

Guideline for the Diagnosis and Management of Croup



This clinical practice guideline was developed by an Alberta Clinical Practice Guideline Working Group. This guideline will be reviewed again as part of routine practice by the end of 2005.

DEFINITIONS

Croup is a childhood respiratory illness caused by a variety of viruses and is usually contracted in the autumn and winter months.¹ It is characterized by the abrupt onset of a barking cough and is frequently associated with inspiratory stridor (noisy breathing on inspiration), hoarseness, and respiratory distress.² Children with croup can be broadly categorized as having four levels of severity:

Mild – occasional barking cough, no audible stridor at rest, and no to mild suprasternal and/or intercostal indrawing (retractions of the skin of the chest wall)

Moderate – frequent barking cough, easily audible stridor at rest, and suprasternal and sternal wall retraction at rest, but no or little distress or agitation

Severe – frequent barking cough, prominent inspiratory and - occasionally - expiratory stridor, marked sternal wall retractions, and significant distress and agitation.

Impending respiratory failure – barking cough (often not prominent), audible stridor at rest (occasionally hard to hear), sternal wall retractions (may not be marked), lethargy or decreased level of consciousness, and often dusky appearance without supplemental oxygen.

RECOMMENDATIONS (see Algorithm)

Diagnosis

PRACTICE POINT

- Croup occurs most commonly in children between 6 months and 3 years of age, but can also occur in children as young as 3 months and as old as 12 to 15 years of age.¹ It has been reported *very* rarely in adults.³
- Croup occurs predominantly in late autumn, but can occur during any season, including summer.¹

History

- ◆ Croup symptoms may occur either with or without antecedent upper respiratory symptoms of cough, rhinorrhea, and fever.
- ◆ Croup symptoms most commonly occur in the late evening and at night and have an abrupt onset. They include:
 - seal-like barking cough
 - inspiratory stridor
 - hoarseness
 - no to moderately high fever
- ◆ Croup symptoms frequently improve en route to medical care, and fluctuate significantly depending on whether the child is calm or agitated.
- ◆ Croup symptoms usually improve during the day, and often recur again the following night.⁴
- ◆ The majority of children resolve their croup symptoms within 48 hours, but a small proportion of children have symptoms that persist for up to one week.⁴
- ◆ Following the resolution of croup symptoms, children usually have typical ‘URTI’- like symptoms and occasionally a secondary bacterial-induced otitis media.^{4,6}

PRACTICE POINT FEATURES SUGGESTING A DIFFERENT DIAGNOSIS^{2,3}

- High fever, toxic appearance, and poor response to epinephrine suggests **bacterial tracheitis**
- Sudden onset of symptoms with high fever, absence of barking cough, dysphagia, drooling, anxious appearance, and sitting forward in “sniffing position” suggests **epiglottitis**
- Other potential causes of stridor which are rare but should be considered include **foreign body lodged in upper esophagus, retropharyngeal abscess, and hereditary angioedema**

Physical Examination

Physicians should always be alert to the possibility of other causes of ‘croup-like’ symptoms, and consequently a careful history and physical exam is important. Key features to focus on include:

- ◆ Audible seal-like barking cough
- ◆ Voice is often hoarse
- ◆ Varying degrees of stridor, *predominantly* inspiratory
- ◆ Varying degrees of retractions of the chest wall
- ◆ Often agitated
- ◆ Absence of drooling
- ◆ Appears non-toxic

Other associated features that can be found on physical examination include:

- ◆ Febrile (up to 40° C)
- ◆ Tachycardia (with more severe obstructive symptoms)
- ◆ Moderate tachypnea (usually less than 50 breaths per minute)
- ◆ If the supraglottic region is visualized, it appears normal

Note this should not be routinely attempted in any child with respiratory distress

PRACTICE POINT

Impending respiratory failure is indicated by:

- Change in mental status such as fatigue and listlessness
- Pallor
- Dusky appearance
- Decreased retractions
- Decreased breath sounds with decreasing stridor

Investigations

- ◆ Laboratory and radiological assessments are not necessary to make the diagnosis of croup. The diagnosis can be reliably made based on the clinical presentation in combination with a careful history and physical examination.

- If laboratory tests are obtained they should be well justified and should be deferred while the patient is in respiratory distress
- Imaging studies are not required in patients with a typical history that respond appropriately to treatment however, lateral and anteroposterior (AP) soft tissue neck film may be helpful in clarifying the diagnosis in children with croup-like symptoms.

Cone-shaped narrowing (“steeppling”) instead of the normal squared shoulder appearance of the subglottic area suggests **croup**. The AP neck radiograph is also helpful in establishing an alternative diagnosis in patients with atypical disease.⁹ The following radiological findings are consistent with these alternative diseases:

- A ragged edge or a membrane spanning the trachea suggests **bacterial tracheitis**
- Thickening of epiglottis and aryepiglottic folds suggests **epiglottitis**
- Bulging posterior pharynx soft tissues suggests **retropharyngeal abscess**

PRACTICE POINT IF RADIOGRAPHS ARE OBTAINED

As progression of airway obstruction may be rapid patients should be monitored during imaging by health care personnel who are able to manage a child’s airway

- ◆ Pulse oximetry is indicated in children with moderate to severe croup. Occasionally children *without* severe croup may have low oxygen saturation due to intrapulmonary involvement.^{7,8} Pulse oximetry is not essential in patients with mild croup.
- ◆ Viral cultures or rapid antigen tests do not aid in the routine management of patients, especially during the epidemic period.

Emergency Department Care

- ◆ Make the child as comfortable as possible, which is usually achieved by having the child sit in the lap of one of the parents/caretakers*
- ◆ Avoid agitating the child with unnecessary procedures*

* *Based on consensus opinion*

- ◆ Blow-by oxygen should be provided to children who are in respiratory distress*
Note that mist therapy has not been shown to have any measurable benefit.^{10,11}
- ◆ Epinephrine is indicated in patients with severe respiratory distress (as indicated by marked sternal wall indrawing and agitation)
 - Improvement occurs within minutes and begins to wear off after one hour.¹²
 - Treatment does not alter disease symptoms beyond two hours.¹²
 - L-epinephrine 1:1000 is as effective as racemic epinephrine and institutional preference may guide management.¹³
 - Nebulized epinephrine therapy does not mandate admission to hospital.^{14,15}
- ◆ Dexamethasone is indicated in all children diagnosed to have croup (including those with only a barking cough without any other signs of respiratory distress)
 - Improvement begins within 2 to 3 hours after administration, and persists for 24 to 48 hours after the administration of a single dose.¹⁶⁻¹⁸
 - Trials have shown clear benefit even in children with very mild symptoms presenting more than a day after start of croup symptoms.^{17,19,20}
 - A potential exception is the rare child with a known immune deficiency or recent exposure to varicella.^{21,22}
 - Dexamethasone may be administered orally in all but those children with very severe croup. Oral dexamethasone (using a parenteral/injectible preparation mixed with a flavoured syrup) is rapidly adsorbed with less than 5% of children vomiting the drug.^{23,24}
- ◆ Nebulized budesonide is not routinely indicated for the treatment of croup.
 - Potential exceptions include: 1) a child who has had persistent vomiting and 2) a child with severe respiratory distress; in these patients, budesonide may be mixed with epinephrine and administered simultaneously.

Nebulized budesonide is likely equivalent but definitely not superior to oral dexamethasone.^{23,25} Administration of a nebulized drug usually takes between 10 and 15 minutes to administer, and most commonly causes significantly more agitation than oral administration of a drug.^{23,25} Further, budesonide is substantially more expensive than dexamethasone.

The dose of budesonide is 2mg. 0.5mg/ml is the appropriate concentration.

- ◆ Neither antibiotics nor oral decongestants are indicated
- ◆ Sedation is contraindicated²⁶

Indications for Admission

Though the vast majority of children can be managed as outpatients, relatively little evidence has been published that addresses exactly which children should be admitted.^{27,28} Therefore these recommendations should be applied with caution.

Absolute

- ◆ Significant respiratory compromise persisting four or more hours after treatment with corticosteroids (*If possible physicians should wait at least 4 hours after treatment with dexamethasone before deciding to admit a child to hospital*)
 - Sternal wall indrawing
 - Easily audible stridor at rest

Relative*

- ◆ Patient living a long distance from hospital or having inadequate transportation
- ◆ Inadequate observation or follow-up is likely
- ◆ Significant parental anxiety exists
- ◆ Recurrent ED visits within 24 hours

In-patient Care

- ◆ Frequent monitoring of respiratory status is required including vital signs and sequential clinical examinations focusing on the child's degree of respiratory distress*
- ◆ Humidified environment:
 - Mist therapy is not recommended^{10,11}
- ◆ Intravenous fluids are usually required only in children with severe respiratory distress*
- ◆ Prescription of appropriate medications (Table 1)

Complications

- ◆ Intubation may be required in a small number of hospitalized patients (< 1%)^{29,30}

- ◆ Bacterial tracheitis can cause a precipitous deterioration in patients initially diagnosed as having croup^{31,32}
- ◆ Cardiopulmonary arrest can occur in patients who are not adequately monitored and managed.
- ◆ Pneumonia is a rare complication of croup³³

Criteria for Discharge from ED

- ◆ The presence of mild symptoms either on initial evaluation or after a period of observation^{27,28}
- ◆ Children should not be discharged earlier than two hours after administration of epinephrine.^{12,14,15,34-36}
- ◆ Parents (caretakers) should be able to return for care if respiratory distress recurs at home*

Supportive Care

- ◆ Provide parent(s)/caregiver(s) with written instructions* (see Appendix 1)
- ◆ Key advice to give parent(s)/caregiver(s) regarding when to return for medical care includes*:
 - If child develops mild respiratory distress, exposure to cool night air may provide adequate relief
 - If child develops more significant respiratory distress *but is not severely agitated or cyanotic*, parents/caregivers can safely drive the child to the nearest emergency department for care.
 - If child develops severe agitation and/or cyanosis, the parents/caretakers should call 911

Follow-up

- ◆ Most children with croup do not require specific follow-up⁴
- ◆ Follow up with a primary care provider or an ED physician should occur in patients who have had prolonged stridor (> one week)*

BACKGROUND

Epidemiology

Croup (laryngotracheobronchitis) is a very common cause of upper airway obstruction in children and has an annual incidence in Alberta of 6 % in children under the age of 6 years.³⁷ Croup is usually caused by the virus parainfluenza and is most prevalent in the late fall to early winter months; however, other viruses have been implicated.¹ Croup occurs most commonly in children between 6 months and 3 years of age, but can also occur in children as young as 3 months and as old as 15 years.¹ It has been reported rarely in adults.³ Boys are affected more often than girls.¹ Though the major concern of parents and health practitioners is the potential for respiratory compromise,³⁸ the vast majority of children can be safely managed at home, and very few require artificial support of their airway.³⁷ In Alberta, more than 60% of children diagnosed to have croup have mild symptoms, about 4 percent are hospitalised, and approximately one in 4,500 children are intubated (approximately one in 170 hospitalized children).^{4,37}

Differential Diagnosis

The vast majority of children who present with acute onset of upper airway obstruction characterized by stridor and indrawing have croup. In general the diagnosis of croup is straightforward; however, rare but problematic causes of stridor must be considered and excluded. The most common alternative diagnosis is bacterial tracheitis.^{29,30} This disease is also the most difficult to distinguish from croup. In fact, bacterial tracheitis is thought to be a superinfection of croup, and can be most readily distinguished from croup by the presence of high fever, toxic appearance, and poor response to epinephrine.³¹ Management of bacterial tracheitis includes intravenous antibiotics and these patients frequently require intubation and respiratory support.

The second most likely alternative diagnosis is epiglottitis. This disease, primarily caused by haemophilus influenzae, was once relatively common in children; however, with the advent of the HIB vaccine, is now relatively rare. A young child with epiglottitis most commonly presents with sudden onset of high fever, dysphagia, drooling, toxic appearance, and is anxious and sitting forward in a “sniffing position”. There is an *absence* of a barking cough. The most crucial aspect of management is to secure the airway, and should only be attempted by physicians extremely experienced in airway management. Any child in whom epiglottitis is being considered should be referred by ambulance and accompanied by a physician.

TABLE 1
PHARMACOTHERAPY

Drug Category	Dose and Duration	Comments
<p>Adrenergic Agonist</p> <ul style="list-style-type: none"> ▪ Epinephrine 	<ul style="list-style-type: none"> ▪ Racemic epinephrine 0.5mL of 2.25% solution diluted in 3mL of NS or sterile water via nebulizer ▪ L Epinephrine 1:1,000 solution 5 ml via nebulizer ▪ May be repeated back-to-back in children with severe respiratory distress 	<ul style="list-style-type: none"> ▪ Racemic epinephrine & L epinephrine are equivalent in terms of effect and safety ▪ The duration of effect of epinephrine does not exceed 2 hours. This patients should not be discharged from medical care for at least 2 hours after receiving a dose of epinephrine.
<p>Corticosteroids</p> <ul style="list-style-type: none"> ▪ Dexamethasone 	<ul style="list-style-type: none"> ▪ 0.6 mg/kg PO/IM once ▪ May repeat dose in 6 to 24 hours 	<ul style="list-style-type: none"> ▪ Oral dexamethasone is well-absorbed and achieves peak serum concentrations as rapidly as with intramuscular administration (without the pain!) ▪ Several controlled trials suggest oral and intramuscular administration yield equivalent results ▪ Experience suggests clinical improvement will begin as early as 2 to 3 hours after treatment ▪ No evidence to suggest multiple doses provide additional benefit over a single dose ▪ Reduces <ul style="list-style-type: none"> - Rate & duration of intubation - Rate & duration hospitalization - Rate of return to medical care - Duration of symptoms in children with mild, moderate and severe symptoms
<ul style="list-style-type: none"> ▪ Budesonide 	<ul style="list-style-type: none"> ▪ 2 mg via nebulizer ▪ (.5mg/ml is the appropriate solution) 	<ul style="list-style-type: none"> ▪ In the vast majority of cases, budesonide offers no advantages over dexamethasone and is substantially more expensive ▪ May be useful in patients with vomiting, severe respiratory distress; budesonide and epinephrine can be administered simultaneously.

Obstruction of the upper airway by a foreign object most commonly presents with a clear history of such; however, rarely, children can present with acute onset of stridor with an occult foreign body, most commonly lodged in the upper esophagus.

Occasionally retropharyngeal abscess and peritonsillar abscess can present with stridor (most children with these problems do not present with stridor). Both of these presentations are very rare. Other extremely rare causes of *acute onset* of stridor include trauma, diphtheria, hereditary angioedema, hypocalcemic tetany, and ingestion of corrosives.

Pathogenesis and Pathophysiology

Viral invasion of the laryngeal mucosa leads to inflammation, hyperemia, edema, epithelial necrosis, and shedding of this region.³⁹ This leads to irritation and narrowing of the subglottic region. Children compensate for narrowing of upper airway by breathing more quickly and deeply. As the narrowing progresses, children's increased effort at breathing becomes counterproductive, airflow through the upper airway becomes turbulent (stridor), their compliant chest wall begins to "cave-in" during inspiration, resulting in inefficient asynchronous chest and abdominal movement, and the child becomes fatigued. At this point, the child becomes hypoxic and hypercapnic, and quickly develops respiratory failure and arrest.^{40,41}

Acute laryngotracheobronchitis may be caused by a variety of viral agents and occasionally by *Mycoplasma pneumoniae*.¹ Parainfluenza type 1 is the most common cause of croup in North America, and parainfluenza type 3 is the second most frequently associated agent.⁴² Influenza A and B, adenovirus, respiratory syncytial virus (RSV), echovirus, and mycoplasma have also been isolated.^{1, 43-45} Rare pathogens include enterovirus, measles, mumps, rhinovirus and *corynebacterium diphtheriae*.

Presentation

The symptoms of croup are commonly preceded by non-specific cough, rhinorrhea, and fever. The characteristic barking cough, stridor, and respiratory distress most commonly develops suddenly during the evening or at night, but occasionally can develop gradually through the course of a day. Stridor typically occurs only during inspiration; but with more severe distress, can be biphasic, occurring during expiration as well. Fever can occur (up to 40°C). Symptoms most commonly are substantially worse at night, and improve during the day. The majority of children with croup resolve their obstructive symptoms within 48 hours, though a small percentage of children remain symptomatic

for up to 5 or 6 days.⁴ Though onset of respiratory distress often occurs suddenly, it is rare for children to have such severe distress that they quickly (within minutes) develop respiratory failure; failure typically occurs over several hours. Signs of respiratory failure and imminent respiratory arrest include reduction in respiratory effort, lethargy, pallor and dusky appearance.

Many medical texts distinguish several types of croup. The most common distinction made is between acute laryngotracheobronchitis (LTB) and spasmodic croup.^{2, 39} Acute LTB is described as an illness in which children have a viral prodrome (non-specific cough, rhinorrhea, and fever) for 12 to 48 hours, whereas spasmodic croup is described as an illness in which symptoms occur precipitously without a viral prodrome.³⁹ This latter type of croup is not characterized by fever, and symptoms are supposed to be more transient, than in children with acute LTB. Children with spasmodic croup are thought to have recurrent episodes. Though these types of croup are widely described in texts, no well-designed cohort studies with careful follow-up have been published which clearly documents that these described differences are valid or support the clinical importance of making these distinctions.

Management

Supportive Care

Because croup symptoms often occur precipitously at night, many parents are quite frightened by this disease, resulting in transport to an emergency department.³⁸ Consequently it is important to educate parents about the self-limited nature of the disease and on how and when to expose their symptomatic child to cold air to reduce symptoms.

Mist

Children with croup have been treated with humidified air for more than a hundred years, dating back to the use of "croup kettles" during the prior century. Despite the long history of use, relatively few experimental studies have been published.¹¹ One well-designed, moderate-sized study and two extremely small studies have failed to show a benefit to mist therapy.^{10, 11} Given the absence of evidence for its benefit, mist wanes, bedside humidifiers, nor mist tents can be recommended. Mist tents, in particular, should not be used because they frequently cause young children to be agitated due to tents being a wet, cold, "caged" environment that separates the child from their parents.⁴⁶ Furthermore, mist tents are often improperly cleaned between use and may disperse contaminants into the child's room.¹¹

Oxygen

The administration of oxygen should be reserved for children with hypoxia (oxygen saturation on room air < 92%) and significant respiratory distress and should never be forced on a child, especially if it results in significant agitation. “Blow-by” (administration of oxygen through a plastic hose with the end opening held near the child’s nose and mouth) is often the most beneficial way of administering oxygen.

Helium-Oxygen Mixtures

Administration of helium to children with croup has been proposed because of the potential of the lower density gas (relative to nitrogen) to decrease turbulent airflow in a narrowed airway. This treatment modality, in experienced hands, may have some benefit in children with very severe respiratory distress. There is insufficient evidence, however, to advocate its general use.⁴⁷⁻⁵¹

Pharmacotherapy

Analgesics/Antipyretics

Though no controlled trials have been published addressing the use of analgesics or antipyretics specifically in children with croup, it is reasonable to suppose that they make children more comfortable by reducing fever and pain.

Antitussives and Decongestants

No experimental studies have been published regarding the potential benefit of antitussives or decongestants in children with croup. Furthermore, there is no rational basis for their use, and therefore should not be administered to children with croup.

Antibiotics

No controlled trials have been published regarding the potential benefit of antibiotics in children with croup. As croup is virtually always due to a viral infection, empiric antibiotic therapy is not rational. Furthermore “super-infection” of children with croup - most commonly bacterial tracheitis and occasionally pneumonia - is such a rare phenomenon (less than 1 in 1,000) that the use of antibiotics for “prophylaxis” is also not rational.

Epinephrine

Based on historical data, the administration of epinephrine in children with severe croup substantially reduces the number requiring an artificial airway.⁵² Epinephrine has been shown, through the use of both clinical assessments and several novel methods for assessing severity, to substantially reduce respiratory distress within 10 minutes of administration and to last for more than an hour.^{12, 26, 53-57}

All effects of epinephrine administration, however, wear off by two hours after administration.¹² Patients treated with epinephrine return to their “baseline” severity and they do not routinely develop worse symptoms (the so-called ‘rebound’ effect) than they had prior to treatment.¹² A number of retrospective and prospective studies have been published that suggest that patients treated with epinephrine may be safely discharged home as long as their symptoms do not recur for at least 2 to 3 hours after treatment.^{14, 15, 18, 34-36}

The racemate form of epinephrine is traditionally used to treat patients with croup; however, epinephrine 1:1000 has been demonstrated to be comparably effective and as safe as the racemate form.¹³ A single size dose (0.5 ml of 2.25% racemic epinephrine and 5.0 ml of epinephrine 1:1000) is used in all children regardless of size. Children’s relative size of tidal volume is thought to modulate the dose of drug actually delivered to the upper airway.

In children with near respiratory failure, “back-to-back” administration of epinephrine can be used. “Continuous” epinephrine is reportedly used in some pediatric intensive care units; however, there is one published report of an otherwise normal child with severe croup treated with three nebulizations of epinephrine within one hour who developed ventricular tachycardia and a myocardial infarction.⁵⁸ Therefore repeat doses of epinephrine should never be used unless a child has near respiratory failure. If “back-to-back” therapy is considered necessary, the treating physician should contact a pediatric intensivist as soon as possible regarding further treatment and transport.

Glucocorticoids

Steroids are the mainstay of therapy for croup. On the basis of more than twenty randomized controlled trials and two meta-analyses, corticosteroids have been shown to reduce the number and duration of intubations, the need for reintubation, the rate and duration of hospitalizations, and the rate of return to a health care practitioner for persistent croup symptoms.^{16, 18, 59-61} A recently completed large multi-centre Canadian study involving 720 children with mild croup showed those children treated with dexamethasone, as compared with placebo, had half the rate of return to a health care practitioner (7% vs. 15%), had substantially less severe croup symptoms and lost less sleep in the 48 hours after treatment. Further, their parents experienced less stress in the 24 hours following treatment, and both the families and the health care system incurred slightly fewer costs - on average, \$21 per child.¹⁷ Benefit appeared to be just as great in those children with very mild symptoms (only a barking cough) and those who had had croup symptoms for several days at the time of assessment. No

adverse effects occurred in either treatment group. Therefore all children diagnosed to have croup (as evidenced by the presence of a seal-like barking cough) should be treated with corticosteroids, with the rare exception of a child with known immune deficiencies or recent definite exposure to varicella.

Dexamethasone appears to be equally effective if given orally or parenterally.^{62,63} However, oral administration is preferred as it is generally less traumatic. The traditional dose of dexamethasone is 0.6 mg/kg.² However, there is some evidence that lower doses (0.15 mg/kg) are equally effective.⁶⁴ On the other hand, a meta-analysis of controlled trials suggests higher doses of corticosteroids yield a clinically important response in a greater proportion of patients.⁶¹ No controlled studies have been published that examine whether or not multiple doses of corticosteroids provide greater benefit than a single dose. Given the short duration of croup symptoms in the majority of patients, however, a single dose of corticosteroid is probably sufficient in most patients.

Inhaled budesonide has been shown to be effective and equivalent to oral dexamethasone.^{23,25} However, since budesonide is no more effective than dexamethasone, is generally more traumatic to administer, and is substantially more expensive, it should not be routinely used. However, in patients with severe or near respiratory failure, the simultaneous administration of budesonide and epinephrine is logical and may be more effective than epinephrine alone. In addition, in children who vomit oral medications, inhalational administration of steroids may be a reasonable alternative.

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Toward Optimized Practice (TOP) Program

Arising out of the 2003 Master Agreement, TOP succeeds the former Alberta Clinical Practice Guidelines program, and maintains and distributes Alberta CPGs. TOP is a health quality improvement initiative that fits within the broader health system focus on quality and complements other strategies such as Primary Care Initiative and the Physician Office System Program.

The TOP program supports physician practices, and the teams they work with, by fostering the use of evidence-based best practices and quality initiatives in medical care in Alberta. The program offers a variety of tools and out-reach services to help physicians and their colleagues meet the challenge of keeping practices current in an environment of continually emerging evidence.

Toward Optimized Practice Leadership Committee

Alberta Health and Wellness
 Alberta Medical Association
 Regional Health Authorities
 College of Family Physicians of Canada, Alberta Chapter

To Provide Feedback

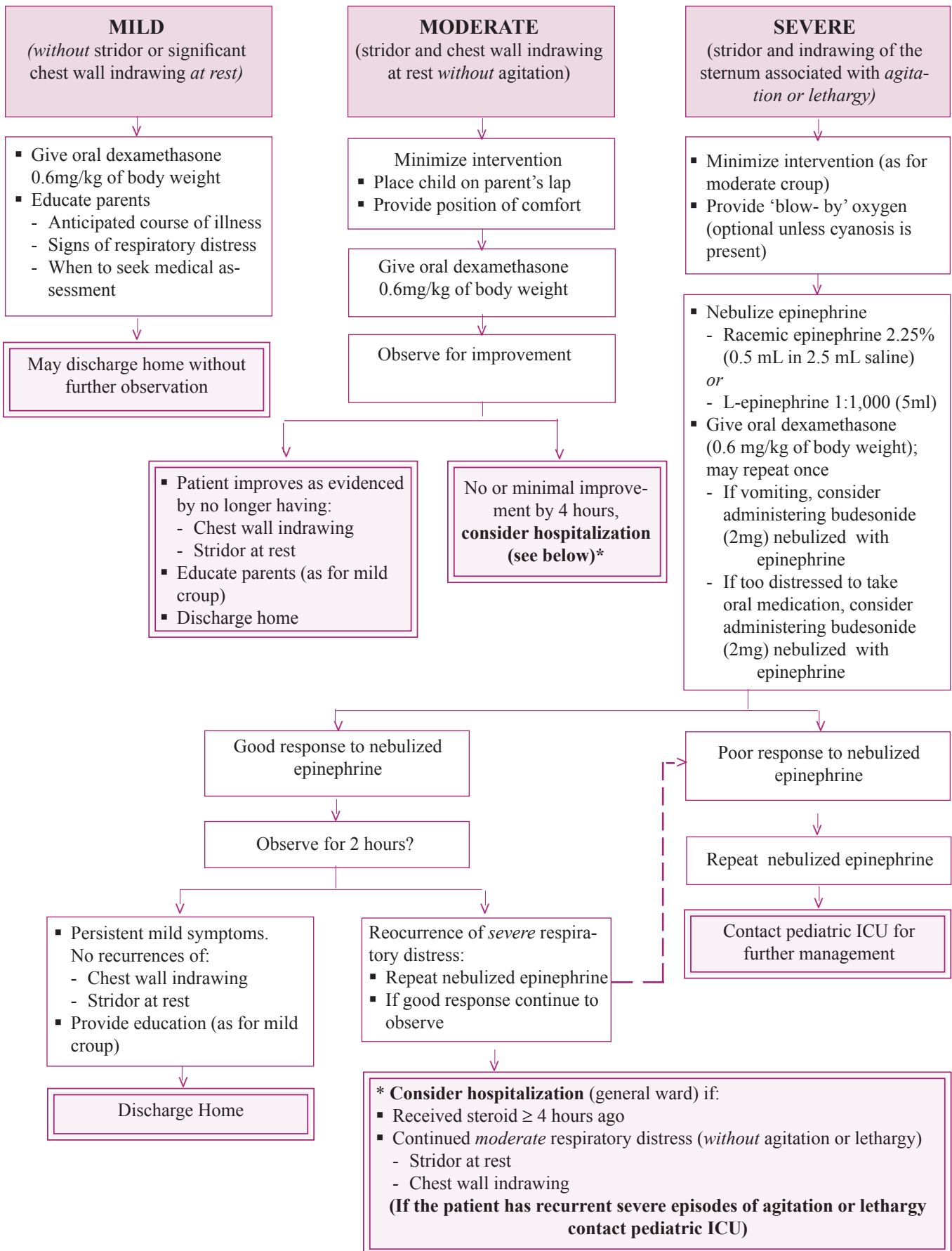
The Croup Working Group is composed of pediatric sub-specialties, emergency and family physicians. The Working Group encourages your feedback. If you need further information or if you have difficulty applying this guideline, please contact:

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*Croup - July 2003
 Reviewed January 2005
 Revised January 2008*

ALGORITHM: CROUP IN THE OUT-PATIENT SETTING

Based on severity at time of initial assessment



APPENDIX 1: INSTRUCTIONS FOR PARENTS OF A CHILD WITH CROUP

What is Croup?

- ◆ Your child has croup, a virus that, in children, causes swelling of the windpipe near the voice box. The swelling can cause a ‘barky, seal-like’ cough, a hoarse voice, and often a ‘crowing’ sound as your child breathes in. This sound is referred to as ‘stridor’.
- ◆ The virus that causes croup is contagious. It is spread when your child coughs and breathes. In other family members – especially adults - this same virus can cause simple ‘cold-like’ symptoms such as hoarseness, cough, sore throat, and a runny nose.
- ◆ Your child’s croupy cough will most likely disappear within a couple of days, though a few children continue to have a croupy cough for up to 7 days. Croup often disappears as quickly as it started, but in some cases, the harsh barky cough is followed by a loose cough and runny nose. Some children also develop ear infections.
- ◆ Croup is usually worse at night. Children who seemed well at bedtime can suddenly wake up with a barky cough and difficulty breathing. They often seem better during the day but then worsen again the next night.
- ◆ Croup recurs in some children but it is usually mild and over with quite quickly. Children eventually “outgrow” the croup symptoms, usually by ten years of age, though some not until they are teenagers.

What can I do to make my child more comfortable?

- ◆ If your child has a fever or a sore throat, you may give him or her acetaminophen (Temptra® or Tylenol®) or ibuprofen (Advil® or Motrin®). Doses are recommended on the side of the bottle, or ask a health care professional. **Never give your child more than 5 doses of acetaminophen or more than 4 doses of ibuprofen in a 24 hour period.**
- ◆ You can open your child’s bedroom window a bit to let the cold air in, but remember to dress your child warmly. Don’t worry - neither you nor your child will get sick from breathing cold air.
- ◆ Encourage ‘cold’ fluids such as juice, a slushy, or a Popsicle. Children with croup usually have a ‘sore throat’, and this may help to soothe it.
- ◆ If your child starts to make easily heard ‘croupy sounds’, and they are **NOT** ‘blue in the face’ or very restless with trouble breathing, try these ‘home treatments’:
 - In colder weather, bundle him/her up in warm clothes and take him or her outside in the colder air for 5 to 10 minutes.
 - In warmer weather, after making sure that your child is warmly dressed, open the freezer door and allow him or her to breath the cold air.
 - **Most importantly - if your child is upset - comfort him/her, and speak calmly and in quiet tones. This will help more than anything to reduce breathing problems.**

How can I monitor my child to be sure they are okay?

- ◆ Croup is a ‘noisy’ disease, so you can check up on your child by always being within hearing range.
- ◆ Every once in a while watch and listen to your child breathing without a shirt or blanket covering their chest so that you can tell if they are having difficulty breathing, and need to be checked by a doctor:
 - Listen for a ‘crowing sound’ while your child is breathing in. If you hear this sound, note whether you hear it all the time, even when he/she is calm, or only when he/she is upset and crying.
 - Look to see whether your child’s chest wall or the notch just below their ‘Adam’s Apple’ is ‘sucking’ or ‘caving in’.
 - See if you can get them to calm down or if they remain upset and restless even when you try to calm them.
 - After making sure that you have enough light to see well, notice the coloring of your child’s lips and face, checking for a ‘bluish-grey’ color.

The croup guideline for physicians and this patient hand-out were developed by a Clinical Practice Guideline working group which promotes appropriate, effective and quality medical care in Alberta. July 2003. Reviewed 2007

*This information is also available on the Alberta Medical Association web site:
www.albertadoctors.org*

Should I call 911?

- ◆ **Call if:**
 - **Your child's face is bluish-grey in color for more than a few seconds; *or***
 - **Your child becomes unusually sleepy or 'glassy-eyed' while making croupy sounds; *or***
 - **Your child is really stressed, is struggling to breathe, and you can not calm them within a few minutes.**
- ◆ **Remember that ambulance paramedics can start treatment for your child immediately, so that, if your child has very severe symptoms, it is safer to call '911' than to drive to the nearest hospital in your car.**

Should I seek medical care right away?

- ◆ Seek care right away if - after exposing your child to cold air:
 - Your child makes a persistent, easily heard 'crowing sound' with breathing.
 - Your child's chest wall 'sucks in' or 'caves in' as they breath.
 - Your child continues to have croupy symptoms that cause them to be significantly agitated or restless.
- ◆ When getting ready to go to the emergency department (or your doctor's), remember to dress both you and your child warmly, and - if it is not too cold outside - roll down your car window a bit. Breathing the cold air improves children's croupy symptoms, so that your child will most likely be quite a bit better when you arrive at the emergency department (or your doctor's office).

What medical treatment improves croup?

- ◆ Because a virus causes croup, antibiotics do not help.
- ◆ Anti-histamines and decongestants (over-the-counter 'cold' medications) DO NOT improve croup symptoms.
- ◆ 'Mist' therapy has been used for many years but it has never actually been shown to help improve croup symptoms.
- ◆ The most effective treatment for croup is dexamethasone, a kind of corticosteroid. Usually only one dose given by mouth is necessary. This medication, which is very safe, helps to reduce breathing troubles, reduces the chances that your child will need to come into hospital or return for medical care. This medicine starts to work within 2 or 3 hours, and lasts for a couple of days.
- ◆ Another effective treatment is an adrenaline (epinephrine) breathing mask, which works within minutes but lasts less than two hours. This is usually used only in children with more severe symptoms.

Is it safe for my child to come home (or should they stay in the hospital)?

- ◆ Most children with croup have mild symptoms so that it is safe for your child to be at home while they get better.
- ◆ About one in 25 children (4%) with croup needs to be kept in hospital for a few days until their breathing improves. If your child has to stay in the hospital, they will be watched, and if their breathing becomes really hard they will be given more adrenaline masks.
- ◆ Of those children who have to stay in hospital, one in every 100 (1%) have so much problem breathing that they need to have a special breathing tube put down their windpipe to help them breathe for a few days. If this is necessary, your child would be transferred to an Intensive Care Unit (ICU). Even children with the most severe symptoms almost always get completely better within one or two weeks, without any left over problems.

Can I prevent my child from getting croup?

- ◆ There is no way to prevent your child from getting croup but hand washing helps to stop the spread of the viral infection that causes croup.