**Guidelines for the management of Acute Asthma in children aged 1-17 years**

Indications:

All children with viral induced wheeze/asthma aged 1-17 years. Also to be used in conjunction with anaphylaxis guideline where appropriate.

Cautions:

Special clerking proforma available in asthma attachment, salbutamol bolus/infusion sticker available in asthma drawer in Paediatric A&E, on discharge all to be given a Personalised Asthma Action Plan

<table>
<thead>
<tr>
<th>Authors</th>
<th>Dr Fiona MacCarthy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dr Claire Matthews</td>
</tr>
<tr>
<td></td>
<td>Dr Stefan Mantke</td>
</tr>
<tr>
<td></td>
<td>Dr Diab Haddad</td>
</tr>
<tr>
<td></td>
<td>Dr Bozhena Zoritch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ratified</th>
<th>March 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next due for ratification</td>
<td>March 2021</td>
</tr>
<tr>
<td>References</td>
<td>NICE asthma</td>
</tr>
<tr>
<td></td>
<td>BTS 2016 guidelines</td>
</tr>
</tbody>
</table>
### Management of Acute Asthma in Children <16

#### Assess Severity

<table>
<thead>
<tr>
<th><strong>Moderate</strong></th>
<th><strong>Severe</strong></th>
<th><strong>Life threatening</strong></th>
</tr>
</thead>
</table>
| • SpO2>92% in air  
• Some respiratory distress but no features of severe asthma  
• PEFR>50% best predicted  
• Requiring reliever<3hrly | • SpO2<92% in air  
• HR>125/min (>140 if <5y)  
• RR>30/min (>40 if <5y)  
• Too breathless to talk or eat  
• PEFR 33-50% best/predicted  
• Requiring reliever>3hrly | • SpO2<92% in air  
• Pallor/cyanosis  
• Poor respiratory effort  
• Silent Chest  
• Altered consciousness  
• Fatigue/exhaustion/agitation  
• PFR<33% best/predicted  
• Hypotension |

#### Fast bleep Paediatric Team/Anaesthetist

- **Oxygen** (aim SATS 94-98%)
- **Salbutamol neb**  
  2.5mg if <5 y  
  5mg if >5 y  
  (+consider MgSO4 neb 150mg)
- **Ipatropium bromide neb**  
  Age <12y 250mcg  
  Age >12 y 500 mcg, repeat 2x in first hour
- **IV Hydrocortisone**  
  see doses in severe
- **IV Salbutamol**  
  Under 2 years bolus 5mcg/kg  
  Over 2 years max dose 250mcg

#### Fast bleep Paediatric Team/Anaesthetist

- **Oxygen** (SATS 94-98%)
- **Salbutamol neb**  
  2.5mg if <5 y, 5mg if >5 y (+consider MgSO4 neb 150mg)
- **Ipatropium bromide neb**  
  Age <12y 250mcg  
  Age >12 y 500 mcg, repeat 2x in first hour

#### Discharge

1. Salbutamol inhaler 2-10 puffs via spacer every 4 hours until symptoms resolve
2. Prednisolone for 3 days
3. Check inhaler technique
4. Give written Asthma Action Plan
5. Advise to see GP for review within next 2 days

#### Fast bleep Paediatric Team/Anaesthetist

- **Oxygen** (SATS 94-98%)
- **Salbutamol neb**  
  2.5mg if <5 y, 5mg if >5 y (+consider MgSO4 neb 150mg)
- **Ipatropium bromide neb**  
  Age <12y 250mcg  
  Age >12 y 500 mcg, repeat 2x in first hour
- **IV Hydrocortisone** see doses in severe
- **IV Salbutamol**  
  Under 2 years bolus 5mcg/kg  
  Over 2 years 15mcg/kg up to max dose 250mcg

#### Fast bleep Paediatric Team/Anaesthetist

- **Oxygen** (SATS 94-98%)
- **Salbutamol neb**  
  2.5mg if <5 y, 5mg if >5 y (+consider MgSO4 neb 150mg)
- **Ipatropium bromide neb**  
  Age <12y 250mcg  
  Age >12 y 500 mcg, repeat 2x in first hour
- **IV Hydrocortisone** see doses in severe
- **IV Salbutamol**  
  Under 2 years bolus 5mcg/kg  
  Over 2 years 15mcg/kg up to max dose 250mcg

#### Arrangement of Ward Admission

1. Call Paeds Team  
2. Oxygen to achieve SpO2 94-98%  
3. Salbutamol neb/inhaler 1-2hrly  
4. Atrovent neb/inf 4-6 hrly  
5. Steroids oral/iv  
6. Monitor fluid intake and gases;K⁺, glu&lactate  
7. Review regularly

#### Arrangement of HDU/PICU

1. Consider CXR & blood gases  
2. IV Salbutamol infusion 1-2mcg/kg/min  
3. IV Mg sulphate 40mg/kg over 20min (max2g)  
4. Liaise with anaesthetic team  
5. STRS  
6. Consider Aminophylline
Notes on the guidelines

1. If a child has signs & symptom across severity categories, always treat according to the most severe features.

2. Start with 4 puffs of inhaled salbutamol, increase by 2 puffs every 2 minutes according to response, up to 10 puffs.

3. Children with acute severe asthma are prone to both dehydration and fluid overload because of tachypnoea coupled with poor intake & the possible development of SIADH (syndrome of inappropriate ADH secretion) respectively; careful & repeated assessment of fluid & electrolyte balance is crucial.

4. Hypokalaemia, a rise or fall in blood glucose and elevation of blood lactate can be induced by β₂ agonists. Steroids & aminophylline can also cause a rise in blood glucose and a fall in serum potassium.

5. During salbutamol infusion, nebulisers should usually be continued at a frequency appropriate to severity level but at a reduced dose of 2.5mg. ECG monitoring is mandatory for children on IV salbutamol.

Instructions for making up solution for IV bolus dose
Take 0.5 mg (500mcg) in 1ml salbutamol and add 9 ml of water for injection to get a concentration of 50 mcg/ml = 5mcg per 0.1 ml. IV bolus dose of 15mcg/kg equals 0.3 ml/kg of this diluted solution.
- Maximal dose is 250mcg

Instructions for making up solution for IV infusion

Step 1 10mg salbutamol and make up to 50ml with normal saline (200mcg/ml)
Step 2 Calculate dose in mcg per hour
Step 3 Dividing this dose by 200 gives the amount of ml required per hour

Example: A 45kg boy needs IV salbutamol starting at 1mcg/kg/min

Step 1 10mg make up to 50ml with normal saline (1ml=200mcg)
Step 2 1mcg/kg/min= 60mcg/kg/hr so for 45kg child
=2700mcg/hr
Step 3 Rate of infusion=2700/200=13.5ml/hr

6. Consider CXR as poor response to treatment may be due to lung collapse, associated genuine chest infection, pneumothorax or dehydration.

7. Blood gases rarely influence initial management in children; the associated distress of sampling may in fact cause worsening. When deemed appropriate a venous sample is usually adequate for assessment.
of any CO retention (<6kPa on venous gas excludes hypercapnia) and the acid–base status.

8. Increase the **salbutamol infusion** rate by 0.5 -1 μcg/kg/min every 10-15 minutes according to response. Can increase above 2 μcg/kg/min only after liaison with retrieval service. (Sticker available in asthma drawer in Paeds A&E to help with calculation)

9. Magnesium sulphate is a safe treatment for asthma but its efficacy in childhood asthma is not proven. Use in cases unresponsive to more conventional treatment.

   In the BTS 2016 guidelines the use of Magnesium sulphate nebulizers 150mg (standardised dose) this nebul can be added to the salbutamol and ipatropium nebulizer in the **first hour**. (This means that a maximum of 3 nebules of salbutamol mixed with ipatropium and magnesium sulphate can be given in the first hour of treatment after this no further **nebulised** magnesium shoud be given. Ipatropium can be given 4-6 hourly thereafter). This is to be discussed with the consultant. It is only indicated in severe asthma Sats less than 91% with a short duration of onset of severe symptoms. Do not delay IV access.

   Intravenous dose 40mg/kg of Magnesium Sulphate (max 2g) over 20 minutes with ECG monitoring (dilute 50% solution Magnesium sulphate solution as calculated to make up a total volume of 20ml with normal saline a chart can be found in the appendix). A second dose can be given 12 hours or more after the first but discuss with the consultant and check serum calcium and magnesium levels before giving. Consensus opinion is that in life-threatening asthma after the MgSO4 nebul, iv magnesium can still be given.

10. Aminophylline rarely adds to the bronchodilation achieved from β agonists.
    It should only be used when there is no response despite the use of adequate doses of inhaled & IV β₂ agonists. Discuss with STRS team at this stage. It has a narrow therapeutic index and its plasma levels are influenced by a range of factors including interactions with some medications (eg macrolides, phenytoin,etc). Check drug interactions & verify there is no recent intake of theophyllines before giving the loading dose. ECG monitoring is mandatory. A 5 mg/kg loading dose should be given over 20 minutes with ECG monitoring followed by a continuous infusion at 1 mg/kg/hour. (see asthma appendix for calculation)

11. Discuss with the consultant regarding use of Heliox. Make sure to escalate for anaesthetic support early.

References:
BTS SIGN 153 asthma management in children 2016
NICE asthma guidelines