# Croup (Acute Laryngotracheobronchitis)

## Definition / Supporting Information

Viral croup (acute laryngotracheobronchitis) is an age-specific viral syndrome characterised by acute laryngeal and subglottic swelling, resulting in:

- Hoarseness
- Cough
- Respiratory distress (see Dyspnoea)
- Inspiratory stridor

Parainfluenza, influenza, and respiratory syncytial virus are the most common responsible viruses. The usual age range is 3 months to 3 years, with a peak at 6–24 months of age.

Spasmodic croup is a term sometimes used to denote afebrile episodes of croup that may be recurrent. This type of croup is often associated with atopy.

## Essential History

**Ask about:**

- Age
- Upper respiratory tract infection symptoms
- Fever (see Feverish illness in children: Assessment and initial management in children younger than 5 years [NICE clinical guideline 160])
- Cough
  - Characteristic cough is spasmodic, with a deep brassy or harsh barking quality
- Duration and timing of stridor (often worse at night)
- Association with other features (eg, worse during feeding or crying)
- Perinatal history (eg, prematurity, history of intubation at birth)
- Immunisation history

## ‘Red Flag’ Symptoms and Signs

Evaluation should progress only after the ABCs (airway, breathing, circulation) of resuscitation have been addressed.

Do not examine the throat if there is evidence of significant upper airway obstruction.

**Ask about:**

- Rapidly progressive illness

- History of recurrent episodes of illness with respiratory distress
- Underlying condition (eg, subglottic stenosis)
- High fever
- Unwell 'toxic' appearance

**Look for:**

- Respiratory distress, especially at rest (see Traffic light system for identifying serious illness [NICE clinical guideline 160, resources] (note, some of the amber features in the guidance are listed as 'red flag' here))
  - Raised respiratory rate
  - Inspiratory stridor
  - Suprasternal, supraclavicular, and substernal recession
  - Asynchronous movements of the chest wall and abdomen
  - Cyanosis (and hypoxia on pulse oximetry)
    - Late signs implying significant upper airway obstruction
  - Prolonged inspiration with inspiratory coarse crackles
  - Expiratory wheezes and rhonchi
  - With more severe obstruction, breath sounds may be diminished and respiratory distress may appear less as the child tires.
  - 'Toxic' appearance / drooling
    - Consider epiglotitis / tracheitis
- 'Tripod' or upright body position
  - Children with significant upper airway obstruction will position themselves either upright on their parent's lap or with their arms extended out backwards, as if in a tripod position.
- Altered level of consciousness
  - Exhaustion, restlessness, and confusion are ominous signs

## Differential Diagnosis / Conditions

- Viral croup must be differentiated from the two bacterial causes of stridor:
  - Bacterial tracheitis
    - Onset is acute with respiratory stridor, high fever, and, often, copious and purulent secretions.
    - The child appears toxic, and respiratory obstruction rapidly progresses, often necessitating tracheal intubation.
  - Epiglottitis
    - May be fatal without immediate therapy
    - Rare since conjugated *Haemophilus influenzae* type b vaccines became available
    - Rapidly progressive and unrelenting course, drooling, toxic appearance

    - Coryza and barking cough characteristic of viral croup are usually not present with epiglottitis.
    - Avoid examination of the throat if significant stridor is present.
- Other infections:
  - Human papillomavirus (acquired perinatally)
  - Retropharyngeal and parapharyngeal abscess
    - Consider in a child with a history of a penetrating pharyngeal injury (eg, by a fish bone)
    - Usually preceded by mild pharyngitis and more gradual in onset than croup
    - The child may be febrile (see Fever), with sore throat and difficulty in swallowing (see Dysphagia).
    - Stridor is not usually present until the disease has markedly progressed.
    - Important differential findings include muffled voice, head held in a position allowing extension of the neck, resistance to oropharyngeal examination (***do not attempt***), progressive drooling, and visible asymmetry to the wall of the posterior oropharynx.
  - Diphtheria
    - Characteristic grey pharyngeal or laryngeal diphtheritic membrane
    - May be excluded if history of adequate immunisations
  - Other infectious agents that may mimic croup are now rare.
- Non-infectious causes of stridor
  - Foreign body aspiration
    - Abrupt onset of stridor
    - Respiratory distress
    - Lack of preceding respiratory symptoms
    - History of previous choking on food or foreign body
  - Acute oedema of the upper respiratory tract caused by an allergic reaction (see Anaphylaxis)
    - Abrupt swelling and severe respiratory distress with stridor
    - Lack of previous respiratory signs
    - Concurrent onset of other manifestations of allergic reaction (eg, swollen lips and tongue and urticaria)
  - Vocal cord paralysis
  - Angioneurotic oedema of the upper airway
  - Hypocalcaemic tetany
  - Congenital malformationsof the upper airway
  - Laryngotracheal malacia, web, cleft
  - Vascular ring
  - Tracheal stenosis

  - Haemangioma, cyst of the larynx or trachea
  - Cystic hygroma
  - Trauma

## Investigations

Evaluation should progress only after the ABCs (airway, breathing, circulation) of resuscitation have been addressed.

To be undertaken by non-specialist practitioners (eg, GP Team) or specialist practitioners (eg, Paediatric / Paediatric Emergency Department Team(s)):

- In severe cases, pulse oximetry to measure oxygen saturation may detect hypoxaemia.
- Laboratory testing is usually not helpful.
- Imaging is not necessary in diagnosing or managing children with viral croup and is contraindicated in a child with significant upper airway obstruction.
  - Lateral neck X-ray may be useful if a foreign body or other soft tissue swelling is being considered.

## Treatment Approach

Evaluation should progress only after the ABCs (airway, breathing, circulation) of resuscitation have been addressed.

To be undertaken by non-specialist practitioners (eg, GP Team):

- The first phase of management is to evaluate which children can be managed at home and which require admission to hospital.
- The disease fluctuates, so severity is often difficult to determine, and no clinical signs consistently predict a complicated course.
  - For most children, signs of croup extend over 3 or 4 days, but upper respiratory tract signs and cough may last longer.
  - Toxic appearance, dehydration, and fatigue are indications for hospital admission.
- Supportive care
  - This is of prime importance for both outpatients and inpatients.
  - The child should be made comfortable to avoid unnecessary anxiety and fatigue.
  - Fluids should be encouraged.
  - Antipyretics may be given for fever and to reduce the associated increased respiratory rate and fluid requirements.
  - Few other home therapies have proved beneficial.
  - Because of the variable nature of croup, several unverified therapies may appear to work.

- Corticosteroid therapy
  - The major advance and mainstay in the management of both ambulatory and hospitalised children with viral croup is the use of systemic or nebulised corticosteroids.
  - Dexamethasone (150 micrograms/kg) and nebulised budesonide (2 mg as a single dose or in 2 divided doses separated by 30 minutes) show clinical benefit within 6 hours after administration.
  - Dexamethasone is also effective for mild cases of croup.
  - Single dose of prednisolone (1 mg/kg) can be used instead of dexamethasone.
- Humidified air
  - Water particles from such devices as vaporisers, home-devised mist tents, and showers are generally too large to reach the lower respiratory tract.
    - They generally humidify primarily the anterior nares and oropharynx.
  - Hot water poses the potential hazard of accidental burns.
  - Cool mist may help to cool the airway and may be beneficial to some children with croup.
  - There are few studies in children of the efficacy of humidified air in treating croup, and they involve small numbers of patients; nevertheless, no significant benefit has been shown.
- Antibiotic therapy
  - Because croup is of viral aetiology, antibiotics are rarely indicated.
  - Secondary or concurrent bacterial infection is unusual, and antibiotics should be reserved for such documented cases.

To be undertaken by specialist practitioners (eg, Paediatric / Paediatric Emergency Department Team(s)):

- The mainstay of treatment for mild to moderate croup is similar to that outlined above.
- In a child with significant upper airway obstruction:
  - The priority is to keep the patient calm.
    - This may involve limited (if any) examination and assessment of vital signs.
  - Assessment and intervention is undertaken using the structured ABCDE approach, according to recommendations of Advanced Paediatric Life Support.
  - Early senior and experienced paediatric anaesthetic support is required if there is significant upper airway obstruction or if the patient has a reduced level of consciousness when the airway must be maintained.

- Nebulised adrenaline (epinephrine) 400 micrograms/kg (max. 5mg), repeated after 30 minutes if necessary.
  - Beneficial for children with more severe croup by reducing the degree of stridor and retractions
  - Should be used with the understanding that:
    - Amelioration of the clinical signs is transient, and the child may worsen again within 2–3 hours.
    - Arterial oxygen saturation is not affected.
  - Should be used only for children with moderately severe or severe croup
    - These children should usually be concurrently treated with corticosteroids.
  - Call senior doctor and anaesthetist if adrenaline is required.

## When to Refer

Refer to specialist practitioners (eg, Paediatric / Paediatric Emergency Department / Paediatric Ear, Nose and Throat Team(s)) if:

- Symptoms progress despite supportive care at home
- The episode of croup occurs during the neonatal period
- The child has a wheezing condition predisposing to more severe croup
- The child has a history of recurrent episodes of croup

### When to Admit

Admit to hospital if:

- The child appears toxic, lethargic, in respiratory distress (see Dyspnoea), or dehydrated
- Onset of illness was sudden, with rapid progression of symptoms
- Signs of respiratory distress are unresponsive to outpatient drug therapy

## ‘Safety Netting’ Advice

Advise parents / carers to seek urgent medical attention if:

- Any ‘red flag’ signs or symptoms develop
- Failure to improve within an expected time frame, or improvement not maintained after steroid treatment

## Patient / Carer Information

***Please note: whilst these resources have been developed to a high standard they may not be specific to children.***

- Croup (Web page), the NHS website

- Epiglottitis (Web page), the NHS website
- Croup (Web page), Patient

# Resources

## National Clinical Guidance

Feverish illness in children: Assessment and initial management in children younger than 5 years (Web page), NICE clinical guideline CG160, National Institute for Health and Care Excellence.

Feverish illness in children under 5 years (Web page), NICE quality standard QS64, National Institute for Health and Care Excellence.

Traffic light system for identifying risk of serious illness (Web page), NICE clinical guideline 160, National Institute for Health and Care Excellence.

## Suggested Resources

***Please note: these resources include links to external websites. These resources may not have national accreditation and therefore PCO UK cannot guarantee the accuracy of the content.***

Croup: Quick Reference Guide (PDF), RCPCH Paediatric Care Online (PCO UK)

Advanced Life Support Group. Advanced Paediatric Life Support: The Practical Approach (APLS) 5th Edition. John Wiley & Sons (Wiley-Blackwell), 2011 (version 6 in progress).

Croup (Web page), NICE clinical knowledge summary, National Institute for Health and Care Excellence.

Dexamethasone for croup (Web page), Medicines for Children

Difficulty in Breathing (Web page – requires log-in), Spotting the Sick Child

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