

Croup Guideline

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Definition:

Croup is a common childhood respiratory illness characterized by a cough, often accompanied by inspiratory stridor, hoarseness, and respiratory distress. The telltale sign of croup is a 'barking' cough. The symptoms are often attributed to inflammation of the larynx and subglottic airway.

Incidence: ^(1, 2)

Croup accounts for more than 15% of respiratory tract diseases seen in pediatric practice. Viral croup is primarily a disease of children <6 years old with a peak incidence between 6 months and 3 years of age; ⁽³⁾ it is uncommon in children >6 years old. In the United States, its peak incidence is about 5 cases per 100 children during the second year of life. Although most cases occur during the late fall and winter, croup can manifest throughout the year. It is more common in boys than in girls with a 1.5:1 ratio. ⁽²⁾ Approximately 85% of cases are defined as mild croup and less than 1% are considered severe croup.

Etiology: ^(1, 2)

Croup is most commonly viral and rarely caused by bacterial infection.

Viral

- Parainfluenza viruses (types 1, 2, and 3) account for more than 65% of croup cases. Types 1 and 2 are primarily responsible for viral croup or acute laryngotracheitis.
- Other causes include influenza A and B, measles, adenovirus, and respiratory syncytial virus (RSV). The most severe laryngotracheitis has been noted in association with influenza A viral infections.
- Spasmodic croup is caused by viruses that also cause acute laryngotracheitis, but lack signs of infection.

Bacterial

- Bacterial croup is divided into laryngeal diphtheria, bacterial tracheitis, laryngotracheobronchitis, and laryngo tracheo bronchopneumonitis.
- Laryngeal diphtheria is caused by *Corynebacterium diphtheriae*. Bacterial tracheitis, laryngotracheobronchitis, and laryngo tracheo bronchopneumonitis typically begin as viral infections, which worsen due to secondary bacterial growth.
- Bacterial infection may occur secondarily with the most common bacterial pathogens being *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*.

Differential Diagnosis: ⁽⁴⁻⁸⁾

- Angioedema
- Bacterial tracheitis is suspected if high fever, toxic appearance, and poor response to epinephrine.
- Epiglottitis is suspect if sudden onset of symptoms with high fever, absence of 'bark cough', dysphagia, drooling, anxious in appearance and sitting forward.
- Foreign body aspiration
- Laryngomalacia/ Tracheomalacia
- Peritonsillar, parapharyngeal or retropharyngeal abscess - may present with fever, drooling, neck stiffness lymphadenopathy, and varying degrees of toxicity. A barking cough is usually absent.
- Spasmodic croup
- Congenital anomalies of the upper airway (laryngeal webs, laryngomalacia, congenital subglottic stenosis, subglottic hemangioma, bronchogenic cyst, laryngeal papillomas, and vocal cord paralysis)
- Anaphylaxis
- Upper airway injury - usually no fever or a viral prodrome.

Guideline Inclusion Criteria:

Age 6 months to 6 years

A previously healthy patient presenting with signs/symptoms consistent with viral croup

- Barky cough
- Stridor
- Hoarse voice
- Moderate respiratory distress

Guideline Exclusion Criteria:

Toxic appearance

Symptoms suggestive of an alternate diagnosis

Known upper airway abnormalities

Hypotonia or neuromuscular disorder

Complex medical comorbidities

Clinical Presentation

Viral croup symptoms usually start like an upper respiratory tract infection. The patient may likely present with low-grade fever, nasal discharge, congestion, and catarrhal inflammation of the mucous membrane in the nose. Usually, it progresses over 12 to 48 hours to include fever, hoarseness, barking cough, and stridor. Respiratory distress (nasal flaring, respiratory retractions, stridor) increases as upper airway obstruction becomes more severe. As airway obstruction progresses, the child may become restless or anxious. When airway obstruction becomes severe, suprasternal, subcostal, and intercostal retractions may be seen.

Critical Points of Evidence

Evidence Supports

- There are a number of validated clinical scoring systems that are used to assess croup severity. The Westley croup score has been the most extensively studied. (see [addendum 1](#))
- Humidification therapy does not improve croup symptoms in patients with mild to moderate disease in the emergency department setting ¹⁰⁻¹²
- Treatment of croup with corticosteroids is beneficial, even with mild illness ¹³⁻¹⁴
- Nebulized epinephrine improves outcomes in patients with moderate to severe croup.
- The use of L-epinephrine has been proposed instead of racemic epinephrine in patients with moderate to severe croup because it is efficacious, well tolerated, and less expensive. ¹⁵

Practice Recommendations and Clinical Management

Evaluation

The immediate goal of the evaluation is to promptly identify patients with severe upper airway obstruction or those at risk for rapid progression of upper airway obstruction. Rapid assessment of general appearance (including the presence of stridor at rest), vital signs, pulse oximetry, airway stability, and mental status is necessary to identify children with severe respiratory distress and/or impending respiratory failure.

Not Routinely Indicated for Croup

- Mist: Humidified air with or without oxygen is not indicated
- Antitussive or decongestant medications are not indicated
- Antibiotics play no role in viral croup
- Radiographs are not routinely indicated (see [exceptions](#))

Laboratory Testing

Viral testing is not routinely performed. Croup is a clinical diagnosis and usually no testing is needed.

Imaging

Croup is a clinical diagnosis and usually no imaging is needed. (see [exceptions](#))

Consults/Referrals:

Consult ENT inpatient if concerns for:

- other etiology of stridor/alternate diagnosis
- prolonged/severe course and/or
- Inadequate response to standard treatment

ENT consult or outpatient referral if symptoms resolved and:

- recurrent croup (3 episodes in last 12 months)
- 2nd episode within 30 days
- History of intubation in the past 6 months
- History of prolonged intubation

Admission Criteria

Admit to inpatient/observation

- Inadequate hydration
- Moderate severity despite treatment with corticosteroids
- Require supplemental oxygen and are proven not to be in acute or impending respiratory failure
- Condition deteriorates or does not improve with therapy
- Patients needing continued doses of racinephrine after peak steroid effect
- Patients not otherwise meeting discharge criteria

Admit to ICU

- Severe or life-threatening severity
- Acute respiratory acidosis
- Bradypnea suggesting respiratory muscle fatigue and impending respiratory failure
- Lack of response to steroids and racemic epinephrine as characterized by persistent moderate-severe

retractions, hypoxemia, severely decreased air entry, altered level of consciousness, difficulty feeding/talking, or difficulty controlling oral secretions

Discharge Criteria

- Child has no symptoms or signs of moderate or severe airway obstruction
- No stridor at rest, intercostal retraction or other signs of increased work of breathing
- Noticeable improvement after at least 2 hours of observation after 1 dose of dexamethasone
- No other indications for hospitalization

Follow-Up Care

- Call Doctor/follow up if:
- Child continues to have trouble breathing
- Stridor (harsh raspy sound) occurs
- Croupy cough lasts more than 14 days
- Child becomes worse

Outcome Measures

- Length of stay in the ED
- Rate of x-ray use
- Rate of viral testing
- Time to racemic epinephrine administration
- Time to dexamethasone administration
- Rate of ED return visits in less than 48 hours

EXCLUSION CRITERIA

- Toxic appearance
- Symptoms or history suggestive of an alternate diagnosis
- Known upper airway abnormalities
- Hypotonia or neuromuscular disorder
- Complex medical co-morbidities

Croup (ED) Management Pathway

Evidence Based Outcome Center



GUIDELINE INCLUSION CRITERIA

- Age 6 months to 6 years
- Previously healthy patient presenting with signs/symptoms consistent with viral croup
 - Barky cough
 - Hoarse voice
 - Stridor
 - Moderate respiratory distress

Manage off pathway ← No

Evaluate patient history and **Differential Diagnosis** 3
 Routine radiographs are NOT indicated (**exceptions**) 2
 Serum workup is NOT indicated for viral croup
 Minimize patient agitation as this may worsen respiratory distress

Mild Croup
 (Westley croup score <2)

- Occasional barky cough
- No audible stridor at rest
- No to mild coarse stridor
- Stridor only during activity

Assess respiratory status/Severity

Signs of Impending Respiratory Failure
 (Westley croup score ≥12)

- Hypoxemia/cyanosis
- Listless
- Poor aeration
- Stridor decreased or absent
- Severe stridor
- Abnormal mental status/confused

Moderate/Severe Croup
 (Westley croup score 3 to ≥8)

- Frequent barky cough
- Mild-severe retractions
- Audible stridor at rest
- Fussy – inconsolable

- Consider Heliox
- Administer racemic epinephrine or L-epinephrine via nebulizer
- Consider IM epi 1:1000 0.1mg/kg up to 0.5mg*
- Give single dose of **dexamethasone** IV or IM
- If concern for impending respiratory failure, consult anesthesia and prepare for intubation
- Admit/transfer to PICU
- (*Consider IM when severe respiratory distress obstructs adequate inhalation of nebulized medication)

Dexamethasone
 0.6 mg/kg PO x 1 dose (max 16mg)

Improved Response?

Yes

No

- Minimize agitation during eval/treatment
- Administer **dexamethasone** orally (if able), or IV (if patient has IV access), or IM
- Give **racemic epinephrine** or L-epinephrine (if stridor observed at rest)
- Observe patient in the ED for 2 hours

Stridor at rest improved response after 30 minutes?

Yes

No

Patient meets discharge Criteria?

Discharge 1

Reassess for further care

Stridor at rest improved response?

Yes

No

- Repeat dose of nebulized racemic epinephrine
- Observe patient in the ED for 2 hours

- Consider hospital admission if:
- Repeated doses of racemic epinephrine are needed for respiratory distress
 - Continue moderate respiratory distress - Stridor at rest
 - Signs of excessive work of breathing
 - If patient has recurrent episodes of agitation or lethargy contact PICU

Discharge Criteria:

- Child has no symptoms or signs of moderate or severe airway obstruction
- No stridor at rest, intercostal retraction or other signs of increased work of breathing
- Noticeable improvement after at least 2 hours of observation after 1 dose of dexamethasone
- No other indications for hospitalization

Medication Dosages:

- Dexamethasone 0.6 mg/kg oral or IM (maximum 16 mg)
- Racemic epinephrine 2.24%, 0.05mL/kg (max 0.5 mL) in 3 mL NS via nebulizer

Imaging for Croup: (Exceptions)

Radiographic confirmation of acute laryngotracheitis is not required in the vast majority of children with croup. Radiographic evaluation of the chest and/or upper trachea is indicated if:

- The course is atypical and/or the diagnosis is in question
- The child has severe symptoms and does not respond as expected to therapeutic interventions
- There is suspicion for an inhaled or swallowed foreign body
- The child has recurrent episodes of croup

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Differential Diagnosis of stridor:

- Angioedema
- Bacterial tracheitis is suspect if high fever, toxic appearance and poor response to epinephrine.
- Epiglottitis is suspect if sudden onset of symptoms with high fever, absence of 'bark cough', dysphagia, drooling, anxious in appearance and sitting forward.
- Consider other causes of stridor:
 - Foreign body aspiration
 - Retropharyngeal or peritonsillar abscess
 - Laryngomalacia/ Tracheomalacia
 - Peritonsillar, parapharyngeal or retropharyngeal abscess - may present with fever, drooling, neck stiffness lymphadenopathy, and varying degrees of toxicity. Barking cough is usually absent.
 - Spasmodic croup (recurrent croup)
 - Congenital anomalies of the upper airway (laryngeal webs, laryngomalacia, congenital subglottic stenosis, subglottic hemangioma, bronchogenic cyst, laryngeal papillomas, and vocal cord paralysis)
 - Anaphylaxis
 - Upper airway injury - usually no fever or a viral prodrome.

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The following tests and treatments are NOT routinely indicated if the suspicion for a diagnosis of croup is strong:

- Viral testing
- Chest or lateral neck x-rays
- Antibiotics
- Albuterol
- Prednisolone (Dexamethasone preferred)
- Inhaled corticosteroids
- Cool mist humidification

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Methods

Existing External Guidelines/Clinical Pathways

Existing External Guideline/Clinical Pathway	Organization and Author	Last Update
Emergency Department Clinical Pathway for Evaluation/Treatment of Children with Croup	Children's Hospital of Philadelphia	12/2024
Croup	Texas Children's Hospital	03/2016
Croup Clinical Pathway	Johns Hopkins All Children's Hospital	11/2021

Any published clinical guidelines have been evaluated for this review using the **AGREE II criteria**. The comparisons of these guidelines are found at the end of this document. **AGREE II criteria** include evaluation of Guideline Scope and Purpose, Stakeholder Involvement, Rigor of Development, Clarity of Presentation, Applicability, and Editorial Independence.

Review of Relevant Evidence: Search Strategies and Databases Reviewed

Search Strategies	Document Strategies Used
Search Terms Used:	Croup, upper respiratory infection, barking cough, stridor
Years Searched - All Questions	1995 - 2024
Language	English
Age of Subjects	0-18 years old
Search Engines	PubMed, Google Scholar, PubMed, Cochrane Library
EBP Web Sites	https://childrensnational.org/ https://texaschildrens.org https://chop.edu
Professional Organizations	https://publications.aap.org/ https://www.aarc.org
Joint Commission	
Government/State Agencies	None
Other	

Evidence Found with Searches

Check Type of Evidence Found	Summary of Evidence – All Questions
X	Systematic Reviews
X	Meta-analysis articles
<input type="checkbox"/>	Randomized Controlled Trials
<input type="checkbox"/>	Non-randomized studies
X	Review articles
<input type="checkbox"/>	Government/State agency regulations
X	Professional organization guidelines, white papers, etc.

Evaluating the Quality of the Evidence

The GRADE criteria were used to evaluate the quality of evidence presented in research articles reviewed during the development of this guideline. The table below defines how the quality of evidence is rated and how a strong versus a weak recommendation is established.

Recommendation	
Strong	Desirable effects clearly outweigh undesirable effects or vice versa
Weak	Desirable effects closely balanced with undesirable effects
Type of Evidence	
High	Consistent evidence from well-performed RCTs or exceptionally strong evidence from unbiased observational studies
Moderate	Evidence from RCTs with important limitations (e.g., inconsistent results, methodological flaws, indirect evidence, or imprecise results) or unusually strong evidence from unbiased observational studies
Low	Evidence for at least 1 critical outcome from observational studies, from RCTs with serious flaws or indirect evidence
Very Low	Evidence for at least 1 critical outcome from unsystematic clinical observations or very indirect evidence

Addendum 1: Clinical Scoring System

Table 1: Westley Croup Score (Clinical Scoring System)		Score
Stridor		
	None	0
	Audible with a stethoscope (at rest)	1
	Audible without stethoscope (at rest)	2
Retractions		
	None	0
	Mild	1
	Moderate	2
	Severe	3
Air entry		
	Normal	0
	Decreased	1
	Severely decreased	2
Cyanosis		
	None	0
	With agitation	4
	At rest	5
Level of Consciousness		
	Normal	0
	Altered	5
Total Score:		

Score	Severity	Description
0 to 2	Mild	Occasional barky cough, no stridor at rest, mild or no retractions
3 to 7	Moderate	Frequent barky cough, stridor at rest, and mild to moderate retractions but no or little distress or agitation
8 to 11	Severe	Frequent barky cough, stridor at rest, marked retractions, significant distress, and agitation
12 to 17	Impending Respiratory failure	Depressed level of consciousness, stridor at rest, severe retractions, poor air entry, cyanosis, or pallor

Westley CR, Cotton EK, Brooks JG. Nebulized racemic epinephrine by IPPB for the treatment of croup: a double-blind study. Am J Dis Child 1978; 132:484.

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Approved by the Pediatric Evidence-Based Outcomes Center Team

Revision History

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