Alberta Acute Childhood Asthma Pathway: Evidence based* recommendations
For Emergency / Urgent Care

AT TRIAGE

1 Should the child be placed into the Pathway?

Inclusion

- Children ≥ 1 year and ≤ 18 years of age who present with wheezing and respiratory distress, and have been diagnosed by a physician to have asthma or have been treated prior to this episode with a bronchodilator for wheezing.**

Exclusion

- Children diagnosed with bronchiolitis (i.e. children < 1 yr of age who present with their first known episode of wheeze)
- Children diagnosed with upper airway obstruction (i.e. children with respiratory distress who have inspiratory stridor)

**While children ≥ 1 year of age with their first known episode of wheeze should not be routinely treated as part of the pathway, treating physicians may choose to include these children in the pathway.

2 Assessment at Triage

- Determine PRAM score (see chart at right), assess RR, HR, BP, T, O2 Sat on Room Air, and LOC

3 Initiate Treatment based on severity as determined by PRAM Score

Asthma Clinical Score (PRAM)♣

Mild, Moderate, Severe or Impending Respiratory Failure

Chalut D, Ducharme F, Davis G - J Pediatrics 2000;137:762-768

♣ modified to adjust for higher altitude

<table>
<thead>
<tr>
<th>Signs</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suprasternal Indrawing</td>
<td>absent</td>
<td>present</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scalene retractions</td>
<td>absent</td>
<td>present</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheezing</td>
<td></td>
<td>exponential only</td>
<td>inspiratory and expiratory</td>
<td>audible without stethoscope/silent chest with minimal air entry</td>
</tr>
<tr>
<td>Air entry</td>
<td>normal</td>
<td>decreased at bases</td>
<td>widespread decrease</td>
<td>absent/minimal</td>
</tr>
<tr>
<td>Oxygen saturation on room air</td>
<td>≥ 94%</td>
<td>90% - 93%</td>
<td>≤ 89%</td>
<td></td>
</tr>
</tbody>
</table>

Severity Classification

<table>
<thead>
<tr>
<th>PRAM CLINICAL Score</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Impending Respiratory Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4</td>
<td></td>
<td></td>
<td>5 - 8</td>
<td>Regardless of score, presence of: lethargy, cyanosis, decreasing respiratory effort, and/or rising pCO2</td>
</tr>
<tr>
<td>9 - 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations

BP – Blood Pressure; CBG/ABG/VBG – Capillary or Arterial or Venous Blood Gas; CH EDs – Children’s Hospital Emergency Departments; DPI – Dry Powder Inhaler; CXR – Chest Radiograph; ED – Emergency Department; ETT – Endotracheal Tube; HR – Heart Rate; ICS – Inhaled Corticosteroid; ICU – Intensive Care Unit (PICU – Pediatric ICU); IM – Intramuscular; IO – Intraosseous; IV – Intravenous; LOC – Level of Consciousness; MDI – Metered Dose Inhaler; PO – “orally”; PRN – “when needed”; RSI – Rapid Sequence Induction; RR – Respiratory Rate; T – Temperature; UCC – Urgent Care Centre; URTI – Upper Respiratory Tract Infection; VS – Vital Signs

*To view online pathway, continuing education module, and supporting evidence go to www.albertachildhoodpathways.com
**Alberta Acute Childhood Asthma Pathway: Evidence based* recommendations**

For Emergency / Urgent Care

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**Abbreviations**
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### MILD
(Score 0-4)
- VS initially and at discharge
- consider supplemental O2
- inhaled salbutamol x 1-2 via MDI/Spacer
- consider oral steroids ②See Page 4
- CXR infrequently necessary

**Discharge if:**
- clinical score ≤ 3

**Discharge Medications / Follow-up**
- inhaled β2 Agonists PRN
- inhaled steroids ②See Page 4
- provide short-term management plan
- recommend follow-up with community physician 3-7 days
- refer to highest level of asthma education available
- antibiotic use discouraged

See Page 4 for dosing in ED/UCC and at discharge

### MODERATE
(Score 5-8)
- VS initially, q1 hour and at discharge
- keep O2 Sat ≥ 95%
- inhaled salbutamol and ipratropium x 3 within 60 minutes via MDI/Spacer
- oral steroids after first aerosol treatment
- CXR infrequently necessary
- In Regional / Rural Centres, consider Pediatrics consult if available

**Score ≤ 3**
- observe 1 hour after last inhaled salbutamol; consider discharge if continued score ≤ 3

**Discharge Medications / Follow-up**
- inhaled β2 Agonist q4 hours x 12 hours - then PRN
- inhaled steroids ②See Page 4
- oral steroids
- provide short-term management plan
- recommend follow-up with community physician 3-7 days
- refer to highest level of asthma education available
- antibiotic use discouraged

See Page 4 for dosing in ED/UCC and at discharge

**Score > 3**
(and < 4 hours after administration of oral steroids)
- admit to hospital

**Reassess following therapy**

**Score > 3**
(and ≥ 4 hours after administration of oral steroids)

**Reassess q30-60 minutes**

**Admit to hospital**

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**RAAPID NORTH 1-800-282-9911**
**RAAPID SOUTH 1-800-661-1700**

Referral, Access, Advice, Placement, Information, and Destination
SEVERE
(Score 9-12)

- VS q20 minutes until improved
- keep O₂ Sat ≥ 95%, consider 100% O₂
- continuous nebulized salbutamol and ipratropium via nebulizer
- oral steroids after first aerosol treatment

- consider IV access and fluids
- In Rural Centres contact RAAPID or Pediatrics if available
- In Regional Centres, consult Pediatrics

- continuous nebulized salbutamol and ipratropium via nebulizer
- cardiopulmonary monitor.
- consider IM epinephrine.
- insert 2 IVs; if no access consider IO.
- give IV/I0/IM steroids.
- call RAAPID and talk to the Pediatric Intensivist on call.
- get most experienced help available.
- rule out pneumothorax clinically, or by CXR if time allows.
- consider IV magnesium sulphate.
- start at 1 mcg/kg/min of salbutamol IV.
- If no improvement, consider intubation.
- give 20 ml/kg normal saline fluid bolus.
- RSI with atropine, ketamine and succinylcholine.
- place cuffed ETT.
- ventilate with low tidal volumes (4 ml/kg).
- maintain sedation and paralysis.
- rule out barotrauma (CXR).
- obtain CBG/ABG/VBG.

Discharge Medications / Follow-up
- inhaled β₂ Agonist q4 hours x 12 hours - then PRN
- inhaled steroids ② See Page 4
- oral steroids
- provide short-term management plan
- recommend follow-up with community physician 3-7 days
- refer to highest level of asthma education available
- antibiotic use discouraged

Reassess following therapy

Score ≤ 3
- observe 1 hour after last salbutamol; consider discharge if continued score ≤ 3

Score > 3 and < 9 (and ≤ 4 hours after administration of oral steroids)
- inhaled salbutamol q30-60 minutes

Reassess q30-60 minutes

Score > 3 (and ≥ 4 hours after administration of oral steroids)

Admit to hospital

Score ≥ 9
- continuous nebulized salbutamol
- initiate IV access and fluids
- consider CXR
- if at CH EDs or Regional Centre, start IV magnesium sulphate
- any other ED/UCC, contact RAAPID

Continued severe symptoms (Score ≥ 9)
- continuous nebulized salbutamol
- if at CH EDs or Regional Centre, contact PICU (RAAPID) and start IV salbutamol
- obtain CBG/ABG/VBG

Reassess following therapy

IMPENDING RESPIRATORY FAILURE

- 100% O₂ via nebulizer @ 8-10 liters per minute.
- continuous nebulized salbutamol and ipratropium via nebulizer.
- cardiopulmonary monitor.
- consider IM epinephrine.
- insert 2 IVs; if no access consider IO.
- give IV/I0/IM steroids.
- call RAAPID and talk to the Pediatric Intensivist on call.
- get most experienced help available.
- rule out pneumothorax clinically, or by CXR if time allows.
- consider IV magnesium sulphate.
- start at 1 mcg/kg/min of salbutamol IV.
- If no improvement, consider intubation.
- give 20 ml/kg normal saline fluid bolus.
- RSI with atropine, ketamine and succinylcholine.
- place cuffed ETT.
- ventilate with low tidal volumes (4 ml/kg).
- maintain sedation and paralysis.
- rule out barotrauma (CXR).
- obtain CBG/ABG/VBG.

DO NOT INTUBATE ROUTINELY

See Page 4 for list of drugs, dosing, and detailed outline of management

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- BP – Blood Pressure; CBG/ABG/VBG – Capillary or Arterial or Venous Blood Gas; CH EDs – Children’s Hospital Emergency Departments; DPI – Dry Powder Inhaler; CXR – Chest Radiograph; ED – Emergency Department; ETT – Endotracheal Tube; HR – Heart Rate; ICS – Inhaled Corticosteroid; ICU – Intensive Care Unit (PICU – Pediatric ICU); IM – Intramuscular; IO – Intraosseous; IV – Intravenous; LOC – Level of Consciousness; MDI – Metered Dose Inhaler; PO – “orally”; PRN – “when needed”; RSI – Rapid Sequence Induction; RR – Respiratory Rate; T – Temperature; UCC – Urgent Care Centre; URTI – Upper Respiratory Tract Infection; VS – Vital Signs

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DOsing IN ED/UCC

**Acute Care Medications**

**Aerosolized Salbutamol**
- Salbutamol
  - Via MDI/Spacer: 5 puffs if < 20 kg or 10 puffs if ≥ 20 kg per inhalation
- MDI/Spacer is preferred over Nebulizer therapy except for those with an O₂ Sat < 88% on room air or PRAM ≥ 9
- Via Nebulizer: 2.5 mg if < 20 kgs or 5 mg if ≥ 20 kgs per treatment

**Aerosolized Anticholinergic**
- Ipratropium
  - Via MDI/Spacer: 2 puffs per inhalation
- Via DPI: 1 puff per inhalation treatment

**Intravenous Corticosteroids**
- Use oral corticosteroids unless patient is vomiting or is in impending respiratory failure
- Prednisolone 2 mg/kg, max dose 80 mg
- Hydrocortisone 8 mg/kg, max dose 400 mg

**Magnesium Sulphate**
- Administer 40 mg/kg IV bolus over 20 minutes (max dose 2 grams)
- Use only in severe asthma unresponsive to aerosolized bronchodilators

**Intravenous Salbutamol**
- Mix 25 ml of salbutamol 1 mg/ml in 25 ml of normal saline, to produce 500 mcg/ml infusion
- Start at 1 mcg/kg/min, titrate upwards as clinically needed.
- Do not exceed 5 mcg/kg/min. Doses above 2 mcg/kg/min require close monitoring of HR, diastolic pressure and serum lactate, especially in older patients.

**Oral Corticosteroids**
- Prednisone/Prednisolone
  - 0-4 years: MDI/Spacer with mask
  - 6 years: DPI preferred
- Dexamethasone
  - 0-4 years: MDI/Spacer with mask
  - ≥ 4 years: MDI/Spacer with mouthpiece
- Methylprednisolone
  - 0-4 years: MDI/Spacer with mask
  - ≥ 4 years: MDI/Spacer with mouthpiece

**Aerosolized β₂ Agonist**
- Terbutaline
  - Via DPI: 1 puff per inhalation treatment
  - Via MDI/Spacer: 2 puffs per inhalation treatment

**Terbutaline (Bricanyl Turbuhalers)**
- Via DPI: 1 puff per inhalation treatment

**Intravenous Salbutamol**
- Administer q4 hours for 12 hours then PRN

**Hydrocortisone**
- 8 mg/kg, max dose 80 mg

**Methylprednisolone**
- 2 mg/kg, max dose 100 mg

**Aerosolized Corticosteroids**
- Inhaled corticosteroids until assessed by primary physician.
- Recommended doses are:
  - Beclometasone MDI/Spacer (Qvar): 100 mcg/puff, 2 puffs BID
  - Budesonide DPI (Pulmicort): 200 mcg/puff, 2 puffs BID
  - Fluticasone DPI (Flovent): 100 mcg/puff, 2 puffs BID
  - Fluticasone MDI/Spacer (Flovent): 125 mcg/puff, 2 puffs BID
  - Ciclesonide MDI/Spacer (Alvesco): 200 mcg/puff, 1 puff BID
  - Mometasone MDI/Spacer (Asmanex): 220 mcg/puff, 1 puff BID
- DPI are preferred over MDI/Spacer in children > 6 years of age

**EPINEPHRINE**
- IM: 0.01 ml/kg of 1/1,000, max dose 0.5 ml
- Use only in impending respiratory failure

**Device Recommendations**
- 0-4 years: MDI/Spacer with mask
- ≥ 4 years: MDI/Spacer with mouthpiece
- ≥ 6 years: DPI preferred

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- ICU – Intensive Care Unit
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DOsing AT DISCHARGE

**Mild, Moderate or Severe**

**Aerosolized Salbutamol**
- Salbutamol
  - Via MDI/Spacer: 5 puffs if < 20 kg or 10 puffs if ≥ 20 kg per inhalation
- MDI/Spacer is preferred over Nebulizer therapy except for those with an O₂ Sat < 88% on room air or PRAM ≥ 9
- Via Nebulizer: 2.5 mg if < 20 kgs or 5 mg if ≥ 20 kgs per treatment

**Aerosolized Anticholinergic**
- Ipratropium
  - Via MDI/Spacer: 2 puffs per inhalation
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- Use oral corticosteroids unless patient is vomiting or is in impending respiratory failure
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- Start at 1 mcg/kg/min, titrate upwards as clinically needed.
- Do not exceed 5 mcg/kg/min. Doses above 2 mcg/kg/min require close monitoring of HR, diastolic pressure and serum lactate, especially in older patients.

**Oral Corticosteroids**
- Prednisone/Prednisolone 2 mg/kg, max dose 60 mg PO daily for 5 days
- Dexamethasone 0.3 mg/kg, max dose 10 mg PO daily for 2-5 days

**Aerosolized Corticosteroids**
- Inhaled corticosteroids until assessed by primary physician.
- Recommended doses are:
  - Beclometasone MDI/Spacer (Qvar): 100 mcg/puff, 2 puffs BID
  - Budesonide DPI (Pulmicort): 200 mcg/puff, 2 puffs BID
  - Fluticasone DPI (Flovent): 100 mcg/puff, 2 puffs BID
  - Fluticasone MDI/Spacer (Flovent): 125 mcg/puff, 2 puffs BID
  - Ciclesonide MDI/Spacer (Alvesco): 200 mcg/puff, 1 puff BID
  - Mometasone MDI/Spacer (Asmanex): 220 mcg/puff, 1 puff BID
- DPI are preferred over MDI/Spacer in children > 6 years of age

**Device Recommendations**
- 0-4 years: MDI/Spacer with mask
- ≥ 4 years: MDI/Spacer with mouthpiece
- ≥ 6 years: DPI preferred

**Impending Respiratory Failure**

Detailed recommendations regarding management of impending respiratory failure can be found online at: www.pedsrespfailure.ca

**Notes**

Use in all children with moderate to severe asthma. Consider giving in mild asthma if: history of ICU care, recent hospital admission, frequent ED visits, or indications of recent poor control such as frequent salbutamol use.

Inhaled steroids are recommended at discharge for a) all children ≥ 6 yrs and adolescents with asthma, and b) all children < 6 yrs with persistent wheeze. For children < 6 yrs with intermittent wheeze associated with URTIs, consider inhaled steroids at discharge if the child has frequent wheezy recurrences (≥3 months), ED visit or hospitalization in last 12 months, prior ICU admission, or indications of recent poor control such as frequent salbutamol use.

Caution should be exercised when using all inhaled corticosteroids at higher doses because they pose a risk for significant adverse effects such as adrenal axis suppression or inhibition of growth (see online pathway for details*).

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Use the Pediatric Asthma Education Checklist as a guide to teach all parents these essentials:

**A** - Airways
- Review the basics of asthma

**S** - Symptoms
- Review symptoms & asthma control

**T** - Technique & Triggers
- This is a must do!!
- Assess technique & demonstrate optimal technique

**H** - Help
- Discuss when & where to go for help

**M** - Medicine
- Review how medications work & when they should be used

**A** - Asthma Action Plan
- Encourage completion of an Action Plan with Family Physician

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