

Consensus Guidelines for Management of Croup: Northern California Pediatric Hospital Medicine Consortium

Executive summary

Objectives

- Standardize the care of pediatric patients with viral croup in acute care, ER, and inpatient settings
- Decrease utilization of non-evidence-based evaluation and treatment modalities for croup

Recommendations

- Consider alternative diagnoses in patients with atypical or severe clinical presentation, or those with poor response to standard treatments
- Do *not* routinely order laboratory testing (including viral testing)
- Do *not* routinely order x-rays
- Use the consensus croup algorithm (appendix 1) for classifying severity and managing accordingly
- Administer Dexamethasone to *all* patients with a diagnosis of croup, regardless of symptom severity
- Do *not* routinely give repeat doses of steroid
- Discharge patients meeting the following criteria:
 - No or minimal stridor at rest
 - No or minimal work of breathing
 - Able to talk and feed without difficulty
 - >2 hours from last racemic epinephrine treatment
 - No supplemental oxygen requirement

Methods

This guideline was developed through local consensus based on published evidence and expert opinion as part of the UCSF Northern California Pediatric Hospital Medicine Consortium.

Metrics Plan

- Percentage of patients with discharge diagnosis of croup that receive Dexamethasone

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Clinical Consensus Guidelines

Introduction

Criteria for Use of Guideline

- Inclusion:
 - Previously healthy children
 - Common age: 6 months – 6 years
 - History & clinical exam consistent with primary diagnosis of croup
- Exclusion:
 - Toxic appearance
 - Symptoms suggestive of alternative diagnosis (see below)
 - Known upper airway abnormality or chronic lung disease
 - Recent airway instrumentation
 - History of chronic / recurrent aspiration
 - Neurologic impairment (hypotonia or neuromuscular disorder)
 - Immunocompromise

Background

- Croup (laryngotracheobronchitis) is a viral illness, most common in late fall to early winter, leading to inflammation of the upper airway
 - Most common pathogen: parainfluenza virus
 - Others: RSV, influenza A and B, Mycoplasma pneumonia, other respiratory viruses
- Symptoms:
 - Sudden onset of barky cough
 - Inspiratory stridor
 - Hoarse voice
 - +/- Antecedent URI symptoms
 - +/- Fever
 - +/- Respiratory distress
- Natural History:
 - Symptoms worse at night
 - Typical resolution after 3 days
 - Commonly followed by URI symptoms

Evaluation

Alternative Diagnoses

- Differential Diagnosis:

- Bacterial tracheitis
- Epiglottitis
- Foreign body aspiration
- Allergic reaction
- Trauma
- Paratonsillar or retropharyngeal abscess
- Diphtheria
- Infectious mononucleosis
- Spasmodic croup
- Laryngeal nerve compression
- Subglottic stenosis
- Subglottic hemangioma
- Tumor
- Consider alternative diagnoses IF:
 - Age < 6 months or > 6 years
 - Duration of stridor > 4 days or cough > 10 days
 - History of non-elective intubation in past 6 months
 - History of prolonged intubation
 - History of recurrent croup
 - 2nd episode within 30 days
 - > 3 episodes within last 12 months
 - Toxic appearance
 - Drooling, difficulty swallowing, severe anxiety
 - Asymmetry of respiratory exam
 - Cutaneous hemangiomas present
 - Hypoxia / cyanosis
 - Poor response to treatment

Severity Assessment

- Quantitative measurement of severity using a scale such as the Westley Croup Score is impractical for routine use in acute care / inpatient settings
- Qualitative clinical severity assessment is recommended:
 - *NOTE:* use clinical gestalt to determine severity classification; patients may have one or more sign or symptom within a selected severity category
 - Mild
 - Barky cough, hoarse voice
 - No stridor at rest
 - Mild coarse stridor only during agitation / activity
 - No or mild work of breathing
 - Moderate
 - Stridor at rest
 - Tachypnea
 - Moderate work of breathing
 - Anxiety / agitation / restlessness
 - Difficulty talking or feeding

- Severe
 - Stridor at rest
 - Severe work of breathing or respiratory fatigue
 - Self-positioning (example: tripodding, neck extension)
 - Decreased LOC
 - Inability to talk or feed
- Impending Respiratory Failure
 - Stridor may be present or decreased
 - Severe work of breathing
 - Bradypnea or poor respiratory effort
 - Cyanosis / hypoxemia despite supplemental oxygen
 - Hypercarbia
 - Listless / decreased LOC

Lab Testing & Imaging

- **Labs:** Routine lab testing (*including* respiratory viral testing) NOT recommended
 - Consider arterial blood gas if suspected / impending respiratory failure
- **Imaging:** Routine imaging (CXR or lateral neck x-ray) NOT recommended
 - Consider imaging if atypical presentation or suspected alternative diagnosis

Management

Acute Management Algorithm

- See APPENDIX 1 for croup algorithm

Admission & Discharge Criteria

- ER Discharge criteria
 - Croup symptoms mild or improved from presentation
 - No or minimal stridor at rest
 - No or minimal work of breathing
 - Able to talk and feed without difficulty
 - >2 hours since last racemic epinephrine treatment
 - <3 total racemic epinephrine treatments
 - Received dexamethasone
- Admission criteria
 - Pediatric Ward
 - Persistent moderate symptoms after Dexamethasone & racemic epinephrine
 - Continued stridor at rest despite therapy
 - Inadequate hydration
 - Moderate work of breathing
 - Need for supplemental oxygen

- Atypical presentation / concern for alternative diagnosis
 - PICU / Transfer to higher level of care
 - Persistent severe croup symptoms despite therapy
 - Escalating stridor at rest despite therapy
 - Need for intubation in ER
 - Impending respiratory failure
 - Bradypnea or poor respiratory effort
 - Severe work of breathing
 - Stridor may be present or decreased
 - Cyanosis / hypoxemia despite supplemental oxygen
 - Hypercarbia
 - Lethargy / decreased LOC
- Hospital discharge criteria
 - Croup symptoms mild or improved
 - No or minimal stridor at rest
 - No or minimal work of breathing
 - Able to talk and feed without difficulty
 - Able to maintain adequate hydration
 - >2 hours since last racemic epinephrine treatment
 - >12 hours since supplemental oxygen requirement
 - Consider postponing discharge until after an event-free/symptom-free NIGHT, unless respiratory exam is completely normal
- Follow-up
 - Consider phone or in person follow-up with PMD in 1-2 days depending on reliability of patient/family and access to care

Therapies

- Medications:
 - See APPENDIX 2 for medication dosing
 - Steroids:
 - *NOTE:* no conclusive studies recommend one drug, dose, or route over another. Oral route may be preferred due to non-invasiveness causing less stress for the child. However, IM, IV, or neb routes may be useful in children who cannot tolerate oral medications.
 - Dexamethasone: single PO dose
 - Administer for *all* patients with croup (regardless of severity)
 - Alternative routes: IV, IM
 - No evidence supports repeated doses of dexamethasone
 - *NOTE:* For severe or atypical cases, repeat steroid doses may be considered; consultation with pediatric subspecialists (PICU, ENT) is recommended
 - Budesonide: single nebulized dose
 - Evidence demonstrates equal efficacy to Dexamethasone but more expensive medication

- Consider as alternative to Dexamethasone in children with emesis, severe respiratory distress, or parental refusal of systemic steroid
 - Prednisone / Prednisolone are *NOT* recommended
 - Nebulized Epinephrine: racemic or L-epinephrine doses PRN
 - Nebulized L-epinephrine may be used as an alternative to racemic epinephrine in settings where racemic epinephrine is unavailable (e.g. EMS vehicles)
 - The clinical effect of nebulized epinephrine is apparent at 30 minutes post-treatment and the clinical benefit of racemic epinephrine has dissipated at 120 minutes (*NOTE*: L-epinephrine may have longer half-life)
 - There is no evidence to suggest that croup symptoms, on average, worsen after the treatment effect of nebulized epinephrine dissipates
- Supportive Care & monitoring
 - Oxygen
 - Initiate supplemental oxygen for saturations <90% in room air
 - *NOTE*: hypoxia in croup is uncommon; consider alternative diagnoses in patients with significant hypoxia
 - Continuous pulse oximetry *NOT* routinely recommended
 - Consider continuous monitoring for unstable patients or those receiving numerous repeated doses of racemic epinephrine
 - Cool mist in ER / hospital settings *NOT* supported by evidence
 - There is no supporting evidence for added benefit of cool mist over other evidence-based therapies in hospital setting
 - Cool mist therapy / moist night air is still recommended + has potential benefit in home setting; recommend to families at ER/hospital discharge
 - Antipyretics PRN
 - Avoid painful procedures and maintain calm atmosphere (example: child in parent's arms for exam and therapies) since agitation may worsen clinical status
- Therapies *NOT* Recommended:
 - Antibiotics
 - Decongestant or antitussive medications
 - Heliox
- Subspecialty consultation (ENT, anesthesia, pulmonology, ID, surgery, etc) indications:
 - Severe / impending respiratory failure
 - Intubation / need to secure critical airway
 - Atypical or complicated presentation (rule-out alternative diagnoses)
 - Recurrent croup
- Critical airway stabilization
 - Intubation:
 - Personnel:
 - Recognize clinical deterioration quickly and activate expert providers with greatest airway skills immediately when respiratory failure + potential need for intubation is identified (consider anesthesia or PICU if available)

- Most experienced provider should intubate
- Equipment:
 - Cuffed ET tube (if available): cuff deflated; use high volume, low pressure cuff if available
 - ETT size: $4 + \frac{1}{4} \times \text{age}$, minus 0.5 for cuffed tube; 0.5 size lower ETT also available for back-up
- Sedation:
 - Use RSI (or protocol most familiar to providers) for intubation
 - *NOTE:* If aspiration is a likely alternative diagnosis, use caution when considering intubation. Paralysis is relatively contraindicated as it is important to maintain spontaneous respirations so potential partial obstruction doesn't become complete
- Supportive resources:
 - For non-invasive PPV, choose a flow-dependent bag over self-inflating bag for option of delivering CPAP (providing PEEP) while awaiting intubation
 - Consider placing salem sump/NG tube to decompress stomach from non-invasive PPV, once patient is appropriately sedated

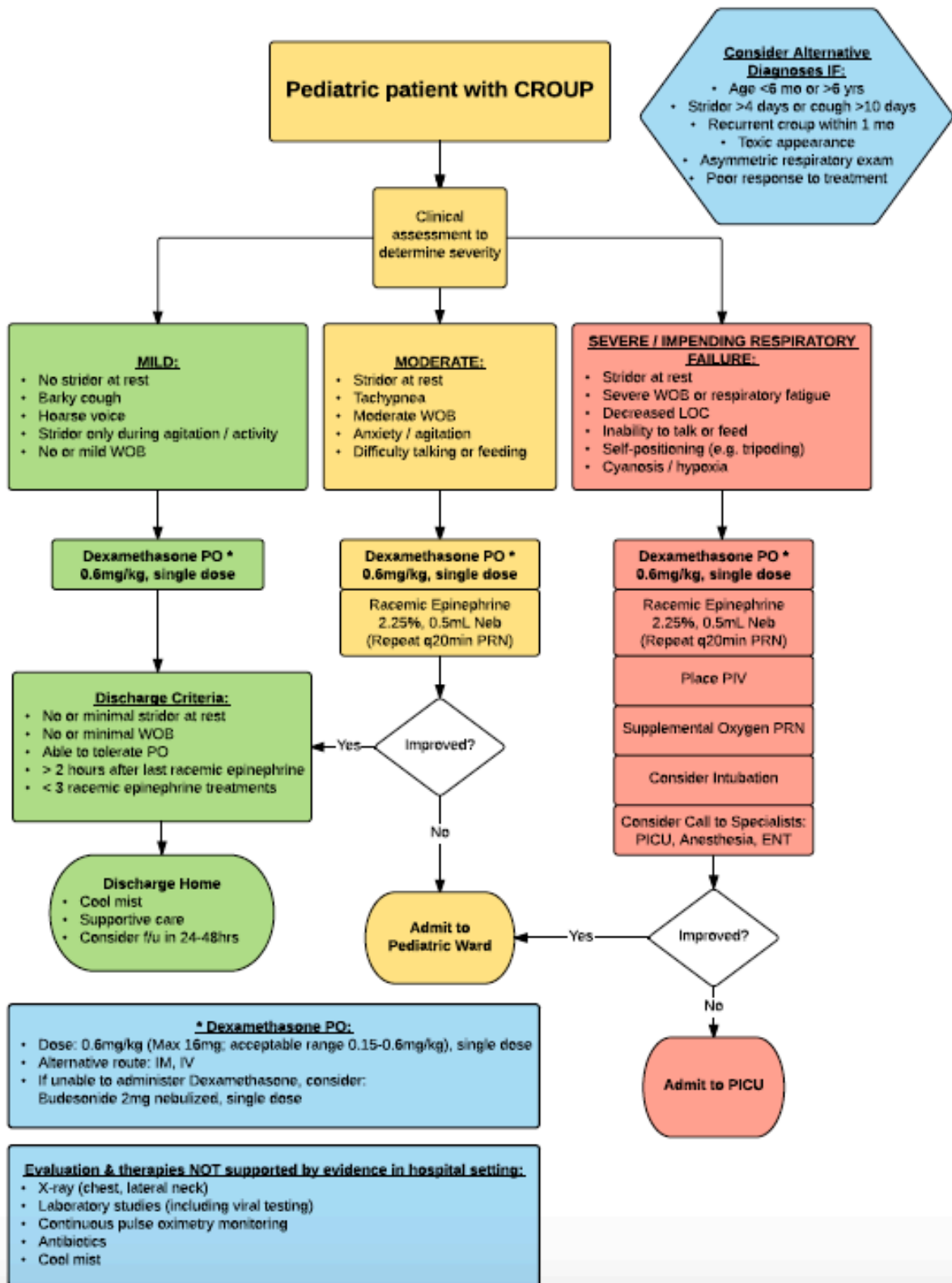
References

- Beigelman A, Chipps BE, Bacharier LB. Update on the utility of corticosteroids in acute pediatric respiratory disorders. *Allergy Asthma Proc*, 2015;36:332-338.
- Bjornson C, et al. 2011. Nebulized epinephrine for croup in children. *Cochrane Database of Systematic Reviews*, 2, 006619.
- Cetinkaya F, Tufekci BS, Kutluk G. A comparison of nebulized budesonide, and intramuscular, and oral dexamethasone for treatment of croup. *Int J Pediatr Otorhinolaryngol*, 2004;68(4): 453-456.
- Johnson DW, Jacobson S, Edney PC, et al. A comparison of nebulized budesonide, intramuscular dexamethasone, and placebo for moderately severe croup. *N Engl J Med*, 1998;339:498-503.
- Mandal A, Kabra SK, Lodha R. Upper Airway Obstruction in Children. *Indian J Pediatr*, 2015;82(8):737-744.
- Petrocheilou A, Tanou K, Kalampouka E, et al. Viral Croup: Diagnosis and a Treatment Algorithm. *Pediatr Pulmonol*, 2014;49:421-429.
- Russel KF, et al. 2011. Glucocorticoids for croup. *Cochrane Database of Systematic Reviews*, 1, 001955.
- Taketomo CK, Hodding JH, Kraus DM. Pediatric & Neonatal Dosage Handbook: A Universal Resource for Clinicians Treating Pediatric and Neonatal Patients, 21st ed. Hudson, OH: Lexi-Comp, 2014.
- Zoorob, R, Sidani M, Murray J. Croup: An Overview. *Am Fam Physician*, 2011;83(9):1067-1073.

Published U.S. Children’s Hospital Croup Guidelines / Pathways:

- **Children’s Hospital of Philadelphia Pathways (links):**
 - Emergency Department Pathway: <http://www.chop.edu/clinical-pathway/croup-emergent-evaluation-and-treatment-clinical-pathway#>
 - Inpatient Pathway: <http://www.chop.edu/clinical-pathway/croup-clinical-pathway>
- **Seattle Children’s Hospital Pathway (PDF):**
<http://www.seattlechildrens.org/healthcare-professionals/gateway/pathways/>
- **University of Cincinnati Best Evidence Statement (PDF):**
<http://www.cincinnatichildrens.org/service/j/anderson-center/evidence-based-care/recommendations/topic/>
- **Colorado Children’s Hospital Guideline (PDF):**
<http://www.childrenscolorado.org/health-professionals/referral-tools/referral-guidelines>

APPENDIX 1: Croup Algorithm



APPENDIX 2: Medications for Croup

Medication	Usual Dose	Dosing Range	Onset	Duration	Notes
Corticosteroids					
Dexamethasone	Preferred: 0.6 mg/kg (max 16 mg/dose) PO x1 Alternative: 0.6 mg/kg (max 16 mg) IM/IV x1	0.15-0.6 mg/kg (max 16 mg)	30 min	24-72 hours	<ul style="list-style-type: none"> Repeat doses are NOT recommended
Budesonide	2 mg nebulized x1	0.5-4 mg (max 4 mg)	1-2 hours	-	<ul style="list-style-type: none"> Consider as second-line to dexamethasone Repeat doses are NOT recommended Non-formulary at some institutions
Nebulized Epinephrine					
Racemic Epinephrine 2.25%	0.5 mL, diluted in 2 mL NS, nebulized q20 min PRN stridor <5 kg: consider 0.25 mL/dose	0.05-0.1 mL/kg (max 0.5 mL)	10-30 min	2-3 hours	<ul style="list-style-type: none"> Usually use fixed dose Only for moderate severity and above Inpatient frequency: q2 hours PRN stridor
L-epinephrine 1:1000	0.5 mL/kg (max 5 mL/dose), diluted in 2 mL NS, nebulized q20 min PRN stridor	0.5 mL/kg (max 5 mL/kg)	10-30 min	2-3 hours	<ul style="list-style-type: none"> Consider as alternative to racemic epinephrine if available in EMS vehicles Only for moderate severity and above Not available at many institutions