

# Evidence based guideline for the management of croup

**Mazza D, Wilkinson F, Turner T, Harris C**

on behalf of the Health for Kids Guideline Development Group.

---

Croup is a common presentation in both the general practice and hospital emergency department setting. The relatively recent introduction of steroid use in the management of croup has resulted in decreased hospital admissions and improved outcomes for children. This resource provides an evidence based guideline for the management of croup in general practice which is endorsed by The Royal Australian College of General Practitioners.

---

■ **Croup, also known as laryngotracheobronchitis, is a common childhood respiratory illness caused by a range of viruses. Viral infection causes inflammation of the upper airway, which is characterised by barking cough, inspiratory stridor, hoarseness and respiratory distress. Most cases of croup are relatively mild and self limiting. However, croup can occasionally cause severe respiratory obstruction and rarely, death.**

## Why was this guideline developed?

Despite the fact that the use of corticosteroids has revolutionised the management of croup, with fewer return visits and/or hospital (re)admissions required and a decrease in length of time spent in hospital,<sup>1</sup> croup remains a common reason for children to present to hospital. In the 5 years from 1 July 1999 to 30 June 2004, there were more than 26 000 presentations by children with croup to Victorian hospital emergency departments. Approximately 30% of these children (~1600 per year) were admitted to hospital, and less than 0.5% (~23 per year) were admitted to intensive care units.<sup>2</sup> Better management in the general practice setting and improved knowledge of the condition may result in decreased hospital utilisation.

This guideline covers diagnosis, natural history and management, infection control issues, and indications for hospital admission and discharge. The full guideline can be found at [www.mihsr.monash.org/hfk/pdf/hfkbronchiolitisguideline.pdf](http://www.mihsr.monash.org/hfk/pdf/hfkbronchiolitisguideline.pdf).

## Recommendations

### Diagnosis

The diagnosis of croup is clinical. There is very little research evidence on which to establish evidence based recommendations for the diagnosis of croup. However, there is a consensus of opinion in the medical literature that a child presenting with abrupt onset of barking cough, inspiratory stridor and hoarseness is likely to have croup. The severity of these symptoms varies over time. Croup is usually preceded by symptoms of a mild upper respiratory tract infection, including low grade fever, runny nose and cough.

---

✓ **A child presenting with abrupt onset of barking cough, inspiratory stridor and hoarseness is likely to have viral croup**

---

Historically there has been a distinction made between viral croup and spasmodic or recurrent croup. Opinion in the medical literature is divided as to whether these are separate entities or represent ends of the spectrum of the croup syndrome. Differentiating between the two conditions is difficult and largely unnecessary as treatment in either case is determined by the patient's history and severity of airway obstruction.

---

**D Consider other diagnoses in children with recurrent croup**

---

## Differential diagnoses

Croup-like symptoms may be present in children with several other conditions including:

- inhaled foreign body
- epiglottitis
- bacterial tracheitis
- congenital abnormality
- subglottic haemangioma.

**D** The following clinical features should alert the clinician to look for conditions other than croup in a child with croup-like symptoms:

- expiratory wheeze or loss of voice
- toxic appearance or high grade fever
- drooling, difficulty swallowing, anxiety
- prolonged, or recurrent stridor
- poor response to treatment
- age less than 3 months

## Investigations

The diagnosis of croup is clinical and other investigations are only rarely of value. In particular, radiography is not helpful in diagnosing croup.

- C** Radiography should not be used to diagnose croup
- C** Radiography should not be routinely used to differentiate croup from epiglottitis
- D** Radiography may occasionally be warranted in patients with stridor where the diagnosis is uncertain. If radiography is ordered, the patient should be monitored during imaging by staff able to manage the patient's airway
- D** Nasopharyngeal aspiration should not be undertaken in children with suspected croup

## Assessment

Assessment of croup is focused on classification of severity of airway obstruction as either:

- mild
- moderate
- severe, or
- life threatening.

There is little high quality evidence on which to base recommendations for the assessment of severity of airway obstruction in children with croup. The clinical signs and symptoms in *Table 1* are based on consensus opinion.

- ✓ Loudness of stridor is not a good indicator of the severity of croup

## Patients at high risk

- ✓ Children with pre-existing conditions causing narrowing of the upper respiratory tract, such as Down syndrome, are at higher risk of severe croup

## What observations should be taken?

The Guideline Development Group (GDG) agreed that the most important observations for a child with croup (*Table 2*) are:

- mental state
- stridor
- accessory muscle use, tracheal tug or chest wall retraction
- heart rate
- respiratory rate.

Croup is a disease of the upper airway and gas exchange in the alveoli is usually unaffected. It is therefore logical that decreased oxygen saturation is a late sign of severity in croup. There is no evidence to determine when oxygen saturation should be measured in children with croup. In the absence of evidence the GDG agreed that oxygen saturation (where available) should be measured at first presentation and then only in children with signs of severe or life threatening croup.

- D** Measurements of oxygen saturation should be made at presentation to hospital, and in children with signs of severe or life threatening croup

## Nonpharmacological management

Children with croup should be kept calm, and distressing procedures kept to a minimum as agitation may worsen airway obstruction.

### Humidified air

Our search identified two randomised controlled trials<sup>3,4</sup> investigating the effectiveness of mist, steam or humidification in the treatment of croup, neither of which showed any clinically significant difference with the use of humidified air.

- B** Mist or humidified air has not been demonstrated to be an effective treatment for children with croup

### Cold air

Some parents also report that children with croup improve when exposed to cool air. No research evidence was identified that investigated the effectiveness of cold or cool air in alleviating symptoms of croup.

Table 1. Algorithm for the management of croup in general practice

<b>Assessment of degree of airway obstruction</b>			
<b>Mild</b>	<b>Moderate</b>	<b>Severe</b>	<b>Life threatening</b>
Normal mental state	Anxious, tired	Agitated, exhausted	Confused, drowsy
No stridor or only when distressed	Stridor at rest		
No or subtle accessory muscle use, tracheal tug or chest wall retraction	Minor accessory muscle use, tracheal tug or chest wall retraction	Marked accessory muscle use, tracheal tug or chest wall retraction	Maximal accessory muscle use, tracheal tug or chest wall retraction or exhaustion
Normal heart rate	Increased heart rate	Markedly increased heart rate	
Able to talk and/or feed	Some limitation of ability to talk and/or feed	Increased respiratory rate Too breathless to talk and/or feed	Poor respiratory effort Silent chest
		Extreme pallor Low muscle tone	Cyanosis*
Note: If the patient has signs or symptoms across categories, always treat according to the most severe features Take special care with children who have relevant comorbidities or chronic illnesses, and consult appropriate specialist clinicians			
<b>Initial treatment</b>			
		Send to hospital by ambulance	Send to hospital by ambulance
		Provide oxygen	Provide oxygen
		Nebulised adrenaline – four 1 mL vials (total 4 mL) of 1:1000 solution – do not dilute – drive nebulisation with oxygen where possible	Nebulised adrenaline – four 1 mL vials (total 4 mL) of 1:1000 solution – do not dilute – drive nebulisation with oxygen where possible
Consider oral prednisolone 1.0 mg/kg	Oral prednisolone 1.0 mg/kg	Oral prednisolone 1.0 mg/kg OR IM dexamethasone 0.6 mg/kg	Oral prednisolone 1.0 mg/kg OR IM dexamethasone 0.6 mg/kg
Allow the child to adopt the position that they find most comfortable	Allow the child to adopt the position that they find most comfortable	Allow the child to adopt the position that they find most comfortable	Allow the child to adopt the position that they find most comfortable
Provide parent information	Provide parent information		
Send home if stable or reassess after 1 hour if there is any concern	Observe if facilities available at the surgery, or send to hospital Reassess within 1 hour		
<b>Response to treatment</b>			
<b>Good response</b>			
<ul style="list-style-type: none"> <li>Send home when child has no signs of moderate or severe airway obstruction and is clinically well</li> <li>Provide patient information, including reasons to return</li> </ul>			
<b>Poor response</b>			
<ul style="list-style-type: none"> <li>Send to hospital by ambulance</li> </ul>			
* Decreased oxygen saturation is a late sign of severity. Oxygenation may be maintained even in severe croup SpO <sub>2</sub> <92% is an indicator of increased severity. However it is recognised that this form of assessment will not be available to most GPs			

Table 2. Normal parameters for paediatric vital signs

	Neonate	Infant (6 months)	Toddler (2 years)	Pre-school	School age (7 years)	Adolescent (15 years)
Heart rate (awake) (beats/min)	100–180	100–160	80–150	70–110	65–110	60–90
Heart rate (asleep) (beats/min)	80–160	80–160	70–120	60–90	60–90	50–90
Respiratory rate (breaths/min)	30–80	30–60	24–40	22–34	18–30	12–20
Systolic BP (5–95%) (mmHg)	60–90	87–105	95–105	95–110	97–112	112–128
Diastolic BP (5–95%) (mmHg)	20–60	50–66	50–66	50–78	57–80	66–80
Temperature (°C)	36.5–37.5	36.5–37.5	36.0–37.2	36.0–37.2	36.0–37.2	36.0–37.2

---

**D Cold air has not been established as an effective treatment for croup**

---

### Oxygen

There is little research investigating the effectiveness of oxygen in children with croup. However, the clinical rationale for its use is clear. In the absence of clear evidence the GDG made the following consensus recommendation:

---

**D Give oxygen to any child with severe or life threatening croup**

---

### Position

No research evidence was identified which examined the effectiveness of different body positions for children with croup. In the absence of evidence the GDG noted that children with croup tend to find their own 'most comfortable position' and developed the following consensus recommendation:

---

**D Children with croup should be allowed to adopt the position that they find most comfortable**

---

## Pharmacological management

### Corticosteroids

There is good evidence to support the use of corticosteroids in croup. A Cochrane systematic review by Russell et al<sup>1</sup> including 31 studies and 3736 children, found that corticosteroids improved croup symptom scores after 6 and 12 hours, but that the difference was no longer significant at 24 hours. Corticosteroids also reduced re-presentation rates, reduced the need for adrenaline and decreased the time spent

in hospital emergency departments. The reviewers established that corticosteroids were as effective in children with mild croup as they were in children with moderate croup.

---

**A Consider giving corticosteroids to children with mild croup**  
**A Children with moderate or severe croup should be given corticosteroids**

---

With an awareness that dexamethasone is not readily available in an oral formulation and oral prednisolone is widely available, the GDG agreed that until further evidence is available, either dexamethasone or prednisolone can be used.

---

**B In children with croup, dexamethasone or prednisolone can be used**

---

There is inadequate evidence to determine the most appropriate dose, the most appropriate number of doses, or method of administration of corticosteroids for children with croup.

In the absence of evidence the GDG agreed to recommend a dose of 0.60 mg/kg oral dexamethasone or 1.0 mg/kg prednisolone in line with other local guidelines and the systematic reviewers' suggestion. The GDG acknowledges that 0.60 mg/kg dexamethasone is not a pharmacologically equivalent dose to 1.0 mg/kg prednisolone. However, there is not enough evidence to establish best practice, and in the absence of evidence it is difficult to justify changes to current practice.

---

**D Children with croup receiving corticosteroids should be given a dose of 0.60 mg/kg dexamethasone or 1.0 mg/kg oral prednisolone; preferably orally, or intramuscularly if the child is vomiting**

---

There is not enough evidence to determine whether multiple doses of corticosteroids are more effective than single doses. In the absence

of evidence the GDG was unable to make a recommendation about the value of repeat doses.

### Adrenaline

A systematic review<sup>5</sup> was identified which examined the effectiveness of nebulised adrenaline in children with croup. The review included three small, randomised controlled trials which found that, compared with placebo, adrenaline improved croup score as soon as 10, and within 30, minutes. One of these studies reported that there was no significant difference between treatment and placebo groups at 120 minutes. All these studies examined the effectiveness of nebulised adrenaline given in a hospital emergency department rather than by the GP. However, the GDG agreed that the evidence was applicable to the general practice setting as well as the hospital setting.

---

**A Children with severe or life threatening croup should be given adrenaline as a first line treatment**

---

There is no evidence as to the most effective dose of adrenaline. In the absence of evidence, the GDG agreed to make a consensus recommendation in line with local practice guidelines.

- 
- D Nebulise four 1 mL ampoules (total 4 mL) of 1 mg in 1 mL (1:1000) adrenaline solution undiluted. Do not dilute the adrenaline solution or give a more dilute solution as this will decrease the effectiveness**
- D Where possible nebulisation should be driven by oxygen**
- 

A number of extended case series<sup>6–8</sup> have investigated the safety of discharging children with croup who have received adrenaline in a hospital emergency department.

While these studies are of relatively poor methodological quality, they provide enough evidence to determine that it is reasonable to discharge a child with croup 2–3 hours after adrenaline is administered, if they are free of stridor and intercostal retractions at rest and clinically well.

- 
- D Not all children who receive adrenaline will require admission to hospital. A child with croup who receives adrenaline and corticosteroids may be discharged after 3 hours observation if they are free of stridor and intercostal retractions at rest and clinically well**
- 

### Analgesics and antipyretics

No research evidence was identified to determine when it is appropriate to give simple analgesics or antipyretics (eg. ibuprofen or paracetamol) to children with croup. Analgesics and antipyretics are not essential to the treatment of croup, but may be useful in addressing associated symptoms such as a sore throat.

### Level of care

Most children with signs of mild to moderate croup can be adequately managed by a GP. When corticosteroids are administered, the child should be monitored either by the GP or in the hospital setting for 2–4 hours.

- 
- D Children with mild croup (Table 2) can be managed by a GP and sent home for observation if the GP is confident the parent/carer can adequately manage the child's illness**
- D Children with moderate croup (Table 2) should be given corticosteroids and observed over a 2–4 hour period. These children can be managed by a GP if they can provide this level of care, otherwise the child should be sent to a hospital**
- 

### When should an ambulance be called?

There is no evidence to determine when a child should be taken to hospital by ambulance. The main reason to call an ambulance to take a child to hospital – rather than to take the child by car – is concern that the degree of airway obstruction may suddenly increase and the child's condition may rapidly deteriorate.

In the absence of evidence, and in consultation with the Victorian Metropolitan Ambulance Service, the GDG agreed to the following consensus recommendations:

- 
- D An ambulance should be called for any child with severe or life threatening croup**
- D If at any time there is concern about a child's ability to breathe, an ambulance should be called to take the child to a hospital**
- 

Children with severe or life threatening croup, or children with moderate croup who do not respond to corticosteroids, should be taken to a hospital emergency department.

### Case study 1 – mild croup

Your receptionist slots in Suzy, 3 years of age, at 9.30 am. Suzy has previously been well. Her mother says she has had symptoms of a cold for the past 48 hours and then last night at 2 am woke with a barking cough and a hoarse voice. From time to time throughout the night when she was running around, she had funny, noisy breathing but it settled by this morning. Her mother thinks she might have croup as Suzy's older brother had it when he was her age. On examination Suzy is happy, alert and playing with the toys in your consulting room. She has a 'seal' like cough from time to time, there is no temperature, no accessory muscle use, no inspiratory stridor and her chest is clear. Her heart rate is normal and she is able to talk, albeit with a hoarse voice.

A provisional diagnosis of mild croup is made. You explain the diagnosis to Suzy's mother and provide her with information on the condition, asking her to call or to return if Suzy's symptoms worsen.

---

Myths dispelled	We don't know	Facts confirmed
<ul style="list-style-type: none"> <li>The use of mist or humidified air is NOT effective in the treatment of croup</li> </ul>	<ul style="list-style-type: none"> <li>Question whether a second dose of steroid after 24 hours is helpful when a child has continuing symptoms</li> </ul>	<ul style="list-style-type: none"> <li>Steroid use has markedly decreased the number of children needing hospital admission with croup</li> </ul>
<ul style="list-style-type: none"> <li>Loudness of stridor is NOT a good indicator of the severity of croup</li> </ul>		<ul style="list-style-type: none"> <li>Either prednisolone or dexamethasone can be used to treat croup</li> </ul>

### Case study 2 – moderate croup

Your receptionist calls you to see Mei Ling, 4 years of age, who she has placed in the treatment room as she looks unwell.

As you walk in the door you notice that the child looks anxious and is sitting quietly on her father's knee. She has inspiratory stridor at rest and when you examine her chest you note that there is some tracheal tug and chest wall retraction. Her pulse rate is 130. Mei Ling's father says she was unable to eat or drink that morning.

You diagnose moderate croup and administer 17.0 mg of prednisolone (her weight is 17 kg).

You explain the diagnosis to her father, provide him with information on the condition, and then ring the local hospital emergency department. You explain to the father that the child will require observation in hospital to ensure she improves.

### Case study 3 – severe croup

You hear a frantic knock on your door... 'Please come quickly, this child looks very sick'.

An anxious looking mother is clutching her 3 year old son who appears very pale, agitated and exhausted. He has marked chest wall retraction and tracheal tug and is too breathless to respond to your questions. His mother says he developed noisy breathing during the night and has deteriorated rapidly this morning.

On examination he has an increased pulse and respiratory rate and poor air entry. You diagnose severe croup and administer oxygen while asking your receptionist to call an ambulance.

You nebulise 4 x 1.0 mL vials of 1:1000 adrenaline using the oxygen tank to drive it. Because the boy is unable to tolerate any oral intake, you draw up and administer dexamethasone intramuscularly at a rate of 0.60 mg/kg. By the time you do all that, the ambulance has arrived and transports the child to hospital.

### Summary of important points

- A child is likely to have croup if they present with abrupt onset of barking cough, inspiratory stridor and hoarseness.
- Loudness of stridor is NOT a good indicator of the severity of croup.

- Distressing procedures should be kept to a minimum as agitation may worsen airway obstruction.
- Consider other diagnoses in children with recurrent croup.
- Radiography should not be used to diagnose croup or differentiate it from epiglottitis.
- Any child with croup who also has a pre-existing upper airway abnormality, or a significant relevant comorbidity or chronic illness, should be sent by ambulance to a hospital emergency department.
- Steroid use should be considered in mild croup and given in moderate-severe croup. Steroids should preferably be given orally, or intramuscularly if the child is vomiting.
- Use either: 0.60 mg/kg dexamethasone or 1 mg/kg oral prednisolone.
- Unlike asthma, there is insufficient evidence to determine whether multiple doses of corticosteroids are more effective than single doses.
- Use of mist or humidified air is NOT an effective treatment for croup.
- Cold air has NOT been established as an effective treatment for croup.
- Children with croup should be allowed to adopt the position they find most comfortable.
- If at any time there is concern about a child's ability to breathe, an ambulance should be called to take the child to a hospital.

### References

- Russell K, Wiebe N, Saenz A, et al. Cochrane Acute Respiratory Infections Group. Glucocorticoids for croup. *Cochrane Database Syst Rev* 2006; Issue 1.
- Department Human Services. 2005. Data available on request.
- Neto GM, Kentab O, Klassen TP, Osmond MH. A randomized controlled trial of mist in the acute treatment of moderate croup. *Academic Emerg Med* 2002;9:873–9.
- Bourchier D, Dawson KP, Fergusson DM. Humidification in viral croup: a controlled trial. *Aust Paediatr J* 1984;20:289–91.
- Johnson D. Croup. *Clinical Evidence* 2004;12:401–26.
- Kelley PB, Simon JE. Racemic epinephrine use in croup and disposition. *Am J Emerg Med* 1992;10:181–3.
- Prendergast M, Jones JS, Hartman D. Racemic epinephrine in the treatment of laryngotracheitis: can we identify children for outpatient therapy? *Am J Emerg Med* 1994;12:613–6.
- Rizos JD, DiGravio BE, Sehl MJ, Tallon JM. The disposition of children with croup treated with racemic epinephrine and dexamethasone in the emergency department. *J Emerg Med* 1998;16:535–9.

## Resource. Parent information

## Medical &amp; nursing care for your child

Care for children with croup focuses on helping them to breathe easily.

- Your child will be assessed to see how hard they are finding it to breathe.
- Some children with croup will be given a medication called prednisolone. This helps reduce the swelling in the windpipe, making it easier for the child to breathe.
- Children with severe croup may be given adrenaline. Adrenaline is breathed in through a mask attached to oxygen. It relieves the tightness and swelling in the voicebox and windpipe.
- Most children respond well and can go home after a few hours of observation.
- Some children need to be treated for several hours in the Emergency Department, and a few children with croup will spend one or two nights in hospital.
- Your child will be able to go home when his / her breathing is improved, and doctors are happy with their condition.

**Did you know?**

If you don't already have a GP you can find a child friendly GP on the web: [www.healthforkids.net.au](http://www.healthforkids.net.au)

## Important points to remember:

- Croup is a common childhood illness.
- Children with symptoms of croup should be taken to see their General Practitioner (GP) if you are at all concerned.
- The symptoms of croup sometimes last for up to a week, and often they get worse at night.
- **Call 000 for an ambulance if you are concerned about your child's ability to breathe**
- If you are concerned that your child's breathing is worsening once you get home, then you should go back to your GP or the Emergency Department.

Maternal Child and Health Support Line: 13 2229

These websites have more information on croup and other illnesses:

<http://www.betterhealth.vic.gov.au/>

[www.rch.org.au/kidsinfo/](http://www.rch.org.au/kidsinfo/)

**Southern Health**

Disclaimer: This health information is for general education purposes only. It should not be used in place of medical advice. Please consult with your doctor and or other health care professionals to ensure individualised and appropriate health care is tailored for your child.

## Information for Parents of Children with Croup



## What is croup?

Croup is a common childhood illness. It is sometimes called laryngotracheobronchitis.

Croup is caused by a viral infection that causes the lining of the voicebox and windpipe to swell. This swelling may make it difficult for a child to breathe.

Croup usually affects children less than five years old because they have a smaller and softer voicebox and windpipe.

There is no way to prevent a child from getting croup. Because it is a viral disease, antibiotics are not effective in treating croup.

**Did you know?**

Croup is more common in young children, but older children and teenagers can get croup too.

## What are the symptoms of croup?

Children with croup normally have some of these symptoms:

- A harsh, "barking cough" (which sounds like a seal)
- Hoarse voice
- A noise when breathing in known as "stridor" (a harsh or high pitched breathing sound)

Before developing croup, children often have other symptoms of a viral infection such as a temperature, runny nose and sore throat.

The symptoms of croup sometimes last for up to a week, and often the symptoms get worse at night.

## What care should I give at home?

After seeing a doctor, most children with croup can be managed at home.

- Stay calm, reassure your child
- Sit with your child in a position they find comfortable
- Try reading a favourite book or watching TV or a video with your child
- Rest is important as activity may make the symptoms worse
- Give your child small amounts of drink at regular intervals.

If a child is breastfed then do not stop, give smaller feeds more frequently.

Mist, steam or humidified air are unlikely to be effective in treating croup. Be very careful with any of these as there is a danger the child might be burned.

**Did you know?**

Mist, steam or humidified air have not been shown to help symptoms of croup.

## When should I take my child to a doctor?

If your child has symptoms of croup and you are concerned at all, take them to see your General Practitioner (GP). Your GP will assess your child and plan appropriate medical care.

If your child has symptoms of croup and they have an existing upper airway abnormality or chronic illness, consult your GP immediately.

Take your child to the Emergency Department, if your child:

- Has stridor (high/harsh sounds when they breathe in) while they are sleeping or sitting quietly
- Looks unwell, pale, anxious, tired
- Has a high temperature
- Is drooling
- Has considerable decrease in intake of fluids / drink over a 12 – 24 hour period

Or if your GP is not available and you are worried about your child's condition

**Did you know?**

Keeping your child relaxed and comfortable can help ease the symptoms of croup

## When should I call an ambulance?

If you are concerned about your child's ability to breathe, call 000 for an ambulance.

Call 000 for an ambulance if:

- If your child has difficulty in breathing
- If your child becomes floppy, agitated or confused
- Their lips or face become blue or very pale

When calling an **ambulance** you will be asked some questions, these may include:

- What is the exact address of the emergency?
- What phone number can they call you back on?
- What is the problem?
- How old is the child?
- Is the child conscious?
- Is the child breathing?