Background

Following a teen’s death from asthma in 2000, the province moved to develop the Ontario Asthma Plan of Action (APA) “to reduce mortality, morbidity and health care costs . . . through integrated initiatives focused on health promotion and prevention, management and treatment, and research and surveillance.”¹² One of the APA initiatives is the Emergency Department Asthma Care Pathways (EDACP), a standardized approach to the urgent treatment of asthma. The Ontario Lung Association has been leading this initiative since 2007.

The EDACP and its implementation tools have been designed to support best practice and to address key objectives of asthma management that can lead to improved asthma care delivery and patient outcomes in the emergency department (ED). Use of clinical pathways may improve quality of care by promoting adherence to clinical guidelines, reducing variation in treatment, and improving communication with patients and between members of the health care team.³

The Ontario Lung Association assembled an inter-professional Steering Committee to oversee the development, dissemination and implementation of the EDACP. An interdisciplinary Expert Content Working Group (ECWG) reviewed Canadian Thoracic Society (CTS) and international asthma guidelines, other relevant published literature, and examples of previously developed pathways with the goal of creating comprehensive clinical pathways. Key priorities identified to guide deliberations included: assessment of exacerbation severity; evidence-based treatment; patient education prior to discharge; comprehensive discharge instructions; and, follow-up arrangements.

An Adult Emergency Department Asthma Care Pathway (A-EDACP) for ages 16 years and older was developed first. A pilot study⁴ undertaken in 2006 demonstrated that pathway use increased referrals for follow-up care and improved patient recollection of teaching done in the ED without a substantial increase in length of stay; there was also increased documentation of objective measures such as peak expiratory flow (PEF) and the use of systemic corticosteroids in the ED and on discharge. Dissemination of the A-EDACP commenced in late 2008. Incorporating new evidence and feedback from clinical users, an updated A-EDACP was released in March 2013. Lessons learned from the provincial implementation guided development of a Pediatric Emergency Department Asthma Clinical Pathway (P-EDACP) for ages 1 to 17 years, which began in late 2009. Pilot implementation of the P-EDACP at Cambridge Memorial Hospital was undertaken between November 2012 and April 2013.

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Funded by the Government of Ontario within the APA, the EDACP is available at no cost to Ontario health care professionals and facilities for non-commercial use. The pathway tools can be accessed electronically through the Ontario Lung Association website: [www.on.lung.ca/edacp](http://www.on.lung.ca/edacp). Hospitals are permitted to adapt the formatting of EDACP tools to suit their site’s requirements for order sets, including adding logos.

**Description: P-EDACP**

**Inclusion Criteria**

The P-EDACP is for patients aged 1 to 17 years presenting with wheeze and/or cough who have a history of asthma and/or prior history of wheezing. The patient must also be assessed using the Paediatric Respiratory Assessment Measure (PRAM) score, a validated measure based on 5 clinical signs: suprasternal retractions, scalene muscle retractions, air entry, wheezing, and oxygen saturation.\(^5\) The PRAM score assists clinicians to determine the asthma exacerbation severity level: mild, moderate, severe, or impending respiratory failure – the latter being informed by clinical presentation rather than a specific PRAM score.\(^6\)

**Pathway Tools**

A comprehensive algorithm guides specific treatment in each severity level, the escalation of treatment if the patient’s condition worsens, and when to consider discharge.

Additional tools include medication guidelines and pre-printed physician’s orders (PPO) for each of the four severity levels, a patient education checklist, and discharge instructions with integrated prescription. To address treatment delays noted during the A-EDACP implementation, an optional medical directive was developed to authorize administration of bronchodilators and systemic corticosteroids prior to physician assessment. A pocket reference guide and small poster will also be available to support implementation.

The discharge instructions are an adaptation, with permission, of a similar tool in use at the Children’s Hospital of Eastern Ontario (CHEO). This tool includes instructions based on the stop-light coloured zones of control depicted in many asthma action plans, along with information about asthma triggers and a quick asthma control quiz.

During pilot implementation, there was a request for a documentation tool to record PRAM scores and medication administration. As each hospital will have its own standards for medication and vital sign documentation, the expert group decided not to create a PRAM documentation tool as part of the pathway; however, examples of such documentation records from CHEO, Montreal Children’s Hospital, and a combined version will be made available, which may guide individual hospitals in creating their own documentation tools.

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\(^6\) ibid
Paediatric Asthma Clinical Pathway

Indications to start Paediatric Asthma Clinical Pathway:
- Age 1-17 years old
- Wheeze and/or cough
- Asthma diagnosis and/or past history of wheeze
- PRAM 0 - 3 (Mild)
  - **PRAM 0 - 3 (Mild)**
  - **FEV<sub>1</sub> greater than 70% of predicted or personal best, if known
- MD to assess within 60 min
- Salbutamol now and Q 60 min pm (via MDI + spacer)
- Vital Signs = PRAM 0 60 min
- PRAM 4 - 7 (Moderate)
  - **PRAM 4 - 7 (Moderate)**
  - **FEV<sub>1</sub> 50-70% of predicted or personal best, if known
  - MD to assess within 30 min
  - Administer oxygen to keep SpO<sub>2</sub> greater than or equal to 92%
  - Salbutamol now and Q 30-60 min pm (via MDI + spacer)
  - Give oral corticosteroid as soon as possible after 1st salbutamol dose (within 60 min of triage)
  - Vital Signs = PRAM q 30-60 min if not improving (PRAM unchanged or less than 3 point improvement), consider: Ipratropium bromide
- PRAM 8 - 12 (Severe)
  - **PRAM 8 - 12 (Severe)**
  - **FEV<sub>1</sub> less than 50% of predicted or personal best, if known
  - MD to assess within 15 min
  - Administer oxygen to keep SpO<sub>2</sub> greater than or equal to 92%
  - Salbutamol + Ipratropium Bromide or β<sub>2</sub>-agonist 2 doses (via MDI + spacer or nebuliser), then Q 20-60 min pm
  - Give systemic corticosteroid as soon as possible after 1st salbutamol/ipratropium dose (within 20 min of triage)
  - Vital Signs = PRAM q 20-60 min
  - Consider IV access and blood gases
- Complete all of above within 60 min of triage.

Reassess Vital Signs + PRAM q 60 min
- If PRAM greater than or equal to 4 or **PRAM**, less than 70% of predicted:
  - MD to reassess and move to top of **Moderate** pathway if PRAM remains less than or equal to 3 or **PRAM**, greater than or equal to 70% of predicted:
    - MD to consider discharge
    - Provide asthma teaching
    - Provide discharge instructions

Reassess Vital Signs + PRAM q 30-60 min
- If at any time PRAM is greater than or equal to 6 or **PRAM**, is less than 50% of predicted, or if PRAM is unchanged or has improved less than 3 points:
  - MD to reassess and move to top of **Severe** pathway if 6-10 hrs post corticosteroid, PRAM is greater than or equal to 4 or **PRAM**, is less than 70% of predicted:
    - MD to reassess and consider admission
- If PRAM less than or equal to 3 or **PRAM**, greater than or equal to 70% of predicted:
  - MD to consider discharge
  - Provide asthma teaching and discharge instructions

Reassess Vital Signs + PRAM q 20-60 min
- If poor response (PRAM unchanged or less than 3 point improvement) or signs or symptoms of impending respiratory failure at any time:
  - MD to reassess STAT and move to top of **Impending Respiratory Failure** pathway
- If no post corticosteroid, PRAM is greater than or equal to 4 or **PRAM**, is less than 70% of predicted:
  - MD to reassess and consider admission
  - PRAM improving, move to Moderate pathway

Impending Respiratory Failure
- tachycardia, cyanosis, decreasing respiratory effort, and/or rising pCO<sub>2</sub>
- MD to assess STAT and remain in attendance until patient stabilized
- Administer 100% oxygen
- Support ventilation if required (bag & mask) do not over-ventilate as this will increase air trapping
- Continuous cardiopulmonary monitoring
- Continuous nebulised salbutamol with ipratropium bromide
- Systemic corticosteroid as soon as possible after 1st salbutamol/ipratropium dose:
  - Obtain IV access

MD to consider:
- IV magnesium sulfate (caution: can cause low BP)
- IV fluids
- CXR + blood gas measurement
- Contact ICU or Regional Tertiary Centre regarding management & transport

CritiCall Ontario
1-800-668-HELP (4357)

**BRONCHOLYTICS**
- **Methacholine Inhaler (MDI)** via spacer, age appropriate spacer, allow 30 sec between puffs:
  - salbutamol (110mcg/puff)
    - 3 yrs: 4 puff/dose
    - 4 - 5 yrs: 6 puff/dose
    - 6 years and older: 8 puff/dose
  - ipratropium bromide (20 mcg/puff)
  - 3 puff/dose, alternate each puff with salbutamol
- **Wet Nebulisation** (drive by oxygen flow of 6-8 L/min via well-fitting mask):
  - salbutamol (5mg/mL solution or unit dose nebuliser
  - less than: 10 kg: dose = 1.25 mg; use 1.25 mg nebuliser OR 3.25 mL of 5 mg/mL solution in 3 mL NACI
  - 10 to 20 kg: dose = 2.5 mg, use 2.5 mg nebuliser OR 0.5 mL of 5mg/mL solution in 3 mL NACI
  - greater than: 20 kg: dose = 5 mg, use 2.5 mg nebuliser OR 1 mL of 5mg/mL solution in 3 mL NACI
  - ipratropium bromide
    - all patients: 250 mcg, mixed with salbutamol

**CORTICOSTEROIDS**
- Oral route
  - **Prednisone/prednisolone**: 2 mg/kg x 1 (max 50 mg/day)
- Intravenous route
  - **Hydrocortisone**: 1 mg/kg/36 hours IV or IV (max 125 mg/dose) x 1, could be repeated q 6h

**MAGNESIUM SULFATE**
- magnesium sulfate (requires cardiologic/unit monitoring and frequent BP checks)
  - 50 mg/kg/dose IV x 1 (max 2 g), give over 20-30 min

Medication Guidelines

**Impaired Medication Delivery by Masked Cise Inhaler (MDI) and age appropriate spacer is preferred unless continuous oxygen is required. Small volume nebulizer is an acceptable alternative.**

**<sup>1</sup>Inhaled medication delivery by metered dose inhaler (MDI) and age appropriate spacer is preferred unless continuous oxygen is required. Small volume nebulizer is an acceptable alternative.**

**<sup>2</sup>See below for PRAM scoring.**

**<sup>3</sup>FEV<sub>1</sub>, for six-second chance. PEFR should only be used in children age 6 years and older with demonstrated reproducibility within 10% and when performed by health care personnel trained in spirometry.**

**<sup>4</sup>Note: FEV<sub>1</sub> results may be discordant with the severity level indicated by the PRAM (as clinical signs and lung function are different parameters); in case of discordance, the physician is invited to use his/her best judgment to oxidize which parameter to use to manage the child. Do not delay treatment to obtain FEV<sub>1</sub>, and/or peak flow.**

**PRAM scoring table**

<table>
<thead>
<tr>
<th>O&lt;sub&gt;2&lt;/sub&gt; Saturation</th>
<th>≥ 95%</th>
<th>&lt; 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supratheral retraction</th>
<th>Absent</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scalen muscle contraction</th>
<th>Absent</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Air entry&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Normal</th>
<th>Minimal or absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wheezing&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Absent</th>
<th>Expiratory only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

**PRAM Score (Max. 12)**

<table>
<thead>
<tr>
<th>Score</th>
<th>0-3</th>
<th>4-7</th>
<th>8-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity</td>
<td>Mild</td>
<td>Moderate</td>
<td>Severe</td>
</tr>
</tbody>
</table>

Disclosures:
This Clinical Pathway is not intended to be inclusive of all applicable care for children under 17 years of age. It is intended as a guide to assist physicians, nurses, respiratory therapists and other healthcare providers in deciding on the appropriate care required for a particular patient. At times, physicians, nurses, respiratory therapists and other healthcare providers may use care plans that differ from this Clinical Pathway. Based on their knowledge, training and experience, physicians/nurses/respiratory therapists can/abide by their independent clinical judgment. Before using this Clinical Pathway, it is important to consult with the appropriate source of advice and/or treatment in the event of a particular clinical situation. The user/user's institution acknowledges and assumes any liability or responsibility for any adverse reactions or untoward events that may occur from the use of this Clinical Pathway.

The views expressed by the authors do not necessarily reflect those of the Government of Ontario.

Funded by the Government of Ontario

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Copyright © 2014 Ontario Lung Association. All rights reserved. Without the prior written permission of the Ontario Lung Association, any and all copying, reproduction, distribution, modification, or the authorization of any such use is strictly prohibited.
Inclusion Criteria: Age 1 to 17 years with wheeze and/or cough AND asthma diagnosis and/or past history of wheeze AND patient has had a Paediatric Respiratory Assessment Measure (PRAM) assessment.

Exclusion Criteria: Emergency Department visit for prescription refill only.

Introduction
This is a proactive tool that provides considerations for asthma management based on the Paediatric Respiratory Assessment Measure (PRAM)\(^1\), the Canadian Paediatric Asthma Consensus Guidelines, 2003 (updated to December 2004), the Canadian Thoracic Society Asthma Management Continuum – 2010 Consensus Summary for children six years of age and over, and adults, the Canadian Thoracic Society 2012 guideline update: Diagnosis and management of asthma in preschoolers, children and adults, and other evidence from subsequent publications.

Instructions
1. **TRIAGE** to determine patient eligibility for clinical pathway.
2. **Determine initial PRAM score** (see below).
3. **Nurse/RT** to begin Paediatric Emergency Department Asthma Clinical Pathway Medical Directive **OR** **Physician** to choose order set according to initial PRAM.
4. **IF PATIENT’S CONDITION CHANGES**, select order set that corresponds with the revised PRAM score.
5. **Refer** to medication guidelines and asthma care path on reverse of physician’s orders for more information.
6. **Physician/Nurse Practitioner** to complete Patient Discharge Prescription.
7. **Physician/RN/RT/Pharmacist** to review “Education Checklist” and “Discharge Instructions” with patient.

### Paediatric Respiratory Assessment Measure (PRAM)

<table>
<thead>
<tr>
<th>SIGNS/SCORING</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>PATIENT’S SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>O₂ saturation</strong> (in room air)</td>
<td>≥ 95%</td>
<td>92-94%</td>
<td>&lt; 92%</td>
<td></td>
<td>(max 2)</td>
</tr>
<tr>
<td><strong>Suprasternal retraction</strong></td>
<td>Absent</td>
<td>Present</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Scalene muscle contraction</strong></td>
<td>Absent</td>
<td>Present</td>
<td></td>
<td></td>
<td>(max 2)</td>
</tr>
<tr>
<td><strong>Air entry</strong></td>
<td>Normal</td>
<td>↓ at the base</td>
<td>↓ at the apex</td>
<td>Minimal or absent</td>
<td>(max 3)</td>
</tr>
<tr>
<td><strong>Wheezing</strong></td>
<td>Absent</td>
<td>Expiratory only</td>
<td>Inspiratory (± expiratory)</td>
<td>Audible without stethoscope or silent chest (minimal or no air entry)</td>
<td>(max 3)</td>
</tr>
</tbody>
</table>

* In case of asymmetry, the most severely affected (apex-base) lung field (right or left, anterior or posterior) will determine the rating of the criterion.

§ In case of asymmetry, the two most severely affected auscultation zones, irrespective of their location (RUL, RML, RLL, LUL, LLL), will determine the rating of the criterion.

PRAM Score 0 – 3  **MILD Asthma**
PRAM Score 4 – 7  **MODERATE Asthma**
PRAM Score 8 – 12  **SEVERE Asthma**
**IMPELLING RESPIRATORY FAILURE** is based on clinical presentation


| Drug Allergies: ________________________________ | Ht: __________ cm | Wt: __________ kg |

**MILD ASTHMA**
(PRAM Score 0 to 3 or *FEV₁* greater than 70% of predicted or personal best, if known)

Refer to Medication Guidelines on Reverse

- ☑ physician to assess within 60 min
- ☑ HR, RR, *Sp*₂, PRAM q 60 min

**FIRST HOUR OF TREATMENT** *(to be administered only if not already given as per the Paediatric ED Asthma Clinical Pathway Medical Directive):*

**β₂-agonist:**

- ☐ salbutamol metered dose inhaler *(preferred)*: ___ puffs NOW and q 60 min PRN
- OR ☐ salbutamol nebule: _____mg NOW and q 60 min PRN
- OR ☐ salbutamol solution (5 mg/mL): _____mg in 3 mL 0.9% sodium chloride NOW and q 60 min PRN

Additional Orders: ______________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

MD Name: _____________________________ Signature: _____________________________ Date: ________________ Time: ________________

**AFTER FIRST HOUR OF TREATMENT:**

**β₂-agonist:**

- ☐ salbutamol metered dose inhaler *(preferred)*: __________ puffs q 60 min PRN
- OR ☐ salbutamol nebule: __________ mg q 60 min PRN
- OR ☐ salbutamol solution (5 mg/mL): __________ mg in 3 mL 0.9% sodium chloride q 60 min PRN

Additional Orders: ______________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

AT DISCHARGE OR ADMISSION, CONSULT:

- ☐ Respiratory Therapist  ☐ Asthma Educator  ☐ Specialist/Service____________________

________________________________________________________________________________

________________________________________________________________________________

MD Name: _____________________________ Signature: _____________________________ Date: ________________ Time: ________________

Nurse Name: __________________________ Signature: _____________________________ Date: ________________ Time: ________________

Based on the Canadian Pediatric Asthma Consensus Guidelines, 2003 (updated to December 2004), the Canadian Thoracic Society Asthma Management Continuum – 2010 Consensus. Summary for children six years of age and over, and adults. and Canadian Thoracic Society 2012 guideline update. Diagnosis and management of asthma in preschoolers, children and adults, and other evidence from subsequent publications. Copyright © 2014, Ontario Lung Association. All rights reserved. Without the prior written permission of the Ontario Lung Association, any and all copying, reproduction, distortion, mutilation, modification, or the authorization of any such acts is strictly prohibited. September 2014
MEDICATION GUIDELINES: MILD ASTHMA
(PRAM Score 0-3 or *FEV₁ greater than 70% of predicted or personal best, if known)

<table>
<thead>
<tr>
<th>β₂-agonist (salbutamol): one initial dose, then q 60 min PRN:</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Preferred: salbutamol metered dose inhaler (MDI): 100 mcg/puff + age-appropriate spacer</em></td>
</tr>
<tr>
<td>Dose according to patient age:</td>
</tr>
<tr>
<td>1 to 3 yrs: 4 puffs/dose</td>
</tr>
<tr>
<td>4 to 6 yrs: 6 puffs/dose</td>
</tr>
<tr>
<td>7 yrs and older: 8 puffs/dose</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alternative: salbutamol nebul or 5 mg/mL solution (add 0.9% sodium chloride for total vol. 3-4 mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose according to patient weight:</td>
</tr>
<tr>
<td>Less than (&lt;) 10 kg = 1.25 mg/dose = 1.25 mg nebul or 0.25 mL of a 5 mg/mL solution</td>
</tr>
<tr>
<td>10 to 20 kg = 2.5 mg/dose = 2.5 mg nebul or 0.5 mL of a 5 mg/mL solution</td>
</tr>
<tr>
<td>Greater than (&gt; 20 kg = 5 mg/dose = 5 mg nebul or 1 mL of a 5 mg/mL solution</td>
</tr>
</tbody>
</table>

Reassess Vital Signs and PRAM every 60 minutes

- If PRAM is greater than or equal to (≥) 4 or *FEV₁ is less than 70% of predicted or personal best, if known:
  - MD to reassess and
  - Move to top of “MODERATE” pathway

- If PRAM remains less than or equal to (≤) 3 or *FEV₁ is greater than or equal to 70% of predicted or personal best, if known:
  - MD to consider discharge
  - Provide asthma teaching
  - Provide discharge instructions

* FEV₁ (or as second choice, PEF) should only be used in children aged 6 years and older with demonstrated reproducibility within 10% and when performed by health care personnel trained in spirometry. NOTE: FEV₁ results may be discordant with the severity level indicated by the PRAM (as clinical signs and lung function are different parameters): in case of discordance, the physician is invited to use his/her best judgment to decide which parameter to use to manage the child. Do not delay treatment to obtain FEV₁ and/or peak flow.

Based on the Canadian Pediatric Asthma Consensus Guidelines, 2003 (updated to December 2004), the Canadian Thoracic Society Asthma Management Continuum – 2010 Consensus. Summary for children six years of age and over, and adults and Canadian Thoracic Society 2012 guideline update: Diagnosis and management of asthma in preschoolers, children and adults, and other evidence from subsequent publications. Copyright © 2014, Ontario Lung Association. All rights reserved. Without the prior written permission of the Ontario Lung Association, any and all copying, reproduction, distortion, mutilation, modification, or the authorization of any such acts is strictly prohibited. September 2014
### MODERATE ASTHMA

(PRAM Score 4 to 7 or *FEV₁ 50-70% of predicted or personal best, if known)

- Refer to Medication Guidelines on Reverse

<table>
<thead>
<tr>
<th>PHYSICIAN’S ORDERS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug Allergies:</td>
<td>Ht: cm  Wt: kg</td>
</tr>
</tbody>
</table>

- ☑ physician to assess within 30 min
- ☑ HR, RR, S₉O₂, PRAM every 30 min x 1 hr, then q 30-60 min until PRAM less than 4
- ☑ administer oxygen to keep S₉O₂ greater than or equal to (≥) 92%

### FIRST HOUR OF TREATMENT

(to be administered only if not already given as per the Paediatric ED Asthma Clinical Pathway Medical Directive):

**β₂-agonist:**

- ☐ salbutamol metered dose inhaler (preferred): _____ puffs NOW and q 30-60 min PRN x 2 doses
- OR ☐ salbutamol nebule: _____ mg NOW and q 30-60 min PRN x 2 doses
- OR ☐ salbutamol solution (5 mg/mL): _____ mg in 3 mL 0.9% sodium chloride NOW and q 30-60 min PRN x 2 doses

**Oral Corticosteroid,** AS SOON AS POSSIBLE, within 60 (SIXTY) min of triage:

- ☐ predniSONE: _____ mg (2 mg/kg; max 50 mg) PO x 1 dose
- OR ☐ prednisoLONE: _____ mg (2 mg/kg; max 50 mg) PO x 1 dose

**Additional Orders:**

- __________________________________________________________________________

<table>
<thead>
<tr>
<th>MD Name</th>
<th>Signature</th>
<th>Date: ________ Time: ________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse Name</td>
<td>Signature</td>
<td>Date: ________ Time: ________</td>
</tr>
</tbody>
</table>

### AFTER FIRST HOUR OF TREATMENT:

**β₂-agonist:**

- ☐ salbutamol metered dose inhaler (preferred): _____ puffs q 60 min PRN
- OR ☐ salbutamol nebule: _____ mg q 60 min PRN
- OR ☐ salbutamol solution (5 mg/mL): _____ mg in 3 mL 0.9% sodium chloride q 60 min PRN

If not improving (PRAM unchanged or less than 3 point improvement), consider:

- ☐ ipratropium bromide metered dose inhaler: 3 puffs, alternate each puff with salbutamol x 3 doses

### AT DISCHARGE OR ADMISSION, CONSULT:

- ☐ Respiratory Therapist  ☐ Asthma Educator  ☐ Specialist/Service________________________

**Additional Orders:**

- __________________________________________________________________________

<table>
<thead>
<tr>
<th>MD Name</th>
<th>Signature</th>
<th>Date: ________ Time: ________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse Name</td>
<td>Signature</td>
<td>Date: ________ Time: ________</td>
</tr>
</tbody>
</table>
**MEDICATION GUIDELINES: MODERATE**
(PRAM Score 4-7 or *FEV₁ 50% to 70% of predicted or personal best, if known)

β₂-agonist (salbutamol) q 30-60 min PRN x 2 doses, then q 60 min PRN:
*Preferred*: salbutamol metered dose inhaler 100 mcg/puff + age-appropriate spacer

**Dose according to patient age:**
- 1 to 3 yrs: 4 puffs/dose
- 4 to 6 yrs: 6 puffs/dose
- 7 yrs and older: 8 puffs/dose

*Alternative*: salbutamol nebulizer or 5 mg/mL solution (add 0.9% sodium chloride for total vol. 3-4 mL)

**Dose according to patient weight:**
- Less than (<) 10 kg = 1.25 mg/dose = 1.25 mg nebulizer or 0.25 mL of a 5 mg/mL solution
- 10 to 20 kg = 2.5 mg/dose = 2.5 mg nebulizer or 0.5 mL of a 5 mg/mL solution
- Greater than (> ) 20 kg = 5 mg/dose = 5 mg nebulizer or 1 mL of a 5 mg/mL solution

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**PLUS**

Oral Corticosteroid **AS SOON AS POSSIBLE**, within 60 (SIXTY) minutes of triage:
- predniSONE/prednisoLONE: 2mg/kg/dose PO x 1 dose (max 50 mg)

**If not improving, consider:**

**Anticholinergic (ipratropium bromide):**
*Preferred*: ipratropium bromide metered dose inhaler (20 mcg/puff)+ age-appropriate spacer:
- 3 puffs q 20 min x 3 doses, alternate each puff with salbutamol

**Alternative**: ipratropium bromide nebulizer or solution (125 mcg/mL or 250 mcg/mL):
- 250 mcg q 20 min x 3 doses; mix with salbutamol, add 0.9% sodium chloride for total vol. 3-4 mL

Reassess Vital Signs and PRAM every 30 to 60 minutes

- If PRAM is greater than or equal to (≥) 8 at any time OR if PRAM is unchanged OR less than 3-point improvement in PRAM or *FEV₁* is less than 50% of predicted or personal best, if known:
  - MD to reassess and
  - Move to top of “SEVERE” pathway

- If 6-8 hours post corticosteroid, PRAM is greater than or equal to (≥) 4 or *FEV₁* is less than 70% of predicted or personal best, if known:
  - MD to reassess and consider admission

- If PRAM score less than or equal to (≤) 3 or *FEV₁* is greater than or equal to 70% of predicted or personal best, if known:
  - MD to consider discharge
  - provide asthma teaching
  - provide discharge instructions

* FEV₁ (or as second choice, PEF) should only be used in children aged 6 years and older with demonstrated reproducibility within 10% and when performed by health care personnel trained in spirometry. NOTE: FEV₁ results may be discordant with the severity level indicated by the PRAM (as clinical signs and lung function are different parameters): in case of discordance, the physician is invited to use his/her best judgment to decide which parameter to use to manage the child. Do not delay treatment to obtain FEV₁ and/or peak flow.
SEVERE ASTHMA
(PRAM Score 8 to 12 or *FEV1 less than 50% of predicted or personal best, if known)

Refer to Medication Guidelines on Reverse

☐ physician to assess urgently
☐ administer oxygen to keep $S_O_2$ greater than or equal to (≥) 92%
☐ HR, RR, $S_O_2$. PRAM q 20 min for 1 hour until PRAM less than 8, then q 30-60 min
☐ continuous cardiopulmonary monitoring
☐ blood gas: □ arterial  OR  □ venous
☐ IV access: □ saline lock  OR  □ __________________________

FIRST HOUR OF TREATMENT (to be administered only if not already given as per the Paediatric ED Asthma Clinical Pathway Medical Directive):

β2-agonist and anticholinergic:
☐ salbutamol metered dose inhaler (MDI) : ____ puffs AND ipratropium bromide
    MDI: 3 puffs q 20 min x 3 doses; alternate puffs of each medication
OR  ☐ salbutamol nebulized (nebule or 5 mg/mL solution): _____ mg MIXED WITH 250 mcg
    ipratropium bromide (125mcg/mL or 250 mcg/mL) q 20 min x 3 doses

Systemic Corticosteroid, AS SOON AS POSSIBLE, within 20 (TWENTY) mins of triage:
☐ predniSONE: ______mg (2 mg/kg; max 50 mg) PO x 1 dose
OR  ☐ prednisoLONE: ______mg (2 mg/kg; max 50 mg) PO x 1 dose
OR  ☐ methylPREDNISolone IV: ______mg (1 mg/kg/dose; max 125 mg/dose) x 1 dose NOW
    (infuse over 3 - 15 minutes)
OR  ☐ methylPREDNISolone IM: ______mg (1 mg/kg/dose; max 125 mg/dose) x 1 dose NOW

Additional Orders: _________________________________________________________________

_____________________________________________ Date: ____________ Time: ____________

MD Name __________________________ Signature __________________________

AFTER FIRST HOUR OF TREATMENT:

β2-agonist:
☐ salbutamol metered dose inhaler: _______ puffs q _______ min PRN
OR  ☐ salbutamol nebulizer: ______mg q _______ min PRN
OR  ☐ salbutamol solution (5 mg/mL): ______mg in 3 mL 0.9% sodium chloride q _______ min PRN

If not improving (PRAM unchanged or less than 3 point improvement), consider:
☐ magnesium sulfate IV: _____mg (50 mg/kg/dose; max 2g/dose x 1 dose NOW;
    give over 20 to 30 minutes
Note: may cause severe hypotension - check BP q 5 min during infusion and x 30 min after

AT DISCHARGE OR ADMISSION, CONSULT:
☐ Respiratory Therapist  ☐ Asthma Educator  ☐ Specialist/Service_____________________

Additional Orders: _______________________________________________________________

_____________________________________________ Date: ____________ Time: ____________

MD Name __________________________ Signature __________________________

_____________________________________________ Date: ____________ Time: ____________

Nurse Name __________________________ Signature __________________________

Based on the Canadian Pediatric Asthma Consensus Guidelines, 2003 (updated to December 2004), the Canadian Thoracic Society Asthma Management Continuum – 2010 Consensus. Summary for children six years of age and over, and adults and Canadian Thoracic Society 2012 guideline update: Diagnosis and management of asthma in preschoolers, children and adults, and other evidence from subsequent publications. Copyright © 2014, Ontario Lung Association. All rights reserved. Without the prior written permission of the Ontario Lung Association, any and all copying, reproduction, distortion, mutilation, modification, or the authorization of any such acts is strictly prohibited. September 2014
β₂-agonist (salbutamol) q 20 minutes x 3 doses, then q 20-60 minutes PRN:
Preferred: salbutamol metered dose inhaler (MDI) 100 mcg/puff + age-appropriate spacer
Dose according to patient age:
- 1 to 3 yrs: 4 puffs/dose  •  4 to 6 yrs: 6 puffs/dose  •  7 yrs and older: 8 puffs/dose
Alternative: salbutamol nebul or 5 mg/mL solution
(add 0.9% sodium chloride for total volume 3-4 mL)
Dose according to patient weight:
Less than (<) 10 kg: 1.25 mg/dose = 1.25 mg nebul or 0.25 mL of a 5 mg/mL solution
10 to 20 kg: 2.5 mg/dose = 2.5 mg nebul or 0.5 mL of a 5 mg/mL solution
Greater than (> ) 20 kg: 5 mg/dose = 5 mg nebul or 1 mL of a 5 mg/mL solution

PLUS

Anticholinergic (ipratropium bromide) q 20 minutes x 3 doses:
Preferred: ipratropium bromide MDI (20 mcg/puff) + age-appropriate spacer:
3 puffs q 20 min x 3 doses, alternate each puff with salbutamol
Alternative: ipratropium bromide nebul or solution (125 mcg/mL or 250 mcg/mL):
250 mcg q 20 min x 3 doses; mix with salbutamol; add 0.9% sodium chloride for a total volume of 3-4 mL

PLUS

Systemic Corticosteroid AS SOON AS POSSIBLE, within 20 (TWENTY) minutes of triage:
PredniSONE/PrednisoLONE: 2mg/kg/dose PO x 1 dose (max 50 mg)
OR if there is a concern about reliability of oral route:
methylPREDNISolone: 1 mg/kg/dose q 6 h IV or IM (max 125 mg /dose); give IV dose over 3-15 min

If not improving, consider:

Magnesium sulfate: 50 mg/kg/dose IV ONCE (max. 2 g per dose) over 20-30 min
Attention: may cause severe hypotension; ensure IV access, monitor BP q 5 minutes during infusion and for 30 minutes after dose end

Reassess Vital Signs and PRAM every 20 to 60 minutes
- If poor response (PRAM unchanged or less than 3 point improvement) OR signs of impending respiratory failure at any time:
  - MD to reassess STAT and
  - Move to top of “IMPEENDING RESPIRATORY FAILURE” pathway
- If 4 hours post corticosteroid PRAM score is greater than or equal to (≥) 4 or *FEV₁ is less than 70% of predicted or personal best, if known:
  - MD to reassess and consider admission
- If PRAM score improving, move to “MODERATE” pathway

FEV₁ (or as second choice, PEF) should only be used in children aged 6 years and older with demonstrated reproducibility within 10% and when performed by health care personnel trained in spirometry. NOTE: FEV₁ results may be discordant with the severity level indicated by the PRAM (as clinical signs and lung function are different parameters): in case of discordance, the physician is invited to use his/her best judgment to decide which parameter to use to manage the child. Do not delay treatment to obtain FEV₁ and/or peak flow.

MEDICATION GUIDELINES: SEVERE
(PrAM 8 – 12 or *FEV₁ less than 50% of predicted or personal best, if known)
**Physician's Orders**

**Drug Allergies:**  

| Ht: _____ cm | Wt: _____ kg |

**Impending Respiratory Failure**

- Lethargy, Cyanosis, Decreasing Respiratory Effort and/or Rising PCO$_2$
- Refer to Medication Guidelines & Algorithm on Reverse

1. Physician to assess STAT and remain in attendance until patient stabilized
2. Administer 100% oxygen
3. Support ventilation if required (bag + mask) Note: avoid high rates and/or volumes
4. Continuous cardiopulmonary monitoring
5. HR, RR, S$_2$O$_2$, PRAM q 15 min
6. Obtain IV access (if not already done): fluid_________ rate of infusion_________
7. NPO
8. Blood gas:  □ arterial OR □ capillary
9. Chest radiograph (portable)
10. Contact CritiCall Ontario: 1-800-668-4357 to be connected with regional ICU/tertiary care centre for further support and to arrange transfer

**Immediate Management:**

- β$_2$-agonist and anticholinergic:
  - □ Salbutamol nebulized (nebul or 5 mg/mL solution): ____ mg MIXED WITH 250 mcg ipratropium bromide (125 mg/mL or 250 mg/mL), continuously with oxygen, add 0.9% sodium chloride for a total volume of 3 to 4 mL
  - Systemic Corticosteroid, AS SOON AS POSSIBLE after first salbutamol/ipratropium dose (if not already given):
    - □ methylPREDNISolone IV: ____ mg (1 mg/kg/dose; max 125 mg/dose) x 1 dose NOW and q 6 h (infuse over 3 to 15 minutes)
    - OR □ methylPREDNISolone IM: ____ mg x 1 dose NOW and q 6 h
  - Magnesium Sulfate:
    - □ Magnesium sulfate IV: ____ mg (50 mg/kg/dose; max. 2 g/dose) x 1 dose NOW; give over 20 to 30 min
    - Note: may cause severe hypotension; check BP q 5 mins during infusion and for 30 mins after

**At Discharge or Admission, Consult:**

- □ Respiratory Therapist  □ Asthma Educator  □ Specialist/Service______________

**Additional Orders:**  

______________________________________________________________________________  
______________________________________________________________________________  
______________________________________________________________________________  
______________________________________________________________________________  
______________________________________________________________________________  

Date: ____________  Time: ____________  

**Nurse Name**  

Date: ____________  Time: ____________

Based on the Canadian Pediatric Asthma Consensus Guidelines, 2003 (updated to December 2004), the Canadian Thoracic Society Asthma Management Continuum – 2010 Consensus Summary for children six years of age and over, and adults, and Canadian Thoracic Society 2012 guideline update: Diagnosis and management of asthma in preschoolers, children and adults, and other evidence from subsequent publications. Copyright © 2014, Ontario Lung Association. All rights reserved. Without the prior written permission of the Ontario Lung Association, any and all copying, reproduction, distortion, mutilation, modification, or the authorization of any such acts is strictly prohibited. September 2014
**MEDICATION GUIDELINES: IMPEENDING RESPIRATORY FAILURE**

Lethargy, Cyanosis, Decreasing Respiratory Effort and/or Rising PCO₂

<table>
<thead>
<tr>
<th>Bronchodilators (β₂-agonist and Anticholinergic):</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>continuous nebulization with oxygen, physician to reassess as necessary</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>salbutamol nebul or 5 mg/mL solution (dose according to patient weight):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than (&lt;) 10 kg = 1.25 mg/dose = 1.25 mg nebul or 0.25 mL of a 5 mg/mL solution</td>
</tr>
<tr>
<td>10 to 20 kg = 2.5 mg/dose = 2.5 mg nebul or 0.5 mL of a 5 mg/mL solution</td>
</tr>
<tr>
<td>Greater than (&gt;) 20 kg = 5 mg/dose = 5 mg nebul or 1 mL of a 5 mg/mL solution</td>
</tr>
</tbody>
</table>

AND

<table>
<thead>
<tr>
<th>ipratropium bromide nebul or solution (125 mcg/mL or 250 mcg/mL):</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 mcg/dose; mix with salbutamol, add 0.9% sodium chloride for total volume of 3 to 4 mL</td>
</tr>
</tbody>
</table>

**PLUS**

<table>
<thead>
<tr>
<th>Systemic Corticosteroid, AS SOON AS POSSIBLE after first bronchodilator dose:</th>
</tr>
</thead>
<tbody>
<tr>
<td>methylPREDNISolone 1 mg/kg/dose q 6 h IV or IM (max 125 mg /dose); give IV dose over 3-15 min</td>
</tr>
</tbody>
</table>

**PLUS**

<table>
<thead>
<tr>
<th>Magnesium sulfate:</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 mg/kg/dose IV ONCE (maximum 2 g per dose); give over 20-30 minutes</td>
</tr>
<tr>
<td><em>Attention: may cause severe hypotension; ensure IV access, monitor BP q 5 min during infusion and for 30 min after</em></td>
</tr>
</tbody>
</table>

---

Based on the Canadian Pediatric Asthma Consensus Guidelines, 2003 (updated to December 2004), the Canadian Thoracic Society Asthma Management Continuum – 2010 Consensus Summary for children six years of age and over, and adults and Canadian Thoracic Society 2012 guideline update: Diagnosis and management of asthma in preschoolers, children and adults, and other evidence from subsequent publications. Copyright © 2014, Ontario Lung Association. All rights reserved. Without the prior written permission of the Ontario Lung Association, any and all copying, reproduction, distortion, mutilation, modification, or the authorization of any such acts is strictly prohibited. September 2014
# Patient Education Checklist

**Learning Goals Reviewed with Patient**
*(To be completed by Physician / Nurse / Nurse Practitioner / RT / Pharmacist)*

<table>
<thead>
<tr>
<th>Learning Goals</th>
<th>Initials &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Assessed device/spacer technique and demonstrated optimal technique: Metered dose inhaler (MDI) with spacer:</td>
<td></td>
</tr>
<tr>
<td>- Ensure age/ability-appropriate valved spacer/device and demonstrate optimal technique</td>
<td></td>
</tr>
<tr>
<td>- <strong>Spacer with mouthpiece</strong> - Shake MDI canister and place end into holding chamber, breathe out, place holding chamber mouthpiece into mouth and make a seal, release puff, inhale slowly (no whistle), hold for 10 seconds, exhale, wait 30 seconds between each puff of the same MDI.</td>
<td></td>
</tr>
<tr>
<td>- <strong>Spacer with mask</strong> - Shake canister, place end of MDI into holding chamber, place mask over mouth and nose and make a seal, release puff, allow patient to inhale and exhale approximately 3 times. Wait 30 seconds between each puff of the same MDI.</td>
<td></td>
</tr>
<tr>
<td>2. Reviewed basics of asthma:</td>
<td></td>
</tr>
<tr>
<td>- Airway inflammation (swelling), increased mucus, and bronchospasm (airways narrow)</td>
<td></td>
</tr>
<tr>
<td>3. Symptom recognition:</td>
<td></td>
</tr>
<tr>
<td>- Cough, wheeze, chest tightness and/or shortness of breath</td>
<td></td>
</tr>
<tr>
<td>4. Reviewed asthma triggers:</td>
<td></td>
</tr>
<tr>
<td>- Know your asthma triggers</td>
<td></td>
</tr>
<tr>
<td>- Avoid cigarettes and secondhand smoke</td>
<td></td>
</tr>
<tr>
<td>5. Reviewed asthma medications:</td>
<td></td>
</tr>
<tr>
<td>a. <strong>Relievers</strong> (e.g. Airomir®, Apo-Salvent®, Bricanyl®, Novo-salmol®, salbutamol, or Ventolin®) – (often blue containers)</td>
<td></td>
</tr>
<tr>
<td>- Relax smooth muscle around airways.</td>
<td></td>
</tr>
<tr>
<td>- Rapid relief</td>
<td></td>
</tr>
<tr>
<td>b. <strong>Controllers</strong> (e.g. Advair®, Alvesco®, Asmanex™ beclomethasone, Flovent®, Pulmicort®, QVAR®, or Symbicort®, Zenhale®)</td>
<td></td>
</tr>
<tr>
<td>- Treat airway inflammation and mucus;</td>
<td></td>
</tr>
<tr>
<td>- Need to be taken <strong>regularly</strong> even when feeling well.</td>
<td></td>
</tr>
<tr>
<td>c. <strong>Oral Steroids</strong></td>
<td></td>
</tr>
<tr>
<td>- (e.g. prednisone, prednisolone)</td>
<td></td>
</tr>
<tr>
<td>- Treats severe airway inflammation and mucus</td>
<td></td>
</tr>
<tr>
<td>- Short term therapy</td>
<td></td>
</tr>
<tr>
<td>6. <strong>Asthma Quiz for Kids</strong> – (see reverse of discharge plan)</td>
<td></td>
</tr>
<tr>
<td>- Measure of current control</td>
<td></td>
</tr>
<tr>
<td>7. <strong>Arrange regular follow-up</strong></td>
<td></td>
</tr>
<tr>
<td>- Family Physician, Paediatrician, Asthma Educator, Specialist</td>
<td></td>
</tr>
<tr>
<td>8. <strong>Discharge Plan and Prescription</strong></td>
<td></td>
</tr>
<tr>
<td>- Given and explained</td>
<td></td>
</tr>
<tr>
<td>- If no drug plan, refer to Social Work or Trillium Fund (available through most pharmacies)</td>
<td></td>
</tr>
<tr>
<td>9. <strong>Hospital’s Asthma (if available) or The Lung Association booklet given to patient.</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Name (print):** ___________________________ **Signature:** _______________________________ **Status:** ______

**Date (YYYY/MM/DD):** ___________ **Time:** ___________
Today, your child was seen in the Emergency Department for a significant asthma exacerbation. To treat this attack, in addition to your Controller and Quick Relief medicine, also give:

- Prednisolone liquid ___ mg daily for ___ days, Refill 0 OR Prednisone tablet ___ mg daily for ___ days, Refill 0

Additional discharge instructions: ____________________________________________________________

Schedule appointment with: □ family doctor □ asthma educator □ specialist _____________ within _____ weeks.

If you have any questions about asthma, call The Lung Association Lung Health Information Line: 1-888-344-LUNG (5864).

Emergency Department
Asthma Clinical Pathway
Paediatric: 1 to 17 years
Discharge Instructions

Physician: __________________________ License # ________ Signature: ______________________ Date: __________________________

Creating by the Children's Hospital of Eastern Ontario. Adapted with permission for use in the Ontario Lung Association ED Asthma Care Pathways.
**ASTHMA QUIZ FOR KIDZ**

* Adapted from Canadian Respiratory Journal 2004; 11(8):541-6.

1. Did you cough, wheeze, or have a hard time breathing 4 or more days out of the last 7 days? 
   - [ ] YES  
   - [ ] NO

2. Did you wake up at night because you were coughing, wheezing, or having a hard time breathing 1 or more times in the last 7 days? 
   - [ ] YES  
   - [ ] NO

3. Did you use your blue puffer 4 or more times in the last 7 days? 
   - [ ] YES  
   - [ ] NO

4. In the last 7 days, did you do less exercise or sports because it was making you cough, wheeze, or you were having a hard time breathing? 
   - [ ] YES  
   - [ ] NO

5. In the last 30 days, did you miss school or regular activities because you were coughing, wheezing, or having a hard time breathing? 
   - [ ] YES  
   - [ ] NO

6. In the last 30 days, did you go to a clinic or a hospital without an appointment because you were coughing, wheezing, or having a hard time breathing? 
   - [ ] YES  
   - [ ] NO

   • How many times did you answer YES? [ ]
   • If you said YES 2 or more times, your asthma is not well controlled. Talk to your mom and dad about seeing a doctor. Let your doctor be your asthma coach!

---

**TRIGGERS**

Follow these steps to avoid these common triggers:

**Colds:** Most common trigger. Wash hands before touching your mouth or nose to prevent colds. Follow Yellow Zone at first sign of a cold.

**Smoke:** Don’t smoke! Do not allow others to smoke in your home or car. Encourage your parents to STOP smoking. Even if they smoke outside, the smoke in their clothes and hair can trigger your asthma.

**Air Pollution:** Avoid fumes and chemicals.

Follow these steps if you have any of the following allergies:

**Pets:** Avoid pets with fur or feathers. If you have pets, wash them often.

**Pollen:** Close windows during pollen season (Spring and Fall). Air conditioning helps. Avoid freshly cut grass.

**Dust Mites:** Wash bed sheets in hot water. Vacuum and dust often. Cover pillows and mattresses with dust mite-resistant covers.

**Mold:** Keep bathroom and basement dry. Keep away from decomposing leaves and garden waste.

---

**Controlling your asthma**

1. Avoid your triggers.
2. Know your medication and how and when to take it. Take controller medications regularly.
3. Follow your action plan.
4. After any emergency room visit, you must schedule a follow-up appointment with a doctor in the next 2 weeks.
5. Always have spare quick relief medication (blue inhaler) available.
**Medical Directive and/or Delegation Template**

Template for Use by Physicians or Authorizers with Ordering Authority

---

**Emergency Department Asthma**

**Title:** Medical Directive – Paediatric Age 1 to 17 years

**Number:** (set by hospital)

**Activation Date:** (set by hospital)

**Review due by:** (set by hospital)

**Sponsoring/Contact Person(s)**

*(name, position, contact particulars):*

(hospital based site champion e.g. professional practice advisor(s), clinical educator)

Ontario Lung Association – www.on.lung.ca

---

**Order and/or Delegated Procedure:**

**Appendix Attached:** ☐ Yes ☐ No

**Title:** Appendix B - Flowchart

1. Supplemental oxygen to keep SaO2 at 92% or greater

2. Salbutamol: metered dose inhaler (MDI) with spacer device (100 mcg/puff) 4 to 8 puffs per dose or nebulized 1.25 mg to 5 mg per dose in 3 mL 0.9% sodium chloride, as per flowchart (Appendix B) attached. Administer first dose as soon as possible. May administer up to 3 doses depending on severity score. See flowchart (Appendix B) for specific number of doses and frequency. MDI with spacer is preferred delivery system unless continuous oxygen is required.

3. Ipratropium bromide: MDI with spacer device (20 mcg/puff) 3 puffs per dose or nebulized ipratropium bromide (250 mcg per dose) times 3 doses. Administer first dose as soon as possible. Administer in alternating puffs with salbutamol (if MDI) or mixed with salbutamol (if nebulized). See flowchart (Appendix B) for specific number of doses and frequency.

   **Note:** For use in ‘Severe’ and ‘Impending Respiratory Failure’ streams only.

4. PredniSONE/prednisoLONE: 2 mg/kg to a maximum of 50 mg PO once, as soon as possible following salbutamol: within 60 minutes of triage for ‘Moderate’ stream and within 20 minutes of triage for ‘Severe’ and ‘Impending Respiratory Failure streams. See flowchart (Appendix B).

   **Note:** do not use in ‘Mild’ stream.

5. Spirometry (FEV₁) or Peak Expiratory Flow (PEF) in children 6 years and over, performed by healthcare personnel trained in spirometry. See flowchart (Appendix B).
Recipient Patients:

Patients who are registered in the Emergency Department presenting with symptoms of an acute asthma exacerbation (e.g., dyspnea, wheezing), under the care of an authorizing physician, who meet the following:

Inclusion Criteria:
Age 1 to 17 years with wheeze and/or cough AND asthma diagnosis and/or past history of wheeze AND who have had a Paediatric Respiratory Assessment Measure (PRAM) assessment (Appendix A).

Exclusion Criteria:
ED visit for prescription refill only.

Authorized Implementers:

Nurses, Respiratory Therapists, Pharmacists registered and in good standing with their respective regulatory college in Ontario, who have received up-to-date education and training on this medical directive.

Indications and Contraindications:

Indications:
Age 1 to 17 years with wheeze and/or cough AND asthma diagnosis and/or past history of wheeze, AND presenting with mild, moderate or severe symptoms of asthma as assessed by Paediatric Respiratory Assessment Measure (PRAM) score.

Contraindications:
Re: medical directive in whole
- if patient has any active chronic conditions other than asthma, suspend medical directive and obtain physician assessment and orders for care.

Re: salbutamol
- heart rate greater than 200 beats/min; and/or
- allergic to salbutamol hold salbutamol and proceed with rest of medical directive. Obtain physician assessment as soon as possible.

Re: ipratropium bromide
- allergic to ipratropium bromide hold ipratropium bromide and proceed with rest of medical directive.

Re: prednisONE or prednisOLONE
- patient unable to take medication via oral route request physician assessment and orders and proceed with remainder of medical directive.
- patient with active or suspected incubation of chickenpox infection hold prednisone/prednisolone and proceed with rest of medical directive. Observe physician assessment as soon as possible.
- allergic to prednisone or prednisolone hold prednisone or prednisolone and proceed with rest of medical directive. Obtain physician assessment as soon as possible.

Re: spirometry (FEV₁) or Peak Expiratory Flow (PEF) – not available in most emergency departments
- FEV₁ (or as second choice, PEF) should only be used in children aged 6 years and older, performed by healthcare personnel trained in spirometry. NOTE: results may not be reproducible during an exacerbation; however, if FEV₁ can be done reproducibly, its value should take precedence to guide therapy and consider discharge over the PRAM. PEF measurement is not recommended in children and adolescents unless spirometry is not available AND there is demonstrated reproducibility within 10%. If patient is unable to perform test proceed with assessment and treatment based on the PRAM NOTE: Do not delay PRAM assessment or treatment to obtain FEV₁ or PEF.
Consent:

Consent (verbal and/or implied) must be provided by patient or substitute decision maker prior to commencing medical directive.

Guidelines for Implementing the Order/Procedure:

This medical directive allows registered nurses, registered respiratory therapists and/or pharmacists to initiate pharmacotherapy with inhaled bronchodilators and oral corticosteroids as soon as possible to children and adolescents who present to the Emergency Department (ED) with a clinical picture consistent with asthma and who are entered into the Paediatric Emergency Department Asthma Clinical Pathway (Asthma Pathway).

Although it is intended that these patients will be treated by a physician according to the Asthma Pathway, the earliest possible therapy initiated by nurse / respiratory therapist / pharmacist will allow symptom relief while awaiting assessment by the physician and is anticipated to shorten the patient’s length -of-stay in the ED and reduce the rate of hospital admission.

Dosage, frequency and choice of medication will be determined by the patient’s age and degree of respiratory distress as described in the Asthma Pathway appended to this medical directive.

The Physician will be notified immediately at any time if the patient is not responding or is deteriorating with the planned treatment.

Any untoward event suspected to be related to the implementation of this directive will be reported immediately to the attending physician. The event will also be documented in the patient’s chart.
### Appendix A: Severity of asthma exacerbation

Assess and calculate Paediatric Respiratory Assessment Measure (PRAM) Score using the following scale.

<table>
<thead>
<tr>
<th>SIGN/SCORING</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Patient’s Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. O₂ saturation (in room air)</td>
<td>≥ 95%</td>
<td>92-94%</td>
<td>&lt; 92%</td>
<td>_____(max 2)</td>
<td></td>
</tr>
<tr>
<td>2. Suprasternal retraction</td>
<td>Absent</td>
<td>Present</td>
<td>_____(max 2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Scalene muscle contraction</td>
<td>Absent</td>
<td>Present</td>
<td>_____(max 2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Air entry*</td>
<td>Normal</td>
<td>at the base</td>
<td>at the apex and the base</td>
<td>Minimal or absent</td>
<td>_____(max 3)</td>
</tr>
<tr>
<td>5. Wheezing§</td>
<td>Absent</td>
<td>Expiratory only</td>
<td>Inspiratory (expiratory)</td>
<td>Audible without stethoscope or silent chest (minimal or no air entry)</td>
<td>_____(max 3)</td>
</tr>
</tbody>
</table>

**PRAM Score Total:** _____(max 12)

* In case of asymmetry, the most severely affected (apex-base) lung field (right or left, anterior or posterior) will determine the rating of the criterion.

§ In case of asymmetry, the two most severely affected auscultation zones, irrespective of their location (RUL, RML, RLL, LUL, LLL), will determine the rating of the criterion.

### Asthma Severity Index

- Pram Score 0 – 3 indicates **MILD** Asthma
- Pram Score 4 – 7 indicates **MODERATE** Asthma
- Pram Score 8 – 12 indicates **SEVERE** Asthma

**IMPENDING RESPIRATORY FAILURE** is based on clinical presentation

### References:


## Emergency Department Paediatric Asthma Medical Directive

### Appendix B: Medical Directive Flowchart

<table>
<thead>
<tr>
<th>PRAM 0-3 Mild</th>
<th>PRAM 4-7 Moderate</th>
<th>PRAM 8-12 Severe</th>
<th>Impending Respiratory Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish baseline FEV&lt;sub&gt;1&lt;/sub&gt;, if possible (patient age 6 yrs or older, able to follow directions, trained staff member available, able to demonstrate reproducibility* within 10%)</td>
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<td>*results may not be reproducible during an exacerbation</td>
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<tr>
<td>Do not delay pharmacotherapy while obtaining FEV&lt;sub&gt;1&lt;/sub&gt;</td>
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<tr>
<td>If patient’s condition worsens at any time, notify physician immediately</td>
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<tr>
<td><strong>ADMINISTER:</strong></td>
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<tr>
<td>salbutamol metered dose inhaler (MDI) preferred, unless continuous oxygen required; dose by patient’s age</td>
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<tr>
<td>1 – 3 yrs = 4 puffs</td>
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<tr>
<td>4 – 6 yrs = 6 puffs</td>
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<tr>
<td>7 yrs and older = 8 puffs</td>
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<tr>
<td>via metered dose inhaler (MDI) and age appropriate spacer; allow 30 seconds between each puff.</td>
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<td><strong>OR</strong></td>
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<tr>
<td>salbutamol (solution/nebulize) via continuous nebulization, dose by patient’s weight:</td>
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<tr>
<td>less than (&lt;) 10 kg = 1.25 mg</td>
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<tr>
<td>10 – 20 kg = 2.5 mg</td>
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<tr>
<td>greater than (&gt;) 20 kg = 5 mg</td>
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<tr>
<td>If necessary increase volume to 3 mL with normal saline</td>
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<tr>
<td><strong>REPEAT:</strong></td>
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<tr>
<td>• PRAM 0 to 3: q 60 minutes PRN, to a maximum of 2 doses in the first hour</td>
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<tr>
<td>• PRAM 4 to 7: q 30 to 60 minutes PRN, to a maximum of 2 doses in first hour</td>
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<td></td>
<td><strong>ADMINISTER:</strong></td>
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</tr>
<tr>
<td>salbutamol metered dose inhaler (MDI) preferred, unless continuous oxygen required; dose by patient’s age</td>
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<tr>
<td>1 – 3 yrs = 4 puffs</td>
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<tr>
<td>4 – 6 yrs = 6 puffs</td>
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<tr>
<td>7 yrs and older = 8 puffs</td>
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<td>AND</td>
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<tr>
<td>ipratropium bromide metered dose inhaler (MDI) – 3 puffs</td>
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<tr>
<td>via metered dose inhaler (MDI) and age appropriate spacer; allow 30 seconds between each puff of ipratropium bromide with salbutamol</td>
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<tr>
<td><strong>OR</strong></td>
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</tr>
<tr>
<td>salbutamol (solution/nebulize) via continuous nebulization, dose by patient’s weight:</td>
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<tr>
<td>less than (&lt;) 10 kg = 1.25 mg</td>
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<td>10 – 20 kg = 2.5 mg</td>
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<tr>
<td>greater than (&gt;) 20 kg = 5 mg</td>
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<tr>
<td>AND</td>
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<tr>
<td>ipratropium bromide (solution/nebulize):</td>
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<tr>
<td>250 mcg mixed with salbutamol; add normal saline for total volume of 3mL</td>
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<tr>
<td><strong>REPEAT:</strong> (both salbutamol and ipratropium bromide)</td>
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<tr>
<td>• PRAM 8 to 12: q 20 minutes x 3 doses in the first hour</td>
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<tr>
<td>• “Impending Respiratory Failure”: repeat continuously</td>
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<tr>
<td><strong>Assess patient regarding requirement for corticosteroids (except for “mild” severity):</strong></td>
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<tr>
<td>☐ Does patient have active or suspected chickenpox infection?</td>
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<tr>
<td><strong>YES</strong></td>
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<tr>
<td>Hold corticosteroid</td>
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<td>Notify MD.</td>
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<tr>
<td>Obtain further orders for therapy.</td>
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<tr>
<td><strong>ADMINISTER ORAL CORTICOSTEROIDS</strong>:</td>
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<tr>
<td>☐ for “Moderate” (PRAM 4-7) as soon as possible and within 60 (sixty) minutes of triage:</td>
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<tr>
<td>☐ for “Severe” (PRAM 8-12) and “Impending Respiratory Failure” as soon as possible and within 20 (twenty) minutes of triage:</td>
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<tr>
<td>predniSONE/prednisoLONE 2 mg/kg PO x 1 dose (maximum 50 mg/dose)</td>
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</tbody>
</table>
| *if patient unable to take medication via oral route, notify MD immediately
<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Francine Ducharme</td>
<td>Chair, Associate Director of Clinical Research at the CHU Sainte-Justine Research Center and Professor at the Department of Pediatrics, Université de Montréal</td>
</tr>
<tr>
<td>Dr. Chris Bourdon</td>
<td>Chief of Staff Sudbury Regional Hospital, ED Lead North East LHIN</td>
</tr>
<tr>
<td>Elizabeth Delville</td>
<td>Respiratory Therapy Society of Ontario (RTSO)</td>
</tr>
<tr>
<td>Bonnie Fleming-Carroll</td>
<td>Associate Chief Nursing and Interprofessional Practice, Hospital for Sick Children</td>
</tr>
<tr>
<td>Jennifer Harrison</td>
<td>Professional Practise Advisor, College of Respiratory Therapists of Ontario</td>
</tr>
<tr>
<td>Danica Irwin</td>
<td>Pharmacist, CHEO</td>
</tr>
<tr>
<td>Dr. Mona Jabbour</td>
<td>Vice-Chief/Chair, Department of Pediatrics, Associate Professor, Pediatrics and Emergency Medicine University of Ottawa Children’s Hospital of Eastern Ontario</td>
</tr>
<tr>
<td>Dr. Alan Kaplan</td>
<td>Chair, Family Physician Airways Group of Canada</td>
</tr>
<tr>
<td>Dr. Brian Kuzik</td>
<td>Consulting Pediatrician R.V.H. Barrie; Associate Professor of Pediatrics Queen's/U of T</td>
</tr>
<tr>
<td>Jennifer Olajos-Clow</td>
<td>Nurse Practitioner, Asthma Educator (Kingston), RNAO</td>
</tr>
<tr>
<td>Dr. Dhenuka K. Radhakrishnan</td>
<td>Pediatric Respirologist, Children’s Hospital, London Health Sciences Centre</td>
</tr>
<tr>
<td>Dr. Joe Reisman</td>
<td>Pediatrician &amp; Respirologist (CHEO)</td>
</tr>
<tr>
<td>James Tjon</td>
<td>Clinical Pharmacist, Pediatric &amp; Respiratory Medicine, HSC</td>
</tr>
<tr>
<td>Dr. Roger Zemek</td>
<td>Pediatric Emergentologist (CHEO)</td>
</tr>
<tr>
<td>Dr. Dawid (David) Zielinski</td>
<td>Pediatrician &amp; Respirologist, Montreal</td>
</tr>
</tbody>
</table>
References for Paediatric Emergency Department Asthma Clinical Pathway


Calgary Health Region (June 2008). Pediatric acute asthma pathway.


Children's Hospital of Eastern Ontario (Aug 2009). Medical Directive “Bronchodilators and oral steroids for asthma”


