VIRAL CROUP

ALGORITHM: Outpatient/ED Management

**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

**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, Biphase with agitation
  - Intercostal and suprasternal retractions
  - Normal saturation on room air, mild tachycardia, mild tachypnea
  - Agitated or tired, low tone
  - Difficulty in talking/feeding

- **Severe/Life-Threatening**
  - Biphase 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)
- **Racemic Epinephrine** and **Dexamethasone** (if not previously given)

**Immediate Severity Assessment**

**Improved?**

- Yes: Observation for 3 hours with minimum Q1 hour assessment
- No: Consider repeat racemic epinephrine (Can be given Q2 hours)

**Admit to ICU**

**Discharge Criteria**

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

**Discharge Instructions**
Return for increased work of breathing

**Admit Criteria**

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

**Transport to Inpatient Management**

**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

**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
- Patient in PICU

**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 tachypnea, 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**
- If not not previously given

**Call code and continue racemic every 20 minutes**

**Immediate Severity Assessment**

**Give Dexamethasone**
- If not previously given

**Evaluate criteria for racemic epinephrine**

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

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

**Observation**
- Complete severity assessment Q4 hr until patient meets discharge criteria
- If patient worsens, consider repeat racepinephrine
- Can be given Q2 hrs

**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

**Discharge Instructions**
- Return for increased work of breathing

**Not Routinely Recommended**
(No evidence supporting the use of)

- Viral PCR
- Radiographs
- Repeat Dexamethasone
- Cool Mist

**Consider**
- Other diagnoses in children who appear toxic, have poor response to racemic epinephrine, 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

**Hypoxia is uncommon in Croup**

Indicates severe disease, alternate diagnosis or lower respiratory tract disease

**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 anti-reflux 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**
  - Croupy cough
  - Fever
  - Post-tussive emesis
  - See in office within 24 hours

- ** Trouble breathing**
  - Lip or face blue during cough
  - Retractions
  - Had croup before that needed decadron
  - Under 1 year of age
  - See in office or ED 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

- **Has, but not now**
  - Stridor

- **Has now**
  - Croupy cough
  - Fever
  - Post-tussive emesis
  - See in office within 24 hours

- **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 or ED now

- **Has 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

- **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, macrognlossia
• 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
  o Hoarse voice
  o Barking cough (often described as a “barking seal”)
  o Stridor (variable, usually inspiratory)
• Respiratory distress (variable):
  o Retractions (suprasternal, intercostal)
  o Tachypnea
  o Tachycardia

Clinical Progress of Croup:

<table>
<thead>
<tr>
<th>Day 1 to 3</th>
<th>Day 3 to 7</th>
</tr>
</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></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:
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,</td>
<td>Biphasic or absent due to poor respiratory effort</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biphasic with agitation</td>
<td></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,</td>
<td>Normal oxygen saturation on room air,</td>
<td>Hyoxemia or cyanosis,</td>
</tr>
<tr>
<td></td>
<td>No tachypnea,</td>
<td>Mild tachypnea, Mild</td>
<td>Marked tachycardia, or bradycardia</td>
</tr>
<tr>
<td></td>
<td>No tachycardia</td>
<td>tachycardia</td>
<td></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 & α-isomers)

- isomers epinephrine)
  - 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, barking 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

ETIIOLOGY 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


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APPROVED BY
Pharmacy & Therapeutics Committee – December 1, 2016
Clinical Care Guideline and Measures Review Committee – December 13, 2016

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<tr>
<td>LAST DATE OF REVIEW OR REVISION</td>
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<tr>
<td>APPROVED BY</td>
<td>Lalit Bajaj, MD, MPH</td>
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<td>Medical Director, Clinical Effectiveness</td>
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REVIEW REVISION SCHEDULE
Scheduled for full review on December 13, 2020
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