL FORMS
There can be variation in the licensing of different medicines containing the same drug.

Nebuliser liquid

- **IPRATROPIUM WITH SALBUTAMOL (Non-proprietary)**
  - Ipratropium bromide 200 microgram per 1 ml, Salbutamol (as Salbutamol sulfate) 1 mg per 1 ml
  - Ipratropium bromide 250 micrograms/2.5ml nebuliser liquid unit dose vials | 60 unit dose (POM) no price available

### Tiotropium

**INDICATIONS AND DOSE**

Maintenance treatment of chronic obstructive pulmonary disease
BY INHALATION OF POWDER
- Adult: 18 micrograms once daily

**SPIRIVA RESPIMAT®**

Maintenance treatment of chronic obstructive pulmonary disease | Adjunct to inhaled corticosteroids and long-acting beta, agonists for the maintenance treatment of patients with asthma who have suffered one or more severe exacerbations in the last year
BY INHALATION OF AEROSOL
- Adult: 5 micrograms once daily

CAUTIONS
Cardiac arrhythmia requiring intervention in the previous 12 months - hospitalisation for moderate to severe heart failure in the previous 12 months - life-threatening cardiac arrhythmia - myocardial infarction in the previous 6 months - unstable cardiac arrhythmia.

SIDE-EFFECTS
- Common or very common
  - Dizziness - epistaxis - oropharyngeal candidiasis - pruritus - taste disturbance
- Rare
  - Gingivitis - glossitis - insomnia - intestinal obstruction - paralytic ileus - sinusitis - stomatitis
- Frequency not known
  - Dehydration - joint swelling

PREGNANCY
Manufacturer advises use only if potential benefit outweighs risk.

BREAST FEEDING
Manufacturer advises avoid—no information available.

RENAL IMPAIRMENT
Plasma-tiotropium concentration raised. Manufacturer advises use only if potential benefit outweighs risk if eGFR less than 50 mL/ minute/1.73 m².

PATIENT AND CARER ADVICE
Counselling. Advise patients to report any worsening of cardiac symptoms during treatment. Patients or carers should be given advice on how to administer tiotropium powder inhalation and pressurised inhalation.

NATIONAL FUNDING/ACCESS DECISIONS

Scottish Medicines Consortium (SMC) Decisions
The Scottish Medicines Consortium has advised (November 2007) that Spiriva Respimat® is restricted for use in chronic obstructive pulmonary disease in patients who have poor manual dexterity and difficulty using the Handihaler® device.

MEDICINAL FORMS
There can be variation in the licensing of different medicines containing the same drug.

Pressurised inhalation

- **TIOTROPIUM (Non-proprietary)**
  - Tiotropium (as Tiotropium bromide) 2.5 microgram per 1 dose
  - Tiotropium bromide 2.5 micrograms/dose solution for inhalation with device CFC free | 60 dose (POM) no price available DT price = £33.50
  - Spiriva Respimat® (Boehringer Ingelheim Ltd)
  - Tiotropium (as Tiotropium bromide) 2.5 microgram per 1 dose
  - Spiriva Respimat 2.5 micrograms/dose solution for inhalation with device | 60 dose (POM) £33.50 DT price = £33.50

Sample pages from BNF 70, copyright © BMJ Group and the Royal Pharmaceutical Society of Great Britain 2015
**Inhalation powder**

- Spiriva (Boehringer Ingelheim Ltd)
  - Tiotropium (as Tiotropium bromide) 18 microgram Spiriva 18microgram inhalation powder capsules | 30 capsule (PoM) £33.50 DT price = £33.50
  - Spiriva 18microgram inhalation powder capsules with HandiHaler | 30 capsule (PoM) £34.87 DT price = £34.87

**Umeclidinium**

**INDICATIONS AND DOSE**

Maintenance treatment of chronic obstructive pulmonary disease

**BY INHALATION OF POWDER**

- Adult: 55 micrograms once daily

**Dose equivalence and conversion**

Each 65 microgram inhalation of umeclidinium bromide delivers 55 micrograms of umeclidinium.

- **CAUTIONS**
  - Cardiac disorders (particularly cardiac rhythm disorders)

- **SIDE-EFFECTS**
  - Uncommon: Arrhythmias • rash • sinusitis • urinary tract infection
  - PREGNANCY: Manufacturer advises use only if potential benefit outweighs risk.
  - BREAST FEEDING: Manufacturer advises avoid—no information available.
  - HEPATIC IMPAIRMENT: Use with caution in severe impairment.
  - PATIENT AND CARER ADVICE: Patient or carers should be given advice on how to administer umeclidinium inhalation powder.

**MEDICINAL FORMS**

There can be variation in the licensing of different medicines containing the same drug.

**Inhalation powder**

- Anoro Ellipta (GlaxoSmithKline UK Ltd)
  - Umeclidinium bromide 65 microgram per 1 dose, Vilanterol (as Vilanterol trifenatate) 62 microgram per 1 dose Anoro Ellipta 55micrograms/dose / 22micrograms/dose dry powder inhaler | 30 dose (PoM) £27.50

**Betaxolol with vilanterol**

The properties listed below are those particular to the combination only. For the properties of the components please consider, umeclidinium above.

**INDICATIONS AND DOSE**

Maintenance treatment of chronic obstructive pulmonary disease

**BY INHALATION OF POWDER**

- Adult: 1 inhalation once daily

- **CAUTIONS**
  - Arrhythmias • bladder outflow obstruction • cardiac disorders • convulsive disorders • diabetes—monitor blood glucose (risk of ketoacidosis) • hypertension • hyperthyroidism • hypokalaemia • prostatic hyperplasia • severe cardiovascular disease • severe hepatic impairment • susceptibility to angle-closure glaucoma • susceptibility to QT-interval prolongation

- **INTERACTIONS**
  - Appendix 1 (sympathomimetics, beta2). However, note that interactions do not generally apply to antimuscarinics used by inhalation.

- **SIDE-EFFECTS**
  - Common or very common: Constipation • cough • dry mouth • headache • nasopharyngitis • oropharyngeal pain • pharyngitis • sinusitis • upper respiratory tract infection • urinary tract infection

- **Uncommon**
  - Atrial fibrillation • rash • rhythm idioventricular • supraventricular extrasystoles • supraventricular tachycardia • tachycardia

- **Frequency not known**
  - Angle-closure glaucoma • arrhythmias • fine tremor (particularly in the hands) • hyperglycaemia • hypokalaemia (when in high doses) • paradoxical bronchospasm • urinary retention

**SIDE-EFFECTS, FURTHER INFORMATION**

**Hypokalaemia** Potentially serious hypokalaemia may result from beta2 agonist therapy.

- **PREGNANCY**
  - Manufacturer advises use only if potential benefit outweighs risk.

- **BREAST FEEDING**
  - Manufacturer advises avoid—no information available.

- **PATIENT AND CARER ADVICE**
  - Patient or carers should be given advice on how to administer umeclidinium with vilanterol dry powder inhaler.

**Selective beta2 agonists**

- **CONTRA-INDICATIONS**
  - Severe pre-eclampsia

- **CAUTIONS**
  - Arrhythmias • cardiovascular disease • diabetes (risk of hyperglycaemia and ketoacidosis, especially with intravenous use) • hypertension • hyperthyroidism • hypokalaemia • susceptibility to QT-interval prolongation

**CAUTIONS, FURTHER INFORMATION**

**Hypokalaemia** Potentially serious hypokalaemia may result from beta2 agonist therapy. Particular caution is required in severe asthma, because this effect may be potentiated by concomitant treatment with theophylline and its derivatives, corticosteroids, diuretics, and by hypoxia.

- **INTERACTIONS**
  - Appendix 1 (sympathomimetics, beta2). Hypokalaemia may be potentiated by concomitant treatment with theophylline and its derivatives, corticosteroids, and diuretics.

- **SIDE-EFFECTS**
  - Angioedema • arhythmias • behavioural disturbances • collapse • fine tremor (particularly in the hands) • headache • hyperglycaemia (especially when given intravenously) • hypokalaemia (with high doses) • hypotension • ketoacidosis (especially when given intravenously) • muscle cramps • myocardial ischaemia • nervous tension • palpitation • paradoxical bronchospasm (occasionally severe) • peripheral vasodilation • rash • sleep disturbances • tachycardia • urticaria

- **PREGNANCY**
  - Women planning to become pregnant should be counselled about the importance of taking their asthma medication regularly to maintain good control.

- **MONITORING REQUIREMENTS**
  - In severe asthma, plasma-potassium concentration should be monitored (risk of hypokalaemia).
  - In patients with diabetes, monitor blood glucose (risk of hyperglycaemia and ketoacidosis, especially when beta2 agonist given intravenously).

- **PATIENT AND CARER ADVICE**
  - When used by inhalation The dose, the frequency, and the maximum number of inhalations in 24 hours of the beta2