

Guideline: Asthma Life Threatening: Management of

Purpose

This guideline applies to all children over 1 year of age presenting with Asthma.

The aim of this guideline is to treat life threatening asthma.

It is applicable to the Emergency Department, clinical wards or in the Intensive Care Unit.

Responsibility

This policy has been adopted by the Kidz First Operational Group.

We acknowledge that this Guideline has been adapted with permission from Starship Children's Health Clinical Guideline by Fran Settle and Edited by Raewyn Gavin April 2007.

Guideline

All patients with life threatening asthma should be discussed with ICU and the supervising Paediatrician or Emergency Care SMO. Patients on bronchodilator infusions with or without assisted non-invasive ventilation (NIV) may be managed in the monitored or resuscitation area of KidzFirst EC with regular ICU review for a prolonged period if they are improving and therapy can be actively de-escalated. Children who require ongoing treatment with salbutamol infusions will be admitted to ICU or may require PICU transfer as directed by ICU.

Recognition of Life-threatening Asthma

- Deterioration despite maximal therapy on severe asthma pathway.
- Respiratory – cyanosis/exhaustion.
- Neurological – confusion/drowsiness.
- Cardiovascular – pulsus paradoxus.

Consider diagnoses other than asthma, especially in infants with poorly responsive respiratory distress. No infant (< 1 year) should be started on intravenous bronchodilators without discussion with a consultant.

Management

If the patient's condition is improving therapy can be de-escalated at any stage.

1. **Call for assistance** - request urgent review with ICU/ Paediatrician or EC SMO.
2. **Oxygen**– use high flow oxygen via mask (e.g. 15 L/min).
3. **Nebulised bronchodilators** - Continuous nebulised salbutamol 5 mg/dose for all ages. Add ipratropium bromide 0.25 mg to the second nebuliser, if there is inadequate response to the first salbutamol nebule. Repeat ipratropium every 20 minutes for 3 doses, then every 4 hours.

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4. **IV access.**
5. Give **Hydrocortisone** - 4 mg/kg IV as soon as possible.
6. **IV Salbutamol bolus** - Give 10 micrograms/kg (single dose maximum 500 micrograms) over 2 minutes. Give in a minimum volume of 5 ml (can be diluted with 0.9% Saline). Repeat dose at 10 minutes if still not improving.
7. **IV Magnesium sulphate bolus** - Use magnesium sulphate 49.3% (493 mg/ml). Give 0.1 ml/kg (approximately 50 mg/kg) over 10 - 20 minutes (dilute to 20 ml with normal saline and infuse via syringe driver). Maximum dose 5 ml (2.5 g).
8. **Salbutamol infusion** - If inadequate response to bolus therapy. Alert the Paediatrician and Emergency consultant if they are not already involved. These patients will need an ICU review as they cannot be admitted to the ward on a salbutamol infusion.
9. **IV Aminophylline bolus** - Give 10 mg/kg IV (maximum dose 500 mg) over 1 hour (dilute to 1mg/ml – the total volume will be 10 ml/kg, compatible with fluid containing sodium chloride and/or Dextrose and/or Potassium). If the child is already on oral theophylline, do not give IV aminophylline unless you have obtained a baseline serum level and can calculate a reduced loading dose. If patient is on any other medications you must check for potential interactions and adjust dose accordingly ([see below](#)).
10. If inadequate response to bolus therapy then start an **Aminophylline infusion** via a separate IV line. These children require ICU input.
11. If inadequate response to IV therapy **Ventilatory support** (CPAP, IPPV) may be required. ICU and EC/Paediatric SMO input must be obtained.

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

Salbutamol Infusion

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

Infusion - Add 25 ml Salbutamol (1 mg/ml) to 25 ml 5% dextrose in a 50 ml syringe. Using the table below work out the required rate of infusion according to weight and dose required.

* Be aware that this differs from the salbutamol infusion used at CED, but has been retained for the Kidz First site because of a long history of safety and ease of preparation.

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Weight	1 mcg/kg/min	2 mcg/kg/min	5 mcg/kg/min
10kg	1.2 ml/hr	2.4 ml/hr	6 ml/hr
12.5kg	1.5 ml/hr	3 ml/hr	7.5 ml/hr
15kg	1.8 ml/hr	3.6 ml/hr	9 ml/hr
17.5kg	2.1 ml/hr	4.2 ml/hr	10.5 ml/hr
20kg	2.4 ml/hr	4.8 ml/hr	12 ml/hr
22.5kg	2.7 ml/hr	5.4 ml/hr	13.5 ml/hr
25kg	3.0 ml/hr	6 ml/hr	15 ml/hr
27.5kg	3.3 ml/hr	6.6 ml/hr	16.5 ml/hr
30kg	3.6 ml/hr	7.2 ml/hr	18 ml/hr
32.5kg	3.9 ml/hr	7.8 ml/hr	19.5 ml/hr
35kg	4.2 ml/hr	8.4 ml/hr	21 ml/hr
37.5kg	4.5 ml/hr	9.0 ml/hr	22.5 ml/hr
≥40kg	4.8 ml/hr	9.6 ml/hr	24 ml/hr

It is important to be aware that dose of salbutamol used for infusion rates in children greatly exceed adult doses. 5 microgram/kg/min should be given for as short a period as possible and with consultation and frequent review by ICU. Prolonged use of high doses of salbutamol is associated with the development of lactic acidosis.

Aminophylline Infusion

If patient is on regular aminophylline or theophylline discuss with consultant prior to starting infusion: Theophylline blood levels may need to be checked. No loading dose is needed if the Theophylline level is within the therapeutic range. Give half of the full loading dose if the level is below the therapeutic range

This infusion is calculated according to patient age and weight. Dose adjustment for obesity: use 50th percentile of expected weight for age.

Aged 1-9 years and less than 23 kg

Dose is 55 mg/kg.

Make up to 50 ml with 5% dextrose.

Run infusion at **1 ml/hr = 1.1 mg/kg/hr** via syringe driver.

Aged 1-9 years and greater than 23 kg

Draw up 50 mL undiluted 25 mg/ml aminophylline solution into a syringe.

This is to be infused undiluted.

Run infusion at rate = **1 mL/hr**.

Aged ≥ 10 years and <35kg

Dose is 35 mg/kg.

Make up to 50 ml with 5% dextrose.

Run infusion at **1 ml/hr = 0.7 mg/kg/hr** via syringe driver.

Aged ≥ 10 years and ≥35kg

Draw up 50 ml undiluted 2 5mg/ml aminophylline solution into a syringe.

This is to be infused undiluted.

Run infusion at rate of $0.028 \times \text{weight} = \text{ml/hr}$ (**Calculated rate = 0.7 mg/kg/hr**).

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Measure aminophylline levels 6-12 hours after commencing infusion (target concentration 55 – 110 µmol/L).

References

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9. Roberts et al, Thorax 2003;58:306-310 Intravenous Salbutamol Bolus Compared with an Aminophylline Infusion in children with severe asthma: a randomised controlled trial
10. WFS Sellers and B Messahel, Anaesthesia, 2003;58:680-683 Rapidly Repeated Intravenous boluses of salbutamol for acute severe asthma

Definitions

Terms and abbreviations used in this document are described below:

Term/Abbreviation	Description
SMO	Senior Medical Officer.
ICU	Intensive Care Unit.
PICU	Paediatric Intensive Care Unit.
CED	Children’s Emergency Department.

Associated Documents

Other documents relevant to this guideline are listed below:

NZ Legislation	None
CMDHB Clinical Board Policies	None
NZ Standards	None
Organisational Procedures or Policies	None

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Asthma Life Threatening Management of Guideline

Other related documents	<p>Starship Hospital Guidelines. Management of acute Asthma. Life threatening Asthma.</p> <p>Kidz First Guidelines. Acute asthma algorithm. Chronic asthma algorithm. Management of acute asthma.</p>
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