South Australian Paediatric Practice Guidelines

acute asthma

Note

This guideline provides advice of a general nature. This statewide guideline has been prepared to promote and facilitate standardisation and consistency of practice, using a multidisciplinary approach. The guideline is based on a review of published evidence and expert opinion.

Information in this statewide guideline is current at the time of publication.

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Health practitioners in the South Australian public health sector are expected to review specific details of each patient and professionally assess the applicability of the relevant guideline to that clinical situation.

If for good clinical reasons, a decision is made to depart from the guideline, the responsible clinician must document in the patient's medical record, the decision made, by whom, and detailed reasons for the departure from the guideline.

This statewide guideline does not address all the elements of clinical practice and assumes that the individual clinicians are responsible for discussing care with consumers in an environment that is culturally appropriate and which enables respectful confidential discussion. This includes:

- The use of interpreter services where necessary,
- Advising consumers of their choice and ensuring informed consent is obtained,
- Providing care within scope of practice, meeting all legislative requirements and maintaining standards of professional conduct, and
- Documenting all care in accordance with mandatory and local requirements

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Government of South Australia
SA Health

Assessment and management summary for acute asthma

Severity	Signs of Severity	Management
Mild	Normal mental state Subtle or no accessory muscle use/recession Talking normally SaO_2 usually > 95% in air	**Salbutamol** by MDI/spacer once and review after 20 – 60 minutes <6 years - 6 puffs (600 microgram) ≥6 years -12 puffs (1200 microgram) Children under 4 years can use a face mask with a spacer *For those using **Symbicort** (budesonide/eformoterol) as combined preventer & reliever (reserved for children over the age of 12 years): give additional inhalations as required by symptoms up to a **maximum of 6** with a **maximum of 12 inhalations per day** (including maintenance doses). If inadequate response, treat using conventional guideline* Good response - home on inhaled β_2-agonist (salbutamol or terbutaline) as needed Poor response - treat as moderate **Consider** oral **prednisolone** for 1-3 days if on preventer or episode has persisted over several days Give 2mg/kg/day (maximum dose 60mg) for initial dose and 1mg/kg for subsequent doses Use multiples of 5mg for ease of administration Discharge with discharge plan and action plan (see appendix 4)
Moderate	Normal mental state Some accessory muscle use or recession Tachycardia Talks in short sentences SaO_2 usually 92-95% in air	Give **oxygen** if SaO_2 is < 93% (if available) **Salbutamol** by MDI/spacer - 3 doses 20 minutely <6 years - 6 puffs (600 microgram) ≥6 years -12 puffs (1200 microgram) Children under 4 years can use a face mask with a spacer Review 10-20 min after 3rd dose to decide on further management Oral **prednisolone** for 3-5 days Give 2mg/kg/day (maximum dose 60mg) for initial dose and 1mg/kg for subsequent doses Use multiples of 5mg for ease of administration Consider referral to hospital Use SAAS if oxygen requirement or concern regarding possible deterioration Discharge home only if has improved significantly **and** parents can access medical support if deteriorates Discharge with discharge plan and action plan (see appendix 4)

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Severity	Signs of Severity	Management
Severe	Agitated/distressed Moderate-marked accessory muscle use or recession Tachycardia Talks in single words Note: wheeze is a poor predictor of severity. SaO_2 usually < 92% in air	Involve **senior help** early (e.g. Consultant, MET team or consider calling for advice [13STAR or local emergency dept]) **Oxygen** to keep saturations ≥ 93% (if available) **Salbutamol** by nebuliser - 3 doses 20 minutely <6 years - 2.5mg nebulised ≥6 years - 5mg nebulised Review ongoing requirements every 10-20 minutes after 3rd dose. If improving, reduce frequency, if no change, continue 20 minutely. If deteriorating at any stage treat as critical **Ipratropium** (250microgram) via nebuliser 3 times in 1st hour (20 minutely, added to Salbutamol) Wean at same rate as Salbutamol and cease once on 1-2hrly Oral **prednisolone** Give 2mg/kg/day (maximum dose 60mg) for initial dose and 1mg/kg for subsequent doses Use multiples of 5mg for ease of administration If vomiting or cannot take oral medications give IV **hydrocortisone** 4mg/kg 6hrly Transfer to hospital via SAAS Consider retrieval via MedStar Kids – 13STAR
Critical	Confused/drowsy Maximal accessory muscle use or recession Exhaustion Marked tachycardia Unable to talk Cyanosis	Involve **Paediatric Specialist help** early (eg Consultant, PICU, MET team or call for assistance MedStar Kids – 13STAR) High flow **oxygen** (10-15L/min). Use a mask with reservoir if available Continuous nebulised **Salbutamol** using 4mL of 0.5% nebuliser solution *undiluted*, refilled as required or 5mg nebules if solution unavailable Nebulised **Ipratropium (**250microgram) 3 times in 1st hour (20 minutely, added to Salbutamol) Wean at same rate as Salbutamol and cease once on 1-2hrly **Hydrocortisone** 4mg/kg 6hrly IV If deteriorating or no improvement, give IV **Magnesium Sulphate** (0.1mmol/kg/dose over 20 to 30minutes, maximum dose 8mmol) **OR** IV **Salbutamol** bolus: 5microgram/kg/min for 1 hour then consider infusion Use the medication not given initially if inadequate response In **pre-hospital setting** consider **Adrenaline** IM - 10microgram/kg (0.01mL/kg adrenaline 1:1 000). Maximum dose 500microg (0.5 mL) Contact MedStar Kids (13STAR) for further advice or retrieval Consider **Salbutamol OR Aminophylline** infusions.(See appendix 6)

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Important points

- Children with asthma should have their severity assessed clinically
- Salbutamol via metered dose inhaler (MDI/puffer) and spacer is the key emergency treatment
- Corticosteroid therapy should be considered for most exacerbations
- Long term management should be reviewed during any acute presentation

Introduction

- Asthma is one of the commonest conditions in childhood. At any point in time 1 in 9 Australian children will have the diagnosis
- It is one of the commonest causes for presentation to primary care, emergency departments and for admission to hospital
- The diagnosis of asthma is usually clinical and should be considered in a child with cough, wheeze or difficulty breathing but may be aided by response to bronchodilators and pulmonary function tests
- Children who present with an acute episode of asthma may also have had recurrent or persistent symptoms for some time. An acute presentation provides an opportunity to review long term management and any problems should be identified and arrangements made for continuing care

Exclusions

Most children should be managed according to this guideline. The following children may need to be managed differently:

- Patients admitted to ICU with life-threatening asthma
- Patients under the care of the WCH Respiratory team
- Patients who have underlying medical conditions which may affect their respiratory status (e.g. other respiratory disease, heart disease, neuromuscular disorders)
- Infants under 1 year of age

Definitions & Acronyms

MDI – Metered Dose Inhaler
HDU – High Dependency Unit
ICS - Inhaled Corticosteroid
MedStar Kids – South Australian emergency retrieval and advice service. Call 13STAR (137827) 24 hours per day
MET – Medical Emergency Team
PICU – Paediatric intensive care unit
SAAS – South Australian Ambulance Service
WCH – Women's and Children's Hospital

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Assessment

History

Where appropriate and possible, a pre-printed template for asthma assessments should be used. See appendix 3 for the WCH Paediatric Emergency Department template. The following areas should be covered unless previously recorded:

- Acute presenting history
  - Trigger
  - Treatment already given and response
- Past asthma history
  - When diagnosed
  - Previous admissions including to ICU
  - Known triggers
  - Interval symptoms
  - Smoking exposure
  - Current and past treatment including compliance and devices used
  - Other atopic conditions including food allergies
  - Family history of atopic conditions
- If previously diagnosed
  - who currently manages the child's asthma
  - dates of last review & next planned review
- Standard history as per any other patient
  - Past medical history
  - Family history
  - Immunisations
  - Medications and allergies
  - Psychosocial history
  - Developmental history

Examination

Key points to be noted include:

- Degree of respiratory distress (see management table)
  - Respiratory rate - compare to age-appropriate normal ranges (see appendix 2)
  - Use of accessory muscles and recession
  - Posture or position
  - Oxygen saturation if available
  - Ability to talk in phrases, sentences or words
  - Ability to feed
- Any clinical signs of major atelectasis or pneumothorax
- Mental state (alertness and responsiveness)
- Heart rate - compare to age-appropriate normal ranges (see appendix 2). Remember that β_2-agonists (Salbutamol, Terbutaline, Eformoterol) will increase the heart rate.

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Pulse oximetry should be performed if available. A small decrease in oxygen saturations commonly occurs after initial bronchodilator treatment and should be put into the context of the child's clinical condition and response to treatment. Significant hypoxia is an indicator of more severe asthma

Peak flow has little use in acute asthma and clinical assessment is the best indicator of severity

Investigations

Generally no investigations are required in assessing acute asthma

- **Chest x-ray –** consider in patients presenting with first episode of wheeze, particularly if doubt about diagnosis. Children with known asthma do not require a CXR unless there is a suspicion of pneumothorax or major collapse/consolidation. Some degree of asymmetry of signs is common
- **Blood tests (including blood gases) –** not routinely required
- **Nasopharyngeal aspirate for respiratory viruses –** may be taken where identifying a viral pathogen may be useful (e.g. illness not classical of asthma) or for cohorting purposes.

Consider other causes of wheeze (eg. bronchiolitis, viral pneumonitis, aspiration, foreign body aspiration, cardiac failure, congenital airway abnormalities). Many viral lower respiratory infections will respond to bronchodilators as well.

Management

Children should be initially assessed and managed as per the table below.

Assessment and management summary

See summary above.

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Adrenaline (IM)	10microgram/kg (0.01mL/kg adrenaline 1:1 000) (Maximum dose 500microg (0.5 mL)
Aminophylline (IV)	Loading dose of 5mg/kg (maximum 500mg) over at least 60 minutes followed by an infusion of: <12 years – 1 mg/kg/hour 12 years to adult – 0.5 to 0.7 mg/kg/hour
Hydrocortisone (IV)	4mg/kg 6hrly (Maximum dose 200mg)
Ipratropium (Inhaled)	<6 years - 4 puffs via MDI (20microgram/puff) or 250microgram nebulised ≥6 years - 8 puffs via MDI (20microgram/puff) or 250microgram nebulised
Magnesium Sulphate (IV)	0.1mmol/kg/dose over 20 to 30minutes (Maximum dose 8mmol)
Prednisolone (Oral)	2mg/kg/day (Maximum dose 60mg) for initial dose and 1mg/kg for subsequent doses. Use multiples of 5mg for ease of administration.
Salbutamol (Inhaled)	<6 years - 6 puffs (600 microgram) via spacer or 2.5mg nebulised ≥6 years -12 puffs (1200 microgram) via spacer or 5mg nebulised Children under 4 years can use a face mask with a spacer
Salbutamol continuous nebulisation (Inhaled)	5mg nebule then refill as required with 5mg nebules or 4mL of 0.5% nebuliser solution, refilled as required
Salbutamol (IV)	Bolus: 5microgram/kg/min for first hour then consider infusion. Infusion: 1-2 microgram/kg/min

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Medication Doses:

Admission and discharge criteria

Discharge from Emergency Dept or other acute care setting:

- Patients may be discharged home if
  - tolerating 3 hours between bronchodilator doses
  - normal saturations in air
  - sensible carers and easy access to medical care in the event of an acute deterioration
- Education
  - All patients & families should have their level of asthma knowledge reviewed and appropriate education given
  - Ensure that the patient's/carer's device technique is correct. Patients and families should go home with written education material including an action and discharge plan. See appendix 2
- Discharge medications
  - Salbutamol initially 3-4 hourly with a weaning plan over the next 3-4 days
  - Continue oral Prednisolone to finish 3-5 days (no need for a weaning dose for courses less than 14 days).
- Inhaler device and spacer technique should be checked before discharge.
- Advise parents to seek further medical attention should the child's condition deteriorate or if there is no significant improvement within 48 hours. Parents should be educated on recognising signs of deterioration.
- Advise GP review in 1-2 weeks and, if possible, arrange GP appointment prior to discharge
- In severe asthma, consider specialist referral– see appendix 5
- Consider preventive treatment if there are frequent acute episodes or interval symptoms between acute episodes (more than one disturbed night per week, difficulty participating in physical activities or bronchodilator use on more than three days per week). See appendix 1

Admission criteria (this may require transfer to a hospital with paediatric facilities):

- Bronchodilator requirement more frequently than 3 hourly
- Oxygen requirement
- Other factors make discharge unsafe (e.g. social issues, lack of understanding, lack of ability to re-present if worsens)

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Consider admission to HDU/PICU/MedStar Kids retrieval:

- Signs of critical asthma severity
- requiring continuous nebulisers for >1 hour without improvement
- requiring Salbutamol more frequently than every 30 minutes after 2 hours
- hypoxia despite maximal oxygen or raised CO_2

Inpatient management

Review regularly as dictated by degree of severity.

Weaning Salbutamol:

- Wean by extending time between doses by 30-60 mins aiming for 3 hours or greater between doses
- A medical review is required if a patient deteriorates or requires more frequent Salbutamol than previously

Preventive treatment should be commenced if there are interval symptoms between acute episodes (more than one disturbed night per week, difficulty participating in physical activities, or bronchodilator use on more than three days per week). It should be considered if there are frequent acute episodes. See appendix 1

If commencing preventive treatment emphasise the importance of ongoing review and arrange follow up if none is in place

Careful attention must be paid to the delivery system chosen. Where using a puffer, spacer devices should be used at all ages. A well-sealing face mask should be used in younger children (usually < 4 years) but children over 4 years should use the mouthpiece on the spacer. Consider Turbuhalers and Accuhalers in older children and adolescents.

All patients admitted with life threatening asthma (severe enough to require ICU admission) should be reviewed by a Paediatric Respiratory Physician.

Education

- All patients & families should have their level of asthma knowledge reviewed and appropriate education given.
- Ensure that the patient's/carer's device technique is correct.
- If parents/carers smoke, ensure they are aware of the importance of a non-smoking environment and offer information on quitting if possible.
- Patients and families should go home with written education material including an action and discharge plan. See appendix 4

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Discharge from hospital

- Patients can be safely discharged if they are stable after 2 consecutive 3 hour periods between Salbutamol doses
- Discharge medications:
    - Salbutamol usually 3-4 hourly with a weaning plan over the next 3-4 days.
    - Continue oral Prednisolone to finish 3-5 days (no need for a weaning dose for courses less than 14 days).
    - Preventer if required
- Arrange follow up - GPs can manage the majority of patients with asthma. Follow up within the next 7 to 10 days is suggested and ideally, an appointment should be made prior to leaving the ward
- Consider preventive treatment if there are frequent acute episodes or interval symptoms between acute episodes (more than one disturbed night per week, difficulty participating in physical activities or bronchodilator use on more than three days per week). See appendix 1
- Consider specialist referral for patients with severe or difficult to control asthma. See appendix 5
- Patients with the following should be considered for referral to an asthma educator or a community asthma nurse:
    - Newly diagnosed asthma
    - Poorly controlled asthma
    - Severe asthma e.g. requiring PICU
    - Compliance issues
    - Concerns regarding home management
    - Patients from a non-English speaking background
- Encourage SA Ambulance cover

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References

The South Australian statewide guideline on the management of acute asthma is based on the British Thoracic Society & Scottish Intercollegiate Guidelines Network, British Guideline on the Management of Asthma, Revised June 2009

No additional literature searches were conducted

Other guidelines reviewed:

1. NSW Asthma Guideline - NSW Department of Health 2004
2. Starship Paediatric Health Clinical Practice Guidelines - Management of acute asthma and Management of life-threatening asthma (content reproduced with the permission of Dr Raewyn Gavin)
3. Royal Children's Hospital guideline - Asthma (Acute) Guideline (content reproduced with the permission of Dr Mike South)

Other information sources:

4. Royal Children's Hospital Paediatric Pharmacopoeia 13th Edition - accessed online
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7. National Asthma Council Australia. Leukotriene receptor antagonists in the management of childhood asthma. Melbourne: National Asthma Council Australia, 2010
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Information for parents

Asthma Foundation SA
The Asthma Foundation SA offers a range of programs and services, and conducts information sessions for people with asthma and their carers
Breathe Better Information Line 1800 645 130
www.asthmasa.org.au
An Asthma SA A*sthma Control Pack* should ideally be given to each patient at diagnosis. They can be ordered from the website.

See www.wch.sa.gov.au/asthma_action for handouts on device use and spacer care.

National asthma council website - www.nationalasthma.org.au

QuitSA - www.quitsa.org.au

SAAS membership - www.saambulance.com.au (see *products and services)*

Companion documents
Dept of Education and Child Development Healthcare forms including asthma specific forms and medication authority. Medical Director compatible forms can be downloaded.

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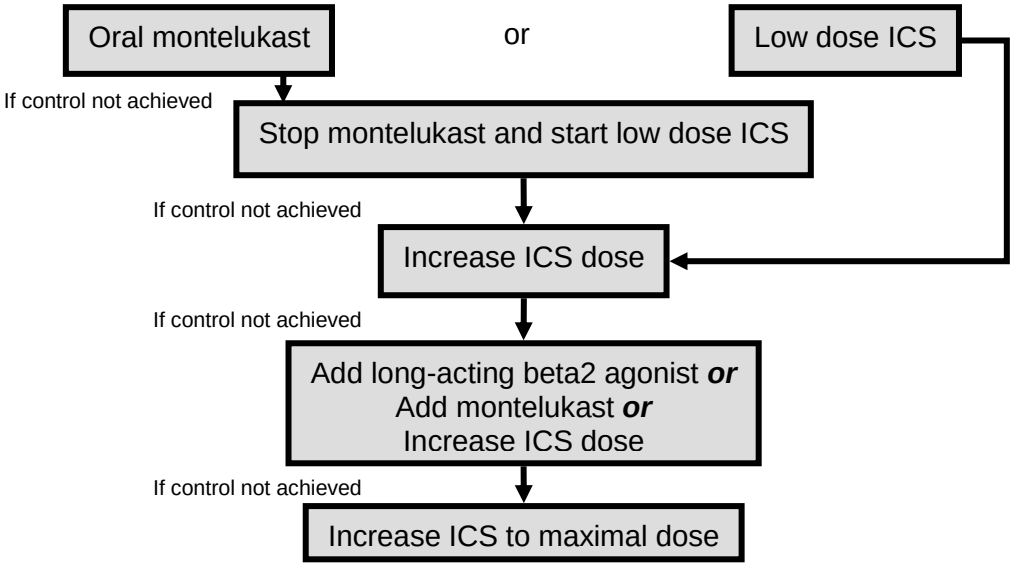
Appendix 1 - Approach to preventive therapy in children

Initial therapy (according to severity)*



*ICS recommended as first line therapy for children with moderate or severe asthma

Indicative inhaled corticosteroid (ICS) equivalents (per day)

	Low	High
Ciclesonide *(Alvesco)*	< 160 mcg	≥ 160 mcg
Beclomethasone dipropionate *(Qvar)*	< 200 mcg	≥ 200 mcg
Fluticasone propionate *(Flixotide)*	< 200 mcg	≥ 200 mcg
Budesonide *(Pulmicort)*	< 400 mcg	≥ 400 mcg

Adapted from National Asthma Council Australia. Leukotriene receptor antagonists in the management of childhood asthma. Melbourne: National Asthma Council Australia, 2010.

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Appendix 2 - Paediatric normal ranges

Respiratory Rate (at rest)

Age (years)	**Respiratory rate (breaths/minute)**
<1	30-40
1-2	25-35
2-5	25-30
5-12	20-25
>12	15-20

Heart Rate (at rest)

Age (years)	**Heart rate (beats/minute)**
<1	110-160
1-2	100-150
2-5	95-140
5-12	80-120
>12	60-100

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Appendix 3

WCH ED asthma assessment template – link to pdf

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Appendix 4 -

Discharge pack

- WCH electronic action plan - www.wch.sa.gov.au/asthma_action
- See www.asthmasa.org.au or www.nationalasthma.org.au for various other written action plans
- See www.wch.sa.gov.au/asthma_action for handouts on device use and spacer care.
- Discharge plan (fill in the grey blank spaces or use the drop down boxes) – Link to Word document.
- Dept of Education and Child Development healthcare plans

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Appendix 5 – Public paediatric specialist referral centres

- Women's and Children's Hospital - General Medicine and Respiratory outpatients
- Flinders Medical Centre - General Medicine outpatients
- Lyell McEwen Hospital - General Medicine outpatients
- Modbury Hospital
- Mt Gambier Hospital
- Pt Augusta Hospital

There are many private paediatricians in Adelaide and Regional centres.

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Appendix 6 - Salbutamol & Aminophylline infusions

Remember if child is improving therapy can be de- escalated at any stage

IV Salbutamol bolus

> Under 2 years - 5 microg/kg over 5 minutes

> Over 2 years – 15 microg/kg over 5 minutes (Maximum dose 250 micrograms). Give in a minimum volume of 5ml (can be diluted with 0.9% sodium chloride).

> Repeat dose at 15 minutes if still not improving.

Salbutamol Infusion

Dose

5 -10 microgram/kg/min for 1 hour then reduce to 1 - 2 microgram/kg/min

Administration Infuse undiluted via a syringe driver.

Standard infusion – 50mg Salbutamol in 50mL	
Weight (kg)	Infusion rate to achieve 1mcg/kg/min (ml/hr)
10	0.6
15	0.9
20	1.2
25	1.5
30	1.8
35	2.1
40	2.4
45	2.7
50	3
60	3.6

> NB 0.06 x weight = rate in mL/hr to achieve rate of 1mcg/kg/min

> Dosage adjustment may be required for patients with renal impairment

> If infusion is running at less than 1mL/hr a chaser should be run simultaneously to prevent line occlusion

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Compatible fluids

> Glucose 5%

> Glucose / sodium chloride combinations

> Sodium chloride 0.9%

Cautions

Closely monitor ECG, blood pressure, potassium and blood glucose

IV Aminophylline bolus

Dosing:

Loading or intermittent dose:

5mg/kg IV (maximum dose 500 mg) over 20-30 minutes

Dilute to 1mg/ml

NB: Do not give a loading dose if theophylline has been given in the last 24 hours. Check plasma level.

Continuous infusion:

Dilute with compatible fluid and infuse at rate prescribed.

5 mg/kg as a loading dose followed by:

Age <12 years – 1 mg/kg/hour

Age 12 years to adult – 0.5 to 0.7 mg/kg/hour

Plasma levels should be monitored

Compatible fluids:

Glucose 5% and 10%

Sodium chloride 0.9%

Glucose / sodium chloride combinations

Compound sodium lactate (Hartmann's)

Caution:

> Rapid IV administration may induce serious CNS and cardiovascular effects

> Mixing Aminophylline with solutions of pH < 8 may cause precipitation

Dose adjustment for obesity:

Use 50th percentile of expected weight for age

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Drugs increasing Aminophylline clearance:

> Tobacco

> Phenytoin

> Carbamazepine

> Phenobarbitone

Factors/drugs decreasing Aminophylline clearance:

> Influenza vaccination

> Pulmonary oedema

> Hepatic or renal dysfunction

> Cimetidine

> Erythromycin

> Ciprofloxacin

Version control and change history

PDS reference: OCE use only

Version	Date from	Date to	Amendment
1	August 2013	current	Original version

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