Mid Essex Hospital Services NHS Trust

MANAGEMENT OF ACUTE ASTHMA IN CHILDREN MORE THAN 2 YEARS IN HOSPITAL	**Type: Clinical Guideline** **Register No: 09055** **Status: Public**

Developed in Response to:	Best practice
CQC Fundamental Standard:	9, 12, 13

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Version Number	3.0
Issuing Directorate	Children and Young People
Ratified by:	DRAG Chairmans Action
Ratified on:	2th January 2018
Trust Executive Board Date	February 2018
Implementation Date	6th February 2018
Next Review Date	December 2020
Author/Contact for Information	Sarah Moon
Policy to be followed by (target staff)	All Clinicians
Distribution Method	Hard Copies to all wards; electronic copy to all appropriate staff Intranet & Website; notification in Staff Focus
Related Trust Policies (to be read in conjunction with)	04072 Hand Hygiene 08038 Aseptic ANTT 09005: Transferring children 0-16 years 04071: Standard Infection Prevention Precautions Policies 11046: Observation policy CYP 08076 Clinical Audit Strategy and Policy

Document Review History:

Version No:	**Authored/Reviewed by:**	**Active Date:**
1.0	Caroline Fox	23rd July 2009
2.0	Victoria Machell	30 October 2014
3.0	Sarah Moon	6th February 2018

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1.0 Purpose

1.1 The aim of this guideline is to help junior or non-medical staff to assess and manage children aged 2 years and over presenting with acute episodes of wheezing.

1.2 To standardize /improve patient care and to comply with national guidance.

2.0 Background

2.1 The diagnosis of asthma is a clinical one; there is no standardized definition of the type, severity or frequency of symptoms, nor of the findings on investigation. Central to all definitions is the presence of the symptoms (more than one of wheeze, breathlessness, chest tightness, cough) and of variable airflow obstruction.

3.0 Assessment of Severity of Asthma

3.1 Clinical signs correlate poorly with the severity of airway obstruction. Some children with acute severe asthma may not seem distressed. Objective measurements of Oxygen saturations (SpO_2), pulse, respiratory rate and – where possible - peak expiratory flow measurements (PEF), are essential. This table details criteria for the clinical assessment of severity.

Moderate asthma	Severe asthma	Life threatening asthma
Wheeze Normal air entry Minimal use of accessory muscles of respiration SpO_2> 92% PEF >50% of predicted No clinical features of severe asthma	Wheeze (bi-phasic) +/- decreased air entry Marked use of accessory muscles of respiration SpO_2< 92% PEF <50% of predicted Pulse >120/min(over 5 years old) >130/min(2-5 years old) Respiratory rate >30/min(over 5 years old) >50/min (2-5 years old)	Silent chest Poor respiratory effort Cyanosis SpO_2< 92% PEF < 33% of predicted Hypotension Exhaustion Confusion Coma

3.2 **Important points when assessing severity of asthma**

- It is not necessary for all the clinical criteria to be met for a patient to be considered to have severe or life threatening asthma.
- Low oxygen saturations (<92%) after initial bronchodilator treatment identifies a more severe group of patients requiring more aggressive management as inpatients.
- Attempt to measure PEF in all children aged over 5 years, taking the best of three measurements, ideally expressed as percentage of personal best (if known) or as percentage of predicted PEF

- PEF of <50% after initial bronchodilator treatment is predictive of a more prolonged asthma attack.

- Chest x-rays and arterial blood gas measurements rarely provide additional useful information and are not routinely indicated. However a CXR should be considered if this is first presentation of asthma or if it is clinically indicated.

Table 1 Peak Expiratory flow rate for use with EU / EN 13826 scale PEF meters only

Height (m)	Predicted EU PEFR (L/min)	Height (m)	Predicted EU PEFR (L/min)
0.85	87	1.30	212
0.90	95	1.35	233
0.95	104	1.40	254
1.00	115	1.45	276
1.05	127	1.50	299
1.10	141	1.55	323
1.15	157	1.60	346
1.20	174	1.65	370
1.25	192	1.70	393

4.0 Management

(Refer to algorithms - Appendices A and B)

4.1 Bronchodilator delivery

- Calm and reassure the child and parents.

- Metered dose inhalers (MDI) and spacer are the preferred option for delivering bronchodilators in asthma i.e. children who are not oxygen dependent. Children receiving â$_2$ agonists via spacer are less likely to have tachycardia and hypoxia than with nebulised bronchodilators

- Children aged under 5 years require the ‘aero-chamber’ and face mask, whilst children over 5 years require the ‘aero-chamber plus inhalers; which should be actuated into the spacer in individual puffs and inhaled immediately by tidal breathing (five breaths). Remember to shake the MDI between actuations.

- Doses can be repeated every 20 minutes. Up to 10 puffs of salbutamol may be needed for severe asthma.

- Nebulised Salbutamol should be administered in children who are oxygen dependent. It can be given continuously in children with severe acute asthma.

- The frequency of inhaled bronchodilators is determined by the severity of the attack and can range from continuous to 4 hourly.

4.2 Steroids

- Early use of oral prednisolone can reduce the need for hospital admission and prevent a relapse in symptoms after initial presentation.
- A soluble preparation of prednisolone should be used.
- Give prednisolone 20mg daily for three days for children aged 2-5 years of age
- Give prednisolone 30-40mg daily for three days for children over 5years of age
- Children already receiving maintenance steroid tablets should be on 2mg/kg up to a maximum of 60mg once daily
- For acute episode of asthma treatment up to three days is usually sufficient
- Intravenous hydrocortisone (4mg/kg repeated 6 hourly) should be reserved for children with severe or life threatening asthma or those who are unable to retain their medication

4.3 Intravenous salbutamol

- The early addition of a bolus dose of intravenous salbutamol can be an effective adjunct to treatment in severe cases.
  (Refer to Table 1)
- Continuous infusion should be considered when there is uncertainty about reliable inhalation or for severe refractory asthma. Discuss child's condition with a senior member of the paediatric team

Table 1: Preparation: Salbutamol 5mg in 5ml amps

Age / weight range	**Dilution**	**Dose range**	**Rate calculations**
All children via **peripheral line**	10mg in 50ml Glucose 5%	The usual loading dose is: Over 2years: 15 micrograms / kg total dose given over 5 minutes. This is followed by a continuous infusion at a rate of 1 – 5 micrograms / kg / minute.	**Using 10mg in 50ml:** 0.025ml/kg = 5 microgram/kg 0.3ml / Kg / hour = 1 microgram / Kg / minute
All children via **central line**	1mg/ml infusion may be given undiluted		**Using 1mg in 1ml:** 0.005ml/kg = 5 microgram/kg 0.06ml / Kg / hour = 1 microgram / Kg / minute

4.4 Intravenous aminophylline

- Aminophylline is **not** recommended in children with mild to moderate acute asthma.

- Discuss child's condition with senior paediatric team member when considering aminophylline in for children with **severe** or **life threatening bronchospasm** unresponsive to maximal doses of inhaled bronchodilators.

- A 5mg/kg loading dose should be given over 20 minutes with ECG monitoring (omit in those on oral theophyllines) followed by a continuous infusion at 1mg/kg/hour.

4.5 Intravenous fluids

- Children with prolonged severe respiratory distress not tolerating oral fluids may require intravenous hydration. Electrolytes should be checked in every case. The results should be requested urgently in order to rule out the possibility of inappropriate secretion of antidiuretic hormone (SIADH) or hypokalaemia. In the case of SIADH the child will need fluid restriction, hypokalaemia needs correction. Both salbutamol and aminophylline are fairly strong diuretics and the risk of hypokalaemia is high.

- Maintenance potassium should be added to all intravenous fluids (20mmol KCl /L).

4.6 Intravenous magnesium sulphate

- Magnesium sulphate is a safe treatment for acute asthma but the evidence of its effectiveness in severe, unresponsive childhood asthma is inconsistent. Seek senior advice and help before using intravenous magnesium sulphate.
  (Refer to Table 2)

Table 2: Preparation: Magnesium sulphate 10% (100mg/ml) amps

Age / weight range	Dose	Dilution
<50kg	40 mg / kg i.e. 0.4ml / kg of 10% injection (maximum 2G) Administer by slow intravenous injection over 20 minutes (maximum rate 10mg/kg/minute).	Use 10% (100mg/ml) injection and give neat via central or peripheral line over at least 10 minutes
>50kg	Administer 2g by slow intravenous injection over 20 minutes	

5.0 Recommendations for Admission

5.1 Children with the following features should be admitted to wards as inpatients:

- Life threatening asthma
- Oxygen requirements on presentation
- Patients known to the department with previously prolonged attacks

- Moderate to severe asthma
- Bronchodilators required more frequently than every four hours
- No response to treatment after up to four hours of bronchodilators and steroids
- An oxygen requirement after four hours of treatment with bronchodilators and steroids
- Concerns with regards to the ability of the carers to manage asthma at home and overnight
- Children's Early Warning Score of 3 or above

5.2 **Continued Monitoring**

- The child requires close continual monitoring
- Recording of pulse rate, respiratory rate and pattern, pulse oximetry and CEWT score
- Supportive nursing care with adequate hydration

6.0 Recommendations for Discharge

- Mild asthma
- Moderate asthma, responsive to treatment
- No oxygen requirements (oxygen saturations >94%).
- Bronchodilators needed four hourly or less.
- Nurses provide written management plan for the carers and also train the family in use of inhaler device.
- Parents/carers able to manage child at home.
- Follow up with General Practitioner (within one week) or outpatient clinic arranged.

7.0 Staff Training

7.1 All medical and nursing staff are to ensure that their knowledge, competencies and skills are up-to-date in order to complete their portfolio for appraisal.

7.2 During induction process junior medical staff will receive instruction on current policy and guidelines.

7.3 Staff will regularly receive updated guidelines to read

8.0 Infection Prevention

8.1 All staff should follow Trust guidelines on infection prevention ensuring that they effectively 'decontaminate their hands' before and after procedures.

9.0 Audit and Monitoring

9.1 Where a Patient's notes have demonstrated that the appropriate action has not been taken then a 'DATIX' form is to be completed. This will highlight further staff training needs.

9.2 A quarterly DATIX audit will be examined by the Lead Nurse and the clinical director and risk lead for CYP.

9.3 Where a child's notes have demonstrated that the appropriate action has not been taken a 'risk event form' is to be completed. This will address any further training needs for staff that require updating.

9.4 Audit of compliance with this guideline will be considered on an annual audit basis in accordance with the Clinical Audit Strategy and Policy (register number 08076), the Corporate Clinical Audit and Quality Improvement Project Plan and the Maternity annual audit work plan; to encompass national and local audit and clinical governance identifying key harm themes. The Women's and Children's Clinical Audit Group will identify a lead for the audit.

9.5 The findings of the audit will be reported to and approved by the Multi-disciplinary Risk Management Group (MRMG) and an action plan with named leads and timescales will be developed to address any identified deficiencies. Performance against the action plan will be monitored by this group at subsequent meetings.

9.6 The audit report will be reported to the monthly Directorate Governance Meeting (DGM) and significant concerns relating to compliance will be entered on the local Risk Assurance Framework.

9.7 Key findings and learning points from the audit will be submitted to the Patient Safety Group within the integrated learning report.

9.8 Key findings and learning points will be disseminated to relevant staff.

10.0 Communication

10.1 Approved guidelines are published monthly in the Trust's Focus Magazine that is sent via email to all staff.

10.2 Approved guidelines will be disseminated to appropriate staff via email after ratification of guideline.

11.0 References

Scottish intercollegiate Guidelines Network. British guideline on the management of asthma. SIGN Guideline 101 May 2008.

Royal College of Paediatrics and Child Health.Medicines for Children. 2 edition, 2003.

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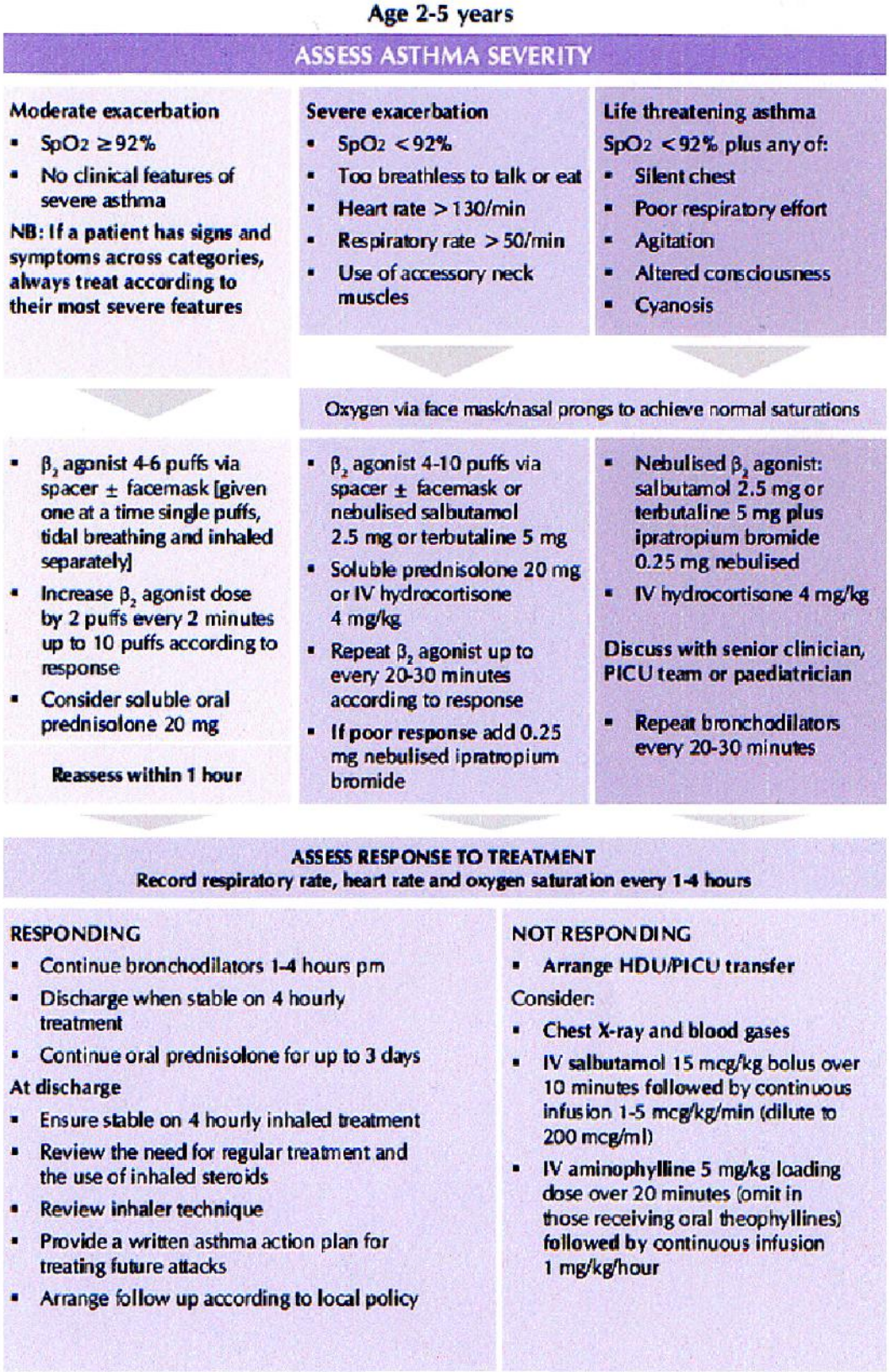
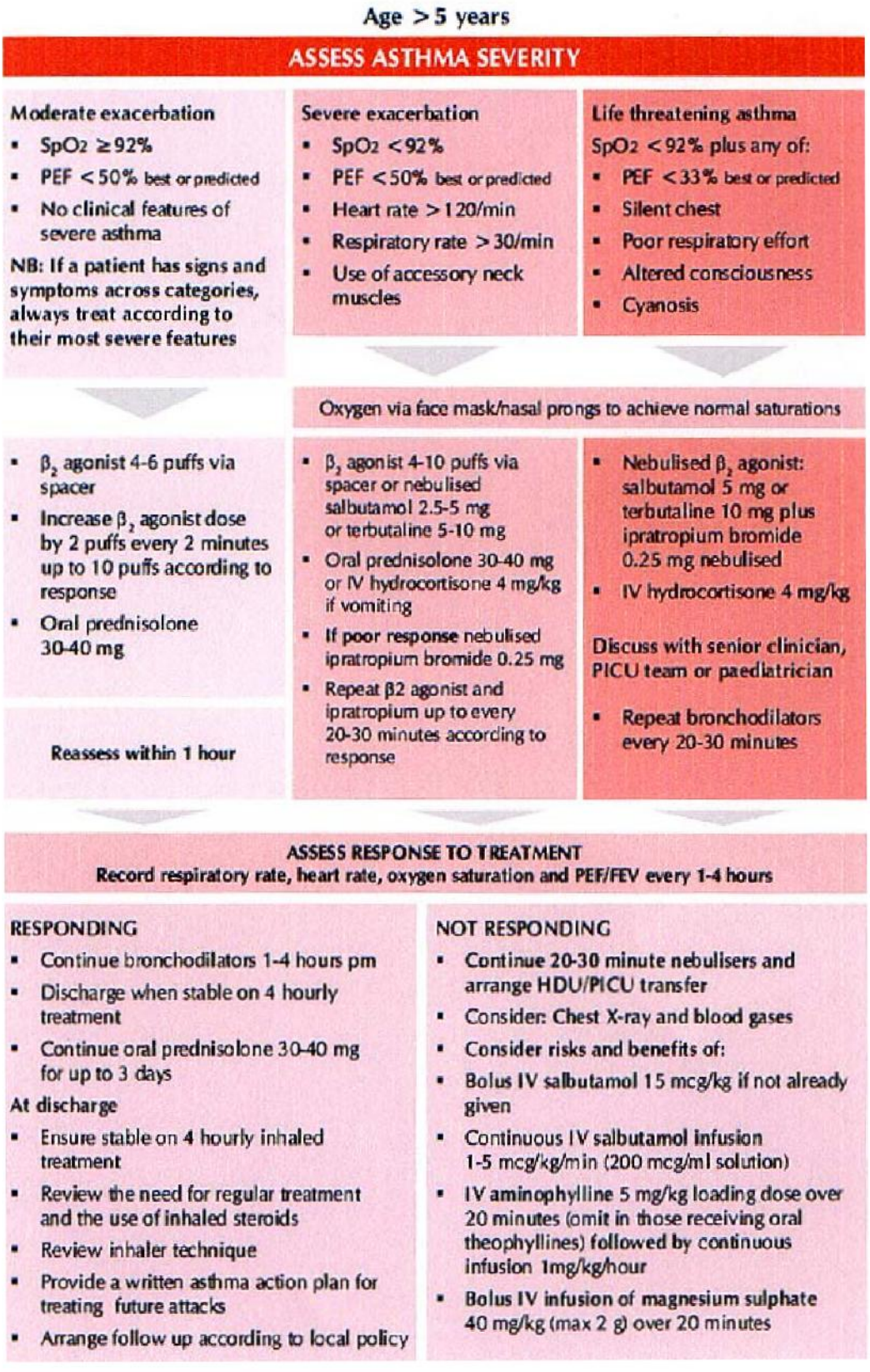
Appendix A


Age 2-5 years
ASSESS ASTHMA SEVERITY
Moderate exacerbation
SpO2 ≥92%
No clinical features of severe asthma
NB: If a patient has signs and symptoms across categories, always treat according to their most severe features
Severe exacerbation
SpO2 <92%
Too breathless to talk or eat
Heart rate >130/min
Respiratory rate >50/min
Use of accessory neck muscles
Life threatening asthma
SpO2 <92% plus any of:
Silent chest
Poor respiratory effort
Agitation
Altered consciousness
Cyanosis
Oxygen via face mask/nasal prongs to achieve normal saturations
β2 agonist 4-6 puffs via spacer ± facemask [given one at a time single puffs, tidal breathing and inhaled separately]
Increase β2 agonist dose by 2 puffs every 2 minutes up to 10 puffs according to response
Consider soluble oral prednisolone 20 mg
Reassess within 1 hour
β2 agonist 4-10 puffs via spacer ± facemask or nebulised salbutamol 2.5 mg or terbutaline 5 mg
Soluble prednisolone 20 mg or IV hydrocortisone 4 mg/kg
Repeat β2 agonist up to every 20-30 minutes according to response
If poor response add 0.25 mg nebulised ipratropium bromide
Nebulised β2 agonist: salbutamol 2.5 mg or terbutaline 5 mg plus ipratropium bromide 0.25 mg nebulised
IV hydrocortisone 4 mg/kg
Discuss with senior clinician, PICU team or paediatrician
Repeat bronchodilators every 20-30 minutes
ASSESS RESPONSE TO TREATMENT
Record respiratory rate, heart rate and oxygen saturation every 1-4 hours
RESPONDING
Continue bronchodilators 1-4 hours prn
Discharge when stable on 4 hourly treatment
Continue oral prednisolone for up to 3 days
At discharge
Ensure stable on 4 hourly inhaled treatment
Review the need for regular treatment and the use of inhaled steroids
Review inhaler technique
Provide a written asthma action plan for treating future attacks
Arrange follow up according to local policy
NOT RESPONDING
Arrange HDU/PICU transfer
Consider:
Chest X-ray and blood gases
IV salbutamol 15 mcg/kg bolus over 10 minutes followed by continuous infusion 1-5 mcg/kg/min (dilute to 200 mcg/ml)
IV aminophylline 5 mg/kg loading dose over 20 minutes (omit in those receiving oral theophyllines) followed by continuous infusion 1 mg/kg/hour

Appendix B


Age > 5 years
ASSESS ASTHMA SEVERITY
Moderate exacerbation
SpO2 ≥ 92%
PEF < 50% best or predicted
No clinical features of severe asthma
NB: If a patient has signs and symptoms across categories, always treat according to their most severe features
Severe exacerbation
SpO2 < 92%
PEF < 50% best or predicted
Heart rate > 120/min
Respiratory rate > 30/min
Use of accessory neck muscles
Life threatening asthma
SpO2 < 92% plus any of:
PEF < 33% best or predicted
Silent chest
Poor respiratory effort
Altered consciousness
Cyanosis
Oxygen via face mask/nasal prongs to achieve normal saturations
β2 agonist 4-6 puffs via spacer
Increase β2 agonist dose by 2 puffs every 2 minutes up to 10 puffs according to response
Oral prednisolone 30-40 mg
Reassess within 1 hour
β2 agonist 4-10 puffs via spacer or nebulised salbutamol 2.5-5 mg or terbutaline 5-10 mg
Oral prednisolone 30-40 mg or IV hydrocortisone 4 mg/kg if vomiting
If poor response nebulised ipratropium bromide 0.25 mg
Repeat β2 agonist and ipratropium up to every 20-30 minutes according to response
Nebulised β2 agonist: salbutamol 5 mg or terbutaline 10 mg plus ipratropium bromide 0.25 mg nebulised
IV hydrocortisone 4 mg/kg
Discuss with senior clinician, PICU team or paediatrician
Repeat bronchodilators every 20-30 minutes
ASSESS RESPONSE TO TREATMENT
Record respiratory rate, heart rate, oxygen saturation and PEF/FEV every 1-4 hours
RESPONDING
Continue bronchodilators 1-4 hours pm
Discharge when stable on 4 hourly treatment
Continue oral prednisolone 30-40 mg for up to 3 days
At discharge
Ensure stable on 4 hourly inhaled treatment
Review the need for regular treatment and the use of inhaled steroids
Review inhaler technique
Provide a written asthma action plan for treating future attacks
Arrange follow up according to local policy
NOT RESPONDING
Continue 20-30 minute nebulisers and arrange HDU/PICU transfer
Consider: Chest X-ray and blood gases
Consider risks and benefits of:
Bolus IV salbutamol 15 mcg/kg if not already given
Continuous IV salbutamol infusion 1-5 mcg/kg/min (200 mcg/ml solution)
IV aminophylline 5 mg/kg loading dose over 20 minutes (omit in those receiving oral theophyllines) followed by continuous infusion 1mg/kg/hour
Bolus IV infusion of magnesium sulphate 40 mg/kg (max 2 g) over 20 minutes