CHAPTER 3 RESPIRATORY SYSTEM

Approved by East Sussex Health Economy Medicines Committee

First line drugs – drugs recommended in both primary and secondary care	**Second line drugs** – alternatives (often in specific conditions) in both primary and secondary care	**Specialist drugs** – Drugs where specialist input is needed (see introduction for definition	**Specialist only drugs** – prescribing within specialist service only.

For further information please refer to: -

- **British Thoracic Society**
  - Guidelines on Asthma Management
  - Guidelines for the Management of COPD

Date	Revision	Contributor
03/13	3.2 (drug addition)	A Luck
05/13	3.4.2 (NICE guidance), 3.7 (minor amendment)	G Ells
07/13	3.11 (NICE guidance)	G Ells
09/14	3.1, 3.2 (drug addition)	G Ells
07/15	3.4.3 (addition and deletion), (NICE guidance)	G Ells
09/15	3.4 (NICE guidance)	G Ells
04/16	3.1 (Drug addition), Appendix 2; 3.11 (NICE guidance)	G Ells

Inhaler Devices:

	Short acting bronchodilator	Long acting bronchodilator	Corticosteroid	Combination
Metered Dose Inhaler (MDI)			Beclometasone (Beclazone®)	
CFC free MDI	Salbutamol	Salmeterol	Beclometasone (CLENIL MODULITE® QVAR®) Fluticasone	Seretide®
Easibreathe®	Salbutamol		Beclometasone	
Autohaler®	Airomir®		QVAR®	
Turbohaler®	Terbutaline	Formoterol	Budesonide	Symbicort®
Accuhaler®	Salbutamol	Salmeterol	Fluticasone	Seretide®
Easyhaler®	Salbutamol	Formoterol	Beclometasone Budesonide	
Respimat®		Olodaterol		
Ellipta®				Relvar® Anoro®

Notes:

1. **MDIs** remain the inhalation device of first choice. Many patients can be taught to use these effectively.
2. **Beclometasone CFC-free** inhalers are not of equal potency and should be prescribed by brand name – they are NOT interchangeable (see Section 3.2)
3. Adding a **spacer** improves deposition leading to reduced absorption of steroids from the mouth and gastrointestinal tract. A spacer should always be prescribed for children and for adults requiring medium to high doses of steroids. Breath-actuated and dry powder devices are less suitable for young children. **MDI + spacer** are the devices of choice for children under 5 years.
4. Where a spacer device is used, the patient should receive both bronchodilator and steroid products that have been tested with that device**.** It is important to prescribe a spacer device which is compatible with the MDI.
5. Where a patient cannot use or where compliance is poor with a MDI + spacer, the patient should try a variety of devices and the one they like best and have shown they can use effectively should be prescribed.
6. Coughing may occur with dry powder devices.
7. **Accuhalers** are designed to be used as **one** puff each time but are sometimes inadvertently used as two puffs

NICE guidance (inhaler devices for children with chronic asthma) Reviewed August 2005

The child's needs, ability to develop and maintain effective technique, and likelihood of good compliance should govern the choice of inhaler and spacer device; only then should cost be considered.

For children aged under 5 years:

- Corticosteroid and bronchodilator therapy should be routinely delivered by pressurised metered-dose inhaler and spacer device, with a facemask if necessary.
- If this is not effective and depending on the child's condition, nebulised therapy may be considered and, in children over 3 years, a dry powder inhaler may also be considered. This should be done under specialist supervision. Nebulised therapy is rarely necessary if good inhaler technique advice is given.

For children aged 5-15 years:

- Corticosteroid therapy should routinely be delivered by a pressurised metered-dose inhaler and spacer device.
- Children and their carers should be trained in the use of the chosen device; suitability of the device should be reviewed at least annually. Inhaler technique and compliance should be monitored.

Nebulised Therapy

1. Nebulisers have not been shown to be superior to MDI + spacer for delivery of steroids for chronic asthma. For patients with COPD, the same applies to the delivery of bronchodilators. All patients in primary care who are considered for nebulised therapy should be reviewed by a consultant respiratory physician or specialist respiratory nurse.
2. All patients receiving nebulised therapy should be reviewed regularly by an appropriately trained clinician to ensure they are receiving optimal therapy.
3. **Children** requiring long-term nebulised therapy should be under the care of a consultant paediatrician.
4. The provision of a home nebuliser for the management of acute asthmatic attacks is generally not recommended in children.

5. **The use of a nebuliser in acute asthmatic attacks in children under 2 years of age may result in a marked deterioration.** Large volume spacers are preferable to nebulisers, where available. If it is felt appropriate to use a nebuliser in primary care, please be cautious.
6. See BNF for further details

3.1 Bronchodilators

3.1.1 Adrenoceptor agonists

3.1.1.1 Selective beta$_2$ agonists

Short acting agents:

Salbutamol
- CFC-free MDI 100 micrograms / dose
- Easibreathe® 100 micrograms / dose
- Accuhaler® 200 micrograms / dose
- Salbutamol® nebuliser solution 1 mg / ml, 2 mg / ml
- Oral solution 2 mg /5 ml (see below)
- Tablets 4 mg (see below)
- Injection 250 micrograms / 5ml, 500 micrograms / 1 ml
- Solution for i.v. infusion 5 mg in 5 ml

Terbutaline
- Turbohaler® 500 micrograms / dose
- Syrup 1.5mg in 5ml
- Injection 500 micrograms in 1 ml, 2.5 mg in 5 ml

Long acting agents:

Salmeterol	Serevent® MDI 25 micrograms / dose Serevent® Accuhaler® 50 micrograms / dose	*Licensed 4 years +*
Formoterol	Dry powder for inhalation 12 micrograms /dose (Easyhaler®) Oxis ® Turbohaler® 6 micrograms / metered inhalation, 12 micrograms / metered inhalation	*Licensed 6 years +*
Olodaterol	Striverdi® Respimat® solution for inhalation 2.5mcg	*Licensed for COPD only*
Umeclidinium/ vilanterol	Anoro® Ellipta® 55/22 dry powder device	*Licensed for COPD only*

Notes:
1. To ensure patients receive the same device each time, prescribing by brand is recommended.
2. Asthma management: **long acting agents should only be given in conjunction with an inhaled steroid.**
3. CFC-free inhalers are more prone to **'blockage'** because of the different solvent (HFA). Therefore it is important patients clean the devices properly as directed in the patient information leaflet.
4. **CSM Warning:** potentially serious hypokalaemia may result from beta$_2$ agonist therapy. Caution is required in severe asthma because the effect may be potentiated by concomitant treatment with theophylline, its derivatives, corticosteroids, diuretics, and hypoxia. Plasma potassium concentration should be monitored in severe asthma.
5. Long acting agents such as **formoterol** and **salmeterol** are recommended as an alternative to high dose inhaled steroids at step 3 for adults and school children. They should be discontinued if no demonstrable evidence of benefit.
6. **Oral salbutamol** should only be used in Step 4 of the management of asthma in adults (tablets) or in children unable to use any form of inhalation device, including paediatric spacer with facemask (oral solution). The tablets can also be used to inhibit premature birth.
7. In primary care, because the term 'nebules' is a brand name, if salbutamol nebules are prescribed, the brand Ventolin® has to be dispensed. Therefore prescribe as salbutamol nebuliser solution.
8. A mouthpiece rather than a face mask should be used when nebulising salbutamol in patients with glaucoma as topical salbutamol may worsen glaucoma.
9. **Severe acute asthma**: in secondary care, for patients with an inadequate response to initial therapy with oxygen, nebulised therapy and hydrocortisone, magnesium sulphate 2g i.v. should be available.
10. For COPD patients, quality of life is more important than lung function. A trial of bronchodilator for 4 weeks should be tried and symptoms assessed. If symptom improvement results, continue on bronchodilator therapy. If not see appendix 2.

3.1.2 Antimuscarinic bronchodilators

Ipratropium bromide	♦ Inhaler 20 micrograms / dose ♦ Nebuliser solution 250 micrograms in 1 ml, 500 micrograms in 2 ml
Tiotropium	♦ Spiriva ® Inhalation powder, hard capsule for use with Handihaler® device, 18 micrograms ♦ Respimat® solution for inhalation 2.5mcg per metered inhalation
Aclidinium	♦ Eklira® Genuair® dry powder device 400mcg

Notes:

1. **Ipratropium** can provide short-term relief in chronic asthma, but it is not licensed for use in asthma. Short acting beta$_2$ agonists act more quickly and are preferred.
2. A mouthpiece rather than a facemask should be used when nebulising ipratropium in patients with glaucoma as topical ipratropium may worsen glaucoma.
3. Tiotropium has been included as an option in the management of COPD (see Appendix 2). It is an alternative to either formoterol or salmeterol. There is no evidence that Tiotropium is significantly superior to salmeterol.
4. There is little experience of using a long acting anticholinergic with a long acting beta$_2$ agonist.

3.1.3 Theophylline

Uniphyllin Continus®	♦ Modified release tablets 200 mg, 300 mg, 400 mg	
Phyllocontin Continus®	♦ Modified release tablets 225mg, 350mg	*Contains aminophylline*
Slo-phyllin®	♦ Modified release capsules 60 mg, 125 mg, 250 mg	
Theophylline	♦ Syrup 60 mg in 5ml	

Theophylline (Uniphyllin®) Regime

1. Theophylline is seldom used, but may be used for very severe asthma and COPD.
2. Initiate therapy on a low dose and increase slowly if there is no therapeutic response.
3. Theophylline has a narrow margin between therapeutic and toxic dose and must be monitored closely with frequent blood tests. Vomiting, agitation, tachycardia, arrthymias, and convulsions may indicate a toxic dose.
4. Blood sample to be taken pre-oral dose. Target range (aminophylline) is 56 -111 micromol/ml (10 – 20 mg /litre)
5. If there is any doubt please contact the Respiratory Consultant at ESHT.
6. Aminophylline is a mixture of theophylline and ethylenediamine which has greater water solubility than theophylline alone. It confers no benefit over theophylline when in tablet form.

Notes:

1. **Interactions:** The half-life is *increased* (giving higher theophylline levels) in heart failure, cirrhosis, and viral infections, in the elderly and by drugs such as cimetidine, ciprofloxacin, erythromycin, fluvoxamine, diltiazem, verapamil and oral contraceptives. The half-life is *decreased* (giving lower theophylline levels) in smokers, and in chronic alcoholism, and by drugs such as phenytoin, carbamazepine, rifampicin and barbiturates.
2. Slo-phyllin® is only included for children as the capsules can be opened and the granules sprinkled on soft food prior to administration. However it is very rare that children should require theophylline.
3. Prescribers should not interchange brands of theophylline or aminophylline due to the differences in bioavailabilty.

3.1.4 Compound bronchodilator preparations

Note:

The BNF suggests most compound bronchodilator preparations have no place in the management of patients with airways obstruction and denotes Combivent® as a preparation **"considered to be less suitable for prescribing".**

3.1.5 Peak flow meters, inhaler devices and nebulisers

Peak flow meter	♦ Mini-Wright® (Clement Clarke) standard (60-800 litres / minute) ♦ Mini-Wright® (Clement Clarke) low range (30-400 litres / minute)

Notes:

1. Readings from new peak flow meters are often lower than those obtained from old Wright-scale peak flow meters. The correct chart should be used. Information available on the British Thoracic Society website.
2. Patients must be given clear guidelines as to the action they should take if their peak flow falls below a certain level.

Spacers

- As per inhalation device

Guide to Spacer devices prescribable on NHS:

Spacer Device	Volume	Compatible MDI	Masks available
Volumatic®	Large	**Clenil Modulite®; Ventolin®; Serevent®; Fluticasone; Seretide®;**	Paediatric
Aerochamber Plus®	Medium	**Airomir®; Salbulin®; Qvar® Atrovent®**	Infant, child or standard

Notes:
1. The Aerochamber Plus® standard with mask cannot be used without the mask. Please prescribe standard device with mouthpiece if the mask is not required.
2. The manufacturer of Atrovent® advises the use of Aerochamber Plus® with the Atrovent® MDI.
3. Devices should be cleaned once a month by washing in mild detergent, rinsed and then air-dried.
4. Plastic spacer devices should be replaced every 6 to 12 months.

3.2 Corticosteroids

The lowest possible dose should be prescribed to maintain therapeutic effect.
The total daily dose of inhaled corticosteroids (Step 2 BTS guidelines) should not be increased above:
Children: **400 microgram** beclometasone or budesonide; **200 microgram** fluticasone
Adults: **800 microgram** beclometasone or budesonide; **400 microgram** fluticasone or Qvar®

For all patients on high dose inhaled corticosteroids, review their treatment with an intention to ***step down*** treatment in view of new BTS guidelines.

Inhaled corticosteroids and adrenal suppression in children (Current Problems in Pharmacovigilance, vol. 28, Oct 2002.)
1. Prescribers are reminded that the presenting symptoms of **adrenal suppression and crisis** are non-specific and include anorexia, abdominal pain, weight loss, tiredness, headache, nausea, vomiting, decreased level of consciousness, hypoglycaemia and seizures.
2. Situations that may potentially **trigger acute adrenal crisis** include infection, trauma, surgery or any rapid reduction in dosage.
3. Adrenal suppression is a dose-related class effect of all inhaled corticosteroids.
4. Adrenal crisis has been observed **more frequently** following the use of **fluticasone**, possibly because higher than licensed doses of fluticasone are prescribed more widely than other inhaled corticosteroids.
5. All inhaled corticosteroids are associated with an increased risk of adrenal crisis when used at higher than licensed doses but prescribers are reminded that **fluticasone** should normally be used at **half** the dose of beclometasone (except Qvar®) or budesonide because of it's greater potency.
6. It is important to review therapy regularly and **titrate down** to the lowest dose at which effective control of asthma is maintained.
7. If a doctor considers that a child's asthma is not controlled on the maximum licensed dose of their inhaled corticosteroid, despite the addition of other therapies, the child should be referred to a specialist in the management of paediatric asthma.

Beclometasone

- Clenil Modulite® MDI 50, 100, 200, 250 micrograms / dose (CFC-free)
- Qvar® 50, 100, 200 microgram / dose (CFC-free)
- Qvar Easibreathe® 50, 100 micrograms / dose

Budesonide

- Dry powder for inhalation 100, 200, 400 micrograms per dose (Easyhaler®)
- Turbohaler® 100 micrograms / dose, 200 micrograms / dose, 400 micrograms / dose

Fluticasone

- CFC free inhaler 50, 125, 250 micrograms / dose
- Accuhaler® 50, 100, 250, 500 micrograms / dose

Notes:
1. **CSM Warning**: Due to the risk of systemic effects, doses above 500 micrograms **fluticasone** twice daily should be prescribed only for patients with severe asthma where additional clinical benefit is expected and is demonstrated by either an improvement in pulmonary function and/or in symptom control, or by the ability to reduce oral corticosteroid therapy. A specialist in the management of asthma should initiate such doses.
2. There is no proved therapeutic benefit in using more potent and expensive drugs such as fluticasone propionate than older and cheaper drugs such as beclometasone diproprionate for patients who have mild to moderate

asthma. The therapeutic index for inhaled corticosteroids can be optimised by tapering the dose until the lowest effective maintenance dose is achieved and by using a metered dose inhaler with a spacer device. (Lipworth BJ. **Modern drug treatment of chronic asthma**. BMJ 1999; 318: 380-384)

3. Refer to the COPD guidelines (Appendix 2) for information regarding the use of corticosteroids in COPD.
4. **Nebulised corticosteroids should only be used long-term after referral to a respiratory physician.**
5. Ciclesonide may be considered for those patients who have tried the formulary choices but have suffered intolerable topical or laryngeal side effects.

CFC-free beclometasone inhalers

1. Beclometasone is the inhaled corticosteroid of first choice
2. Two CFC-free MDIs, Clenil Modulite®, and Qvar® are available.
3. The MHRA has highlighted it is vitally important that prescribers are aware the two CFC-free products are **not equipotent**.
4. In addition, Qvar® and the original CFC-containing formulations of beclometasone are not equipotent. This could have safety implications.
5. When initiating patients on inhaled corticosteroid therapy prescribe a CFC-free beclometasone device since CFC-containing products are likely to be gradually phased out.
6. Ensure products are **prescribed by brand** since the dose varies. If generically written either a CFC-containing or a CFC-free product may be dispensed.
7. Pharmacists receiving prescriptions for generic beclometasone MDI must establish whether a CFC-free product is required, and if so, which brand should be dispensed.
8. When a patient switches from a beclometasone CFC-containing MDI and they are well controlled, they should switch to a beclometasone CFC-free MDI, rather than to a different steroid or to a breath-actuated or dry powder device.
9. If a patient switches to an inhaler which has a different potency to the inhaler they have been using previously, and the dose is not changed appropriately, they may notice that the symptoms return, their condition becomes less well controlled or they develop side effects and begin to feel generally unwell. The importance of any changes should be discussed and titration of the dose managed carefully. The **strength** of the inhaler should be reduced by 50%, not the number of puffs e.g. a patient using Becotide® **100** MDI at a dose of two puffs twice a day should be switched to Qvar® **50** MDI at a dose of two puffs a day.
10. Once changed to a CFC-free product the patient should not switch from one CFC-free inhaler to the other unless advised to do so by their doctor.
11. Qvar® is not currently licensed in the UK for children under 12 years.
12. Clenil Modulite® **must** be co-prescribed with a Volumatic® spacer in children (under 16 years) and in patients exceeding doses >1000mcg daily.

Conversion table when switching from CFC-containing beclometasone MDI to CFC – free

Total daily dose (mcg)		
CFC – BDP dose	**Clenil Modulite®**	**Qvar®**
200-250	200-250	100
300	300	150
400-500	400-500	200
600-750	600-750	300
800-1000	800-1000	400
1100	1100	500
1200-1500	1200-1500	600
1600-2000	1600-2000	800

Combination preparations

BNF states that in general, patients are best treated with single ingredient preparations.

Flutiform®
- Aerosol inhalation 50 / 5mcg, 125 / 5mcg, 250 / 10mcg

Combination of fluticasone and formoterol
Licensed for asthma in adults and children (12+)

Seretide®
- Accuhaler® 100, 250, 500
- Evohaler® 50, 125, 250

Combination of fluticasone and salmeterol

Symbicort®
- Turbohaler® 100 / 6; 200 / 6; 400/12

Combination of budesonide and formoterol

Relvar®
- Ellipta® dry powder device 22/92mcg, 22/184mcg

Combination of vilaterol +fluticasone furoate.
Licensed for asthma from 12 years

Notes:

1. The **higher doses** (Seretide® Accuhaler 250 and 500, Evohaler 125 and 250) are only advised in step 4 of the management of asthma in adults.
2. 92mcg daily of the furoate salt of fluticasone in **Relvar® Ellipta®** is equivalent to 250mcg bd of fluticasone propionate. 184mcg od = 500mcg bd.
3. Only the lower dose preparation of Relvar® Ellipta® is licensed for use in COPD
4. There is no evidence that combined preparations improve concordance.
5. Combined preparations do not allow the flexibility of the individual components with regard to titration and reducing doses of inhaled corticosteroids and therefore are not suitable for all asthmatics.
6. Only consider using in patients already stabilised on the available doses of bronchodilators and inhaled corticosteroids.
7. Prescribers should check the licensed indications of the preparation they wish to prescribe as not all products are licensed for all indications and ages

3.3 Cromoglicate, related therapy and leukotriene receptor antagonists

3.3.1 Cromoglicate and related therapy

Nedocromil sodium
- Aerosol inhalation CFC-free 2mg / metered inhalation

Sodium cromoglicate
- Aerosol inhalation 5mg / metered inhalation

Notes:

BTS Guidelines on the Management of Asthma (updated July 2007) states: Sodium cromoglicate is of some benefit in adults and is effective in children aged 5 -12. There is no evidence of benefit with sodium cromoglicate in children aged <5yrs. Nedocromil is of benefit in adults and children over 5 years of age.

3.3.2. Leukotriene receptor antagonists (LTRAs)

Montelukast
- Tablets 10 mg **(licensed > 14 years)**
- Chewable tablets 4 mg **(licensed 2 -5 years)**
- Chewable tablets 5 mg **(licensed 6-14 years)**

Granules available for age 6 months upwards

Notes:

1. Montelukast is a leukotriene receptor antagonist (LTRA) for use in the management of asthma, not any other condition.
2. There is no role for montelukast in the management of COPD.
3. Montelukast is licensed as an adjunctive therapy in the control of mild to moderate and exercise induced asthma and can be used from the age of 6 months.
4. LTRAs can be used as an **add-on to, but not a substitute for, inhaled steroids**. It is important to keep a small dose of inhaled corticosteroid.
5. LTRAs are not effective in all patients. A **therapeutic trial** should be given for **4 weeks**. If after this time no response is observed, **discontinue treatment**.
6. Montelukast can be used as an alternative at Step 2 of the British Thoracic Society asthma guidelines for children under five, or step 3 as an alternative to long acting β_2 agonist following no response for adults and children aged 5-12.
7. Patients in whom LTRAs may be particularly effective are those with aspirin sensitivity, a large exercise induced component to the symptoms, highly atopic eczema and rhinitis.
8. In therapeutic terms, the LTRAs can be regarded as identical. Therefore, a lack of success with one should not be followed by a trial of the other.

3.4 Antihistamines, hyposensitisation and allergic emergencies

3.4.1 Antihistamines

Sedating antihistamines

Chlorphenamine
- Tablets 4 mg
- Syrup 2 mg in 5 ml
- Injection 10 mg in 1 ml

Hydroxyzine
- Tablets 10 mg, 25 mg
- Syrup 10 mg in 5 ml

Non-sedating antihistamines

Loratadine
- Tablets 10 mg
- Syrup 5 mg in 5 ml

Cetirizine

- Tablets 10 mg
- Oral solution 5 mg in 5 ml

Notes:

1. Sedating antihistamines are sometimes used to treat purities. There is little evidence to suggest any one product is more superior to another and patients vary in their response.
2. Loratadine should be prescribed rather than the more expensive active metabolite, desloratidine. There is no evidence suggesting the active metabolite confers any advantages.
3. Likewise, cetirizine should be prescribed rather than the more expensive enantiomer, levocetirizine. There is no evidence suggesting the enantiomer confers any advantages.

3.4.2 Allergen immunotherapy

Immunotherapy should be carried out at specialist centres by physicians experienced in this area.

1. **Pharmalgen ®** can be used in accordance with NICE TA246 to treat bee and wasp venom allergy.
2. **Omalizumab (Xolair®)** is approved for use in accordance with NICE TA 278 for severe persistent allergic asthma and in accordance with NICE TA 339 to treat previously treated chronic spontaneous urticaria.

3.4.3 Allergic emergencies

Dose of **intramuscular** injection of adrenaline (epinephrine) for anaphylactic shock. (Subcutaneous injection **not** recommended.)

Age	Dose	Volume of adrenaline 1 in 1000 (1mg / ml)	Dose of auto-injector
Under 6 months	50 micrograms	0.05 ml	
6 months – 6 years	120 micrograms	0.12 ml	150 microgram
6-12 years	250 micrograms	0.25 ml	300 microgram
Adult and adolescent	500 micrograms	0.5 ml	300 microgram

Based on advice from the Resuscitation Council (UK).

Adrenaline (epinephrine)	♦ Injection 1 in 1000 0.5 ml, 1 ml ♦ Jext ® Auto-injector 150 microgram dose ♦ Jext® Auto-injector 300 microgram dose ♦ Emerade® Auto-injector 150microgram dose ♦ Emerade® Auto-injector 300microgram dose ♦ Emerade® Auto-injector 500microgram dose	*For use in healthcare environments* *For use in the healthcare setting and where a different device to Jext is required*

Notes:

1. It is advisable to prescribe adrenaline auto-injector by the brand name to avoid confusion, as different brands have different administration techniques.
2. Two pens should be prescribed for the first prescription. Expiry dates are relatively short hence they should be prescribed like for like when replacing used pens.
3. Two pens should be prescribed if required to replace two pens which have expired.

3.5 Respiratory stimulants and pulmonary surfactants

3.5.1 Respiratory stimulants

Doxapram

- Injection 100 mg in 5 ml

3.6 Oxygen

Notes:

1. Community pharmacies no longer provide a home oxygen service and hence FP10 prescriptions should no longer be issued. All patients receiving a home oxygen service receive supplies from Allied Respiratory. Free helpline number: 0500 823773.
2. To order oxygen, health professionals must complete a Home Oxygen Order Form (HOOF). They will also need to obtain patient consent to release their data to the supplier and to the Fire Brigade, who will require it for safety reasons.
3. Allied Respiratory will contact the patient to arrange delivery, undertake any installation required and provide all necessary equipment. They will also ensure the patient is trained in using the equipment and then inform the clinicians that the order has been completed.
4. **Recommended flow rates:**

- nasal cannulae- 2 litres/min(higher rates irritate)
- 24% mask requires 2 litres/min
- 28% mask requires 4 litres/min
- 35% mask requires 8 litres/min
- Higher % only appropriate for hospital inpatients i.e. 60% at 15 litres/min.

3.7 Mucolytics

Carbocisteine
- Capsules 375mg
- Oral liquid 125 mg / 5 ml, 250 mg / 5 ml

Dornase alfa
- Nebuliser solution 2500 units in 2.5ml

Hypertonic sodium chloride
- MucoClear® 3% nebuliser solution
- Nebusal® 7% nebuliser solution

Mannitol▼
- Bronchitol® 40mg powder in hard capsules for inhalation

Notes:
1. **Dornase alfa** should only be initiated within hospital for the treatment of cystic fibrosis.
2. A Jet Nebuliser used exclusively for dornase alfa is required
3. Hypertonic sodium chloride is a treatment option for mobilisation of lower respiratory tract secretions in mucous consolidation (e.g. cystic fibrosis, suppurative lung disease, bronchiolitis) in adults and children from 6 years.
4. It is suitable for GP prescribing following specialist initiation, which should be undertaken in hospital due to the risk of bronchospasm.
5. The lower strength 3% solution should be used where 7% solution is not tolerated and for cases of bronchiolitis.
6. There is little evidence to support the use of this treatment in the under 6's.
7. **NICE TA266: Cystic Fibrosis – Mannitol for inhalation** gives details of a small group of patients eligible for treatment with mannitol dry powder for inhalation. Treatment will be initiated in secondary care.

3.8 Aromatic inhalations

Menthol and eucalyptus
- Inhalation, BP 1980

3.9 Cough preparations

3.9.1 Cough suppressants

Pholcodine
- Linctus 5 mg in 5 ml

3.9.2 Expectorant and demulcent cough preparations

Simple linctus
- Linctus

Note:
The BNF recommends that cough preparations should be avoided but recognises that Simple linctus has the advantage of being harmless and inexpensive.

3.10 Systemic nasal decongestants

Pseudoephedrine
- Tablets 60 mg
- Elixir 30 mg in 5 ml SF

Note:
Systemic nasal decongestants are of doubtful value but unlike the preparations for local application they do not give rise to rebound nasal congestion. Sympathomimetics should be avoided in patients with hypertension, hyperthyroidism, coronary heart disease, or diabetes, and in patients taking monoamine-oxidase inhibitors.

3.11 Antifibrotics

Pirfenidone▼
- Esbriet® Tablets 267 mg

Nintedanib▼
- Ofev® capsules 100mg, 150mg

Pirfenidone and nintedanib are treatments for treating idiopathic pulmonary fibrosis. Treatment should be initiated in accordance with **NICE TA 282: Pirfenidone for treating idiopathic pulmonary fibrosis (April 2013)** and **NICE TA 379: Nintedanib for treating idiopathic pulmonary fibrosis (Jan 2016).** Prescribing should remain within the specialist tertiary service.

Appendix 1: British Guideline on the Management of Asthma

Scottish Intercollegiate Guidelines Network
The British Thoracic Society
November 2005

Aims of pharmacological management:

1. **control symptoms,** including nocturnal symptoms and exercise-induced asthma
2. **prevent exacerbations**
3. **achieve best possible pulmonary function**
4. **minimise side effects**

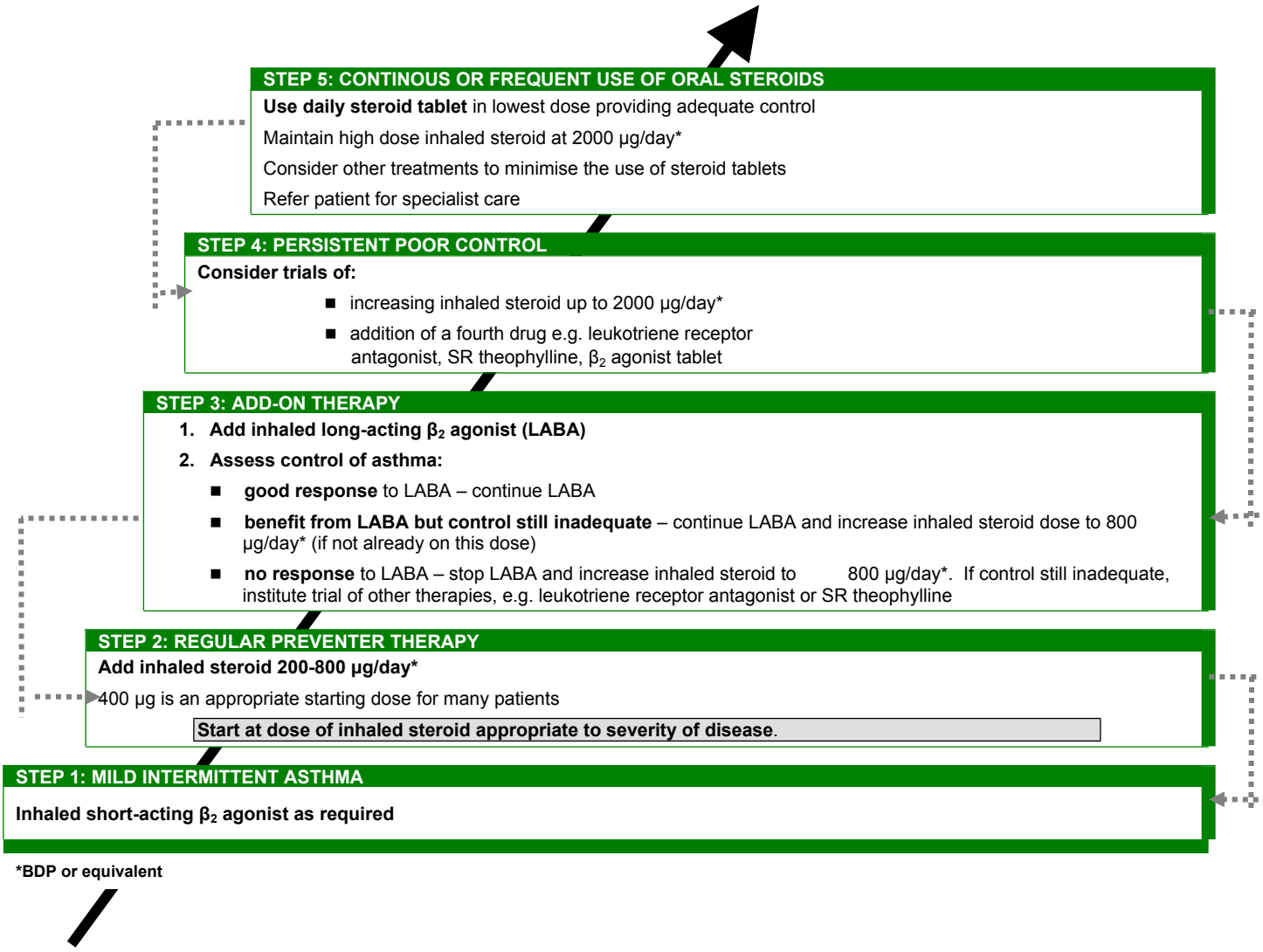
THE STEPWISE APPROACH

1. **Start treatment at the step most appropriate to initial severity**
2. **Achieve early control**
3. **Maintain control by:**
   - ↑ **stepping up treatment as necessary**
   - ↓ **stepping down when control is good**

All doses of inhaled steroids in this appendix refer to beclometasone (BDP) given via a metered dose inhaler (pMDI). Adjustment may be necessary for fluticasone and mometasone and may also be necessary for alternative devices.

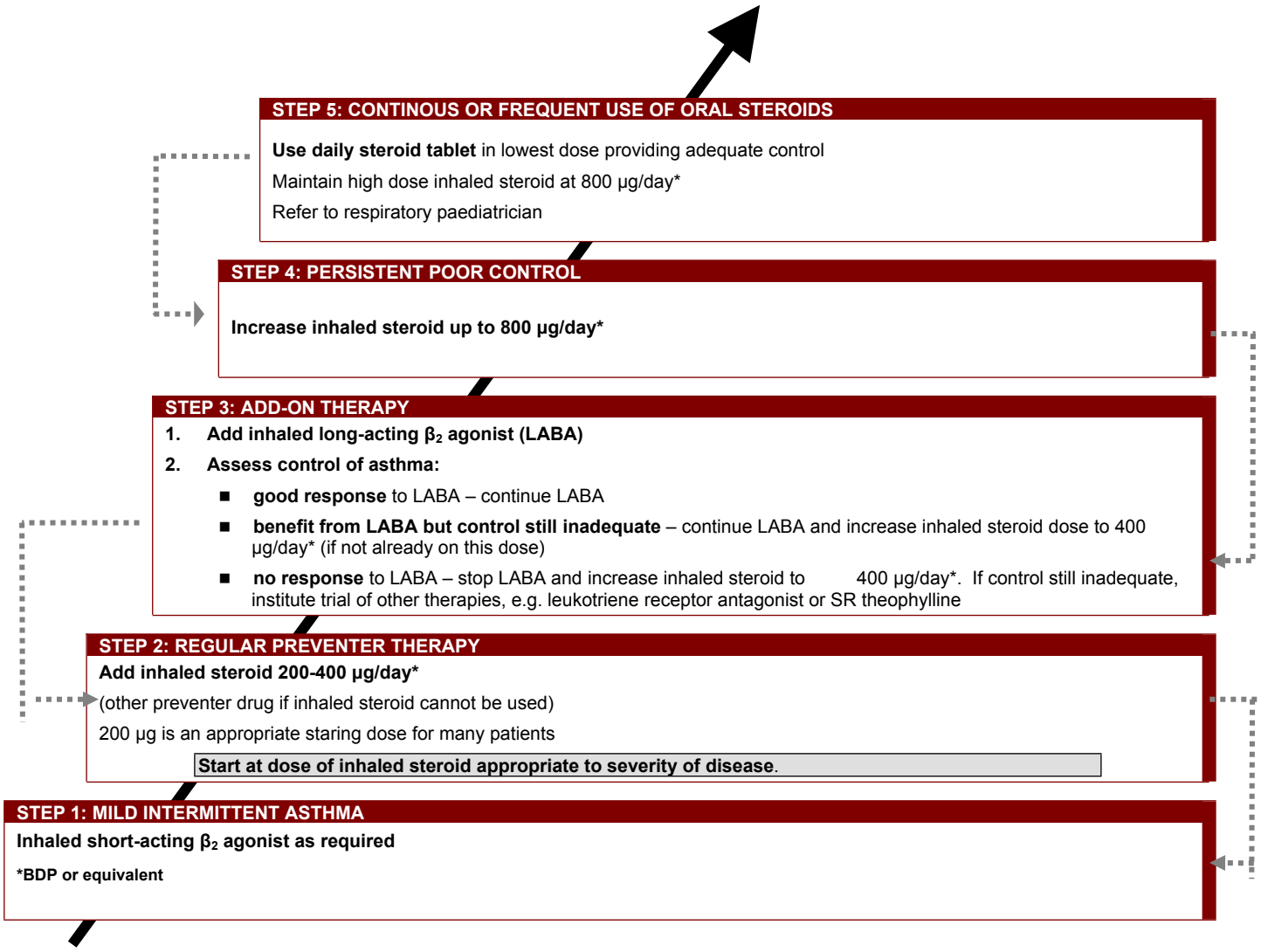
- Regular review of patients as treatment is stepped down is important. When deciding which drug to step down first and at what rate, the severity of asthma, the side effects of the treatment, the beneficial effect achieved, and the patient's preference should all be taken into account.
- Patients should be maintained at the lowest possible dose of inhaled steroid. Reduction in inhaled steroid dose should be slow as patients deteriorate at different rates. Reductions should be considered every three months, decreasing the dose by approximately 25-50% each time.

SUMMARY OF STEPWISE MANAGEMENT IN ADULTS

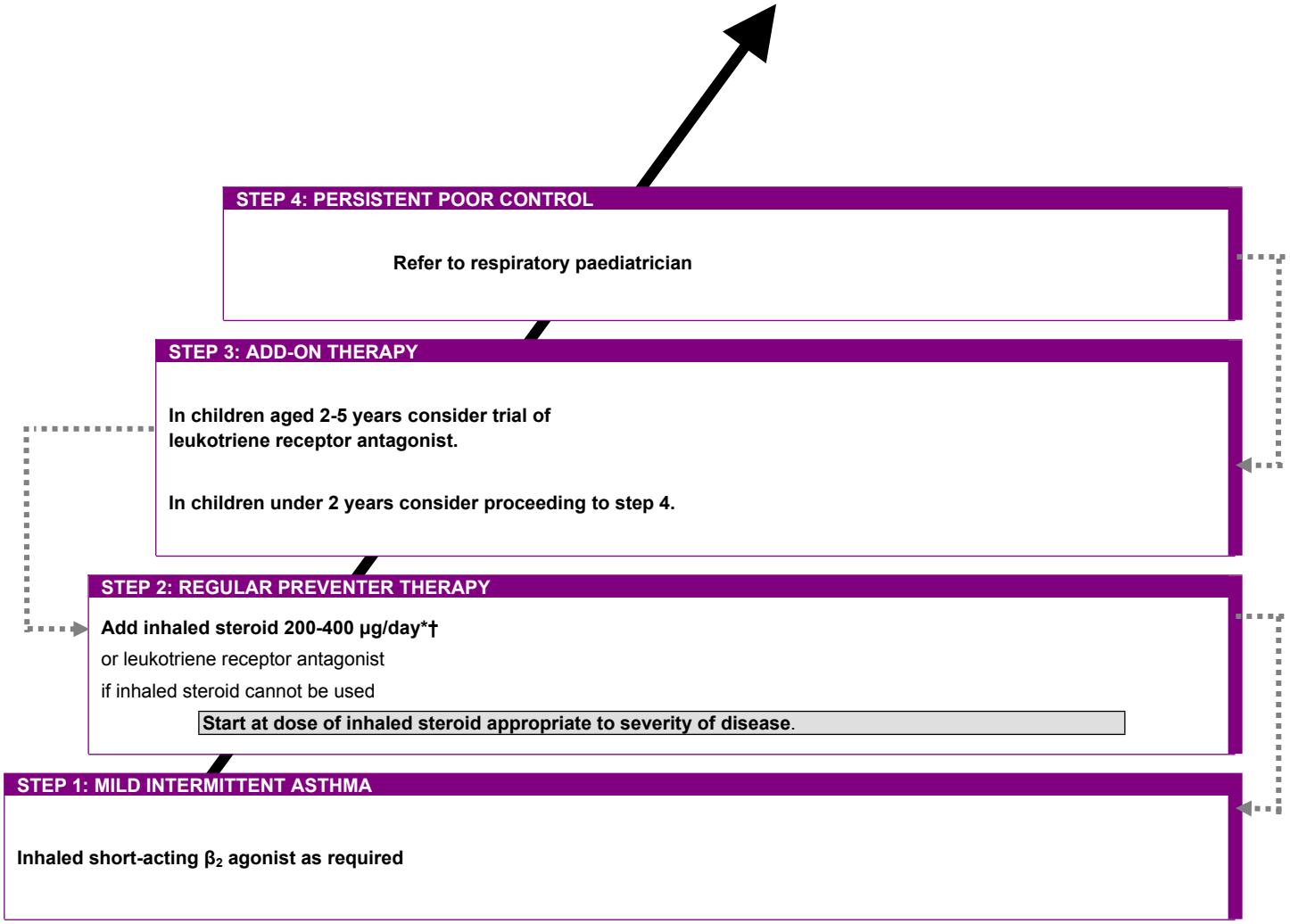


*BDP or equivalent

SUMMARY OF STEPWISE MANAGEMENT IN CHILDREN AGED 5-12



SUMMARY OF STEPWISE MANAGEMENT IN CHILDREN UNDER 5



*BDP or equivalent

†Higher normal doses may be required if drug delivery is difficult (up to 10 puffs a day)

Viral Wheeze

The Drugs & Therapeutics Bulletin (Vol 45. No 3. March 2007) reviewed the evidence for managing viral wheeze in primary care for children 1-5 years of age. The article concluded that viral wheeze often resolves by the age of 6 but it is difficult to know which children may proceed to develop asthma. There is a paucity of evidence to assist clinicians and children who are not particularly distressed may not need treatment at all.

Although inhaled short-acting beta $_2$ agonists are often used, there is a lack of published evidence to evaluate the benefits. Limited evidence suggests a short course of very high dose inhaled corticosteroid may reduce symptoms during a wheezing attack. Regular inhaled corticosteroids do not appear to prevent the development of asthma, nor prevent repeated episodes and hence the recommendation is to keep children under review and therapy may not be necessary.

Appendix 2: Prescribing Guidelines for the management of stable COPD in Primary Care

Based on NICE CG101: Chronic obstructive pulmonary disease (June 2010)

The key points for implementation with respect to drug treatment arising from this guidance are as follows:

- In people with stable COPD who remain breathless or have exacerbations despite use of short-acting bronchodilators as required, offer the following as maintenance therapy:

  – if forced expiratory volume in 1 second (FEV1) ≥ 50% predicted: either long-acting beta2 agonist (LABA) or long-acting muscarinic antagonist (LAMA)

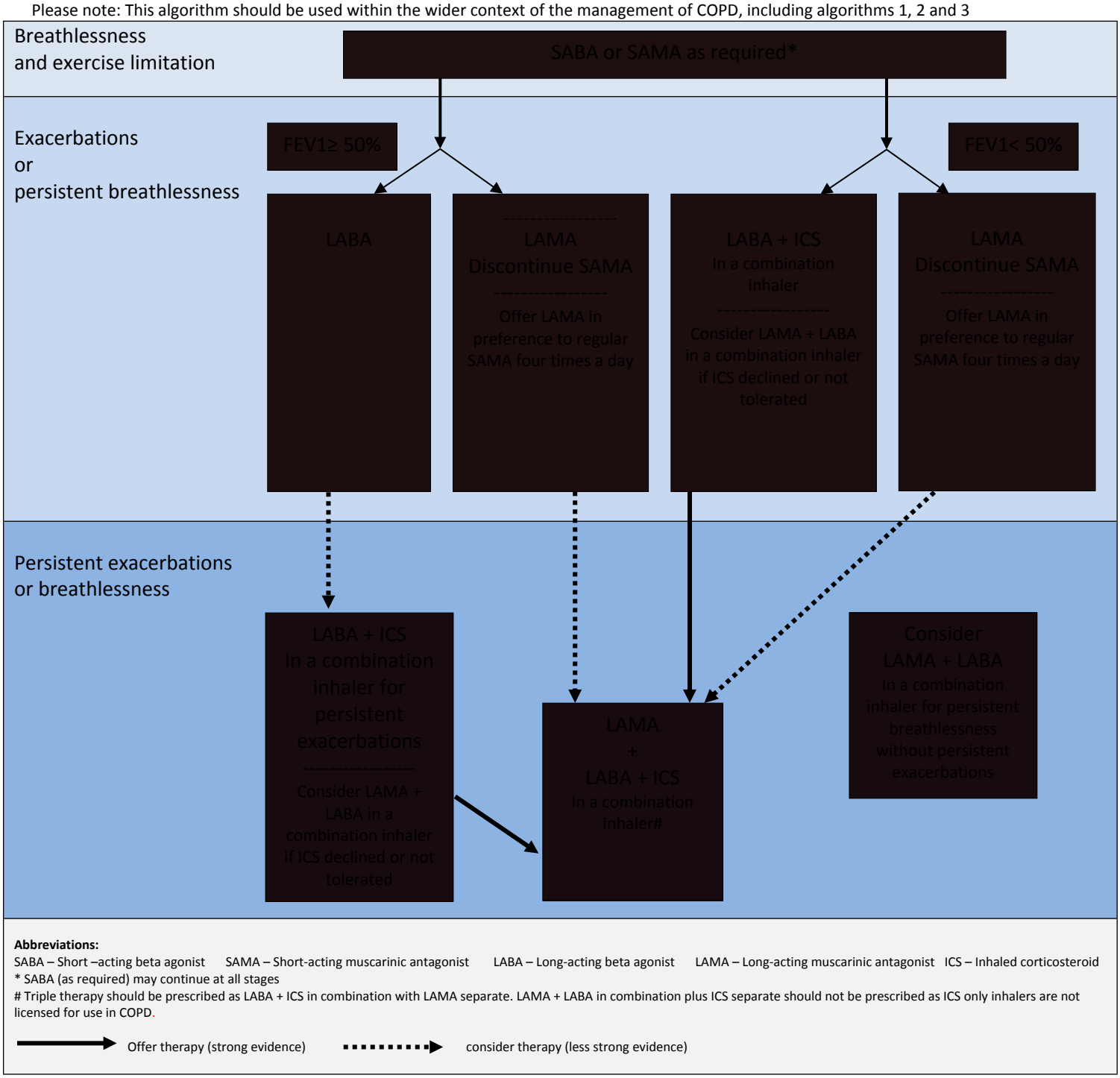
  – if FEV1 < 50% predicted: either LABA with an inhaled corticosteroid (ICS) in a combination inhaler, or LAMA.

- Offer LAMA in addition to LABA + ICS to people with COPD who remain breathless or have exacerbations despite taking LABA + ICS, irrespective of their FEV1

Use of inhaled therapies

Algorithm 2a: Use of inhaled therapies

Please note: This algorithm should be used within the wider context of the management of COPD, including algorithms 1, 2 and 3



Abbreviations:
SABA – Short –acting beta agonist SAMA – Short-acting muscarinic antagonist LABA – Long-acting beta agonist LAMA – Long-acting muscarinic antagonist ICS – Inhaled corticosteroid
* SABA (as required) may continue at all stages
# Triple therapy should be prescribed as LABA + ICS in combination with LAMA separate. LAMA + LABA in combination plus ICS separate should not be prescribed as ICS only inhalers are not licensed for use in COPD.

→ Offer therapy (strong evidence) ⇢ consider therapy (less strong evidence)

Full guidance can be viewed **here**

General Information

1. Referral to the Chest Clinic is indicated in the following circumstances:

- diagnostic uncertainty
- suspected severe COPD
- the individual requests a second opinion
- onset of cor pulmonale
- assessment for oxygen therapy, long-term nebuliser therapy or oral corticosteroid therapy
- bullous lung disease
- rapid decline in FEV1
- assessment for pulmonary rehabilitation
- assessment for lung volume reduction surgery or lung transplantation
- dysfunctional breathing
- onset of symptoms under 40 years or a family history of alpha-1 antitrypsin deficiency
- symptoms disproportionate to lung function deficit
- frequent infections
- haemoptysis.

2. Patients must have a consultant assessment prior to starting oxygen therapy. If a patient is extremely immobile or unable to attend the Chest Clinic, a COPD assessment can be performed in their home by a member of the outreach team

Notes on drug treatment

1. Choose a drug based on the person's symptomatic response and preference, the drug's side effects, potential to reduce exacerbations and cost.
2. Do not use oral corticosteroid reversibility tests to identify patients who will benefit from inhaled corticosteroids.
3. Be aware of the potential risk of developing side effects (including non-fatal pneumonia) in people with COPD treated with inhaled corticosteroids and be prepared to discuss this with patients.
4. The inhaler device may need to be tailored to the individual, and instruction offered. Suitable choices include an MDI + spacer, breath-actuated inhaler or powder device, not all drugs available in each type.
5. Aminophylline levels increase with erythromycin, ciprofloxacin, cimetidine, verapamil and a number of other drugs. Clearance is reduced in heart failure and increased alcohol, smoking and enzyme inducing drugs. Nausea is often a sign of toxicity.
6. There is no evidence that Tiotropium is significantly superior to salmeterol.
7. There is no evidence comparing long acting inhaled therapy versus regular short acting drugs delivered by nebuliser. The former is cheaper however. Studies comparing short acting bronchodilators given at high doses via pMDI + spacer with the same drugs given through nebuliser show that the majority of patients experience fewer side effects with pMDI + spacer while achieving the same degree of bronchodilation.

Related guidance: NICE NG9 Bronchiolitis in children (May 2015)