# Croup

## Emergency Department

Nationwide Children's — When your child needs a hospital, everything matters.

Center for Clinical Excellence

**Inclusion Criteria:**
- Age 6 months to 6 years
- Signs & Symptoms of croup

**Exclusion Criteria:**
- Toxic appearance
- Symptoms suggestive of an alternative diagnosis
- Known upper airway abnormality
- Hypotonia or neuromuscular disorder
- Chronic lung disease (BPD, CF, pulmonary artery hypertension)
- Recent airway instrumentation
- Congenital or acquired heart disease
- Foreign body aspiration or ingestion

Impending Respiratory Failure?

*Combination of poor respiratory effort, hypoxia, cyanosis, or mental status changes*

→ **Activate Difficult Airway Team** → **Off Pathway**

**Determine Severity**

| | Mild | Moderate | Severe |
|---|---|---|---|
| **Mental status** | Normal | Anxious | Anxious or lethargic |
| **Stridor** | Minimal or none at rest | Inspiratory stridor at rest<br>Biphasic stridor with agitation | Biphasic stridor at rest |
| **Work of breathing** | Minimal or none | Moderate | Severe |
| **Heart & Respiratory Rates** | Normal or slightly elevated | Moderately elevated | Significantly elevated |
| **Oral intake** | Normal | Decreased | Unable to feed |

**Dexamethasone**

**Dexamethasone & Racemic epinephrine**

Treatments Not Recommended

**Discharge Criteria:**
- Minimal or no stridor at rest
- Minimal or no retractions
- Able to tolerate PO

Stridor at rest and moderate-severe distress?

Yes

**Racemic epinephrine**
*If at urgent care, consider prompt transfer to ED*

Stridor at rest and moderate-severe distress?

Yes

**Racemic epinephrine**
- Consider heliox for severe respiratory distress without hypoxia
- *Consider alternative diagnoses*

No

2 hours of observation

Meets discharge criteria?

Yes → **Discharge home**

No → **Admit** to Infectious Diseases or Hospital Peds versus PICU based on criteria

**Admission Criteria**

**Inpatient (HP or ID)**
- Hypoxia
- Stridor at rest
- ≥ 3 doses of racemic epinephrine needed to manage respiratory distress

**PICU**
- Need for heliox
- Respiratory failure requiring NIPPV or intubation

# Signs & Symptoms

Croup is a common respiratory illness of the larynx, trachea, and bronchi that leads to **inspiratory** stridor and a barking cough. It is usually caused by a virus. Croup is primarily a clinical diagnosis, with typical findings of abrupt onset of a barking cough, inspiratory stridor, hoarseness, and sometimes dyspnea and fever. Biphasic stridor, when present, may represent more severe disease.

Return to Algorithm

# Differential Diagnosis

**Signs and symptoms suggestive of an alternative diagnosis:**

- Age < 6 months or > 6 years
- Expiratory wheeze
- Drooling or difficulty swallowing
- Prolonged or recurrent stridor
- Recurrent croup (2nd episode within 30 days or > 3 episodes in the last 12 months)
- Toxic appearance
- Poor response to treatment
- Asymmetry of respiratory exam
- Non-elective intubation in the past 6 months or history of prolonged intubation

**Alternative Diagnoses:**

**Bacterial tracheitis**

- Signs/symptoms of croup that have markedly worsened, toxic appearing, poor response to racemic epinephrine

**Epiglottitis**

- Incomplete immunizations, absence of barky cough and presence of anxiety that is out of proportion to degree of respiratory distress, fever, toxic appearing, drooling, swelling of epiglottis “thumb sign” on lateral radiograph

**Foreign body aspiration**

- History of choking in previously healthy child

**Large airway lesions, hemangioma, neoplasm**

- Chronic course and absence of fever

**Known upper airway abnormality**

- Vocal cord paralysis, subglottic stenosis, tracheomalacia, history of vascular ring or TEF

**Deep neck space abscesses (peritonsillar abscess, retropharyngeal abscess, parapharyngeal abscess)**

- Fever, drooling, neck stiffness, lymphadenopathy and varying degrees of toxicity, barky cough absent

**Thermal injury/smoke inhalation**

**Asthma**

- Lower airway sounds rather than stridor

**Anaphylaxis or Angioedema**

Rapid onset without antecedent URI symptoms or fever

Return to Algorithm

# Recommended Treatments

**Dexamethasone** (0.6 mg/kg, max 16 mg) PO, IV, IM should be administered by the least invasive route possible.

**Racemic epinephrine** (0.5 mL of a 2.25% solution diluted to 3 mL total volume with normal saline) should be given to all patients with moderate-severe croup.

Onset: 10-30 minutes
Can be repeated after 20 minutes if symptoms persist
Duration: 1-2 hours

**Heliox** is a mixture of helium (70-80%) and oxygen (20-30%) that promotes laminar flow of air rather than turbulent flow. When administered via a non-rebreather mask heliox can decrease the work of breathing in children with severe symptoms. Use of heliox is limited in children with hypoxia because of the low fractional concentration of oxygen in the gas mixture.

**Consider ENT consultation / referral:**

- Recurrent croup (2$^{nd}$ episode within 30 days or > 3 episodes in the last 12 months)
- Atypical croup (crescendo onset, age < 6 months or > 6 years)
- Recent non-elective intubation
- History of prolonged intubation

Return to Algorithm

# Treatments Not Routinely Recommended

**Radiographs:** not indicated in the vast majority of children with croup. Imaging is indicated in the following circumstances:

- Atypical course and diagnosis is not clear
- Severe symptoms without adequate response to therapeutic interventions
- Concern for inhaled foreign body
- Recurrent episodes of croup

**Viral testing:** not routinely necessary but may be useful when making decisions about isolation

**Cool mist:** lack of proven benefit but may be used if comforting to the child

**Repeat dexamethasone:** not routinely recommended unless symptoms persist

Return to Algorithm

# References


1. Bjornson C, Johnson DW, McMillan A, et al. Nebulized epinephrine for croup in children. *Evid Based Child Health*. 2012;7(4):1311-1354.
2. Bjornson CL, Johnson DW. Croup-treatment update. *Pediatr Emerg Care*. 2005;21(12):863-873. doi:10.1097/01.pec.0000190225.04986.e0
3. Cherry JD. Clinical practice. *Croup. N Engl J Med*. 2008;358(4):384-391. doi:10.1056/NEJMcp072022
4. Cooper T, Kuruvilla G, Persad R, El-Hakim H. Atypical croup: association with airway lesions, atopy, and esophagitis. *Otolaryngol Head Neck Surg*. 2012;147(2):209-214. doi:10.1177/0194599812447758
5. Gates A, Gates M, Vandermeer B, et al. Glucocorticoids for croup in children. *Cochrane Database Syst Rev*. 2018;8(8):CD001955. Published 2018 Aug 22. doi:10.1002/14651858.CD001955.pub4
6. Johnson DW. Croup. *BMJ Clin Evid*. 2014;2014:0321. Published 2014 Sep 29.
7. Moraa I, Sturman N, McGuire TM, van Driel ML. Heliox for croup in children. *Cochrane Database Syst Rev*. 2021;8(8):CD006822. Published 2021 Aug 16. doi:10.1002/14651858.CD006822.pub6
8. Parker CM, Cooper MN. Prednisolone Versus Dexamethasone for Croup: a Randomized Controlled Trial. *Pediatrics*. 2019;144(3):e20183772. doi:10.1542/peds.2018-3772
9. Scolnik D, Coates AL, Stephens D, Da Silva Z, Lavine E, Schuh S. Controlled delivery of high vs low humidity vs mist therapy for croup in emergency departments: a randomized controlled trial. *JAMA*. 2006;295(11):1274-1280. doi:10.1001/jama.295.11.1274
10. Smith DK, McDermott AJ, Sullivan JF. Croup: Diagnosis and Management. *Am Fam Physician*. 2018;97(9):575-580.
11. Udoh I, Heegeman D, Ravi S. Retrospective Evaluation of Return Rates in Pediatric Patients Treated With Inhaled Racemic Epinephrine for Croup. *WMJ*. 2022;121(1):26-29.
12. Weber JE, Chudnofsky CR, Younger JG, et al. A randomized comparison of helium-oxygen mixture (Heliox) and racemic epinephrine for the treatment of moderate to severe croup. *Pediatrics*. 2001;107(6):E96. doi:10.1542/peds.107.6.e96
13. 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(5):484-487. doi:10.1001/archpedi.1978.02120300044008
14. Yang WC, Lee J, Chen CY, Chang YJ, Wu HP. Westley score and clinical factors in predicting the outcome of croup in the pediatric emergency department. *Pediatr Pulmonol*. 2017;52(10):1329-1334. doi:10.1002/ppul.23738
15. Bagwell T, Hollingsworth A, Thompson T, et al. Management of Croup in the Emergency Department: The Role of Multidose Nebulized Epinephrine. *Pediatr Emerg Care*. 2020;36(7):e387-e392. doi:10.1097/PEC.0000000000001276
16. Udoh I, Heegeman D, Ravi S. Retrospective Evaluation of Return Rates in Pediatric Patients Treated With Inhaled Racemic Epinephrine for Croup. *WMJ*. 2022;121(1):26-29.
17. Croup severity score adapted from:
    - Fitzgerald DA, Kilham HA. Croup: assessment and evidence-based management. *Med J Aust*. 2003;179(7):372-377. doi:10.5694/j.1326-5377.2003.tb05597.x
    - Clare E, Martin M, et al. *Croup clinical pathway*. Johns Hopkins All Children's Hospital. Published December 13, 2021. Accessed April 24, 2026. https://www.hopkinsmedicine.org/-/media/files/allchildrens/clinical-pathways/croup-clinical-pathway-12_13_2021.pdf
    - Tyler A, Gardner H, Cripe J, et al. *Croup clinical pathway*. Children's Hospital Colorado. Published August 11, 2011. Updated October 7, 2021. Accessed April 24, 2026. https://www.childrenscolorado.org/globalassets/healthcare-professionals/clinical-pathways/croup.pdf


**Return to Algorithm**

# Pathway Team & Process

## Content Development Team:

### Leaders:

Emergency Medicine:
Sarah Chen, MD
Berkeley Bennett, MD, MS
Betsy Schmerler, MD

Pharmacy:
Kim Jones, PharmD

### Members:

Urgent Care:
Luciana Berg, MD
Kathryn Nuss, MD
Karla Hauersperger, MD
Traci Downs-Bouchard, MD

Emergency Medicine:
Kelli Mavromatis, RN
Laura Rust, MD, MPH

Respiratory Care:
Punam Shingala, MRT

Otolaryngology:
Amy Manning, MD
Charles Elmaraghy, MD

## Clinical Pathways Program:

Medical Director – Emergency Medicine:
Aarti Gaglani, MD

Medical Director – Clinical Informatics & Emergency Medicine:
Laura Rust, MD, MPH

Business & Development Manager:
Rekha Voruganti, MBOE, LSSBB

Program Coordinators:
Tahje Brown, MBA

## Clinical Pathway Approved:

Medical Director – Associate Chief Medical Officer, Center for Clinical Excellence:
Ryan Bode, MD, MBOE

Origination Date: *February, 2023*

Next Revision Date: *February, 2028*

## Clinical Pathway Development

This clinical pathway was developed using the process described in the NCH Clinical Pathway Development Manual Version 6, 2025. Clinical Pathways at Nationwide Children's Hospital (NCH) are standards which provide general guidance to clinicians. Patient choice, clinician judgment, and other relevant factors in diagnosing and treating patients remain central to the selection of diagnostic tests and therapy. The ordering provider assumes all risks associates with care decisions. NCH assumes no responsibility for any adverse consequences, errors, or omissions that may arise from the use or reliance on these guidelines. NCH's clinical pathways are reviewed periodically for consistency with new evidence; however, new developments may not be represented, and NCH makes no guarantees, representations, or warranties with respect to the information provided in this clinical pathway.

Copyright © 2025. Nationwide Children's Hospital. All rights reserved. No part of this document may be reproduced, displayed, modified, or distributed in any form without the express written permission of Nationwide Children's Hospital.

**For more information about our pathways and program please contact:**
**ClinicalPathwaysProgram@NationwideChildrens.org**

Return to Algorithm

# Goals & Metrics

**Goal**
To appropriately diagnose and effectively treat patients with croup.

**Population**

Inclusion:
- Age: ≥ 6 months to ≤ 6 years.
- Diagnoses:
  Patients presenting to the ED with a diagnosis of croup (can use a SNOMED concept for this) or who received a racemic epinephrine treatment.
- Care Setting:
  ED

Exclusions:
- Congenital heart disease
- BPD
- Cystic fibrosis

**Metrics:**

Process measures:
- ED/UC Order Panel & SmartSet utilization

Outcome measures:
- ED length of stay
- Time from racemic epinephrine administration to discharge disposition.
- Admission rate
- Percent of non-ICU admitted patients who do not receive supplemental oxygen AND do not receive additional racemic epinephrine treatments.

Balancing measure:
- 72hr ED/UC bounce back rate

Return to Algorithm