

# BREAKING DOWN OUR EVIDENCE-BASED TOOLS

In 2013, we completed a national needs assessment to learn about the information needs and preferences of healthcare professionals in general emergency departments across Canada. We used the results to develop a series of evidence-based tools for pediatric emergency care. Read below to find out more about how they can help you in your clinical practice.

## BOTTOM LINE RECOMMENDATIONS

### INFORMATION SUMMARIES

Bottom Line Recommendations (BLRs) are information summaries that highlight key issues and offer an up-to-date review of current, available evidence for treating children in emergency settings.

### RECOMMENDATIONS & EDUCATION

Our BLRs contain practical information but are not intended as step-by-step guides. They are ideal for education purposes and to summarize existing evidence on a given topic in pediatric emergency care.

**BOTTOM LINE RECOMMENDATIONS**

## Asthma

Asthma is the most common chronic disease in children. Acute exacerbations of asthma are one of the most common reasons for children to seek emergency care and require urgent hospitalization. Up to two-thirds of children with asthma who seek emergency care can be classified as having mild respiratory distress, between 2 and 5% have severe respiratory distress, and the remainder have moderate respiratory distress.

**Overview of Management**

- Evidence-based management of children with acute asthma exacerbations (including repeated doses of salbutamol and ipratropium, and oral corticosteroids in the first 60 minutes of care) reduces hospitalization rates substantially.

**NOTE:**  
While Canadian pediatric emergency departments (EDs) have similar approaches to treating children with asthma, there are some regional differences. Depending on where in Canada you practice, please see the following clinical pathways for more detailed guidance (including dosing of bronchodilators) or the **TREKK Asthma PedsPac**:

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

**Classifying asthma severity**

- Use of a standardized, validated clinical score (the Pediatric Respiratory Assessment Measure or PRAM) to classify the severity of respiratory distress in children with asthma exacerbations results in improved use of evidence-based medications and lower rates of hospitalization.<sup>1,2</sup>
- Cut-off scores for categorizing patients as having mild, moderate, or severe respiratory distress differ between provincial pathways. *See pathways listed above for specific details.*

**MILD**

- Salbutamol should be delivered with metered dose inhalers (MDIs) and spacers rather than nebulization.<sup>3</sup>
- While oral corticosteroids are frequently administered to children with mild respiratory distress, clear evidence of benefit in those with mild symptoms is lacking.

**MODERATE**

- Treat with salbutamol delivered via MDI and spacers every 20 minutes, for a total of three doses.
- Methods for adjusting the dose of salbutamol for children of different ages vary between pediatric emergency departments. Some adjust based on age in years and others adjust based on broad weight cut-offs. *See provincial pathways listed above for specific adjustments.*
- Administration of oral corticosteroids just before or immediately after initiating bronchodilator therapy substantially decreases respiratory distress within 2-6 hours of treatment and substantially decreases hospitalization rates.
- Oral dexamethasone or prednisone/prednisolone are likely to be comparably effective;<sup>4</sup> in some studies, dexamethasone was reported to result in substantially lower rates of vomiting.
  - Liquid parenteral form of dexamethasone administered orally is used preferentially in most Canadian pediatric emergency departments.
  - Standard dosing: dexamethasone 0.15 to 0.6 mg/kg, or prednisone/prednisolone 1-2 mg/kg.
- See provincial pathways above for specific dosing and maximum doses.*
- Multiple doses of ipratropium (two or three) added to salbutamol aerosols and oral corticosteroids in the first 60 minutes of treatment yield greater improvement and lower hospitalization rates. *See provincial pathways for specific dosing.*
  - Benefits appear to be greatest in those with severe respiratory distress; it is less certain in those children with moderate distress.

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## PEDIATRIC PACKAGES

### STEP-BY-STEP CARE

Our Pediatric Packages (PedsPacs) are intended as a step-by-step guide for managing critically ill children. By necessity, the PedsPacs make judgments about things (such as specific courses of treatment or pediatric doses) that are unclear from the evidence alone, based on the consensus of pediatric experts across Canada.

### COMPLETE PACKAGE

PedsPacs come as comprehensive bundles of practical tools, including management algorithms, pocket cards, order sets, a transport checklist, and a triage screening poster.

### Pediatric Diabetic KetoAcidosis (DKA) Algorithm

**Recognition of DKA**

DKA can occur in existing or new onset type 1 or type 2 diabetes

**Diagnostic criteria:** Diabetes (random blood glucose  $\geq 11.1$  mmol/L) + Ketouria + Acidosis

**Clinical features:** Polyuria, polydipsia, weight loss, dehydration, Kussmaul breathing, headache, decreased level of consciousness, abdominal pain, vomiting

**Alert Pediatric Referral Centre**

**Initial Management**

- Assess ABCs, vital signs (including BP) + neurovitals (GCS, pupils)
- Rapid bedside glucose
- O<sub>2</sub> 10-15 Lpm non-rebreather mask (if signs of shock)
- IV Access x 2 lines (consider intravenous if unsuccessful)
- Serum glucose, electrolytes, venous gas, urea, creatinine, serum osmolality
- Urinalysis for glucose, ketones; bladder catheterization if needed
- Consider other investigations:
  - Obtain cultures (e.g. blood, urine, throat) if clinical evidence of infection
  - ECG for baseline assessment of K<sup>+</sup> status (if delay in obtaining serum K<sup>+</sup>)

**DKA Severity**

|                  | Mild        | Moderate   | Severe |
|------------------|-------------|------------|--------|
| pH               | 7.32 - 7.29 | 7.1 - 7.18 | < 7.1  |
| HCO <sub>3</sub> | 10 - 14     | 5 - 9      | < 5    |

**Hyperosmolar Hyperglycemic State (HHS)**

Consider if:

- Glucose  $\geq 33$  mmol/L, HCO<sub>3</sub>  $> 15$
- Minimal acidosis/alkalosis, negative or trace urine ketones
- Osmolality  $\geq 330$  mOsm/L

**CAUTION!**  
Intubation and ventilation are high-risk procedures for DKA patients, and should never be undertaken without consultation with your pediatric referral centre or transport team.

**Signs of CEREBRAL EDEMA?**

- GCS  $< 14$  and/or irritability in younger children
- And/or Cushing's triad:  $\uparrow$ BP,  $\uparrow$ HR,  $\uparrow$ RR

**Fluid Resuscitation (Based on recent evidence)**

Administer 10 mL/kg NS bolus over 30 minutes.

Persistent tachycardia, or other signs of hypoperfusion (cap refill  $> 2$  sec or cool extremities)?

**Rehydration Table: Total IV Fluids**

| Weight       | mL/kg/hr          |
|--------------|-------------------|
| 5 - 10 kg    | 6.5               |
| 10 - 20 kg   | 6                 |
| 20 - 40 kg   | 5                 |
| $\geq 40$ kg | 4 (MAX 250 mL/hr) |

**Repeat 10 mL/kg NS bolus over 30 min. Reassess after each bolus and repeat if persistent hypoperfusion. Discuss with Pediatric Referral Centre.**

**IV Fluids and Insulin**

- Rehydrate with IV NS until glucose  $< 15$  mmol/L or decreases by  $> 5$  mmol/L/hr once the glucose is  $< 25$  mmol/L. Then change to D10WNS.
- Add 40 mmol/L KCl into IV fluid for K<sup>+</sup>  $< 5$  mmol/L, and patient has voided in ED)
- Start insulin infusion 0.1 units/kg/hr IV after 1 hour of IV fluids
- NEVER use IV insulin bolus
- NEVER administer sodium bicarbonate

!See DKA instructions in Drug Dosing Binder

**Cerebral Edema Management**

- Call Pediatric Referral Centre
- Assess and manage ABCs
- Bed rest, elevate head of bed to 30°
- If hypoperfusion: Eacheptan, cap refill  $> 2$  sec, cool extremities, give 10 mL/kg NS bolus over 30 minutes; reassess after bolus and repeat if persistent hypoperfusion. Discuss further fluid management with Pediatric Referral Centre.
- Run IV fluids at 60% of rate outlined in Rehydration Table
- 3% NS-E (Ag IV over 15 min) OR Mannitol (0.5 - 1 g/kg IV over 20 min)
- Start insulin infusion 0.1 units/kg/hr IV after 1 hour of IV fluids
- Head CT not required prior to transport

**Pediatric Referral Centre Discussion**

**CONSIDERATION OF:**

- Difficult vascular access
- Additional treatment of cerebral edema
- Airway management
- Ongoing fluid management

**Ongoing Monitoring Until Transfer**

- Q 1 hour: Blood glucose, Fluid in and outs, Neurovitals (GCS, pupils), HR and BP
- Q 2-4 hours: Electrolytes and venous gas, Monitor ECG for T-wave changes

Dedicate one IV line to use as saline lock for serial bloodwork

**PedsPacs** A PedsPac resource from TREKK. For more tools in the series, call 204-975-7744 or visit trekk.ca ©2018, TREKK. Published: Dec, 2018. Version: 1.0. Review date: Dec, 2020.

## PARENT TOOLS

### DESIGNED BY, AND WITH PARENTS IN MIND

Our parent tools are designed to provide evidence-based health information to parents and families to help them care for their sick children at home, and to aid them in understanding when to seek emergency department care.

Interactive and informative, these tools are developed with the help of parents and families and use art and storytelling to provide quality health information.

