Clinical Handbook for Paediatric Asthma

The Provincial Council for Maternal and Child Health & Ministry of Health and Long-Term Care

December 12, 2017
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Clinical Handbook: Paediatric Asthma

1.0 Introduction

1.1 Purpose

This Clinical Handbook has been created to serve as a compendium of the evidence-based rationale and clinical consensus for emergency department and inpatient management of paediatric asthma.

This document has been prepared for informational purposes only. This document does not mandate health care providers to provide services in accordance with the recommendations included herein. The recommendations included in this document are not intended to take the place of the professional skill and judgment of health care providers.

1.2 Key Objectives of the Clinical Handbook

The Key objectives of this QBP are to:

- Provide clinicians with evidence-based recommendations regarding management of paediatric asthma for the Emergency Department and inpatient episodes of care and for discharge;
- Reduce variation in the diagnosis of asthma;
- Promote standardized assessment of severity;
- Promote standardized severity-based treatment;
- Reduce variation in the inpatient treatment of asthma;
- Reduce inappropriate ED revisits and inpatient admissions;
- Ensure that children (and their parents) discharged from the ED or inpatient units receive education regarding the management of their asthma and instructions for appropriate follow-up and referral via an Asthma Action Plan

1.3 Development of the Clinical Pathway

This clinical pathway was developed by an Expert Panel composed of clinical experts in emergency medicine, paediatrics, respirology, nursing, pharmacy, respiratory therapy, asthma education and decision support. Please refer to Section 6 for a complete membership list. Feedback and input was sought various stages throughout the development process, from external experts. This process was important to the overall feasibility and acceptance of the final recommendations made. All decisions made by the Expert Panel were made by general consensus.
The Emergency Department episode of care recommends the use of the Ontario Lung Association (OLA) Paediatric Emergency Department Asthma Clinical Pathway (P-EDACP). This pathway was rigorously developed by an Expert Content Working Group that included paediatricians, paediatric emergentologists, nursing, respirologists, respiratory therapists, pharmacists, and research\(^1\).

The recommendations devised by the Expert Panel for the inpatient episode of care were externally reviewed by experts in the fields of respirology and allergy. They included members of the OLA P-EDACP Expert Content Working Group, members of the National Asthma Guidelines and those from the Canadian Thoracic Society National Asthma Committee.

2.0 Description of Paediatric Asthma and Episodes of Care

Paediatric Asthma is a leading cause of chronic disease and disability. It is a high volume condition for both Emergency Departments (ED) and inpatient care across all levels of care accounting for 17,600 ED visits and 2,500 inpatient admissions in Ontario in 2013-14\(^2\). In addition to its impact on acute care, paediatric asthma also reaches deeply into the community health continuum where chronic management takes place. As such the scope of this clinical handbook will address both the ED and inpatient episodes of care as well as the discharge planning of these patients into the community, see figure 1. While it will not specifically address chronic management of asthma in the community, the Expert Panel feels strongly that appropriate discharge planning from the ED and inpatient settings is integral to ensuring fewer ED visits and inpatient admissions, as well setting the stage for appropriate care in the community.

Figure 1: Scope of Paediatric Asthma Episodes of Care

\(^2\) Data from the CIHI Portal, as per the QBP definition for Asthma. Accessed June 3, 2015.
2.1 Population Group Definition

This Pediatric Asthma Clinical Handbook is intended for patients < 18 years of age with a known or suspected diagnosis of asthma. Infants < 1 year of age are more likely to have bronchiolitis, however asthma does occur in this age group as well.

In young children (preschoolers), asthma is a clinical diagnosis as there are currently no objective tests to confirm a diagnosis of asthma (Ducharme FM, 2015). As such, to confirm an asthma diagnosis in preschool children it is important for clinicians to document reversibility of airflow obstruction with asthma treatments (bronchodilators +/- oral corticosteroids) and absence of clinical factors suggesting an alternate diagnosis. Personal atopy (eczema, food allergy, etc) and family history of asthma/atopy are helpful, but not required to make an asthma diagnosis.
3.0 Best Practices\(^3\) Guiding the Implementation of Recommendations for Paediatric Asthma

3.1 Definition of Best Practices

The process for identifying recommended best practices involved the following steps:

- Reviewing existing clinical guidelines, consensus statements, and hospital algorithms;
- Consulting with members of the Expert Panel and their network of experts for additional evidence not included in the guidelines and consensus statements;
- Reviewing and summarizing the evidence cited for each recommendation;
- Discussion amongst the expert panel to contextualize the proposed recommendations to the needs/current practices of the Ontario health system;
- Identifying gaps in the evidence that are of value to the care of children with asthma;
- Consulting with external experts regarding the recommendations put forward.

3.2 Recommendations

Emergency Department Episode of Care Recommendations

For the ED episode of care the Expert Panel recommends the use of the following evidence-based clinical pathway:

<table>
<thead>
<tr>
<th>#</th>
<th>Recommendation</th>
<th>Supporting Evidence</th>
<th>Evidence Type</th>
<th>Evidence Grade</th>
</tr>
</thead>
</table>
| 1.0 | Implementation of the Ontario Lung Association (OLA) Paediatric Emergency Department Asthma Care Pathway (P-EDACP), with the following amendment to the Medication Guidelines:  
- Prednisone 1-2 mg/kg loading dose day 1, followed by 1 mg/kg/day for a minimum of 3 days | Expert Panel Consensus                   | Evidence-based clinical pathway\(^4\)        | N/A            |

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\(^3\) Best practice refers to a combination of best available evidence and clinical consensus as recommended by the Clinical Expert Advisory Groups

\(^4\) The P-EDACP was developed by an interprofessional steering committee and interdisciplinary expert content working group that reviewed Canadian Thoracic Society and international asthma guidelines, other relevant published literature and examples of previously developed pathways.
In 2014 the OLA published the P-EDACP as part of the Ontario Asthma Plan of Action initiative. This pathway 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 ED. The P-EDACP is a comprehensive algorithm that guides specific treatment at each severity level, the escalation of treatment if the patient’s condition worsens and when to consider discharge. It contains a number of tools including:

- Instruction on assessing severity using the PRAM score
- Medication guidelines
- Pre-printed physician orders for each of four severity levels
- Patient education checklist
- Discharge instructions with integrated prescription

The P-EDACP was developed by an interprofessional steering committee and interdisciplinary expert content working group that reviewed Canadian Thoracic Society and international asthma guidelines, other relevant published literature and examples of previously developed pathways.

The Expert Panel recommends the following adjustments to the Medication Guidelines provided as part of the P-EDACP algorithm:

- Prednisone 1-2 mg/kg loading dose day 1, followed by 1 mg/kg/day for a minimum of 3 days.
- The equivalent Dexamethasone dose is 0.15-0.3 mg/kg daily for a minimum of 2 days, maximum of 3 days.

The Paediatric Asthma Care Pathway is provided on the next page. For the complete P-EDACP please see Appendix A. For the most up-to-date version of the P-EDACP visit the OLA website at:

www.on.lung.ca/edacp
Inpatient Recommendations

For the inpatient episode of care, the Expert Panel recommends the following standardized evidence-informed recommendations regarding the use of oxygen saturation monitoring, systemic and inhaled steroids and discharge follow-up:

| #   | Recommendation                                                                                                                                  | Supporting Evidence                                                                 | Evidence Type     | Evidence Grade
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 Oxygen Saturation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>If respiratory status is stable (tolerating Q4h Bronchodilator), patient is appropriate for discharge.</td>
<td>Expert Panel Consensus</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1.2</td>
<td>Once off O2, there is no evidence for continuous O2 saturation monitoring; spot checks for oxygen saturation (with respiratory assessment) may be appropriate.</td>
<td>Expert Panel Consensus</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>2.0 Systemic Steroids</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Continue systemic steroids upon admission. Suggested therapies could include: Prednisone: start with 1-2mg/kg/day (day 1), followed by 1mg/kg/day (morning) for a minimum 3 days total therapy. Maximum dose: 50mg. Dexamethasone: 0.15-0.3mg/kg/day (daily), for a minimum 2 days / maximum 3 days total therapy. Scant evidence for duration. Maximum dose 10mg/day. Consider use of IV steroids and other ancillary treatments for patients who are not improving or deteriorating.</td>
<td>Canadian Paediatric Society, 2012</td>
<td>Position Statement</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Canadian Paediatric Society and Canadian Thoracic Society, 2015</td>
<td>Position Statement</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Canadian Medical Association, 1999</td>
<td>Position Statement</td>
<td>Level 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Asthma Council of Australia</td>
<td>Guideline</td>
<td>Evidence not graded</td>
</tr>
<tr>
<td>2.2</td>
<td>Inhaled beta agonist is recommended first line treatment for acute asthma exacerbation.</td>
<td>Canadian Medical Association, 1999</td>
<td>Position Statement</td>
<td>Level 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>British Thoracic Society, Scottish Intercollegiate Guidelines Network, 2014</td>
<td>Guideline</td>
<td>Level of Evidence 1+</td>
</tr>
</tbody>
</table>

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5 See Appendix B for an explanation of the evidence grading methodologies.
### 3.0 Inhaled Corticosteroids

<table>
<thead>
<tr>
<th>Section</th>
<th>Recommendation</th>
<th>Supporting Evidence</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>If admitted on inhaled corticosteroids, continue while in hospital.</td>
<td>Rowe et al. Early use of inhaled corticosteroids in the emergency department treatment of acute asthma</td>
<td>Cochrane Systematic Review</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Institutes of Health, 2007</td>
<td>Guideline</td>
</tr>
<tr>
<td>3.2</td>
<td>If not on inhaled steroids on admission begin inhaled corticosteroids prior to or on discharge.</td>
<td>Canadian Medical Association, 1999</td>
<td>Position Statement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rowe et al. Early use of inhaled corticosteroids in the emergency department treatment of acute asthma</td>
<td>Cochrane Systematic Review</td>
</tr>
<tr>
<td></td>
<td></td>
<td>British Thoracic Society, Scottish Intercollegiate Guidelines Network, 2014</td>
<td>Guideline</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Asthma Council of Australia</td>
<td>Guideline</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Canadian Paediatric Society, 2012</td>
<td>Position Statement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Institutes of Health, 2007</td>
<td>Guideline</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Global Initiative for Asthma, 2006</td>
<td>Guideline</td>
</tr>
<tr>
<td>3.3</td>
<td>Low to Moderate dosing inhaled steroids as per CTS dosing tables: preschool; 6 years and older.</td>
<td>Canadian Thoracic Society, 2010</td>
<td>See dosing table for children &gt;6 years, Figure 11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Canadian Paediatric Society and Canadian Thoracic Society, 2015</td>
<td>See dosing table for children 1-5 years, Figure 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thoracic Society of Australia and New Zealand</td>
<td>Position Statement</td>
</tr>
</tbody>
</table>
**Discharge Recommendations**

Upon discharge, the Expert Panel recommends the following standardized evidence-informed recommendations; appropriate referrals to an asthma specialist and spirometry, as well as standardized discharge instructions and education:

<table>
<thead>
<tr>
<th>#</th>
<th>Recommendation</th>
<th>Supporting Evidence</th>
<th>Evidence Type</th>
<th>Evidence Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 Referral Recommendations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Referral to an Asthma Specialist upon discharge.</td>
<td>National Institutes of Health, 2007</td>
<td>Guideline</td>
<td>Evidence Category A and B</td>
</tr>
<tr>
<td>1.2</td>
<td>Referral for outpatient spirometry is recommended for all children ≥ 6 yrs in order to support diagnosis and to monitor asthma control.</td>
<td>Canadian Paediatric Society, 2012</td>
<td>Position Statement</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Global Initiative for Asthma, 2006</td>
<td>Guideline</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Canadian Thoracic Society, 2012</td>
<td>Guideline</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Canadian Medical Association, 1999</td>
<td>Position Statement</td>
<td>Level 3 and 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Institutes of Health, 2007</td>
<td>Guideline</td>
<td>Evidence Category B and C</td>
</tr>
<tr>
<td>2.0 Discharge Instructions and Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>All ED and inpatient discharges receive a written Asthma Action Plan/Discharge Instructions (one is available in the P-EDACP, Attachment A).</td>
<td>Expert Panel Consensus</td>
<td>Evidence-based clinical pathway⁶</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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⁶ The P-EDACP was developed by an interprofessional steering committee and interdisciplinary expert content working group that reviewed Canadian Thoracic Society and international asthma guidelines, other relevant published literature and examples of previously developed pathways.
Related Figures

Figure 11: Inhaled corticosteroid dosing table for children >6 years (Lougheed et al., 2010)

Inhaled corticosteroid (ICS) dosing categories in children and adults

<table>
<thead>
<tr>
<th>Corticosteroid</th>
<th>Trade name</th>
<th>Daily ICS dose, mcg</th>
<th>Children (6 to 11 years of age)</th>
<th>Adults (12 years of age and over)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Beclomethasone dipropionate HFA</td>
<td>QVAR®</td>
<td>≤200</td>
<td>201–400</td>
<td>≤400</td>
</tr>
<tr>
<td>Budesonide*</td>
<td>Pulmicort Turbohaler®</td>
<td>≤400</td>
<td>401–800</td>
<td>&gt;800</td>
</tr>
<tr>
<td>Ciclesonide*</td>
<td>Alvesco®</td>
<td>≤400</td>
<td>201–400</td>
<td>≤400</td>
</tr>
<tr>
<td>Fluticasone</td>
<td>Flovent MDI and spacer; FloventDISK®</td>
<td>≤200</td>
<td>201–500</td>
<td>&gt;500</td>
</tr>
</tbody>
</table>

Note: Dose equivalencies are approximate and are based on efficacy data. Categories are somewhat arbitrary but are based on manufacturers' recommendations.

*Licensed for once daily dosing in Canada; ‡Gracelway Pharmaceuticals Canada; †AstraZeneca Inc, Canada; ¶Wyeth Canada Inc, Canada; #GlaxoSmithKline Inc, Canada. HFA Hydrofluoroalkanes; mcg micrograms; MDI Metered dose inhaler.

Figure 12: Inhaled corticosteroid dosing table for children 1-5 years. (Ducharme et al., 2015)

Inhaled corticosteroid (ICS) dosing categories* in children one to five years of age

<table>
<thead>
<tr>
<th>Corticosteroid (trade name)</th>
<th>Daily ICS dose, micrograms (mcg)†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Beclomethasone (QVAR®)</td>
<td>100</td>
</tr>
<tr>
<td>Ciclesonide (Alvesco®)</td>
<td>100</td>
</tr>
<tr>
<td>Fluticasone (Flovent®)</td>
<td>100-125§</td>
</tr>
</tbody>
</table>

*Proposed dosing categories are based on a combination of approximate dose equivalency as well as safety and efficacy data rather than the available product formulations. Shaded area indicates that these medications are not approved for use in this age group by Health Canada with the exception of Beclomethasone (QVAR), which is approved for use in children ≥5 years of age. Because delivery by metered-dose inhaler is preferred, budesonide is not included in this table because it is only available for use by nebulization in Canada in children <6 years of age. High doses of ICS are not recommended in this age group and referral to an asthma specialist is suggested if asthma is not controlled on a medium dose of ICS. The ICS doses are reported ex-valve as the total daily dose; they should be divided in half for twice-daily administration, except where indicated otherwise. ICS are to be administered by metered-dose inhaler with an age-appropriate valved spacer. †Licensed for once daily dosing in Canada; §Fluticasone is not licensed for once-daily dosing in Canada but 125 mcg once daily is sometimes used to improve adherence over twice-daily use of 50 mcg.
3.3 Clinical Documentation

Implementation of these clinical practices for Paediatric Asthma will require several clinical documentation changes including the following:

- Documentation of the asthma severity score (PRAM score). Sample documentation tools are available as part of the P-EDACP.
- Completion of the Asthma Action Plan, including documentation of discharge medication (prescription) and appropriate referrals, included in the P-EDACP.
- Completion of the Patient Education Checklist, which is also included in the P-EDACP.

Accurate documentation of asthma diagnosis and treatment times will be essential for the successful implementation of these clinical practices.

3.4 Patient Outcomes

Successful implementation of the Paediatric Asthma clinical practices will:

- Ensure more efficient and evidence-based management asthma in paediatric population;
- Reduce repeat ED visits and hospital admissions; and potentially decrease ED LOS
- Improve asthma self-management and symptom control;
- Increase capacity for care closer to home in community settings.
4.0 Implementation of Best Practices

General considerations for implementing the best practices to ensure standardized and optimal patient care delivery:

**Expert-Developed Pathway:** The expert developed P-EDACP is recommended for the ED episode of care where the majority of pediatric patients with acute asthmatic exacerbations are seen and treated. The OLA has a number of excellent resources to support use of the pathway and asthma care in general.

**Care Closer to Home:** For the majority of acute asthmatics, good care can be delivered in any ED setting; it does not require specialized treatment facilities or personnel beyond those currently available in accredited hospitals. The P-EDACP was specifically designed for use in any ED setting. Prompt assessment of exacerbation severity and initiation of severity-based treatment will result in improved status for most patients. The P-EDACP will also aid in recognition of those for whom referral or transfer to a specialized pediatric centre and/or critical care services may be required.

**Diagnostic Confusion:** Because there are no objective diagnostic tests in young children (< 6 years of age), asthma remains a clinical diagnosis in this age group. As a result, there is diagnostic uncertainty and confusion in the care of very young children. In particular, there is overlap of other conditions such as bronchiolitis (typically in < 1 yr of age) and another entity known as viral wheeze (< 6 yrs of age). A formal diagnosis of asthma is not required for use of the P-EDACP; however, specific inclusion and exclusion criteria are available. Hence, clinicians treating a patient with known or suspected asthma should follow the P-EDACP recommendations.

**Practice Variation:** In addition to the diagnostic uncertainty above, variations in practice exist across the province. These variations occur in the ED and inpatient episodes of care, as well as availability of outpatient and community based resources, such as access to asthma educators, use of spirometry and follow-up care. The P-EDACP will help to address the former, but additional resources will be required in the outpatient and community settings.

**Potential Implementation Barriers:** Community Resources: As noted above, variable access to asthma educators, spirometry and follow-up care in communities will be a barrier to full implementation of the Asthma best practice recommendations. While these issues may not affect the hospital episodes of care, they are known to impact chronic asthma management and repeat exacerbations.

**Hospital Committee Approval Processes:** Implementation delays are often related to lengthy hospital committee approval processes. Given the P-EDACP will be one of several pathway initiatives for implementation, hospitals will need to streamline their approval processes to expedite implementation. Some hospitals have done this by creating specific implementation committees with representation from key hospital committee members (e.g.: Pharmacy & Therapeutics, Medical Advisory, Nursing Advisory, Professional Practice, etc.)

Tailoring the recommended patient clinical pathways and best practices to local circumstances

Tailored implementation at the local level is critical for successful adoption and sustained use. Recommended best practices for tailored implementation include the following:
• Identification of a site lead/champion who will be responsible to adapt the documents to meet hospital formatting requirements, lead the pathway and recommendations through the necessary hospital approval committees, discuss the recommendations and implications with front line health professionals (nurses, physicians, respiratory therapists, pharmacists) and organize education sessions and other resources to support its use.

• Ensuring a designated physician lead (ED chief or influential ED physician or pediatrician) is involved as physician buy-in is critical and this lead will be essential in promoting practice change.

• Ensuring buy-in from hospital administration.

• Convening a small implementation team, including the above, to provide oversight in the implementation process, including:
  
  o Detailed review of the P-EDACP, inpatient and discharge recommendations.
  o Identification of gaps on comparison with current institutional and individual practices.
  o Development of operational strategy to ensure optimal environment for care based on their own local circumstances, unique clinical team compositions and available staffing capacities.
  o Discussion of feasible changes for that institution and timelines for completion
  o Progress reports/accountability to hospital administration.
  o Audit and feedback of pathway use.
  o Engagement with peers / sharing implementation experiences and insights.

The roles of clinicians and multi-disciplinary teams in implementing the best practices

The roles of individual clinicians and team members will not change significantly nor will they be tasked with new responsibilities. Physicians are always at liberty to individualize care for a given patient, using their clinical judgment. The greatest change is that with use of the associated medical directive in the P-EDACP, health professionals (nurses, RTs, pharmacists) can administer treatments in a timely manner, without waiting for a physician assessment and orders. Use of preprinted order sets also reduce errors and provide the team with a consistent, standardized treatment plan.
5.0 Implications for Multi-disciplinary Teams and Current Clinical Practice

Implication for multidisciplinary teams

Successful implementation of the best practices will require collaboration among hospital-based physician teams, asthma specialists and asthma educators, respiratory therapists, nursing staff, and pharmacy, in close collaboration with hospital administrative leads. Of note, the P-EDACP includes a medical directive that will require pre-authorization by the physician group.

Alignment with clinical practice

While the best practices will not require new skills or management techniques, it will help reduce variability in clinical practice by improving adherence to clinical guidelines and best practices across the province:

- For the ED episode of care, implementation of the best practices will ensure alignment with the OLA P-EDACP. Specifically, it will provide the most effective care in a time-efficient manner.
- For inpatient episode of care, implementation will entail a standardized evidence-informed approach to the use of oxygen saturation monitoring, systemic and inhaled steroids;
- For discharge, implementation will ensure an appropriate discharge plan, entailing the use of standardized discharge instructions and education, and an evidence-informed approach to making referrals to an asthma specialist and spirometry.
## 6.0 Membership

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liz Brunato</td>
<td>Asthma Education Center Coordinator</td>
<td>Halton Healthcare Services</td>
</tr>
<tr>
<td>Anna Bucciarelli</td>
<td>Senior Project Manager</td>
<td>Provincial Council for Maternal and Child Health</td>
</tr>
<tr>
<td>Lori Chen</td>
<td>Clinical Pharmacist</td>
<td>SickKids</td>
</tr>
<tr>
<td>Doreen Day</td>
<td>Senior Project Manager</td>
<td>Provincial Council for Maternal and Child Health</td>
</tr>
<tr>
<td>Ted Everson</td>
<td>Emergency Physician</td>
<td>Trilliam Health Partners (THP)</td>
</tr>
<tr>
<td>Ram Gobburu</td>
<td>Paediatrician</td>
<td>Stratford General Hospital</td>
</tr>
<tr>
<td>Donna Goldenberg (Co-Chair)</td>
<td>Paediatrician</td>
<td>Trilliam Health Partners (THP)</td>
</tr>
<tr>
<td>Karen Grewal</td>
<td>Paediatrician</td>
<td>Kingston General/Hotel Dieu Hospitals</td>
</tr>
<tr>
<td>Akhter Hamid Muhammad</td>
<td>Paediatrician</td>
<td>Rouge Valley Health System (Centenary)</td>
</tr>
<tr>
<td>Danica Irwin</td>
<td>Pharmacist</td>
<td>CHEO</td>
</tr>
<tr>
<td>Mona Jabbour (Co-Chair)</td>
<td>Paediatrician, Vice-Chair Paediatrics, Emergency Physician</td>
<td>CHEO</td>
</tr>
<tr>
<td>Doug Jowett</td>
<td>Paediatric Nurse Consultant</td>
<td>Maternal Newborn Youth and Child Network - London Health Sciences Centre</td>
</tr>
<tr>
<td>Joanna Massam</td>
<td>Paediatrician, Respirologist</td>
<td>North York General Hospital</td>
</tr>
<tr>
<td>Danielle McKinlay</td>
<td>Information Controller</td>
<td>McMaster Children's Hospital Hamilton Health Sciences</td>
</tr>
<tr>
<td>Zoe Nugent</td>
<td>Paediatrician, Respirologist</td>
<td>Peterborough Regional Health Centre</td>
</tr>
<tr>
<td>Susan O'Farrell</td>
<td>Respiratory Therapist</td>
<td>Niagara Health System, St. Catharines Site</td>
</tr>
<tr>
<td>Padmaja Subbarao</td>
<td>Respirologist</td>
<td>The Hospital for Sick Children</td>
</tr>
<tr>
<td>Angelina Wiwczor</td>
<td>Nurse Practitioner, NEO Kids</td>
<td>Health Sciences North</td>
</tr>
</tbody>
</table>
Appendix A: Paediatric Emergency Department Asthma Care Pathway

Funded by the Government of Ontario within the APA, the **P-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.

For more information see the *Paediatric Emergency Department Asthma Care Pathway Information Package* on page the following page. To download the the most up-to-date version of the P-EDACP visit the OLA website at: [www.on.lung.ca/edacp](http://www.on.lung.ca/edacp)
Background

Following a teen’s death from asthma 13 years ago 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.” One of the APA initiatives is the Emergency Department Asthma Care Pathway (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.

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 a comprehensive care pathway. 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 EDACP (A-EDACP) for ages 16 years and older was developed first. A pilot study 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 (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.

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. 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.

**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*
EMERGENCY DEPARTMENT
ASTHMA CARE PATHWAY
PAEDIATRIC: 1 to 17 years

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)\(^1\), Canadian Paediatric Asthma Consensus Guidelines, 2003 (updated to December 2004), 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 Care 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/Physician 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>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>Supraternal retraction</td>
<td>Absent</td>
<td>Present</td>
<td></td>
<td></td>
<td>(max 2)</td>
</tr>
<tr>
<td>Scallene muscle contraction</td>
<td>Absent</td>
<td>Present</td>
<td></td>
<td></td>
<td>(max 2)</td>
</tr>
<tr>
<td>Air entry*</td>
<td>Normal</td>
<td>Decreased at bases</td>
<td>Widespread decrease</td>
<td>Absent/Minimal</td>
<td>(max 3)</td>
</tr>
<tr>
<td>Wheezing*</td>
<td>Absent</td>
<td>Expiratory only</td>
<td>Inspiratory and expiratory</td>
<td>Audoible without stethoscope/silent chest with minimal air entry</td>
<td>(max 3)</td>
</tr>
<tr>
<td>O2 saturation in room air</td>
<td>≥ 95%</td>
<td>92%-94%</td>
<td>&lt; 92%</td>
<td></td>
<td>(max 2)</td>
</tr>
</tbody>
</table>

*If asymmetric findings between the right and left lungs, the most severe side is rated

PRAM Score 0 – 3 MILD Asthma
PRAM Score 4 – 7 MODERATE Asthma
PRAM Score 8 – 12 SEVERE Asthma

IMPEMINING RESPIRATORY FAILURE
is based on clinical presentation


Disclaimer: This Clinical Pathway is not intended to set the standard of care applicable in any particular clinical situation. It is merely prepared 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 all times, physicians, nurses, respiratory therapists and other healthcare providers must exercise their independent clinical judgment, based on their knowledge, training and experience, taking into account the specific facts and circumstances of each patient, when deciding on the appropriate course of investigation and/or treatment to recommend in a particular clinical situation. Any reference throughout the document to specific pharmaceutical products as examples does not imply endorsement of any of these products.

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**Emergency Department**  
**Asthma Care Pathway**  
**Paediatric: 1 to 17 years**  
**PHYSICIAN’S ORDERS**

| Drug Allergies: __________________ | Ht: _____ cm | Wt: _____ kg |

| **MILD ASTHMA (PRAM Score 0 to 3)** |

*Refer to Medication Guidelines on Reverse*

☐ physician to assess within 60 min  
☐ HR, RR, S$_p$O$_2$, PRAM q 60 min

*FIRST HOUR OF TREATMENT:*

*to be administered only if not already given as per the Paediatric ED Asthma Care Pathway Medical Directive*

β$_2$-agonist:

☐ *salbutamol metered dose inhaler (preferred): ___ puffs NOW and q 60 min PRN  
OR ☐ *salbutamol nebulizer: ___ 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: ____________________________________________________________

_________________________________________ Date: ________ Time: ________

MD Name ______________ Signature

**AFTER FIRST HOUR OF TREATMENT:**

β$_2$-agonist:

☐ salbutamol metered dose inhaler (preferred): _____ puffs q 60 min PRN  
OR ☐ salbutamol nebulizer: _____ 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: ____________________________________________________________

_________________________________________ Date: ________ Time: ________

MD Name ______________ Signature

**AT DISCHARGE OR ADMISSION, CONSULT:**

☐ Respiratory Therapist ☐ Asthma Educator ☐ Specialist/Service____________________

_________________________________________ Date: ________ Time: ________

MD Name ______________ Signature

_________________________________________ Date: ________ Time: ________

Nurse Name ______________ Signature

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MEDICATION GUIDELINES: MILD ASTHMA (PRAM Score 0-3)
(or FEV₁ greater than 70% predicted or personal best, if known)

β₂-agonist (salbutamol): one initial dose, then q 60 min 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 nebule 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 nebule or 0.25 mL of a 5 mg/mL solution
- 10 to 20 kg = 2.5 mg/dose = 2.5 mg nebule or 0.5 mL of a 5 mg/mL solution
- Greater than (>) 20 kg = 5 mg/dose = 5 mg nebule or 1 mL of a 5 mg/mL solution

Reassess Vital Signs and PRAM every 60 minutes:

- If PRAM is greater than or equal to (≥) 4:
  - MD to reassess and
  - Move to top of "MODERATE" pathway

- If PRAM remains less than or equal to (≤) 3:
  - MD to consider discharge
  - Provide asthma teaching
  - Provide discharge instructions
Emergency Department
Asthma Care Pathway
Paediatric: 1 to 17 years

PHYSICIAN’S ORDERS

Drug Allergies: ____________________________  Ht: ______ cm  Wt: ______ kg

MODERATE ASTHMA (PRAM Score 4 to 7)
Refer to Medication Guidelines on Reverse

☐ physician to assess within 30 min
☐ HR, RR, \( S_\text{p}_2 \text{O}_2 \) PRAM every 30 min x 1 hr, then q 30-60 min until PRAM less than 4
☐ administer oxygen to keep \( S_\text{p}_2 \text{O}_2 \) greater than or equal to (≥) 92%

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

\( \beta_2 \)-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: ____________________________________________________________

_________________________  ________________  Date: __________  Time: ______
_____________  ________________  Date: __________  Time: ______
_____________  ________________  Date: __________  Time: ______

Nurse Name  Signature

AFTER FIRST HOUR OF TREATMENT:

\( \beta_2 \)-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: ____________________________________________________________

_________________________  ________________  Date: __________  Time: ______
_____________  ________________  Date: __________  Time: ______
_____________  ________________  Date: __________  Time: ______

Nurse Name  Signature
MEDICATION GUIDELINES: MODERATE (PRAM Score 4-7) 
(or FEV1 50% to 70% predicted or personal best, if known)

<table>
<thead>
<tr>
<th>β2-agonist (salbutamol)</th>
<th>q 30-60 min PRN x 2 doses, then q 60 min PRN:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred:</td>
<td>salbutamol metered dose inhaler 100 mcg/puff + age-appropriate spacer</td>
</tr>
<tr>
<td>Dose according to patient age:</td>
<td></td>
</tr>
<tr>
<td>1 to 3 yrs:</td>
<td>4 puffs/dose</td>
</tr>
<tr>
<td>4 to 6 yrs:</td>
<td>6 puffs/dose</td>
</tr>
<tr>
<td>7 yrs and older:</td>
<td>8 puffs/dose</td>
</tr>
<tr>
<td>Alternative:</td>
<td>salbutamol nebulor 5 mg/mL solution (add 0.9% sodium chloride for total vol. 3-4 mL)</td>
</tr>
<tr>
<td>Dose according to patient weight:</td>
<td></td>
</tr>
<tr>
<td>Less than (&lt;) 10 kg:</td>
<td>1.25 mg/dose = 1.25 mg nebulor 0.25 mL of a 5 mg/mL solution</td>
</tr>
<tr>
<td>10 to 20 kg:</td>
<td>2.5 mg/dose = 2.5 mg nebulor 0.5 mL of a 5 mg/mL solution</td>
</tr>
<tr>
<td>Greater than (&gt; 20 kg:</td>
<td>5 mg/dose = 5 mg nebulor 1 mL of a 5 mg/mL solution</td>
</tr>
</tbody>
</table>

PLUS

**Oral Corticosteroid AS SOON AS POSSIBLE, within 60 (SIXTY) minutes of triage:**
predniSONE/prednisoloLONE: 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

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:
  - MD to reassess and
  - Move to top of “SEVERE” pathway

- If 6-8 hours post corticosteroid, PRAM is greater than or equal to (≥) 4:
  - MD to reassess and consider admission

- If PRAM score less than or equal to (≤) 3:
  - MD to consider discharge
  - provide asthma teaching
  - provide discharge instructions
**Emergency Department**
**Asthma Care Pathway**
**Paediatric: 1 to 17 years**
**PHYSICIAN’S ORDERS**

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

**SEVERE ASTHMA (PRAM Score 8 to 12)**
*Refer to Medication Guidelines on Reverse*

- physician to assess urgently
- administer oxygen to keep $S_O_2$ greater than or equal to ($\geq$) 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 Care 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
- salbutamol nebulized (nebule or 5 mg/mL solution): _____ mg MIXED WITH 250 mcg ipratropium bromide (125 mcg/mL or 250 mcg/mL) q 20 min x 3 doses

- Systemic Corticosteroid, AS SOON AS POSSIBLE, within 20 (TWENTY) mins of triage:
  - *prednisolone: _____ mg (2 mg/kg; max 50 mg) PO x 1 dose
  - *prednisolone: _____ mg (2 mg/kg; max 50 mg) PO x 1 dose
  - methylprednisolone IV: _____ mg (1 mg/kg/dose; max 125 mg/dose) x 1 dose NOW
  - (infuse over 3 - 15 minutes)
  - methylprednisolone IM: _____ mg (1 mg/kg/dose; max 125 mg/dose) x 1 dose NOW

**Additional Orders:**

---

**MD Name** | **Signature** | **Date:** | **Time:**
---|---|---|---

**AFTER FIRST HOUR OF TREATMENT:**

*β₂-agonist:
- salbutamol metered dose inhaler: _____ puffs q _____ min PRN
- salbutamol nebulize: _____ mg q _____ min PRN
- 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:**

---

**MD Name** | **Signature** | **Date:** | **Time:**
---|---|---|---

**Nurse Name** | **Signature** | **Date:** | **Time:**
---|---|---|---
MEDICATION GUIDELINES: SEVERE (PRAM 8 - 12)
(or FEV1 less than 50% predicted or personal best, if known)

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 nebulizer 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 nebulizer or 0.25 mL of a 5 mg/mL solution
- 11 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

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 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 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 "IMPELLING RESPIRATORY FAILURE" pathway
- If 4 hours post corticosteroid PRAM score is greater than or equal to (≥) 4:
  - MD to reassess and consider admission
- If PRAM score improving, move to "MODERATE" pathway

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# Emergency Department

**Asthma Care Pathway**

**Paediatric: 1 to 17 years**

**PHYSICIAN’S ORDERS**

**Drug Allergies:**

<table>
<thead>
<tr>
<th>Ht.</th>
<th>cm</th>
<th>Wt.</th>
<th>kg</th>
</tr>
</thead>
</table>

**IMPENDING RESPIRATORY FAILURE**

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

*Refer to Medication Guidelines & Algorithm on Reverse*

- [ ] physician to assess STAT and remain in attendance until patient stabilized
- [ ] administer 100% oxygen
- [ ] support ventilation if required (bag + mask)  
  Note: avoid high rates and/or volumes
- [ ] continuous cardiopulmonary monitoring
- [ ] HR, RR, SpO₂, PRAM q 15 min
- [ ] obtain IV access (if not already done): fluid________ rate of infusion _________
- [ ] NPO
- [ ] blood gas:  
  - arterial **QR**  
  - capillary
- [ ] chest radiograph (portable)
- [ ] 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:**

- β₂-agonist and anticholinergic:
  - [ ] salbutamol nebulized (nebule 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)
    - **QR** [ ] methylPREDNISolone IM: ____ mg x 1 dose NOW and q 6 h

- [ ] 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:**

<table>
<thead>
<tr>
<th>MD Name</th>
<th>Signature</th>
<th>Date:</th>
<th>Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse Name</td>
<td>Signature</td>
<td>Date:</td>
<td>Time:</td>
</tr>
</tbody>
</table>
MEDICATION GUIDELINES: IMPENDING 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>continuous nebulization with oxygen, physician to reassess as necessary</td>
</tr>
</tbody>
</table>

salbutamol nebule or 5 mg/mL solution (dose according to patient weight):

| Less than (<) 10 kg = 1.25 mg/dose = 1.25 mg nebule or 0.25 mL of a 5 mg/mL solution |
| Greater than (>) 20 kg = 2.5 mg/dose = 2.5 mg nebule or 0.5 mL of a 5 mg/mL solution |

AND

ipratropium bromide nebule or solution (125 mcg/mL or 250 mcg/mL):

250 mcg/dose, mix with salbutamol, add 0.9% sodium chloride for total volume of 3 to 4 mL

PLUS

Systemic Corticosteroid, AS SOON AS POSSIBLE after first bronchodilator dose:

methylPREDNISolone 1 mg/kg/dose q 6 h IV or IM (max 125 mg/dose); give IV dose over 3-15 min

PLUS

Magnesium sulfate:

50 mg/kg/dose IV ONCE (maximum 2 g per dose); give over 20-30 minutes

Attention: may cause severe hypotension; ensure IV access, monitor BP q 5 min during infusion and for 30 min after
# Patient Education Checklist

**Emergency Department**  
**Asthma Care Pathway**  
**Paediatric: 1 to 17 years**  
**Education Checklist**

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

Name (print):  
Signature:  
Status:  
Date (YYYY/MM/DD):  
Time:  

---

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March 2014

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Emergency Department
Asthma Care Pathway (EDACP)
Paediatric: 1 to 17 years
Discharge Instructions

PHYSICIAN: Complete and initial beside selected orders.

PHARMACIST: Label short-acting (relief) inhaler as “Take as directed as per EDACP Discharge instructions”. Fill other medications as directed by physician.

**Asthma under control**

**CONTROLLER Medicine:**
- (specify name) ______ mcg/inhalation, take ___ inhalations
- ___ times per day, for 3 months. Refill 3
- ____ metered dose inhaler (puffer) OR ____ dry powder
- ____ Other

**QUICK RELIEF Medicine:**
- (specify name) ______ inhalations every 4 to 6 hours
- as needed. 1 inhaler. Refill 1
- ____ SPACER DEVICE: dispense ____ device ________ (specify name)
- ____ Infant with mask __ Paediatric with mask __ Adult with mouthpiece

**Asthma not well controlled**

Continue **GREEN ZONE CONTROLLER medicine**.

Take **QUICK RELIEF medicine** every 4 hours until better.

If the effect of the quick relief medication does not last 4 hours or if the child’s symptoms are getting worse, see a doctor

**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 ___ prednisolone tablet ____ mg daily for ___ days. Refill 0

Additional discharge instructions:

**Asthma out of control**

Take **QUICK RELIEF medicine** (blue inhaler) every 4 hours.

If you need **QUICK RELIEF medicine** (blue inhaler) more than every 4 hours, seek medical attention NOW.

If still in Red Zone after 15 minutes or you have not reached your doctor, call 911 or go to nearest emergency department NOW. Take **QUICK RELIEF medicine** (blue inhaler) as needed (even every 10 or 20 minutes if not improving) on way to hospital.

Schedule appointment with: □ family doctor □ asthma educator □ specialist _______ within _______ weeks

If you have any questions about your asthma, call the Lung Association’s Asthma Helpline 1-888-344-LUNG (5864)

Physician: ___________________________ License #: ______ Signature: ___________________________ Date: (dd/mm/yyyy)

Created by the Centre hospitalier pour enfants de l’Ontario, Centre hospital pour enfants de l’Ontario, Adapted with permission for use in the Ontario Lung Association ED Asthma Care Pathway

Children’s Hospital of Eastern Ontario
Centre hospitalier pour enfants de l’Ontario
ASTHMA QUIZ FOR KIDZ*

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

1. Did you cough, wheeze, or have a hard time breathing 4 or more days out of the last 7 days? □ □

2. Did you wake up at night because you were coughing, or wheezing, or having a hard time breathing 1 or more times in the last 7 days? □ □

3. Did you use your blue puffer 4 or more times in the last 7 days? □ □

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? □ □

5. In the last 30 days, did you miss school or regular activities because you were coughing, wheezing, or having a hard time breathing? □ □

6. In the last 30 days, did you go to a clinic or hospital without an appointment because you were coughing, wheezing, or having a hard time breathing? □ □
   - 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 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.onlung.ca

Order and/or Delegated Procedure:

Appendix Attached: ☐ Yes ☐ No Title: Appendix B - Flowchart

1. Supplemental oxygen to keep \(\text{SaO}_2\) 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 (FEV\(_1\)) 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 condition 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 prednisOLOSE
- 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. Obtain 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.

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*Based on Medical Directive/Delegation Template of the Federation of Health Regulatory Colleges of Ontario, Ontario Lung Association, March 2014*
<table>
<thead>
<tr>
<th>Consent</th>
<th>Appendix Attached: ☐ Yes ☐ No Title:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consent (verbal and/or implied) must be provided by patient or substitute decision maker prior to commencing medical directive.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Guidelines for Implementing the Order/Procedure</th>
<th>Appendix Attached: ☐ Yes ☐ No Title:</th>
</tr>
</thead>
<tbody>
<tr>
<td>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 Care Pathway (Asthma Pathway).</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Documentation and Communication</th>
<th>Appendix Attached: ☐ Yes ☐ No Title:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Review and Quality Monitoring Guidelines</th>
<th>Appendix Attached: ☐ Yes ☐ No Title:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Administrative Approvals (as applicable)</th>
<th>Appendix Attached: ☐ Yes ☐ No Title:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Approving Physician(s)/Authorizer(s)</th>
<th>Appendix Attached: ☐ Yes ☐ No Title:</th>
</tr>
</thead>
</table>

Based on Medical Directive/Delegation Template of the Federation of Health Regulatory Colleges of Ontario Ontario Lung Association March 2014
**Emergency Department Paediatric Asthma Medical Directive**  
**Appendix A: Severity of asthma exacerbation**

1. 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. Suprasternal retractions</td>
<td>Absent</td>
<td>Present</td>
<td></td>
<td></td>
<td>(max 2)</td>
</tr>
<tr>
<td>2. Scalen muscle contraction</td>
<td>Absent</td>
<td>Present</td>
<td></td>
<td></td>
<td>(max 2)</td>
</tr>
<tr>
<td>3. Air entry&quot;</td>
<td>Normal</td>
<td>Decreased at bases</td>
<td>Widespread decrease</td>
<td>Absent/minimal</td>
<td>(max 3)</td>
</tr>
<tr>
<td>4. Wheezing&quot;</td>
<td>Absent</td>
<td>Expiratory only</td>
<td>Inspiratory and expiratory</td>
<td>Audible without stethoscope/ silent chest with minimal air entry</td>
<td>(max 3)</td>
</tr>
<tr>
<td>5. O₂ saturation in room air</td>
<td>≥98%</td>
<td>92%-94%</td>
<td>&lt;82%</td>
<td></td>
<td>(max 2)</td>
</tr>
</tbody>
</table>

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

*If asymmetric findings between the right and left lungs, the most severe side is rated.*

**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:**


Paediatric EDACP Expert Content Working Group

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Respiratory Therapy Society of Ontario (RTSO)

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Professional Practise Advisor, College of Respiratory Therapists of Ontario

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Pharmacist, CHEO

Dr. Mona Jabbour  
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Children’s Hospital of Eastern Ontario

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Clinical Pharmacist, Pediatric & Respiratory Medicine, HSC

Dr. Roger Zemek  
Pediatric Emergentologist (CHEO)

Dr. Dawid (David) Zielinski  
Pediatrician & Respirologist, Montreal
References for Paediatric Emergency Department Asthma Care 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”


Appendix B: Evidence Grading Methodologies

**British Thoracic Society Scottish Intercollegiate Guidelines Network 2014**

**Evidence Grading Methodology:** Scottish Intercollegiate Guidelines Network (SIGN) methodology.

<table>
<thead>
<tr>
<th>LEVELS OF EVIDENCE</th>
<th>GRADES OF RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1+++ High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias</td>
<td>A At least one meta-analysis, systematic review, or RCT rated as 1+++; and directly applicable to the target population; or A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results</td>
</tr>
<tr>
<td>1+ Well conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias</td>
<td>B A body of evidence including studies rated as 2++; directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1+++ or 1+</td>
</tr>
<tr>
<td>1 Meta-analyses, systematic reviews, or RCTs with a high risk of bias</td>
<td>C A body of evidence including studies rated as 2++; directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2++</td>
</tr>
<tr>
<td>2+++ High quality systematic reviews of case control or cohort studies</td>
<td>D Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2++</td>
</tr>
<tr>
<td>2 High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal</td>
<td>GRADE OF RECOMMENDATION</td>
</tr>
<tr>
<td>2 Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal</td>
<td>3 Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal</td>
</tr>
<tr>
<td>3 Non-analytic studies, eg case reports, case series</td>
<td>4 Expert opinion</td>
</tr>
</tbody>
</table>

**KEY TO EVIDENCE STATEMENTS AND GRADES OF RECOMMENDATIONS**

Note: The grade of recommendation relates to the strength of the evidence on which the recommendation is based. It does not reflect the clinical importance of the recommendation.

- A: At least one meta-analysis, systematic review, or RCT rated as 1+++; and directly applicable to the target population; or A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results.
- B: A body of evidence including studies rated as 2++; directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1+++ or 1+.
- C: A body of evidence including studies rated as 2++; directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2++.
- D: Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2++.

**GOOD PRACTICE POINTS**

- Recommended best practice based on the clinical experience of the guideline development group.
Levels of evidence

The evidence cited in the guidelines has been classified as accurately as possible into 5 levels.

**Level I evidence** is based on randomized, controlled trials (or meta-analysis of such trials) of adequate size to ensure a low risk of incorporating false-positive or false-negative results.

**Level II evidence** is based on randomized, controlled trials that are too small to provide level I evidence. These may show either positive trends that are not statistically significant or no trends and are associated with a high risk of false-negative results.

**Level III evidence** is based on nonrandomized, controlled or cohort studies, case series, case-controlled studies or cross-sectional studies.

**Level IV evidence** is based on the opinion of respected authorities or that of expert committees as indicated in published consensus conferences or guidelines.

**Level V evidence** expresses the opinion of those individuals who have written and reviewed these guidelines, based on their experience, knowledge of the relevant literature and discussion with their peers.

These 5 levels of evidence do not directly describe the quality or credibility of evidence. Rather, they indicate the nature of the evidence being used. In general, a randomized, controlled trial has the greatest credibility (level I); however, it may have defects that diminish its value, and these should be noted. Evidence that is based on too few observations to give a statistically significant result is classified as level II. In general, level III studies carry less credibility than level I or II studies, but credibility is increased when consistent results are obtained from several level III studies carried out at different times and in different places.

Decisions must often be made in the absence of published evidence. In these situations it is necessary to use the opinion of experts based on their knowledge and clinical experience. All such evidence is classified as “opinion” (levels IV and V).

Distinction is made between the published opinion of authorities (level IV) and the opinion of those who have contributed to these guidelines (level V). However, it should be noted that by the time level V evidence has gone through the exhaustive consensus-building process used in the preparation of these guidelines, it has achieved a level of credibility that is at least equivalent to level IV evidence.

---

Canadian Thoracic Society 2012 (Lougheed et al.)

**Evidence Grading Methodology:** Appraisal of Guidelines, Research and Evaluation (AGREE) II instrument.

<table>
<thead>
<tr>
<th>Grade of recommendation/description</th>
<th>Benefit versus risk and burdens</th>
<th>Methodological quality of supporting evidence</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A/Strong recommendation, high-quality evidence</td>
<td>Benefits clearly outweigh risk and burdens or vice versa</td>
<td>RCTs without important limitations or overwhelming evidence from observational studies</td>
<td>Strong recommendation, can apply to most patients in most circumstances without reservation</td>
</tr>
<tr>
<td>1B/Strong recommendation, moderate-quality evidence</td>
<td>Benefits clearly outweigh risk and burdens or vice versa</td>
<td>RCTs with important limitations (inconsistent results, methodological flaws, indirect or imprecise) or exceptionally strong evidence from observational studies</td>
<td>Strong recommendation, can apply to most patients in most circumstances without reservation</td>
</tr>
<tr>
<td>1C/Strong recommendation, low-quality or very low-quality evidence</td>
<td>Benefits clearly outweigh risk and burdens or vice versa</td>
<td>Observational studies or case series</td>
<td>Strong recommendation but may change when higher quality evidence becomes available</td>
</tr>
<tr>
<td>2A/Weak recommendation, high-quality evidence</td>
<td>Benefits closely balanced with risks and burden</td>
<td>RCTs without important limitations or overwhelming evidence from observational studies</td>
<td>Weak recommendation, best action may differ depending on circumstances, patients’ or social values</td>
</tr>
<tr>
<td>2B/Weak recommendation, moderate-quality evidence</td>
<td>Benefits closely balanced with risks and burden</td>
<td>RCTs with important limitations (inconsistent results, methodological flaws, indirect or imprecise) or exceptionally strong evidence from observational studies</td>
<td>Weak recommendation, best action may differ depending on circumstances, patients’ or social values</td>
</tr>
<tr>
<td>2C/Weak recommendation, low-quality or very low-quality evidence</td>
<td>Uncertainty in the estimates of benefits, risks and burden; benefits, risk and burden may be closely balanced</td>
<td>Observational studies or case series</td>
<td>Very weak recommendations; other alternatives may be equally reasonable</td>
</tr>
</tbody>
</table>
### National Institutes of Health 2007 and Global Initiative for Asthma 2006

Evidence Grading Methodology: Jadad et al., 2000

<table>
<thead>
<tr>
<th>Evidence Category</th>
<th>Sources of Evidence</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Randomized controlled trials (RCTs). Rich body of data.</td>
<td>Evidence is from endpoints of well designed RCTs that provide a consistent pattern of findings in the population for which the recommendation is made. Category A requires substantial numbers of studies involving substantial numbers of participants.</td>
</tr>
<tr>
<td>B</td>
<td>Randomized controlled trials (RCTs). Limited body of data.</td>
<td>Evidence is from endpoints of intervention studies that include only a limited number of patients, posthoc or subgroup analysis of RCTs, or meta-analysis of RCTs. In general, Category B pertains when few randomized trials exist, they are small in size, they were undertaken in a population that differs from the target population of the recommendation, or the results are somewhat inconsistent.</td>
</tr>
<tr>
<td>C</td>
<td>Nonrandomized trials. Observational studies.</td>
<td>Evidence is from outcomes of uncontrolled or nonrandomized trials or from observational studies.</td>
</tr>
<tr>
<td>D</td>
<td>Panel consensus judgment.</td>
<td>This category is used only in cases where the provision of some guidance was deemed valuable but the clinical literature addressing the subject was insufficient to justify placement in one of the other categories. The Panel Consensus is based on clinical experience or knowledge that does not meet the above-listed criteria.</td>
</tr>
</tbody>
</table>

Appendix B: Evaluation Metrics

The province currently lacks measures related to the quality of care provided to paediatric asthma patients, specifically measures that address the assessment of severity of an asthma exacerbation, the provision of appropriate treatment based on severity, and appropriate discharge action. Measures that can currently be collected are largely generic measures that focus on the downstream outcomes of care (i.e. readmissions) or general utilization data such as length of stay. These measures, while useful in that they are readily reported and can be collected for hospitals across the province, do not detail the clinical processes and quality of care provided during an ED visit or inpatient admission for asthma. In addition, appropriate targets/benchmarks for these measures are unknown.

As such the Expert Panel recommends a combination of both quality of care metrics as well as outcomes metrics be used to evaluate clinical adoption. Much of the data for the quality of care metrics is currently unavailable, however, given the importance of these metrics in assessing clinical adoption of the best practices, the Expert Panel stresses to the Ministry of Health and Long-Term Care that efforts be made to begin their collection. It is thought that the addition of these indicators to hospital charting and submission to the NACRS or DAD registries would not be onerous and the benefit to the system would be sizeable.

The proposed evaluation metrics have been divided into two categories – Primary evaluation metrics, those the Expert Panel deemed as most important to be collected, and secondary evaluation metrics. While both sets of metrics reflect the key indicators that will most directly measure the impact of clinical adoption, if only a select few are to be implemented the Expert Panel noted those they felt would be most impactful on the Primary Evaluation Metrics list.
## Primary Evaluation Metrics

<table>
<thead>
<tr>
<th>Evaluation Metric</th>
<th>Domain</th>
<th>Relevance</th>
<th>Rationale</th>
<th>Feasibility/ Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a Proportion of children with asthma whose severity has been documented on presentation (PRAM score)</td>
<td>Effectiveness Appropriateness Efficiency</td>
<td>Administrators Clinicians</td>
<td>To assess if treatment delivered was appropriate (Evaluation Metric 1b and 1c) Treatment is based on condition severity</td>
<td>Data not readily available</td>
</tr>
<tr>
<td>1b Proportion of children with moderate to severe asthma (PRAM Score 4-12) who had severity-based treatment (systemic corticosteroids and first three treatments of salbutamol) initiated within 1 hour of presentation (triage time).</td>
<td>Effectiveness Appropriateness Efficiency</td>
<td>Administrators Clinicians</td>
<td>To measure the proportion of patients receiving appropriate severity-based treatment</td>
<td>Data not readily available</td>
</tr>
<tr>
<td>2 Proportion of children with asthma who, upon discharge from the ED or inpatient unit, received a written Asthma Action Plan</td>
<td>Appropriateness Integration Patient-centredness</td>
<td>LHINs Administrators Clinicians</td>
<td>To measure appropriate care provided The written Asthma Action Plan provides guidance for post-discharge care, doubles as a prescription and serves as a communication tool with the primary care physician</td>
<td>Data not readily available</td>
</tr>
<tr>
<td>3a Percentage of patients with an ED revisit for the same condition within 72 hours</td>
<td>Effectiveness Appropriateness Efficiency Patient-centredness</td>
<td>MOHLTC LHINs Administrators Clinicians</td>
<td>To determine efficiency of ED or in-hospital treatment and to monitor variation</td>
<td>Readily available NACRS</td>
</tr>
<tr>
<td>3b Percentage of patients with an ED revisit for the same condition within one month</td>
<td>Effectiveness Appropriateness Efficiency Patient-centredness</td>
<td>MOHLTC LHINs Administrators Clinicians</td>
<td>To determine efficiency of treatment and to monitor variation A revisit within thirty days indicates failure in following post-discharge recommendations, including education and primary care follow up.</td>
<td>Readily available NACRS</td>
</tr>
<tr>
<td>Evaluation Metric</td>
<td>Domain</td>
<td>Relevance</td>
<td>Rationale</td>
<td>Feasibility/ Data Source</td>
</tr>
<tr>
<td>-------------------</td>
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</tr>
<tr>
<td>4 Emergency Department Length of Stay</td>
<td>Effectiveness Efficiency Access Patient-centredness</td>
<td>MOHLTC LHINs Administrators Clinicians</td>
<td>To determine efficiency of treatment and to monitor variation</td>
<td>Readily available NACRS/hospital data (wait times initiative)</td>
</tr>
<tr>
<td>5 Proportion of children with asthma who were admitted or transferred to another hospital for admission</td>
<td>Effectiveness Appropriateness Efficiency</td>
<td>MOHLTC LHINs Administrators Clinicians</td>
<td>To determine efficiency of treatment and to monitor variation</td>
<td>Readily available NACRS/Hospital data (wait times initiative)/DAD</td>
</tr>
<tr>
<td>6 Hospital (inpatient) LOS</td>
<td>Effectiveness Appropriateness Efficiency</td>
<td>MOHLTC LHINs Administrators Clinicians</td>
<td>To determine efficiency of treatment and to monitor variation</td>
<td>Readily available DAD</td>
</tr>
<tr>
<td>7a Proportion of children with moderate to severe asthma who, upon discharge from the ED or inpatient unit, received/were prescribed a full course of systemic steroids.</td>
<td>Appropriateness</td>
<td>LHINs Administrators Clinicians</td>
<td>To measure the proportion of patients receiving appropriate treatment</td>
<td>Data not readily available</td>
</tr>
<tr>
<td>8b Proportion of children with asthma who, upon discharge from the ED or inpatient unit, are prescribed a full course of inhaled corticosteroids (3 month course)</td>
<td>Appropriateness Integration Patient-centredness</td>
<td>LHINs Administrators Clinicians</td>
<td>To measure the proportion of patients receiving appropriate treatment</td>
<td>Data not readily available</td>
</tr>
<tr>
<td>9 Proportion of children with Asthma who, upon discharge from the ED, have a completed Paediatric – Emergency Department Asthma Care Pathway Education checklist</td>
<td>Appropriateness Integration Patient-centredness</td>
<td>LHINs Administrators Clinicians</td>
<td>To measure appropriate care provided</td>
<td>Data not readily available</td>
</tr>
</tbody>
</table>
References


