BOTTOM LINE RECOMMENDATIONS

Asthma Exacerbations

For Children Aged ≥ 12 months

Approximately one-third of children with asthma presenting to the emergency department (ED) have moderate respiratory distress, and less than 5% will have a severe exacerbation. Refer to TREKK's Severe Asthma Exacerbation Algorithm for emergent management. There are some differences between provincial asthma pathways with regards to PRAM scores and treatment. Pathways are hyperlinked below and provide additional management information:

Alberta **British Columbia** **Ontario** **Quebec (Sainte-Justine)**

Classifying asthma severity

» Use of the Pediatric Respiratory Assessment Measure (PRAM) to classify severity of respiratory distress in children with asthma exacerbations improves use of evidence-based medications and lowers hospitalization rates.[1]

» Regardless of their PRAM score, children with lethargy, cyanosis, decreasing respiratory effort and/or rising pCO_2 should be considered to have **impending respiratory failure**. Consult Pediatric Referral Centre.

Management

Summary of Evidence-based Management of Acute Asthma Exacerbations		
Severity	PRAM Score*	Recommended Treatment
Mild	1-3	» Salbutamol via MDI/spacer for 1 dose and then PRN[2] » Dose (100 mcg/puff): Less than 20 kg: 5 puffs; greater than or equal to 20 kg: 10 puffs » Although evidence is lacking, oral steroids are also sometimes used if history of chronic symptoms, frequent exacerbations, recent admission.
Moderate	4-7	» Salbutamol via MDI/spacer Q20 minutes x 3 doses, and then PRN[2] (see dose above). Consider alternating doses with 2 to 3 doses of ipratropium in the 1st hour. » Ipratropium dose (20 mcg/puff): 4 puffs » Oral dexamethasone with 1st bronchodilator dose(s) Dose: 0.6 mg/kg/dose (MAX 12 mg/dose) PO
Severe	8-12	» See TREKK Severe Asthma Exacerbation Algorithm » Continuous nebulized salbutamol and ipratropium and oral corticosteroid in the first hour of treatment, then salbutamol PRN or continuous depending on response
Impending Respiratory Failure	Lethargy, cyanosis, decreasing respiratory effort, and/or rising pCO_2	» See TREKK Severe Asthma Exacerbation Algorithm » Continuous cardiorespiratory monitoring, supplemental O_2, and ventilatory support as needed » Continuous nebulized salbutamol and ipratropium for first hour and IV corticosteroid, then continuous salbutamol » Magnesium sulfate IV » Isotonic IV fluids to maintain adequate perfusion, as needed » Consider either high flow nasal oxygen or non-invasive ventilation if signs of respiratory failure » Intubation is high-risk and a last resort procedure when other therapies have failed. Best done in consultation with PICU/Pediatric Referral Centre/Transport Service.

* Some provincial pathways have different PRAM severity cut-offs

» Giving oral corticosteroids and repeated doses of bronchodilators in the first 60 minutes of care reduces hospitalization rates substantially.[3]

» *MDI/spacer versus nebulization*: Beta-agonist treatment with MDI/spacer is clinically equivalent with fewer side-effects and shorter ED length of stay as compared with nebulization.[2] Patients with severe respiratory distress improve more quickly with bronchodilators nebulized continuously vs intermittent treatment every 20 minutes.[4] Use a large-volume nebulizer for continuous therapy or a small-volume nebulizer with repeat doses given "back-to-back".[4]

» *Ipratropium*: 2-3 doses in the first hour of treatment yields greater improvement and decreases hospitalization.[5] Benefits appear to be greatest in severe respiratory distress but may also aid patients in moderate distress.[5]
» *Corticosteroids*: Early administration of steroids with initial beta-agonists shortens respiratory distress and decreases hospitalization.[3] Oral dexamethasone or prednisone/prednisolone are comparably effective;[6] Dexamethasone is the preferred due to less vomiting and better tolerance.[6] A one or two-day course of dexamethasone appears to be as effective as a five-day course of oral prednisone/prednisolone.[6]
» *Magnesium sulfate*: Give to children in impending respiratory failure as part of initial management OR to those who remain in moderate to severe respiratory distress after the first hour of bronchodilator treatment in addition to continuous bronchodilator therapy.[7]

Criteria for hospital admission or prolonged observation

» Consider admission to hospital if persistent PRAM score greater than or equal to 4 more than 4-6 hours after corticosteroid given.
» Consult Pediatric Referral Centre/Transport Team if persistent PRAM score greater than or equal to 8 after initial 1-2 hours of treatment.

Criteria for safe discharge home

» PRAM score less than or equal to 3 at least 1-2 hours after last bronchodilator treatment.
  - No significant intercostal and/or suprasternal indrawing
  - Good air entry on auscultation with at most mild expiratory wheeze
  - Oxygen saturation greater or equal to 92% in room air (>90% for higher altitude)
» Provide all children being discharged home with:
  - Prescription for age-appropriate **reliever medication**, **controller medication (if required), and spacer for use with all MDIs.**
    - **All** children presenting with a PRAM ≥4 should go home on controller medication (i.e., daily inhaled corticosteroid) until follow up
  - **Asthma Teaching and Action Plan** for:
    1) when and how to use discharge medications
    2) when to seek further care
    3) steps to reduce asthma triggers and/or allergens
  - Instructions to **follow up** with primary care provider or alternative (ideally within 7 days)

VIEW SUGGESTED DISCHARGE MEDICATIONS BELOW

For a full list of references and development team members, please see page 4.

BOTTOM LINE RECOMMENDATIONS

Asthma Exacerbations For Children Age ≥ 12 months

	SUGGESTED DISCHARGE MEDICATIONS		
	DRUG	**DOSE**	**CONSIDERATIONS**
RELIEVER *(BETA AGONIST)*	Salbutamol MDI (100 mcg/puff) *(Ventolin®)*	2-4 puffs q4h for 24 hours, and then 2 puffs q4h PRN	Prescribe a reliever for ALL patients with asthma. Prescribe a spacer for use with ALL MDIs. Age < 12 years: salbutamol Age ≥ 12 years: salbutamol OR if patient is already on budesonide/formoterol, they could be discharged with it instead of salbutamol.
	Budesonide/ Formoterol DPI *(Symbicort®)**	Age ≥ 12 years Rapid symptom relief: 1 inhalation PRN. If symptoms persist repeat dose. MAX 8 inhalations per 24 hours. See below for ICS maintenance dosing.	
CONTROLLER (INHALED *CORTICOSTEROID/ICS*)	Fluticasone Propionate MDI *(Flovent®)*	*Age (yr)* — *Low/Starting Dose* 1-5 — 50 mcg BID 6-11 — 100 mcg BID ≥12 — 125 mcg BID	All children presenting with a PRAM >4 should go home on scheduled low/starting dose ICS until follow up. Consider low/starting dose ICS in children with PRAM ≤3 who are at higher risk for severe exacerbations.§ Only move to medium dose after ensuring good technique, adherence and trigger control on low dose ICS. Minimum duration: 3 months. Ensure follow up with primary care (ideally within 7 days of exacerbation). If primary care not available, consider referral to pediatrics/asthma clinic.
	Ciclesonide MDI *(Alvesco®)*	*Age (yr)* — *Low/Starting Dose* 1-5 — 100 mcg once daily ≥6 — 200 mcg once daily	
	Budesonide/ FormoterolDPI *(Symbicort®)*	Age ≥ 12 years if already prescribed. Low Dose 200 mcg BID in *addition* to its use as a reliever as above. MAX 8 inhalations/day.	
ORAL STEROID	Dexamethasone	0.6 mg/kg/dose (MAX 12 mg/dose) PO once daily x 1 day (OPTIONAL for patients requiring 2 day course including dose given in ED)	A 1-2 day course of dexamethasone OR a 5 day course of prednisone/prednisolone should be prescribed for ALL moderate or severe exacerbations (PRAM >4). Dexamethasone is preferred due to better tolerance. If suspension unavailable, tablets can be halved/quartered and crushed then added to small amount of food.
	Prednisone or Prednisolone	1 mg/kg/dose (MAX 60 mg/dose) PO once daily x 4 days for 5 days total therapy	

*Symbicort: ICS budesonide 100 mcg or 200 mcg/inhalation + long-acting beta-agonist with fast onset formoterol 6 mcg/inhalation

§Higher risk for severe exacerbations includes ANY of: 1) history of severe exacerbation requiring systemic steroids, ED visit or hospitalization; 2) asthma not well-controlled#; 3) overuse of reliever medication (> 2 inhalers/year); or 4) current smoker.

#Well-controlled asthma defined as ALL of the following: 1) daytime symptoms < 2 days/week; 2) nighttime symptoms < 1 night/week; 3) normal physical activity; 4) mild (no ED visit/hospitalization) and infrequent (frequency does not impair quality of life) exacerbations; 5) no school absence due to asthma; and 6) < 2 reliever doses/week.

Asthma Exacerbations

For Children Aged ≥ 12 months

trekk
TRANSLATING EMERGENCY KNOWLEDGE FOR KIDS

Bottom Line Recommendations

Bottom Line Recommendations are short summaries for healthcare providers of the latest knowledge related to the diagnosis and management of pediatric emergency conditions. This resource is not intended to be used as a step-by-step guide. It is ideal for educational purposes and to summarize existing evidence on asthma exacerbations in pediatric emergency care. Development of this resource involved a rigorous and iterative process, bringing together experts from a variety of specialties (nursing, simulation, emergency medicine, intensive care, and pharmacy). For a complete list of the evidence that informed the creation of this resource visit our website here. To learn more about the development, see the References & Development Team sections below.

References

1. Ducharme FM, Chalut D, Plotnick L, et al. The Pediatric Respiratory Assessment Measure: a valid clinical score for assessing acute asthma severity from toddlers to teenagers. J Pediatr. 2008;152(4):476-80.
2. Cates CJ, Crilly JA, Rowe BH. Holding chambers (spacers) versus nebulisers for beta-agonist treatment of acute asthma. Cochrane Database Syst Rev. 2013;(9).
3. Rowe BH, Spooner C, Ducharme F, Bretzlaff J, Bota G. Early emergency department treatment of acute asthma with systemic corticosteroids. Cochrane Database Syst Rev. 2001.
4. Camargo CA Jr, Spooner CH, Rowe BH. Continuous versus intermittent beta-agonists in the treatment of acute asthma. Cochrane Database Syst Rev. 2003;(4)
5. Griffiths B, Ducharme FM. Combined inhaled anticholinergics and short-acting beta2-agonists for initial treatment of acute asthma in children. Cochrane Database Syst Rev. 2013;(8).
6. Keeney GE, Gray MP, Morrison AK, et al. Dexamethasone for acute asthma exacerbations in children: a meta-analysis. Pediatrics. 2014;133(3):493-9.
7. Griffiths B, Kew KM. Intravenous magnesium sulfate for treating children with acute asthma in the emergency department. Cochrane Database Syst Rev. 2016;4(4).

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