VIRAL CROUP

ALGORITHM: Outpatient/ED Management

Severity Assessment

Mild Severity
- Stridor only with activity/agitation
- Suprasternal retractions only
- Normoxia, no tachypnea, no tachycardia
- Normal mental status
- Able to talk or feed

Moderate
- Inspiratory stridor at rest, Biphasic with agitation
- Intercostal AND suprasternal retractions
- Normal saturation on room air, mild tachycardia
- Agitated OR tired, low tone
- Difficulty in talking / feeding

Severe/Life-Threatening
- Biphasic stridor or absent due to poor respiratory effort
- Severe retractions (intercostal, nasal flaring)
- Hypoxemia or cyanosis, marked tachycardia or bradycardia
- Abnormal, confused, drowsy
- Unable to talk or feed

Give Dexamethasone (if not previously given)

Give Racemic Epinephrine

Immediate Severity Assessment

Improved?

Yes
- Observation for 3 hours with minimum Q1 hour assessment
- Consider repeat racpinephrine
- Can be given Q2 hours

No
- Consider repeat racpinephrine
- Admit Criteria
- Patient with continued stridor at rest AND any symptoms listed in the severity assessment above
- Patients receiving multiple doses of racpinephrine
- Patients not otherwise meeting discharge criteria
- Consider ICU admission for poor response to racpinephrine or toxic appearance

Discharge Criteria
- Minimal stridor at rest (stridor with activity to be expected)
- Minimal retractions
- Able to talk or feed without difficulty
- 3 hours since racpinephrine

Discharge Instructions
Return for increased work of breathing

Transport to Inpatient Management

Admit to ICU

Discharge Criteria

Yes
- Patient with continued stridor at rest AND any symptoms listed in the severity assessment above
- Patients receiving multiple doses of racpinephrine
- Patients not otherwise meeting discharge criteria
- Consider ICU admission for poor response to racpinephrine or toxic appearance

No
- Remains mild severity
- Discharge Criteria

Admit Criteria

Criteria for Transport

Inclusion Criteria
- Previously healthy
- Age 6 months to 6 years

Exclusion Criteria
- Symptoms suggestive of an alternative diagnosis
- Known upper airway abnormality
- Hypotonia or neuromuscular disorder

Consider other diagnoses in children who appear toxic, have high fever, or have a rapid decompensation

Signs of Impending Respiratory Failure
- Poor respiratory effort
- Stridor may be present or decreased
- Listless or decreased LOC
- Cyanosis / Hypoxia

Criteria for Transport

Patients being evaluated in an outpatient clinic or facility outside CHCO/NOC who meet admission criteria should be referred to the CHCO ED.
Consider transporting by ambulance.
ALGORITHM: Inpatient Management

Severity Assessment

Mild Severity
- Stridor only with activity/agitation
- Suprasternal retractions only
- Normoxia, no tachynea, no tachycardia
- Normal mental status
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Moderate
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- Severe retractions (intercostal, nasal flaring)
- Hypoxemia or cyanosis, marked tachycardia or bradycardia
- Abnormal, confused, drowsy
- Unable to talk or feed

Give Dexamethasone (if not previously given)

Give Racemic Epinephrine
- If not previously given

Immediate Severity Assessment

Give Dexamethasone (if not previously given)

Observation

Complete severity assessment Q4 hr until patient meets discharge criteria

Discharge Criteria
- Minimal stridor at rest/stridor with activity to be expected
- Minimal retractions
- Able to talk or feed without difficulty
- 3 hours since racpinephrine

Discharge Instructions
Return for increased work of breathing

Not Routinely Recommended
- Viral PCR
- Radiographs
- Repeat Dexamethasone
- Cool Mist

Inclusion Criteria
- Previously healthy
- Age 6 months to 6 years
- Symptoms suggestive of an alternative diagnosis
- Known upper airway abnormality
- Hypotonia or neuromuscular disorder
- Patient in PICU

Exclusion Criteria
- Symptoms suggestive of an alternative diagnosis
- Known upper airway abnormality
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- Patient in PICU

Consider other diagnoses in children who appear toxic, have poor response to racemic epinephrine, have high fever, or have a rapid decompensation

Immediate Severity Assessment

Signs of Impeding Respiratory Failure
- Poor respiratory effort
- Stridor may be present or decreased
- Listless or decreased LOC
- Cyanosis/Hypoxia

Hypoxia is uncommon in Croup
Indicates severe disease, alternate diagnosis or lower respiratory tract disease

Can give racemic epinephrine every 1 hour if MD at bedside and RRT called
- Consider alternative diagnosis (see page 5 for differential diagnosis and recommendations)
- Consider blood gas
- Consider ICU transfer
- Consider ENT consult

Give Dexamethasone (if not previously given)

Evaluate criteria for racemic epinephrine

Observe

Meet discharge criteria

Hypoxia

Consider further workup, and/or RRT evaluation (see page 5 for differential diagnosis)

Can give racemic epinephrine every 20 minutes

Consider blood gas
Consider ICU transfer
Consider ENT consult

Discharge Criteria
- Minimal stridor at rest/stridor with activity to be expected
- Minimal retractions
- Able to talk or feed without difficulty
- 3 hours since racpinephrine

Discharge Instructions
Return for increased work of breathing

Consider additional workup, and/or RRT evaluation

Hypoxia

Consider additional workup, and/or RRT evaluation

Consider evaluation and treatment for allergies

Recommendations
1. Consider ENT consultation for direct laryngoscopy in patients with 2 or more episodes of croup AND one of the following:
   - History of intubation
   - Age less than 36 months
   - Prolonged severe disease requiring inpatient management
2. Consider evaluation for GERD and initiation of antireflux medications in patients with prolonged or recurrent croup
3. Consider evaluation and treatment for allergies
TARGET POPULATION

Inclusion Criteria
- First or repeat episode
- Age 6 months to 6 years
- Principle diagnoses: croup (laryngotracheitis)

Exclusion Criteria
- Suspicion of bacterial tracheitis, epiglottitis, upper-airway abscess (peritonsillar or retropharyngeal), or other serious bacterial infection
- Severe or life-threatening disease requiring PICU admission
- Chronic lung disease (bronchopulmonary dysplasia, cystic fibrosis, pulmonary artery hypertension)
- Known upper airway abnormalities (for example: laryngomalacia, tracheomalacia, subglottic stenosis)
- Recent airway instrumentation
- Foreign body aspiration or ingestion
- Neuromuscular disorder or hypotonia
- Allergic reaction
- Angioedema
- Active varicella or tuberculosis (TB)
- Congenital or acquired heart disease
**PREVENTION**

- Droplet precautions for all care settings
- Good hand washing
- Protect high risk patients from exposure
- Eliminate exposure to smoke

**OUTPATIENT TELEPHONE TRIAGE**

- **Stridor**
  - Has, but not now
    - Croupy cough
    - Fever
    - Post-tussive emesis
  - See in office within 24 hours
  - Stridor
  - Has now
    - Trouble breathing
    - Lip or face blue during cough
    - Retractions
    - Had croup before that needed decadron
    - Under 1 year of age
  - See in office now
  - Struggling for breath
  - Passed out/stopped breathing
  - Lips or face bluish
  - Croup started after bee sting, new medicine, allergic food
  - Drooling/trouble swallowing
  - Call 911

- **See in office**
  - Stridor
  - Has now
    - Croupy cough
    - Fever
    - Post-tussive emesis
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        - Passed out/stopped breathing
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        - Croup started after bee sting, new medicine, allergic food
        - Drooling/trouble swallowing
        - Call 911

- **Activate EMS (911):** Severe difficulty breathing (struggling for breath, grunting noises with each breath, unable to speak or cry), blue lips or reduced level of consciousness.
- **ED visit (immediate):** Underlying heart or lung disease, breathing heard across room, poor fluid intake, temperature greater than 105°F, excessive drooling, inability to lie flat without distress
  - Age less than 12 months, respiratory rate (RR) greater than 60, unable to sleep
  - Age greater than 12 months, RR greater than 40, difficulty breathing, not interactive
- **Office visit same day:** Worsening cough, some difficulty breathing, poor fluid intake, chronic or underlying illness
- **Phone contact with primary care provider (PCP):** Barking cough, acting normally, good fluid intake

**CLINICAL MANAGEMENT**

Obtain History and perform physical exam
Evaluate hydration status
Distinguish croup from a more extensive or progressive process
Evaluate patient using Croup severity assessment

**History:**

- Obtain past medical history \ birth (hospitalization, intubation/mechanical ventilation), sick contacts
- Check immunization status: Haemophilus influenza type b (HIB), pneumococcal, tetanus. Important when considering epiglottitis or diphtherial croup
- Obtain all pertinent patient history, including onset and duration of symptoms including croup prodrome (rhinorrhea, sore throat, low grade fever, cough) and timing of evidence of upper airway obstruction (hoarse voice, barking cough, audible stridor) and subglottic involvement (aphonia)
Inquire regarding history of congenital or acquired heart disease, congenital or acquired subglottic stenosis, tracheomalacia, tracheal webs, choanal narrowing or atresia, micrognathia, macroglossia.

Check current medications and time and dose of last antipyretic and recent steroid use.

**Clinical Symptoms of Croup:**
- Symptoms increase at night and improve during day
  - Hoarse voice
  - Barking cough (often described as a "barking seal")
  - Stridor (variable, usually inspiratory)
- Respiratory distress (variable):
  - Retractions (suprasternal, intercostal)
  - Tachypnea
  - Tachycardia

**Clinical Progress of Croup:**

<table>
<thead>
<tr>
<th>Day 1 to 3</th>
<th>Day 3 to 7</th>
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</thead>
<tbody>
<tr>
<td>Rhinorrhea</td>
<td>Onset symptoms of upper airway inflammation</td>
</tr>
<tr>
<td>Sore throat</td>
<td>Hoarseness</td>
</tr>
<tr>
<td>Low grade fever</td>
<td>Barking cough</td>
</tr>
<tr>
<td>Mild cough</td>
<td>Stridor (variable)</td>
</tr>
<tr>
<td>Mild cough</td>
<td>Respiratory distress (variable)</td>
</tr>
</tbody>
</table>

**Clinical symptoms that suggest Croup is not the diagnosis:**
- Bacterial tracheitis should be considered if patients have a toxic appearance, poor response to racemic epinephrine, high fever, or have a rapid decomposition
- Hypoxemia is uncommon in croup and indicates severe disease, an alternate diagnosis, or lower respiratory tract disease

**Differential Diagnosis:**
- Distinguish croup from a more extensive or progressive process
- Conditions mimicking croup:

```
    Increased Work of Breathing
     ▼
      Stridor
       ▼
      Stridor not prominent
       ▼
    Barking cough/voice hoarseness
    High fever/barking cough/voice hoarseness/rapid deterioration
    History of choking/dysphagia
    High fever/sore throat/dysphagia/muffled voice
    High fever/sore throat/torticollis/limitation of neck movements
    Retro-/para-pharyngeal abscess
     ▼
    Imaging with radiographs or CT scan may aid diagnosis. Choice of imaging depends on clinical situation. Consult radiology for recommendations.
```
Monitoring:
Continuous cardiac/pulse oximetry monitoring only recommended for unstable patients and patients receiving 2 or more racemic epinephrine nebulizations within an hour due to risk of ventricular arrhythmias.

Severity Assessment:
Assess and record severity every 1-4 hours with vitals depending on patient’s current severity and patient’s location. (See algorithms)

Patients should be classified as mild, moderate or severe/life-threatening for each of the 5 categories including: stridor, retractions, vital signs, feeding and neurologic status. A patient’s overall severity is defined by the most severe classification across all 5 categories.

<table>
<thead>
<tr>
<th></th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe/life-threatening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stridor</td>
<td>Only with activity/agitation</td>
<td>Inspiratory at rest, Biphasic with agitation</td>
<td>Biphasic or absent due to poor respiratory effort</td>
</tr>
<tr>
<td>Retractions</td>
<td>Suprasternal only</td>
<td>Intercostal AND suprasternal</td>
<td>Severe (intercostal, nasal flaring)</td>
</tr>
<tr>
<td>Vital signs</td>
<td>Normal oxygen saturation on room air, No tachypnea, No tachycardia</td>
<td>Normal oxygen saturation on room air, Mild tachypnea, Mild tachycardia</td>
<td>Hypoxemia or cyanosis, Marked tachycardia, or bradycardia</td>
</tr>
<tr>
<td>Feeding/talking</td>
<td>Able</td>
<td>Difficult</td>
<td>Unable</td>
</tr>
<tr>
<td>Neurologic status</td>
<td>Normal</td>
<td>Agitated OR tired, low tone</td>
<td>Abnormal, confused, drowsy</td>
</tr>
</tbody>
</table>

LABORATORY STUDIES | IMAGING

Not routinely indicated: Diagnostic tests are only indicated if they will change outcome. Croup is a clinical diagnosis and usually no testing is needed.

THERAPEUTICS

Routinely Indicated:
Corticosteroids
Dosing: Single dose

- Dexamethasone
  - Dose: 0.6 mg/kg orally (preferred), IV, IM
  - Frequency: Once
  - Maximum Dose: 16 mg
  - Duration of action: 24 to 72 h
  **Note**: the taste of oral dexamethasone liquid may not be well tolerated thus the preferred method of administration may be a crushed dexamethasone tablet mixed with vehicle of choice

- Nebulized Budesonide
  - Dose: 2mg inhaled via nebulizer over 30 minutes
  - Equal efficacy to dexamethasone; expensive
  **Note**: not for routine care. Consider in children with emesis or severe respiratory distress where IV access is unobtainable and the severity of symptoms makes IM dexamethasone not optimal due to its delayed onset.
Nebulized Epinephrine

Racemic Epinephrine (1:1 mixture of δ & ϑ-isomers)

- Dose: 0.05 mL/kg/dose of 2.25% solution in 2.5mL normal saline (NS) via nebulizer over 15 minutes
- Frequency: as needed based on severity (see algorithms)
- Maximum single dose: 0.5 mL
- Duration of action: less than or equal to 2 hours

**Note:** If a patient requires 2 or more nebulizations within an hour, cardiac monitoring is recommended due to risk of ventricular arrhythmias.

The term ‘rebound phenomenon’ is a misnomer. Epinephrine doesn’t change the duration of croup. Benefits lasts up to 2 hours. It is safe to send children home from the ED after receiving racemic epinephrine if they have been observed for a minimum of 3 hours post therapy.

**Recommended in some patients:**
In patients requiring 3 or more doses of racemic epinephrine consider ENT evaluation, additional work-up for alternative diagnoses and/or a Rapid Response Team (RRT) evaluation.

- Consider ENT consult for laryngoscopy in patients with 2 more episodes of croup AND one of the following:
  - History of intubation
  - Age less than 36 months
  - Prolonged or severe disease requiring inpatient management

- Consider evaluation for GERD and initiation of anti-reflux medications with prolonged or recurrent croup
- Consider evaluation and treatment for allergies

**Not Routinely Indicated:**

**Oxygen**

- The presence of hypoxemia or intermittent desaturations is a sign of impending respiratory failure in croup and other central airway obstruction. Oxygen can be used to normalize SpO2, but further diagnostic evaluation and therapies may be needed. If hypoxemia is present, a blood gas may be useful to assess for hypercarbia.

**Other Therapies**

- Mist: Humidified air with or without oxygen is not indicated
- Antitussive or decongestant medications are not indicated.
- Antibiotics
  - No role in viral croup
DISPOSITION

Begin discharge planning at time of initial presentation

- Assess caretaker ability to provide home care
- Assess home resources adequate to support care
- Confirm transportation and telephone
- Confirm follow-up PCP/designee in specified time frame
- Complete croup teaching
- Provide verbal and written instructions to caretakers
- Assure family awareness indications return
- Provide 24-hour contact number for PCP or designee
- Assure chart faxed to PCP or designee

Discharge Home

- Croup severity mild
- Minimal Stridor at rest (stridor with activity to be expected)
- Normal saturation on room air
- Able to talk and feed without difficulty
- Minimal or no retractions (mild suprasternal acceptable)
- 3 hours since racepinephrine

Note: Patients who have received nebulized epinephrine may be discharged home from the outpatient/ED/UC setting after a minimum of 3 hours if no stridor at rest. Consider additional monitoring or work-up prior to discharge in inpatients requiring repeated doses of racemic epinephrine (see algorithm)

Admit to Inpatient/ Observation

- Moderate severity despite treatment with corticosteroids
- Inadequate hydration
- Require supplemental oxygen and are proven not to be in acute or impending respiratory failure
- Condition deteriorates or does not improve with therapy
- Patients receiving multiple doses of racepinephrine
- 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
FOLLOW-UP | DISCHARGE INSTRUCTIONS

With PCP or designee as scheduled
If patient evaluated and discharged from the ED: PCP phone follow-up within 24 hours
If seen in PCP office: Parent/guardian to call back if patient worsens
If admitted: PCP phone follow-up within 24 hours of discharge and PCP office visit within 2 days.

Note: If patients received multiple doses of steroids while hospitalized, consider more than one outpatient follow-up visit due to long half-life of dexamethasone.

EDUCATION

Parent | Caregiver Education
- Expected clinical course less than seven days
- Educate to return for respiratory distress
- Smoking cessation counseling
- Provide parent with patient education materials

Knowledge Base
Viral croup is an acute inflammatory process in response to a viral infection that causes upper airway obstruction (primarily of the subglottic region) resulting in inspiratory stridor, barky cough and in more severe cases respiratory distress. Infection begins in the nasopharynx and spreads to the respiratory epithelium of larynx & trachea. Inflammation and edema of the vocal folds causes hoarseness.

Age: 6 months to 6 yrs (Mean = 18 mos)
Duration: 2 to 7 days
Morbidity: Highest first year of life
Epidemiology: Year round; most common fall and winter

ETIOLOGY OF CROUP
- Parainfluenza type 1(most common) 2, 3
- Influenza A & B
- Human metapneumovirus (hMPV)
- Respiratory syncitial virus (RSV)
- Rhinovirus
- Mycoplasma pneumoniae
- Enteroviruses
- Herpes Simplex viruses
- Adenovirus
- Measles virus
REFERENCES


# Clinical Pathway

## Clinical Improvement Team Members

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<table>
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<tr>
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<tr>
<td>Pharmacy &amp; Therapeutics Committee</td>
<td>December 1, 2016</td>
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<td>Clinical Care Guideline and Measures Review Committee</td>
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## Manual/Department and Origin

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## Review Revision Schedule

Scheduled for full review on December 13, 2020

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