Clinical Resource

Clinical Handbook for Paediatric Asthma

Updated: November 2021

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Contents

Revision History

November 12, 2021 - Updated
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A Note on Health Equity

Advancing health equity across the reproductive and child healthcare system in Ontario is a priority at PCMCH. Social determinants of health, and their intersections, affect the health of individuals, groups and communities in many different ways. Health equity is achieved by removing unfair and avoidable barriers that compromise health and well-being. Although health inequity often impacts people from racial and ethnic minority groups, it is critical to note that people are socially disadvantaged for many reasons aside from race and ethnicity. Addressing anti-Indigenous and anti-Black racism and other forms of systemic oppression that disproportionally affect the health of equity-seeking groups is an important step in ensuring health equity.

This document, and the outlined recommendations, are meant to be clinically applicable for a wide range of populations. Exercising clinical judgment is essential when applying the recommendations. In addition, Ontario is home to individuals from many diverse groups, including different ages, genders, gender identities, races, ethnicities, cultures and abilities living in a wide range of geographical locations. These factors can greatly influence a person's unique needs, expectations and responses to the care received and how it is managed. It is essential that the care provided by healthcare providers (HCPs) is culturally safe and sensitive, considers the individual and/or family's unique circumstances, and recognizes that what may be suitable for one person may not be appropriate for another, even if they have the same medical condition. In some situations, it may be appropriate for HCPs to consider consulting with organizations that specialize in supporting specific groups for assistance. Such organizations may be able to give advice on how to appropriately tailor the care being provided to an individual.

1.0 Introduction

1.1 Purpose

The *Clinical Handbook for Paediatric Asthma* (*Clinical Handbook*) is a compendium of the evidence-based rationale and clinical consensus for emergency department and in-patient management of paediatric asthma. It is for informational purposes only and does not mandate healthcare providers to provide services according to the recommendations it contains. The recommendations in this document do not take the place of healthcare providers' professional skill and judgment.

1.2 Key Objectives of the *Clinical Handbook*

The key objectives of the *Clinical Handbook* are to:

- provide clinicians with evidence-based recommendations regarding management of paediatric asthma for the Emergency Department (ED), in-patient episodes of care and for discharge;
- reduce variations in asthma diagnosis and the treatment of inpatients with asthma;
- promote standardized assessments of severity and severity-based treatment;
- reduce inappropriate ED revisits and in-patient admissions; and
- ensure that, upon discharge, children and their parents/caregivers receive asthma management education and instructions for appropriate follow-up and referrals in an Asthma Action Plan.

1.3 Clinical Pathway Development

This clinical pathway was developed by an Expert Panel, consisting of specialists in emergency medicine, paediatrics, respirology, nursing, pharmacy, respiratory therapy, asthma education and decision support. Please refer to the Acknowledgement section for a complete membership list. Feedback and input were sought at various stages throughout the development process from external experts. This process was important to ensure the overall feasibility and acceptance of the final recommendations. All decisions of the Expert Panel were made by general consensus.

The ED episode of care recommends using the Lung Health Foundation, formerly the Ontario Lung Association (OLA), Peadiatric Emergency Department Asthma Clinical Pathway (P-EDACP). This pathway was developed by an Expert Content Working Group that included paediatricians, paediatric emergentologists, nurses, respirologists,

respiratory therapists, pharmacists and researchers (Appendix A).

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

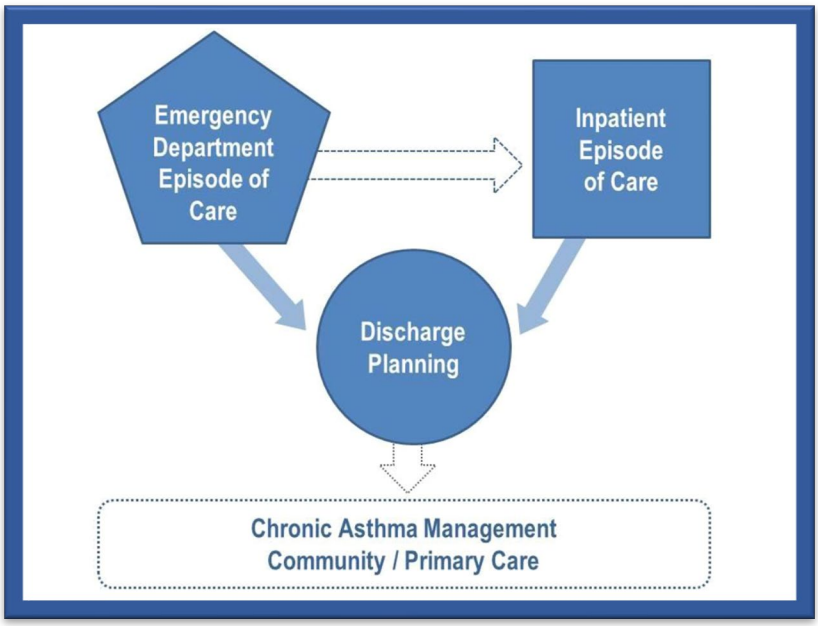
1.4 Asthma Quality Standard: Care in the Community

The scope of the *Clinical Handbook* does not address primary and community-based settings, however the Asthma Quality Standard: Care in the Community for People under 16 Years of Age from Ontario Health (OH) addresses the diagnosis and management of asthma in children and adolescents under 16 years of age, with a focus on primary care and community-based settings. Improving the quality of asthma care in these settings can help children and adolescents better control their disease and prevent acute exacerbations, ED visits, hospital admissions and deaths.

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 EDs and in-patient units across all levels of care. In 2013-14, it accounted for 17,600 ED visits and 2,500 in-patient admissions in Ontario.[1] As well as impacting acute care, paediatric asthma reaches deeply into the community health continuum where chronic management takes place. As such, this clinical handbook will address ED and in-patient episodes of care, as well as the discharge planning of these patients into the community (see Figure 1). While it does not specifically address chronic management of asthma in the community, the Expert Panel feels strongly that appropriate discharge-planning from the ED and in-patient settings will ensure fewer ED visits and in-patient admissions and support appropriate care in the community.

Figure 1: Scope of Paediatric Asthma Episodes of Care



[1] Data from the CIHI Portal, as per the QBP definition for Asthma. Accessed June 3, 2015.

2.1 Population Group Definition

This *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 (pre-schoolers), asthma is typically a clinical diagnosis (Ducharme et al., 2015). As such, confirming asthma in pre-school children requires clinicians to document reversibility of airflow obstruction with asthma treatments – bronchodilators +/- oral corticosteroids – and absence of clinical factors suggesting an alternate diagnosis. Personal atopy (i.e., eczema, food allergy, etc.) and family history of asthma/atopy are helpful but are not required to make an asthma diagnosis.

3.0 Best Practices Guiding the Implementation of Recommendations for Paediatric Asthma

3.1 Definition of Best Practices

Identifying recommended best practices[2] involved:

- reviewing existing clinical guidelines, consensus statements and hospital algorithms;
- consulting members of the Expert Panel and their network of experts for evidence not in the guidelines and consensus statements;
- reviewing and summarizing the evidence cited for each recommendation;
- expert panel discussions about how the proposed recommendations relate 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; and
- consulting with external experts regarding the recommendations.

3.2 Recommendations

Emergency Department Episode of Care Recommendations

The Expert Panel recommends using the following evidence-based clinical pathway for the ED episode of care:

#	Recommendation	Supporting Evidence	Evidence Type	Evidence Grade
1.0	Implementation of the Lung Health Foundation Peadiatric Emergency Department Asthma Clinical Pathway (P-EDACP), with the following amendment to the Medication Guidelines: - Prednisone/prednisolone: start with **2 mg/kg/day (day 1),** followed by 1 mg/kg/ day (morning) for a minimum 3 days total therapy. Maximum dose: **50 mg.** **OR** - Dexamethasone: **0.6 mg/kg/day every 24** hours for 2 days. Scant evidence for duration. Maximum dose **12 mg.**	Expert Panel Consensus	Evidence-based clinical pathway[3]	N/A

[2] Best practice refers to a combination of bestavailable evidence and clinical consensus as recommended by the Clinical Expert Advisory Groups.

[3] 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 Lung Health Foundation published the P-EDACP as part of the Ontario Asthma Plan of Action initiative. This pathway and its implementation tools support best practice and address key objectives of asthma management that can improve 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 several tools including:

- Instruction on assessing severity using the Peadiatric Respiratory Assessment Measure (PRAM) score
- Medication guidelines
- Pre-printed physician orders for the 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, and other relevant literature and pathways.

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

- Prednisone/prednisolone 2 mg/kg loading dose day 1, followed by 1 mg/kg/day for a minimum of 3 days. Maximum dose 50 mg.
- The equivalent Dexamethasone dose is 0.6 mg/kg daily for 2 days. Maximum dose 12 mg.

The Peadiatric Asthma Clinical Pathway is on the next page. See Appendix A for the complete P-EDACP or by visiting the Lung Health Foundation website at: **https://hcp.lunghealth.ca/clinical-programs/**

PEDIATRIC ASTHMA CLINICAL PATHWAY

Indications to start Pediatric Asthma Clinical Pathway : Age 1-17 years with wheeze and/or cough **AND** asthma diagnosis and/or past history of wheeze.

Physician assessment required prior to starting on clinical pathway if: Any active chronic condition other than asthma **OR** Prior serious adverse reaction to salbutamol, ipratropium bromide, or oral corticosteroids **OR** Active chickenpox or suspected incubation of chickenpox **OR** Heart rate greater than or equal to 200 beats/min.

*PRAM 0 - 3 (Mild)

§FEV$_1$ greater than 70% of predicted or personal best, if known

- **MD** to assess within 60 min
- Salbutamol now and q 60 min prn (via MDI + spacer)
- Vital Signs + PRAM q 60 min

Reassess Vital Signs + PRAM q 60 min

If PRAM greater than or equal to **4** or §FEV$_1$ 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 §FEV$_1$ greater than or equal to 70% of predicted:
- MD to consider discharge
- Provide asthma teaching
- Provide discharge instructions

*PRAM 4 - 7 (Moderate)

§FEV$_1$ 50-70% of predicted or personal best, if known

- **MD** to assess within 30 min
- Administer oxygen to keep SpO_2 greater than or equal to 92%
- Salbutamol + ipatropium bromide NOW and q 20 min for a total of 3 doses (via MDI + spacer or nebulizer), then salbutamol q30 - 60 min PRN
- **Give oral corticosteroid AS SOON AS POSSIBLE** after 1st salbutamol/ipratropium dose (within 60 min of triage)
- Vital Signs + PRAM q 30 - 60 min

Reassess Vital Signs + PRAM q 30-60 min

If at any time PRAM is greater than or equal to 8 or §FEV$_1$ 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 6-8 hours post corticosteroid, PRAM is greater than or equal to 4 or §FEV$_1$ is less than 70% of predicted:
- MD to reassess and consider admission

If PRAM less than or equal to 3 or §FEV$_1$ greater than or equal to 70% of predicted:
- MD to consider discharge, provide asthma teaching, and discharge instructions

*PRAM 8 - 12 (Severe)

§FEV$_1$ less than 50% of predicted or personal best, if known

- **MD** to assess within 15 min
- Administer oxygen to keep SpO_2 greater than or equal to 92%
- Salbutamol + ipatropium bromide NOW and q 20 min for a total of 3 doses (via MDI and spacer or nebulizer), then salbutamol q 20 - 60 min PRN
- **Give oral corticosteroid AS SOON AS POSSIBLE** after 1st salbutamol/ipatropium dose (within 20 min of triage)
- Vital Signs + PRAM q 20 - 60 min
- Consider IV access and blood gases

COMPLETE ALL OF THE ABOVE WITHIN 60 MINUTES OF TRIAGE

Reassess Vital Signs + PRAM q 20-60 min

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 **'Impending Respiratory Failure' pathway**

If 4 hours post corticosteroid, PRAM is greater than or equal to 4 or §FEV$_1$ is less than 70% of predicted:
- MD to reassess and consider admission

If PRAM is improving, move to 'Moderate' pathway

Impending Respiratory Failure

Lethargy, cyanosis, decreasing respiratory effort and/or rising pCO_2

- **MD** to assess STAT and remain in attendance with patient until stabilized
- Administer 100% oxygen
- Support ventilation if required (bag and mask); do not over-ventilate as this will increase air trapping
- Continuous cardiopulmonary monitoring
- Continuous nebulized salbutamol with ipratropium bromide
- After first hour, continuous nebulized salbutamol
- **Systemic corticosteroid AS SOON AS POSSIBLE** after 1st salbutamol/ipatropium 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 and transport

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

* See below for PRAM scoring. §FEV$_1$ (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 healthcare personnel trained in spirometry. NOTE: FEV$_1$ 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 their best judgement to decide which parameter to use to manage the child. Do not delay treatment to obtain FEV$_1$ and/or peak flow.

MEDICATION GUIDELINES

BRONCHODILATORS

Inhaled medication delivery by MDI and age appropriate valved spacer is preferred unless continuous oxygen is required because of increased efficiency and decreased side effects: tachycardia, tremor and decreased risk of transmission of respiratory infections.

<u>Metered Dose Inhaler (MDI)</u>† via age appropriate spacer, allow 30 sec between puffs

salbutamol (100 mcg/puff)
less than 20 kg: 5 puffs/dose
greater than or equal to 20kg: 10 puffs/dose

ipratropium bromide (20 mcg/puff)
3 puffs/dose, alternate each puff with salbutamol

<u>Wet Nebulization</u>† driven by oxygen flow of 6-8 L/min via well-fitting mask

salbutamol (5mg/mL solution or unit dose nebule)
less than 20 kg: dose = 2.5 mg; use 2.5 mg nebule OR
0.5 mL of 5mg/mL solution in 3 – 4 mL NaCL 0.9%
greater than or equal to 20 kg: dose = 5 mg; use 2 x 2.5 mg nebule OR
5 mg nebule OR
1 mL of 5 mg/mL solution in 3 – 4 mL NaCL 0.9%

ipratropium bromide
all patients: 250 mcg, mixed with salbutamol

CORTICOSTEROIDS

<u>Oral route</u>

dexamethasone 0.6 mg/kg/dose x 1 (max 12 mg/dose)
prednisone/prednisolone 2 mg/kg/dose x 1 (max 50 mg/dose)

<u>Parenteral route</u>

hydrocortisone sodium succinate
8mg/kg/dose IV or IM (max 400 mg/dose) x1, then 5mg/kg/dose (max 400 mg/dose) q6h

MAGNESIUM SULFATE

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

†Small volume nebulizer is an acceptable alternate.

PRAM SCORING TABLE

Criterions	Description	Score
O_2 saturation	≥ 95%	0
	92-94%	1
	< 92%	2
Suprasternal retraction	Absent	0
	Present	2
Scalene muscle contraction	Absent	0
	Present	2
Air entry *	Normal	0
	↓ at the base	1
	↓ at the apex and the base	2
	Minimal or absent	3
Wheezing §	Absent	0
	Expiratory only	1
	Inspiratory (± expiratory)	2
	Audible without stethoscope or silent chest (minimal or no air entry)	3
	PRAM score : (max. 12)	

Score	0-3	4-7	8-12
Severity	Mild	Moderate	Severe

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* *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, irrespectively of their location (RUL, RML, RLL, LUL, LLL), will determine the rating of the criterion.*

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In-patient Episode of Care Recommendations

The Expert Panel makes the following recommendations regarding the use of oxygen saturation monitoring, systemic and inhaled steroids, and discharge follow-up for the in-patient episode of care:

#	Recommendation	Supporting Evidence	Evidence Type	Evidence Grade[4]
1.0 Oxygen Saturation				
1.1	If respiratory status is stable (tolerating Q4h Bronchodilator), patient is appropriate for discharge.	Expert Panel Consensus	N/A	N/A
1.2	Once off O_2 there is no evidence for continuous O_2 saturation monitoring; spot checks for oxygen saturation (with respiratory assessment) may be appropriate.	Expert Panel Consensus	N/A	N/A
2.0 Systemic Steroids				
2.1	To continue systemic steroids upon admission. Suggested therapies could include: **Prednisone/prednisolone:** (after 2 mg/kg dose in ER on day 1) **1 mg/kg/day (morning) for a minimum 3 days total therapy. Maximum dose: 50 mg.** **Dexamethasone: 0.6 mg/kg/day (every 24 hours) for 2 days total therapy.** Scant evidence for duration. **Maximum dose: 12 mg.** Consider use of IV steroids and other ancillary treatments for patients who are not improving, deteriorating or unable to swallow/keep down oral steroids.	Canadian Paediatric Society, 2012	Position Statement	N/A
		Canadian Paediatric Society and Canadian Thoracic Society, 2015	Position Statement	N/A
		Canadian Medical Association, 1999	Position Statement	Level 1
		National Asthma Council of Australia	Guideline	Evidence not graded
2.2	Inhaled beta agonist is recommended first line treatment	Canadian Medical Association, 1999	Position Statement	Level 1

	for acute asthma exacerbation.	British Thoracic Society, Scottish Intercollegiate Guidelines Network, 2014	Guideline	Level of Evidence 1+

[4]See Appendix B for an explanation of the evidence grading methodologies

3.0 Inhaled Corticosteroids				
3.1	If admitted on inhaled corticosteroids, continue while in hospital.	Rowe et al. Early use of inhaled corticosteroids in the emergency department treatment of acute asthma	Cochrane Systematic Review	N/A
		British Thoracic Society, Scottish Intercollegiate Guidelines Network, 2014	Guideline	Expert Opinion
		National Institutes of Health, 2007	Guideline	Evidence Category B
3.2	If not on inhaled steroids on admission begin inhaled corticosteroids prior to or on discharge.	Canadian Medical Association, 1999	Position Statement	Level 1
		Rowe et al. Early use of inhaled corticosteroids in the emergency department treatment of acute asthma	Cochrane Systematic Review	N/A
		British Thoracic Society, Scottish Intercollegiate Guidelines Network, 2014	Guideline	Recommendation Grade A
		National Asthma Council of Australia	Guideline	Evidence not graded
		Canadian Paediatric Society, 2012	Position Statement	N/A
		National Institutes of Health, 2007	Guideline	Evidence Category B
		Global Initiative for Asthma, 2006	Guideline	Evidence Category B
3.3	Low to Moderate dosing inhaled steroids as per	Canadian Thoracic Society, 2010	See dosing table for children >6 years, Figure 2	

	CTS dosing tables: preschool; 6 years and older. For steroid naïve patients – if exacerbating on inhaled steroids – step up therapy (refer to guidelines) AND asthma specialist referral confirmed, and diagnosis confirmed.	Canadian Paediatric Society and Canadian Thoracic Society, 2015	See dosing table for children 1-5 years, Figure 3	
		Thoracic Society of Australia and New Zealand	Position Statement	Strong Recommendation

Discharge Recommendations

The Expert Panel makes the following recommendations regarding referrals to an asthma specialist and spirometry, as well as providing standard discharge instructions and education, upon the patient's discharge:

#	Recommendation	Supporting Evidence	Evidence Type	Evidence Grade
1.0 Referral Recommendations				
1.1	Referral to an Asthma Specialist upon discharge.	National Institutes of Health, 2007	Guideline	Evidence Category A and B
1.2	Referral for outpatient spirometry is recommended for all children ≥ 6 yrs in order to support diagnosis and to monitor asthma control.	Canadian Paediatric Society, 2012	Position Statement	N/A
		British Thoracic Society, Scottish Intercollegiate Guidelines Network, 2014	Guideline	Level of Evidence 2++
		Global Initiative for Asthma, 2006	Guideline	N/A
		Canadian Thoracic Society, 2012	Guideline	1A
		Canadian Medical Association, 1999	Position Statement	Level 3 and 4

		National Institutes of Health, 2007	Guideline	Evidence Category B and C
2.0 Discharge Instructions and Education				
2.1	All ED and in-patient discharges receive a written Asthma Action Plan/Discharge Instructions by the discharging physician as well as a referral to Asthma Education (one is available in the P-EDACP, Appendix A).	Expert Panel Consensus	Evidence-based clinical pathway[5]	N/A

[5] 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 2: Inhaled corticosteroid dosing table for children >6 years (Lougheed et al., 2010)

Inhaled corticosteroid (ICS) dosing categories in children and adults

		Daily ICS dose, mcg					
		Children (6 to 11 years of age)			Adults (12 years of age and over)		
Corticosteroid	Trade name	Low	Medium	High	Low	Medium	High
Beclomethasone dipropionate HFA	QVAR†	≤200	201–400	>400	≤250	251–500	>500
Budesonide*	Pulmicort Turbuhaler‡	≤400	401–800	>800	≤400	401–800	>800
Ciclesonide*	Alvesco§	≤200	201–400	>400	≤200	201–400	>400
Fluticasone	Flovent MDI and spacer; Flovent Diskus¶	≤200	201–500	>500	≤250	251–500	>500

*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; †Graceway Pharmaceuticals Canada; ‡AstraZeneca Inc, Canada; §Nycomed Canada Inc, Canada; ¶GlaxoSmithKline Inc, Canada. HFA Hydrofluoroalkane; mcg micrograms; MDI Metered dose inhaler.*

Figure 3: 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

	Daily ICS dose, micrograms (mcg)†	
Corticosteroid (trade name)	**Low**	**Medium**
Beclomethasone (QVAR®)	100	200
Ciclesonide‡ (Alvesco®)	100	200
Fluticasone (Flovent®)	100-125§	200-250

**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 µg once daily is sometimes used to improve adherence over twice-daily use of 50 µg*

3.3 Clinical Documentation

Implementing these clinical practices will require the following clinical documentation changes:

- documenting the asthma severity score (PRAM score);
- completing the Asthma Action Plan, including documentation of discharge medication (prescription) and appropriate referrals; and
- completion of the Patient Education Checklist

Sample documentation tools to support these changes are in the P-EDACP.
Accurate documentation of asthma diagnosis and treatment times is 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 the paediatric population;
- reduce repeat ED visits and hospital admissions, and potentially decrease ED Length of Stay (LOS);
- improve asthma self-management and symptom control; and
- increase capacity for care closer to home in community settings.

4.0 Implementation of Best Practices

Below are 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 when the majority of paediatric patients with acute asthmatic exacerbations are seen and treated. The Lung Health Foundation's excellent resources support use of the pathway and asthma care in general.

Care Closer to Home: Good care can be delivered to the majority of acute asthmatics in any ED setting. The setting does not require specialized treatment facilities or personnel beyond those currently available in accredited hospitals. The P-EDACP was 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 help care providers identify patients who may require referral or transfer to a specialized paediatric centre and/or critical care service.

Diagnostic Confusion: Because there are no objective diagnostic tests for young children (< 6 years of age), asthma remains a clinical diagnosis in this age group. This results in diagnostic uncertainty and confusion in the care of very young children. In addition, there can be overlap with other conditions such as bronchiolitis (typically in < 1 year of age) and another known as viral wheeze (< 6 years of age). A formal diagnosis of asthma is not required for use of the P-EDACP but specific inclusion and exclusion criteria are available. Clinicians treating a patient with known or suspected asthma should therefore follow the P-EDACP recommendations.

Practice Variation: In addition to diagnostic uncertainty, variations in practice exist across the province. These variations occur in the ED and in-patient 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 outpatient and community settings.

Potential Implementation Barriers: Community Resources: As noted above, variable access to asthma educators, spirometry and follow-up care in communities are 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 can be related to lengthy hospital committee approval processes. Given the P-EDACP is one of several pathway initiatives for implementation, hospitals will need to streamline 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.).

4.1 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:

- Identification of a site lead/champion who will be responsible for adapting the documents to meet hospital formatting requirements, leading the pathway and recommendations through the necessary hospital approval committees, discussing the recommendations and implications with front-line health professionals (i.e., nurses, physicians, respiratory therapists, pharmacists) and organizing education sessions and other resources to support its use.
- Ensuring a designated physician lead (ED chief or influential ED physician or paediatrician) is involved; 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, which should involve:
    - a detailed review of the P-EDACP, in-patient and discharge recommendations;
    - identification of gaps comparing current institutional and individual practices;
    - development of operational strategy to ensure optimal environment for care based on local circumstances, unique clinical team compositions and available staffing capacities;
    - discussion of feasible changes for that institution and timelines for completion;
    - progress reports/accountability to hospital administration;
    - an audit and feedback of pathway use;
    - engagement with peers/sharing implementation experiences and insights.

4.2 The Roles of Clinicians and Multidisciplinary Teams in Implementing the Best Practices

Individual clinicians' and team members' roles will not change significantly, nor will caregivers be tasked with new responsibilities. Physicians can always individualize care for a given patient, using their clinical judgment. The greatest change comes with the use of the associated medical directive in the P-EDACP. It will allow nurses, RTs and pharmacists to administer treatments in a timely manner, without having to wait for a physician assessment and orders. Use of preprinted order sets also reduces errors and provides the team with a consistent, standardized treatment plan.

5.0 Implications for Multidisciplinary Teams and Current Clinical Practice

5.1 Implication for Multidisciplinary Teams

Successful implementation of the best practices requires collaboration among hospital-based physician teams, asthma specialists and educators, respiratory therapists, nursing staff and pharmacists, in close collaboration with hospital administrative leads. Note that the P-EDACP includes a medical directive that requires pre-authorization by physicians.

5.2 Alignment with Clinical Practice

While the best practices will not require new skills or management techniques, they will help reduce variations in clinical practice and improve adherence to clinical guidelines across the province. In addition, best practice implementation will:

- ensure the ED episode of care aligns with the Lung Health Foundation P-EDACP. Specifically, it will provide the most effective care in a time-efficient manner.
- entail a standardized evidence-informed approach to the use of oxygen saturation monitoring, systemic and inhaled steroids for in-patient episode of care.
- 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 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 focusing on the downstream outcomes of care (i.e., re-admissions) 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 in-patient 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 that efforts be made to begin their collection. It is thought that the addition of these indicators to hospital charting and submission to the National Ambulatory Care Reporting System (NACRS) or Discharge Abstract Database (DAD) registries would be of sizeable benefit to the system and not onerous.

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 (Appendix C).

Your feedback is important to us!

Please complete an online survey by scanning the QR code → or by clicking HERE.

Acknowledgments

The Provincial Council for Maternal and Child Health (PCMCH) thanks the PCMCH Paediatric Asthma Expert Panel, Lung Health Foundation and other stakeholders for their support in the development of the *Clinical Handbook for Paediatric Asthma*. PCMCH acknowledges the contributions of Anna Bucciarelli, Doreen Day, Ted Everson and Doug Jowett to the original *Paediatric Asthma Clinical Handbook* published in 2017. Additionally, PCMCH appreciates the review and feedback from the Quality Standards Team at Ontario Health and the Ministry of Health's Provincial Programs Branch.

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Appendices

Appendix A: Lung Health Foundation P-EDACP

lung health starts now

lung health foundation

Pediatric Emergency Department Asthma Clinical Pathway

Information Package January 2021

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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."[1,2] One of the APA initiatives is the Emergency Department Asthma Care Pathway (EDACP), a standardized approach to the urgent treatment of asthma. The Lung Health Foundation, formerly 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 a comprehensive clinical 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 Emergency Department Asthma Care Pathway (A-EDACP) for ages 16 years and older was developed first, with initial dissemination in late 2008. Incorporating new evidence and feedback from clinical users, an updated A-EDACP was released in March 2013. A study in 2017 showed that although ED practice patterns varied across the province, the findings of the study supported an overall positive effect of pathway implementation on reducing return ED visits.[4] A pilot study[5] 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.

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.

[1] Young JG. Verdict explanation. In: Chief Coroner, Province of Ontario. Inquest touching the death of Joshua Fleuelling. Jury verdict and recommendations. Sept–Nov, 2000 (Toronto).

[2] Ontario Asthma Plan of Action **https://www.health.gov.on.ca/en/pro/programs/cdpm/asthma.aspx**

[3] Allen D, Gillen E, Rixson L. Systematic review of the effectiveness of integrated care pathways: what works, for whom, in which circumstances? Int J Evid Based Healthc. 2009 Jun; 7(2):61-74. DOI: 10.1111/j.1744-1609.2009.00127.x.

[4] Kwok C, Lajkosz K, Madeley C, et al. Effects of a standardized emergency department asthma care pathway on health services utilization. European Respiratory Journal 2018 52: Suppl. 62, OA5155

[5] Lougheed MD, Olajos-Clow J, Szpiro K, et al. Ontario Respiratory Outcomes Research Network. Multicentre evaluation of an emergency department asthma care pathway for adults. CJEM 2009 11(3):215-29.

Funded by the Government of Ontario within the Asthma and COPD Program, the EDACP is available at no cost to Ontario healthcare professionals and facilities for non-commercial use. The pathway tools can be accessed electronically through the Lung Health Foundation website: https://hcp.lunghealth.ca/clinical-programs/ Hospitals are permitted to adapt the formatting of EDACP tools to suit their site's requirements for order sets, including adding logos.

P-EDACP Description

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 Pediatric Respiratory Assessment Measure (PRAM) score, a validated measure based on 5 clinical signs: suprasternal retraction, scalene muscle contraction, 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.[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 provider **order sets** for each of the four severity levels, a **patient education checklist**, and **discharge instructions** with integrated prescription. To address treatment delays, an optional **medical directive** was developed to authorize administration of bronchodilators and systemic corticosteroids prior to physician assessment.

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 colored zones of control depicted in many asthma action plans.

[6] Ducharme, F., Chalut, D., Plotnick L. et al. (2008). The Pediatric Respiratory Assessment Measure: A Valid Clinical Score for Assessing Acute Asthma Severity from Toddlers to Teenagers. The Journal of Pediatrics, 152 (4), 476-480.e1.

PEDIATRIC ASTHMA CLINICAL PATHWAY

Indications to start Pediatric Asthma Clinical Pathway : Age 1-17 years with wheeze and/or cough **AND** asthma diagnosis and/or past history of wheeze.

Physician assessment required prior to starting on clinical pathway if: Any active chronic condition other than asthma **OR** Prior serious adverse reaction to salbutamol, ipratropium bromide, or oral corticosteroids **OR** Active chickenpox or suspected incubation of chickenpox **OR** Heart rate greater than or equal to 200 beats/min.

*PRAM 0 - 3 (Mild)

§FEV_1 greater than 70% of predicted or personal best, if known

- **MD** to assess within 60 min
- Salbutamol now and q 60 min prn (via MDI + spacer)
- Vital Signs + PRAM q 60 min

*PRAM 4 - 7 (Moderate)

§FEV_1 50-70% of predicted or personal best, if known

- **MD** to assess within 30 min
- Administer oxygen to keep $Sp0_2$ greater than or equal to 92%
- Salbutamol + ipatropium bromide NOW and q 20 min for a total of 3 doses (via MDI + spacer or nebulizer), then salbutamol q30 - 60 min PRN
- **Give oral corticosterioid AS SOON AS POSSIBLE** after 1st salbutamol/ipratropium dose (within 60 min of triage)
- Vital Signs + PRAM q 30 - 60 min

*PRAM 8 - 12 (Severe)

§FEV_1 less than 50% of predicted or personal best, if known

- **MD** to assess within 15 min
- Administer oxygen to keep $Sp0_2$ greater than or equal to 92%
- Salbutamol + ipatropium bromide NOW and q 20 min for a total of 3 doses (via MDI and spacer or nebulizer), then salbutamol q 20 - 60 min PRN
- **Give oral corticosterioid AS SOON AS POSSIBLE** after 1st salbutamol/ipatropium dose (within 20 min of triage)
- Vital Signs + PRAM q 20 - 60 min
- Consider IV access and blood gases

Impending Respiratory Failure

Lethargy, cyanosis, decreasing respiratory effort and/or rising pCO_2

- **MD** to assess STAT and remain in attendance with patient until stabilized
- Administer 100% oxygen
- Support ventilation if required (bag and mask); do not over-ventilate as this will increase air trapping
- Continuous cardiopulmonary monitoring
- Continuous nebulized salbutamol with ipratropium bromide
- After first hour, continuous nebulized salbutamol
- **Systemic corticosterioid AS SOON AS POSSIBLE** after 1st salbutamol/ipatropium 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 and transport

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

COMPLETE ALL OF THE ABOVE WITHIN 60 MINUTES OF TRIAGE

Reassess Vital Signs + PRAM q 60 min

If PRAM greater than or equal to 4 or §FEV_1 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 §FEV_1 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 8 or §FEV_1 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 6-8 hours post corticosteroid, PRAM is greater than or equal to 4 or §FEV_1 is less than 70% of predicted:
- MD to reassess and consider admission

If PRAM less than or equal to 3 or §FEV_1 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 of impending respiratory failure at any time:
- MD to reassess STAT and move to top of **'Impending Respiratory Failure' pathway**

If 4 hours post corticosteroid, PRAM is greater than or equal to 4 or §FEV_1 is less than 70% of predicted:
- MD to reassess and consider admission

If PRAM is improving, move to 'Moderate' pathway

* See below for PRAM scoring. §FEV_1 (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 healthcare personnel trained in spirometry. NOTE: FEV_1 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 their best judgement to decide which parameter to use to manage the child. Do not delay treatment to obtain FEV_1 and/or peak flow.

MEDICATION GUIDELINES

BRONCHODILATORS

Inhaled medication delivery by MDI and age appropriate valved spacer is preferred unless continuous oxygen is required because of increased efficiency and decreased side effects: tachycardia, tremor and decreased risk of transmission of respiratory infections.

<u>Metered Dose Inhaler (MDI)</u>† via age appropriate spacer, allow 30 sec between puffs

salbutamol (100 mcg/puff)
less than 20 kg: 5 puffs/dose
greater than or equal to 20 kg: 10 puffs/dose

ipratropium bromide (20 mcg/puff)
3 puffs/dose, alternate each puff with salbutamol

<u>Wet Nebulization</u>† driven by oxygen flow of 6-8 L/min via well-fitting mask

salbutamol (5mg/mL solution or unit dose nebule)

less than 20 kg: dose = 2.5 mg; use 2.5 mg nebule OR
0.5 mL of 5mg/mL solution in 3 – 4 mL NaCL 0.9%
greater than or equal to 20 kg: dose = 5 mg; use 2 x 2.5 mg nebule OR
5 mg nebule OR
1 mL of 5 mg/mL solution in 3 – 4 mL NaCL 0.9%

ipratropium bromide
all patients: 250 mcg, mixed with salbutamol

CORTICOSTEROIDS

<u>Oral route</u>

dexamethasone 0.6 mg/kg/dose x 1 (max 12 mg/dose)
prednisone/prednisolone 2 mg/kg/dose x 1 (max 50 mg/dose)

<u>Parenteral route</u>

hydrocortisone sodium succinate
8 mg/kg/dose IV or IM (max 400 mg/dose) x1, then 5 mg/kg/dose (max 400 mg/dose) q6h

MAGNESIUM SULFATE

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

†Small volume nebulizer is an acceptable alternate.

PRAM SCORING TABLE

Criterions	Description	Score
O_2 saturation	≥ 95%	0
	92-94%	1
	< 92%	2
Suprasternal retraction	Absent	0
	Present	2
Scalene muscle contraction	Absent	0
	Present	2
Air entry *	Normal	0
	↓ at the base	1
	↓ at the apex and the base	2
	Minimal or absent	3
Wheezing §	Absent	0
	Expiratory only	1
	Inspiratory (± expiratory)	2
	Audible without stethoscope or silent chest (minimal or no air entry)	3
	PRAM score : (max. 12)	

Score	0-3	4-7	8-12
Severity	Mild	Moderate	Severe

** 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, irrespectively of their location (RUL, RML, RLL, LUL, LLL), will determine the rating of the criterion.

Funded by the Government of Ontario

EMERGENCY DEPARTMENT ASTHMA CLINICAL PATHWAY PEDIATRIC: 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 Pediatric 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 Pediatric Respiratory Assessment Measure (PRAM) [1,2], 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, the Canadian Thoracic Society 2012 guideline update: Diagnosis and management of asthma in preschoolers, children and adults, the Canadian Thoracic Society and Canadian Paediatric Society 2015 position paper: Diagnosis and management of asthma in preschoolers, 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 Pediatric Emergency Department Asthma Clinical Pathway Medical Directive **OR Physician/NP** to choose order set according to initial PRAM.
4. I**F 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 order set for more information.
6. **Physician/Nurse Practitioner** to complete Patient Discharge Prescription.
7. **Physician/NP/RN/RT/Pharmacist** to review "Education Checklist" and "Discharge Instructions" with patient.

Pediatric Respiratory Assessment Measure (PRAM)

Signs/Scoring	0	1	2	3	Patient's Score
O_2 saturation (in room air)	≥ 95%	92-94%	< 92%		(max 2)
Suprasternal retraction	Absent		Present		(max 2)
Scalene muscle contraction	Absent		Present		(max 2)
Air entry*	Normal	**decreased** at the base	**decreased** at the apex and base	Minimal or absent	(max 3)
Wheezing§	Absent	Expiratory only	Inspiratory (± expiratory)	Audible without stethoscope or silent chest (minimal or no air entry)	(max 3)
*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 TOTAL SCORE:**	**(MAX 12)**

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

1 Chalut, D. S., Ducharme, F.M., &; Davis, G. M. (2000). The Preschool Respiratory Assessment Measure (PRAM): A responsive index of acute asthma severity. The Journal of Pediatrics, 137 (6), 762- 768. 2

2 Ducharme, F., Chalut, D., Plotnick, L. et al. (2008). The Pediatric Respiratory Assessment Measure: A Valid Clinical Score for Assessing Acute Asthma Severity from Toddlers to Teenagers. The Journal of Pediatrics, 152 (4), 476-480.e1.

Hospital Logo

EMERGENCY DEPARTMENT ASTHMA CLINICAL PATHWAY PEDIATRIC: 1 to 17 years ORDER SET

Patient Identification

Drug Allergies: _____ ***Ht:*** _____ ***cm Wt:*** _____ ***kg***

MILD ASTHMA

(PRAM Score 0 to 3 or *FEV_1 greater than 70% of predicted or personal best, if known)

Refer to Medication Guidelines on Reverse

Transcription + Nursing Notes

☑ physician to assess within 60 min
☑ HR, RR, SpO_2, PRAM q 60 min

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

β2-*agonist*:

☐ salbutamol metered dose inhaler (MDI) with spacer (*preferred*): _____ puffs NOW and q 60 min PRN, (wait 30 sec and shake MDI between puffs)

OR ☐ salbutamol nebule: _____ mg NOW and q 60 min PRN

OR ☐ salbutamol solution (5 mg/mL): _____ mg in 3 mL NaCl 0.9% NOW and q 60 min PRN

Additional Orders: _____

_____

_____

_____

_____	_____	_____	_____
MD Name	Signature	Date	Time

AFTER FIRST HOUR OF TREATMENT

β2-agonist:

☐ salbutamol MDI with spacer (*preferred*): _____ puffs q 60 min PRN (wait 30 sec and shake MDI between puffs)

OR ☐ salbutamol nebule: _____ mg q 60 min PRN

OR ☐ salbutamol solution (5 mg/mL): _____ mg in 3 mL NaCl 0.9% q 60 min PRN

Additional Orders: _____

_____

_____

_____

AT DISCHARGE OR ADMISSION, complete a consultation referral form for: _____

☐ Respiratory Therapist ☐ Asthma Educator ☐ Specialist/Service _____

_____	_____	_____	_____
MD Name	Signature	Date	Time
_____	_____	_____	_____
Nurse Name	Signature	Date	Time

MEDICATION GUIDELINES: MILD ASTHMA

(PRAM Score 0-3 or *FEV_1 greater than 70% of 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
(wait 30 seconds and shake MDI between puffs)

Dose: Less than 20 kg: 5 puffs/dose
Greater than or equal to 20 kg: 10 puffs/dose

Alternative: salbutamol nebule or 5 mg/mL solution (add NaCl 0.9% for total volume 3-4 mL)

Dose: Less than 20 kg: dose = 2.5 mg; use 2.5 mg nebule OR 0.5 mL of 5mg/mL solution in 3 – 4 mL NaCL 0.9%
Greater than or equal to 20 kg: dose = 5 mg; use 2 x 2.5 mg nebule OR 5 mg nebule OR
1 mL of 5 mg/mL solution in 3 – 4 mL NaCL 0.9%

(MDI preferred over nebulizer because of increased efficiency, decreased side effects: tachycardia, tremor and decreased risk of transmission of respiratory infections)

Reassess Vital Signs and PRAM every 60 minutes

If PRAM is greater than or equal to 4 or *FEV_1 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 *FEV_1 is greater than or equal to 70% of predicted or personal best, if known:

- MD to consider discharge
- Provide asthma teaching
- Provide discharge instructions

*FEV_1 (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 healthcare personnel trained in spirometry. NOTE: FEV_1 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 FEV_1 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. January 2021

Hospital Logo

EMERGENCY DEPARTMENT ASTHMA CLINICAL PATHWAY PEDIATRIC: 1 to 17 years ORDER SET

Patient Identification

Drug Allergies: _____ ***Ht:*** _____ ***cm Wt:*** _____ ***kg***

MODERATE ASTHMA

(PRAM Score 4 to 7 or *FEV_1 50-70% of predicted or personal best, if known)

Refer to Medication Guidelines on Reverse

Transcription + Nursing Notes

☑ physician to assess within 30 min
☑ HR, RR, SpO_2, PRAM every 30 min x 1 hr, then q 30-60 min until PRAM less than 4
☑ administer oxygen to keep SpO_2 greater than or equal to (≥) 92%

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

β2-*agonist and anticholinergic*:

☐ salbutamol metered dose inhaler (MDI) with spacer (*preferred*): _____ puffs AND ipratropium bromide MDI: 3 puffs q 20 min x 3 doses; (*alternate medications, after last ipratropium bromide puff, wait 30 sec and shake MDI between salbutamol puffs*)

OR ☐ 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

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

☐ dexamethasone: _____ mg (0.6 mg/kg/dose; max 12 mg) PO x 1 dose
OR ☐ predniSONE: _____ mg (2 mg/kg/dose; max 50 mg) PO x 1 dose
OR ☐ prednisoLONE: _____ mg (2 mg/kg/dose; max 50 mg) PO x 1 dose

AFTER FIRST HOUR OF TREATMENT

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

☐ salbutamol MDI with spacer (preferred): _____ puffs q _____ min and q _____ min PRN (wait 30 sec and shake MDI between puffs)

OR ☐ salbutamol nebule: _____ mg q _____ min and q _____ min PRN

DISCHARGE ORDERS (use Asthma Action Plan with prescription)

AT DISCHARGE OR ADMISSION, complete a consultation referral form for:

☐ Respiratory Therapist ☐ Asthma Educator ☐ Specialist/Service _____

Additional Orders: _____

MD Name	Signature	Date	Time
Nurse Name	Signature	Date	Time

MEDICATION GUIDELINES: MODERATE ASTHMA

(PRAM Score 4-7 or *FEV_1 50% to 70% of predicted or personal best, if known)

β2-agonist (salbutamol) q 20 min x 3 doses, then q 30-60 min PRN
Preferred: salbutamol metered dose inhaler (100 mcg/puff + age-appropriate spacer (wait 30 sec and shake between puffs)

Dose: Less than 20 kg: 5 puffs/dose
Greater than or equal to 20 kg: 10 puffs/dose

Alternative: salbutamol nebule or 5 mg/mL solution (add NaCl 0.9% for total volume 3-4 mL)

Dose: Less than 20 kg: dose = 2.5 mg; use 2.5 mg nebule OR 0.5 mL of 5mg/mL solution in 3 – 4 mL NaCL 0.9%
Greater than or equal to 20 kg: dose = 5 mg; use 2 x 2.5 mg nebule OR 5 mg nebule OR
1 mL of 5 mg/mL solution in 3 – 4 mL NaCL 0.9%

(MDI preferred over nebulizer because of increased efficiency, decreased side effects: tachycardia, tremor and decreased risk of transmission of respiratory infections)

AND

Anticholinergic (ipratropium bromide):
Preferred: ipratropium bromide MDI (20 mcg/puff) + age-appropriate spacer: 3 puffs/dose q 20 min x 3 doses

Alternative: ipratropium bromide nebule or solution (125 mcg/mL or 250 mcg/mL):
250 mcg q 20 min x 3 doses; mix with salbutamol; add NaCl 0.9% for a total volume of 3-4 mL

PLUS

Oral Corticosteroid AS SOON AS POSSIBLE, within 60 (SIXTY) minutes of triage:
dexamethasone: (0.6 mg/kg/dose; max 12 mg) PO x 1 dose
OR predniSONE: (2 mg/kg/dose; max 50 mg) PO x 1 dose
OR prednisoLONE: (2 mg/kg/dose; max 50 mg) PO x 1 dose

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** *FEV_1 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 *FEV_1 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 *FEV_1 is greater than or equal to 70% of predicted or personal best, if known:
- MD to consider discharge
- provide asthma teaching
- provide discharge instructions

*FEV_1 (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 healthcare personnel trained in spirometry. NOTE: FEV_1 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 FEV_1 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. January 2021

Hospital Logo

EMERGENCY DEPARTMENT ASTHMA CLINICAL PATHWAY PEDIATRIC: 1 to 17 years ORDER SET

Patient Identification

Drug Allergies: _____ ***Ht:*** _____ ***cm*** ***Wt:*** _____ ***kg***

SEVERE ASTHMA

(PRAM Score 8 to 12 or *FEV_1 less than 50% of predicted or personal best, if known)

Refer to Medication Guidelines on Reverse

Transcription + Nursing Notes

☑ physician to assess urgently
☑ administer oxygen to keep S_pO_2 greater than or equal to (≥) 92%
☑ HR, RR, S_pO_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 ☐ capillary OR ☐ venous
☐ IV access: ☐ saline lock OR ☐ _____

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

β2-*agonist and anticholinergic*:

☐ salbutamol metered dose inhaler (MDI) with spacer: ____ puffs AND ipratropium bromide MDI with spacer (*preferred*): 3 puffs q 20 min x 3 doses; (alternate medications, after last ipratropium bromide puff, wait 30 sec and shake MDI between salbutamol puffs)

OR ☐ 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) min of triage:

☐ dexamethasone: ____ mg (0.6 mg/kg/dose; max 12 mg) PO x 1 dose
OR ☐ predniSONE: ____ mg (2 mg/kg/dose; max 50 mg) PO x 1 dose
OR ☐ prednisoLONE: ____ mg (2 mg/kg/dose; max 50 mg) PO x 1 dose
OR ☐ Hydrocortisone sodium succinate IV/IM: ____ mg (8 mg/kg/dose; max 400 mg/dose) x 1 dose NOW **then**
☐ Hydrocortisone sodium succinate IV/IM: ____ mg (5 mg/kg/dose; max 400 mg/dose) q6h

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

☐ magnesium sulfate IV: _____ mg (50 mg/kg/dose; max 2 g/dose x 1 dose NOW; give over 20-30 min

Note: may cause severe hypotension - check BP q 5 min during infusion and for 30 minutes after dose end

If allergic reaction suspected, consider IM epinephrine

☐ epinephrine: _____ mg (0.01 mg/kg/dose IM, MAX 0.5 mg. Use 1 mg/ml formulation.)

AFTER FIRST HOUR OF TREATMENT

β2-agonist:

☐ salbutamol MDI with spacer (preferred): _____ puffs q _____ min and q _____ min PRN (wait 30 sec and shake MDI between puffs)
OR ☐ salbutamol nebule: _____ mg q _____ min and q _____ min PRN
OR ☐ salbutamol solution (5 mg/mL): _____ mg in 3 – 4 mL NaCl 0.9% q _____ min and q _____ min PRN

AT DISCHARGE OR ADMISSION, complete a consultation referral form for:

☐ Respiratory Therapist ☐ Asthma Educator ☐ Specialist/Service _____

MD Name	Signature	Date	Time
Nurse Name	Signature	Date	Time

MEDICATION GUIDELINES: SEVERE ASTHMA

(PRAM Score 8 to 12 or *FEV_1 less than 50% of predicted or personal best, if known)

β2-agonist (salbutamol) q 20 min x 3 doses, then q 20-60 min PRN
Preferred: salbutamol metered dose inhaler (MDI) 100 mcg/puff + age-appropriate spacer (wait 30 sec and shake MDI between puffs)

Dose: Less than 20 kg: 5 puffs/dose
Greater than or equal to 20 kg: 10 puffs/dose

Alternative: continuous nebulization with oxygen: salbutamol nebule or 5 mg/mL solution (add NaCl 0.9% for total volume 3-4 mL)

Dose: Less than 20 kg: dose = 2.5 mg; use 2.5 mg nebule OR 0.5 mL of 5mg/mL solution in 3 – 4 mL NaCL 0.9%
Greater than or equal to 20 kg: dose = 5 mg; use 2 x 2.5 mg nebule OR 5 mg nebule OR 1 mL of 5 mg/mL solution in 3 – 4 mL NaCL 0.9%

(MDI preferred over nebulizer because of increased efficiency, decreased side effects: tachycardia, tremor and decreased risk of transmission of respiratory infections)

AND

Anticholinergic (ipratropium bromide) q 20 minutes x 3 doses:
Preferred: ipratropium bromide MDI (20 mcg/puff) + age-appropriate spacer: 3 puffs/dose q 20 min x 3 doses

Alternative: ipratropium bromide nebule or solution (125 mcg/mL or 250 mcg/mL):
250 mcg q 20 min x 3 doses; mix with salbutamol; add NaCl 0.9% for a total volume of 3-4 mL

PLUS

Systemic Corticosteroid AS SOON AS POSSIBLE, within 20 (TWENTY) minutes of triage
dexamethasone: (0.6 mg/kg/dose; max 12 mg) PO x 1 dose
OR predniSONE: (2 mg/kg/dose; max 50 mg) PO x 1 dose
OR prednisoLONE: (2 mg/kg/dose; max 50 mg) PO x 1 dose
If there is a concern about reliability of oral route:
hydrocortisone sodium succinate IV/IM: 8 mg/kg/dose (max 400 mg /dose) NOW;
then 5 mg/kg/dose (max 400 mg/dose) q6h

If not improving, consider:

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

If allergic reaction suspected, consider:

epinephrine: 0.01 mg/kg/dose IM, MAX 0.5 mg. Use 1 mg/mL formulation

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 "IMPENDING RESPIRATORY FAILURE" pathway

If 4 hours post corticosteroid PRAM score is greater than or equal to 4 or *FEV_1 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

*FEV_1 (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: FEV_1 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 FEV_1 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. January 2021

Hospital Logo

EMERGENCY DEPARTMENT
ASTHMA CLINICAL PATHWAY
PEDIATRIC: 1 to 17 years
ORDER SET

Patient Identification

Drug Allergies: _____ ***Ht:*** _____ ***cm*** ***Wt:*** _____ ***kg***

IMPENDING RESPIRATORY FAILURE

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

Refer to Medication Guidelines on Reverse

Transcription + Nursing Notes

- ☑ 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, SpO_2, PRAM q 15 min
- ☑ obtain IV access (if not already done): fluid _____ rate of infusion _____
- ☑ NPO
- ☐ blood gas: ☐ arterial OR ☐ capillary OR ☐ venous
- ☐ 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 5mg/mL solution): _____ mg MIXED WITH 250 mcg ipratropium bromide (125 mcg/mL or 250 mcg/mL), continuously with oxygen, add NaCl 0.9% for a total volume of 3 to 4 ml. After 1st hour, continuous nebulized salbutamol

PLUS Systemic Corticosteroid AS SOON AS POSSIBLE after first salbutamol/ipratropium dose

☐ hydrocortisone sodium succinate IV/IM: _____ mg (8 mg/kg/dose; max 400 mg/dose) x 1 dose NOW then _____ mg (5 mg/kg/dose; max 400 mg/dose) q6h

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

☐ magnesium sulfate IV: _____ mg (50 mg/kg/dose; max 2 g/dose) x 1 dose NOW: give over 20 to 30 minutes

Note: may cause severe hypotension; check BP q 5 mins during infusion and for 30 minutes after dose end

If allergic reaction suspected, consider IM epinephrine

☐ epinephrine: _____ mg (0.01 mg/kg/dose IM, MAX 0.5 mg. Use 1 mg/ml formulation.)

AT DISCHARGE OR ADMISSION, complete a consultation referral form for:

☐ Respiratory Therapist ☐ Asthma Educator ☐ Specialist/Service _____

ADDITIONAL ORDERS: _____

_____

_____	_____	_____	_____
MD Name	Signature	Date	Time
_____	_____	_____	_____
Nurse Name	Signature	Date	Time

MEDICATION GUIDELINES: IMPENDING RESPIRATORY FAILURE

Lethargy, Cyanosis, Decreasing Respiratory Effort and/or Rising PCO_2

Bronchodilators (β2-agonist and Anticholinergic):
continuous nebulization with oxygen; physician to reassess as necessary

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

Less than 20 kg: dose = 2.5 mg; use 2.5 mg nebule OR 0.5 mL of 5mg/mL solution in 3 – 4 mL NaCL 0.9%
Greater than or equal to 20 kg: dose = 5 mg; use 2 x 2.5 mg nebule OR 5 mg nebule OR
1 mL of 5 mg/mL solution in 3 – 4 mL NaCL 0.9%

AND

ipratropium bromide nebule or solution (125 mcg/mL or 250 mcg/mL):
250 mcg/dose; mix with salbutamol, add NaCL 0.9% for total volume of 3 - 4 mL

PLUS

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

Hydrocortisone sodium succinate IV/IM: 8 mg/kg/dose (max 400 mg /dose) NOW; then 5 mg/kg/dose (max 400 mg/dose) q6h

If not improving:

Magnesium sulfate:

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

Attention: may cause severe hypotension; ensure IV access, monitor BP q 5 min during infusion and for 30 minutes after dose end

If allergic reaction suspected, consider IM epinephrine

epinephrine 0.01 mg/kg/dose IM, MAX 0.5 mg. Use 1 mg per mL formulation.

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. January 2021

Hospital Logo

EMERGENCY DEPARTMENT ASTHMA CLINICAL PATHWAY PEDIATRIC: 1 to 17 years EDUCATION CHECKLIST

Patient Education Checklist **Learning Goals Reviewed with Patient** *(To be completed by Physician / Nurse / Nurse Practitioner / RT / Pharmacist)*	Initials & Comments
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 5 to 10 times (higher end for younger patients). 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®, Arnuity™, Ellipta®, Asmanex®, Flovent®, Pulmicort®, QVAR™, Symbicort®, or Zenhale®) • Treat airway inflammation and mucus; • Need to be taken **daily** even when feeling well **c. Oral Steroids** (e.g. dexamethasone , prednisone or prednisolone) • Treats severe airway inflammation and mucous • Short term therapy	
6. Arrange regular follow-up within 2 – 7 days • Family Physician, Pediatrician, Asthma Educator, Specialist	
7. Asthma Action Plan and Prescription • Given and explained • If no drug plan, refer to Social Work or Trillium Fund (available through most pharmacies)	
8. Provide asthma booklet from hospital or the Lung Health Foundation	
_____ _____ _____ Name Signature Status _____ _____ Date (YYYY/MM/DD) Time	

Emergency Department Asthma Action Plan & Prescription (Pediatric 1-17 years)

Prescriber : Complete & initial beside selected orders.
Pharmacist : Label short-acting (reliever) inhaler as "take as directed per Asthma Action Plan". Fill other medications as directed by physician

NAME : _____

DATE : _____ **WEIGHT :** _____ **kg**

Go: Maintain Therapy

DESCRIPTION

You/your child has **ALL** of the following:

- Use of reliever puffer **no more than** 3 times per week*
- Daytime symptoms (cough, wheeze or breathing problems) **no more than** 3 times per week*
- Ability to do physical activity (playing, running, or sports) without difficulty
- No nighttime asthma symptoms
- Not missing regular activities or school
- No symptoms of a cold

***1 time a week if 1 to 5 years old.**

INSTRUCTIONS

Controller medicine

- ☐ Flovent® 125 mcg/puff, 1 puff twice daily (≥ 12 months)
- ☐ Alvesco® 200 mcg/puff, 1 puff once daily (≥ 6 years)
- ☐ QVAR® 100 mcg/puff, 1 puff twice daily (≥ 5 years)
- ☐ Other: _____

(Rx: 1 inhaler, Refill 3)

Reliever medicine (blue puffer)

- ☐ Salbutamol (Ventolin® 100 mcg/puff) 2 puffs every 4 to 6 hours
- ☐ Salbutamol (Ventolin® 100 mcg/puff) before exercise 2 puffs as needed
- ☐ Other: _____

(Rx: 1 inhaler, Refill 3)

Spacer device

- ☐ 0-18 months
- ☐ 1-5 years
- ☐ Mouthpiece for 5 years and older

(Rx: 1 device, Refill 1)

Caution: Step Up Therapy

DESCRIPTION

You/your child has **ANY** of the following:

- Use your reliever puffer **more than** 3 times per week*
- Daytime symptoms (cough, wheeze or breathing problems) **more than** 3 times per week*
- Difficulty with physical activity (playing, running or sports)
- Asthma symptoms 1 or more nights per week
- Missing regular activities or school
- Symptoms of a cold

***1 time a week if 1 to 5 years old.**

INSTRUCTIONS

- ☑ Take blue reliever 2 to 4 puffs every 4 hours as needed, and:
- ☑ Continue to take your **Go: Maintain Therapy** medications
- ☑ If reliever puffer is needed consistently every 4 hours, or if there is no improvement in your symptoms in 2-3 days, contact your healthcare provider

Stop: Get Help Now

DESCRIPTION

You/your child has **ANY** of the following:

- Reliever puffer lasts **less than** 3 hours
- "Pulling in" of skin in the neck/between or below ribs
- Feeling very short of breath
- Difficulty talking
- Continuous wheeze or cough

INSTRUCTIONS

Take blue reliever 4-6 puffs every 15-20 minutes and:

Call 911 or go directly to the emergency department

Asthma can be a life-threatening illness - **DO NOT WAIT!**

Bring this asthma action plan with you to the emergency department

! Today your child was seen in the **Emergency Department** for a significant asthma exacerbation. To treat this attack :

- ☑ Continue your **controller** medicine, AND
- ☑ Take your **reliever** medicine (blue puffer) _____ puffs every 4 to 6 hours as needed

AND for all moderate or severe exacerbations, MD/NP to choose one of the following to start next day :

- ☐ Dexamethasone _____ mg (0.6mg/kg, MAX 12mg) daily for 1 day (Refill 0) **OR**
- ☐ Prednisolone **OR** Prednisone _____ mg (1 mg/kg, MAX 50mg) daily for 4 days (Refill 0)

Tablet/liquid may be dispensed as per patient preference. Tablet can be crushed and added to small amount of food.

Additional Instructions:

Schedule appointment with : ☐ Family doctor ☐ Asthma educator ☐ Specialist **WITHIN 2-7 DAYS**

Prescriber : _____ **License # :** _____ **Signature :** _____ **Date :** _____

Pediatric Asthma Action Plan

(Pediatric 1-17 years)

The goal of asthma treatment is to live a healthy, active life.
This Asthma Action Plan outlines steps for you to self-manage asthma when you start having more symptoms. Your healthcare provider might also change your usual asthma treatment according to the level of asthma control over time. Review all symptoms and this plan regularly with your healthcare provider.

Asthma Triggers

Colds are the most common trigger - wash hands often

Smoking or being in a house or a car where someone smokes

Fumes, chemicals and strong scents

Check the Air Quality Health Index before you leave home: **airhealth.ca**

Allergies may be triggering your asthma

Follow the instructions below if you are allergic to any of these :
(have allergy skin testing if you are unsure)

Pets with fur or feathers - If you have pets, wash them regularly and keep them out of bedrooms.

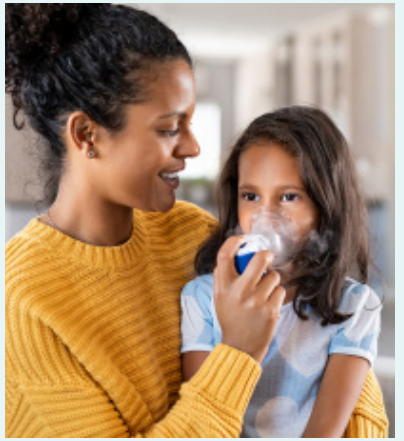
Pollen and grass - Try to stay inside on high pollen days and avoid freshly cut grass.

Dust and dust mites - Wash bedsheets in hot water and vacuum with a HEPA filter or central vacuum regularly; consider mattress and pillow covers.

Mould - Keep bathroom and basement dry, clean visible mould, avoid decomposing leaves in the fall.

Simple ways to take care of your asthma

- Avoid triggers
- Know your medication and how and when to take it
- Take controller medications regularly
- Follow your action plan
- Always have your reliever medication with you
- Use appropriate spacer (holding chamber) with metered dose inhaler



How to avoid another emergency visit

An emergency room visit is a sign that your (child's) asthma is not well controlled.

Schedule a follow-up appointment with your healthcare provider **within the next 2-7 days to review:**

- control of asthma symptoms
- regular use of asthma medications
- correct inhaler technique
- how to avoid asthma triggers

This asthma action plan was adapted from Gupta S., et al. Respiration 2012; 84(5):406-15. Pictograms in the asthma action plan were adapted from Tulloch J., et. al. Can Respir J. 2012 Jan-Feb;19(1):26-31 Instructions were designed to align with: Ducharme FM, Dell SD, Radhakrishnan D, et al. Diagnosis and management of asthma in preschoolers: A Canadian Thoracic Society and Canadian Paediatric Society position paper. Can Respir J 2015; 22(3):135-143 and Lougheed MD, Lemiere C, Ducharme F, et al. Canadian Thoracic Society 2012 guideline update: Diagnosis and management of asthma in preschoolers, children and adults. Can Respir J 2012: Vol 19(2), 127-64.

For information on how this action plan was developed, or to download a copy of this action plan and/or for associated resources, please visit https://hcp.lunghealth.ca/programs-tools/clinical-tools/

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MEDICAL DIRECTIVE AND/OR DELEGATION TEMPLATE

Template for Use by Physicians or Authorizers **with** *Ordering Authority*

Title : Emergency Department Asthma Medical Directive – Pediatric Age 1 to 17

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)*

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) 5 or 10 puffs per dose or nebulized 2.5 mg or 5 mg per dose in 3-4 mL NaCl 0.9%, 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. Alternate with salbutamol (if MDI) or mixed with salbutamol (if nebulized). See flowchart (Appendix B) for specific number of doses and frequency.
4. dexamethasone: 0.6 mg/kg to a maximum of 12 mg PO once, OR predniSONE: 2 mg/kg to a maximum of 50 mg PO once, OR prednisoLONE: 2 mg/kg to a maximum of 50 mg PO once as soon as possible following first salbutamol/ipratropium dose: 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:	**Appendix Attached** ☒ **Yes** ☐ **No** **Title: Appendix A - Severity of Asthma Exacerbation**

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 Pediatric Respiratory Assessment Measure (PRAM) assessment (Appendix A).

Exclusion Criteria:
ED visit for prescription refill only.

Authorized Implementers:	**Appendix Attached** ☐ **Yes** ☐ **No** **Title:**

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:	**Appendix Attached** ☐ **Yes** ☐ **No** **Title:**

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 Pediatric Respiratory Assessment Measure (PRAM) score.

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

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

Re: ipratropium bromide
- [x] allergic to ipratropium bromide [x] hold ipratropium bromide and proceed with rest of medical directive

Re: dexamethasone, predniSONE, prednisoLONE
- [x] patient unable to take medication via oral route [x] request physician assessment and orders and proceed with remainder of medical directive.
- [x] patient with active or suspected incubation of chickenpox infection [x] hold dexamethasone, predniSONE or prednisoLONE and proceed with rest of medical directive. Obtain physician assessment as soon as possible.
- [x] patient allergic to dexamethasone, predniSONE, or prednisoLONE [x] hold dexamethasone, predniSONE or prednisoLONE and proceed with rest of medical directive. Obtain physician assessment as soon as possible.

Re: spirometry (FEV_1) or Peak Expiratory Flow (PEF) – not available in most emergency departments
- [x] FEV_1 (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 FEV_1 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 [x] proceed with assessment and treatment based on the PRAM.

  NOTE: Do not delay PRAM assessment or treatment to obtain FEV_1, or PEF

Consent:	**Appendix Attached** ☐ **Yes** ☐ **No** **Title:**

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:	**Appendix Attached** ☐ **Yes** ☐ **No** **Title:**

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 Pediatric 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 weight 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.

Documentation and Communication:	**Appendix Attached** ☐ **Yes** ☐ **No** **Title:**
Review and Quality Monitoring Guidelines:	**Appendix Attached** ☐ **Yes** ☐ **No** **Title:**
Administrative Approvals (as applicable):	**Appendix Attached** ☐ **Yes** ☐ **No** **Title:**
Approving Physician(s) / Authorizer(s):	**Appendix Attached** ☐ **Yes** ☐ **No** **Title:**

Emergency Department Pediatric Asthma Medical Directive
Appendix A: Severity of asthma exacerbation

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

Signs/Scoring	0	1	2	3	Patient's Score
O_2 saturation (in room air)	≥ 95%	92-94%	< 92%		_____ (max 2)
Suprasternal retraction	Absent		Present		_____ (max 2)
Scalene muscle contraction	Absent		Present		_____ (max 2)
Air entry*	Normal	**decreased** at the base	**decreased** at the apex and base	Minimal or absent	_____ (max 3)
Wheezing†	Absent	Expiratory only	Inspiratory (± expiratory)	Audible without stethoscope or silent chest (minimal or no air entry)	_____ (max 3)
				PRAM TOTAL SCORE :	_____ **(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:

Chalut, D. S., Ducharme, F. M., & Davis, G. M. (2000). The Preschool Respiratory Assessment Measure (PRAM): A responsive index of acute asthma severity. The Journal of Pediatrics, 137 (6), 762-768.

Ducharme, F., Chalut, D., Plotnick, L., et al. (2008). The Pediatric Respiratory Assessment Measure: A Valid Clinical Score for Assessing Acute Asthma Severity from Toddlers to Teenagers. The Journal of Pediatrics , 152 (4), 476-480.e1.

Emergency Department Pediatric Asthma Medical Directive
Appendix B: Medical Directive Flowchart (page 1 of 2)

PRAM 0 - 3
Mild

PRAM 4 - 7
Moderate

Administer oxygen as required to keep SpO_2 ≥ 92%

Establish baseline FEV_1, if possible (patient age 6 yrs or older, able to follow directions, trained staff member available, able to demonstrate reproducibility* within 10%)
* Results may not be reproducible during an exacerbation
Do not delay pharmacotherapy while obtaining FEV_1

If patient's condition worsens at any time, notify physician immediately

ADMINISTER

salbutamol via **metered dose inhaler (MDI)** and age appropriate spacer *preferred*, unless continuous oxygen required; dose by patient's weight:

Less than 20 kg = 5 puffs/dose
Greater than or equal to 20 kg = 10 puffs/dose

(allow 30 seconds between each puff)

OR

salbutamol (solution/nebule) via continuous nebulization, dose by patient's weight:

Less than 20 kg = 2.5 mg/dose
Greater than or equal to 20 kg = 5 mg/dose
If necessary increase volume to 3-4 mL with NaCl 0.9%

REPEAT
(salbutamol)
PRAM 0 to 3: q 60 minutes PRN,
to a maximum of 2 doses in the first hour

ADMINISTER

salbutamol via **metered dose inhaler (MDI)** and age appropriate spacer *preferred*, unless continuous oxygen required; dose by patient's weight:

Less than 20 kg = 5 puffs/dose
Greater than or equal to 20 kg = 10 puffs/dose

AND
ipratropium bromide via metered dose inhaler (MDI)
and age appropriate spacer: 3 puffs/dose; alternate each puff of ipratropium bromide with salbutamol

(allow 30 seconds between each puff)

OR

salbutamol (solution/nebule) via continuous nebulization, dose by patient's weight:

Less than 20 kg = 2.5 mg/dose
Greater than or equal to 20 kg = 5 mg/dose

AND
ipratropium bromide (solution/nebule):
250 mcg mixed with salbutamol; add NaCl 0.9% for volume of 3-4 mL

REPEAT
(both salbutamol and ipratropium bromide)
PRAM 4 to 7: q 20min X 3 doses in the first hour

Assess patient regarding requirement for corticosteroids (**except for "mild" severity**):
Does patient have active or suspected chickenpox infection?

YES

Hold corticosteroid
Notify MD
Obtain further orders for therapy

NO

ADMINISTER ORAL CORTICOSTEROIDS*:
for "Moderate" (PRAM 4-7) a**s soon as possible after 1st**

salbutamol/ipratropium dose and within 60 (sixty) minutes of triage:
dexamethasone 0.6 mg/kg/dose PO x 1 dose (maximum 12 mg/dose)
predniSONE / prednisoLONE 2 mg/kg/dose PO x 1 dose (maximum 50 mg/dose)

*if patient unable to take medication via oral route, notify MD immediately

Emergency Department Pediatric Asthma Medical Directive
Appendix B: Medical Directive Flowchart (page 2 of 2)

PRAM 8-12
Severe

Impending
Respiratory Failure

Administer oxygen as required to keep SpO_2 ≥ 92%

Establish baseline FEV_1, if possible (patient age 6 yrs or older, able to follow directions, trained staff member available, able to demonstrate reproducibility* within 10%)
* Results may not be reproducible during an exacerbation
Do not delay pharmacotherapy while obtaining FEV_1

MD to assess STAT and remain in attendance until patient is stabilized

If patient's condition worsens at any time, notify physician immediately

ADMINISTER

salbutamol metered dose inhaler (MDI) and age appropriate spacer *preferred*, unless continuous oxygen required; dose by patient's weight:

Less than 20 kg = 5 puffs/dose
Greater than or equal to 20 kg = 10 puffs/dose

AND

ipratropium bromide metered dose inhaler (MDI) and age appropriate spacer. 3 puffs/dose; alternate each puff of ipratropium bromide with salbutamol

(allow 30 seconds between each puff)

OR

salbutamol (solution/nebule) via continuous nebulization, dose by patient's weight:

Less than 20 kg = 2.5 mg/dose
Greater than or equal to 20 kg = 5 mg/dose

AND

ipratropium bromide (solution/nebule)
250 mcg mixed with salbutamol; add NaCl 0.9% for total volume of 3-4ml

REPEAT

(both salbutamol and ipratropium bromide)
PRAM 8 to 12: q 20 minutes x 3 doses in the first hour

ADMINISTER

salbutamol (solution/nebule) via continuous nebulization, dose by patient's weight:

Less than 20 kg = 2.5 mg/dose
Greater than or equal to 20 kg = 5 mg/dose

AND

ipratropium bromide (solution/nebule)
250 mcg mixed with salbutamol; add NaCl 0.9% for total volume of 3-4ml

REPEAT

(both salbutamol and ipratropium bromide)
"Impending Respiratory Failure": repeat continuously.
After 1st hour, continuous nebulized salbutamol

Assess patient regarding requirement for corticosteroids (except for "mild" severity): Does patient have active or suspected chickenpox infection?

YES

Hold corticosteroid
Notify MD
Obtain further orders for therapy

NO

ADMINISTER ORAL CORTICOSTEROIDS*:
for "Severe" (PRAM 8-12) and "Impending Respiratory Failure"
as soon as possible after 1st salbutamol/ipratropium dose
and within 20 (twenty) minutes of triage:
dexamethasone 0.6 mg/kg/dose PO x 1 dose (maximum 12 mg/dose)
predniSONE / prednisoLONE 2 mg/kg/dose PO x 1 dose (maximum 50 mg/dose)

*if patient unable to take medication via oral route, notify MD immediately

Appendix B: Evidence Grading Methodologies

British Thoracic Society Scottish Intercollegiate Guidelines Network 2014

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

KEY TO EVIDENCE STATEMENTS AND GRADES OF RECOMMENDATIONS	
LEVELS OF EVIDENCE	
1^{++}	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1^{+}	Well conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias
1^{-}	Meta-analyses, systematic reviews, or RCTs with a high risk of bias
2^{++}	High quality systematic reviews of case control or cohort studies 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
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
2^{-}	Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, eg case reports, case series
4	Expert opinion
GRADES OF RECOMMENDATION	
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

NHS Evidence accredited provider
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www.evidence.nhs.uk

NHS Evidence has accredited the process used by **Scottish Intercollegiate Guidelines Network** to produce guidelines. Accreditation is applicable to guidance produced using the processes described in SIGN 50: a guideline developer's handbook, 2008 edition (**www.sign.ac.uk/guidelines/fulltext/50/index.html**). More information on accreditation can be viewed at **www.evidence.nhs.uk**

Canadian Medical Association 1999 (Boulet et al.,1999)
Evidence Grading Methodology: The Steering Committee on Clinical Practice Guidelines for the Care and Treatment of Breast Cancer

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.

CMAJ. 1998:158(3 Suppl):S1-2

Canadian Thoracic Society 2012 (Lougheed et al., 2012)
Evidence Grading Methodology: Appraisal of Guidelines, Research and Evaluation (AGREE) II instrument

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

National Institutes of Health 2007 and Global Initiative for Asthma 2006
Evidence Grading Methodology: (Jadad et al., 2000)

Table A. Description of Levels of Evidence

Evidence Category	Sources of Evidence	Definition
A	Randomized controlled trials (RCTs). Rich body of data.	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.
B	Randomized controlled trials (RCTs). Limited body of data.	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.
C	Nonrandomized trials. Observational studies.	Evidence is from outcomes of uncontrolled or nonrandomized trials or from observational studies.
D	Panel consensus judgment.	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.

Jadad AR, Moher M, Browman GP, Booker L, Sigouis C, Fuentes M, et al. Systematic reviews and meta-analyses on treatment of asthma: critical evaluation. BMJ 2000;320:537-40.

Appendix C: Evaluation Metrics

Primary Evaluation Metrics

Evaluation Metric		Domain	Relevance	Rationale	Feasibility/ Data Source
1a	Proportion of children with asthma whose severity has been documented on presentation (PRAM score)	Effectiveness Appropriateness Efficiency	Administrators Clinicians	To assess if treatment delivered was appropriate (Evaluation Metric 1b and 1c) Treatment is based on condition severity	Data not readily available
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).	Effectiveness Appropriateness Efficiency	Administrators Clinicians	To measure the proportion of patients receiving appropriate severity-based treatment	Data not readily available
2	Proportion of children with asthma who, upon discharge from the ED or inpatient unit, received a written Asthma Action Plan	Appropriateness Integration Patient-centredness	OH Administrators Clinicians	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	Data not readily available
3a	Percentage of patients with an ED revisit for the same condition within 72 hours	Effectiveness Appropriateness Efficiency Patient-centredness	MOH OH Administrators Clinicians	To determine efficiency of ED or in-hospital treatment and to monitor variation	Readily available NACRS

Evaluation Metric		Domain	Relevance	Rationale	Feasibility/ Data Source
3b	Percentage of patients with an ED revisit for the same condition within one month	Effectiveness Appropriateness Efficiency Patient-centredness	MOH OH Administrators Clinicians	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	Readily available NACRS

Secondary Evaluation Metrics

Evaluation Metric		Domain	Relevance	Rationale	Feasibility/ Data Source
4	Emergency Department Length of Stay	Effectiveness Efficiency Access Patient-centredness	MOH OH Administrators Clinicians	To determine efficiency of treatment and to monitor variation	Readily available NACRS/hospital data (wait times initiative)
5	Proportion of children with asthma who were admitted or transferred to another hospital for admission	Effectiveness Appropriateness Efficiency	MOH OH Administrators Clinicians	To determine efficiency of treatment and to monitor variation	Readily available NACRS/Hospital data (wait times initiative)/DAD
6	Hospital (inpatient) LOS	Effectiveness Appropriateness Efficiency	MOH OH Administrators Clinicians	To determine efficiency of treatment and to monitor variation	Readily available DAD
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.	Appropriateness	OH Administrators Clinicians	To measure the proportion of patients receiving appropriate treatment	Data not readily available
8b	Proportion of children with asthma who, upon discharge from the ED or inpatient	Appropriateness Integration	OH Administrators	To measure the proportion of patients receiving appropriate treatment	Data not readily available

	Evaluation Metric	Domain	Relevance	Rationale	Feasibility/ Data Source
	unit, are prescribed a full course of inhaled corticosteroids (3 month course)	Patient-centredness	Clinicians		
9	Proportion of children with Asthma who, upon discharge from the ED have a completed Paediatric – Emergency Department Asthma Care Pathway Education checklist	Appropriateness Integration Patient-centredness	OH Administrators Clinicians	To measure appropriate care provided	Data not readily available

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Ducharme F.M., Dell S.D., Radhakrishnan D., Grad R.D., Watson W.T.A., Yang C.L., Zelman M. (2015). Diagnosis and management of asthma in preschoolers: A Canadian Thoracic Society and Canadian Paediatric Society position paper. *Can Respir J* 22(3):135-143.

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