



Croup

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Croup is almost always a viral illness producing inflammation of the larynx, vocal cords and the upper part of the trachea. This is a common pediatric illness affecting mostly young children and infants six months to three years of age. As with most viral respiratory illnesses, this will be a late fall, winter and early spring experience more common in child day care settings. Causative viruses are most commonly para-influenza 1, but can include para-influenza 2 & 3, influenza, RSV, coronavirus, rhinovirus, metapneumovirus, bocavirus and a few others. That was "medspeak", sorry... Generally speaking viral respiratory illnesses with wet noses, sometimes cough and low-grade or higher fever are all ripe for the development of croup.

So, what is this croup "thing"? It's perhaps better thought of as a set of symptoms provoked by similar causative viruses than as a disease itself. The principal symptoms are hoarseness, barking cough (Google "barking seal" and listen) and stridor (medspeak!). Stridor is wheezy, raspy, noisy breathing (Google this, too!) and is usually when the patient breathes in, but in severe croup, stridor could be both when breathing in and breathing out. It's usually reasonably sudden in onset (minutes to hours in its onset) and curiously is anecdotally observed to be a bit more nocturnal in its onset than in the cold light of day. This could be that anything that troubles a child will be more reportable if it occurs at night and sleep disrupts the surrounding family. It is, however, an observable pattern. Fever is often absent or mild, but striking fever can be present. If striking fever is present and influenza is prevalent in the community, think about influenza because specific antiviral therapy and the nonspecific care techniques for croup may both be applicable. Significant fever could also be suggestive of one of the quite rare bacterial syndromes that looks like croup. So, if there is significant fever, no matter the severity of stridor and "barking-seal" cough, physician evaluation would be prudent.

As with most illnesses, the severity ranges from mild to severe. Parents tend to be most interested in the unusual "barking" cough, while physicians tend to be more interested in the degree of stridor (noisy / raspy / wheezy breathing). The barking cough is linked to the degree of vocal cord inflammation and the stridor to the degree of laryngeal and tracheal inflammation and narrowing. It



is the narrowing and the rare prospect of significant respiratory distress and airway obstruction that provokes the anxiety that is felt when croup symptoms are present.

There are predictors among the symptoms that help to identify which child is likely, based on historical information, to need medical intervention and should seek care more urgently. Most of those historical features are listed below:

1. Stridor at rest--continuous stridor, in and out stridor
2. Significant fever
3. Sudden onset of symptoms
4. Preexistent abnormality of the airway
5. NICU baby on a ventilator for some time (intubated)
6. Abnormal chest wall movements with breathing
7. Rapid breathing
8. Trouble swallowing liquids or saliva
9. Developmentally / intellectually challenged child
10. Prior significant distress with croup

Initial home therapy for croup symptoms includes hydration, fever management with Tylenol (> 3month of age) or ibuprofen (> 6 months of age) when needed and airway humidification. The airway humidification can be accomplished with a device that produces mist, but not steam humidifiers because of the risk of burning a child. A steamy shower in a closed bathroom to produce a steamy room is time honored and can be helpful. If you have a nebulizer for delivery of inhaled medications in asthma care, nebulized saline may be helpful. The use of albuterol or budesonide in a non-asthmatic patient with croup may be helpful, but might be inappropriate without specific direction to do so.

Some degree of parental or physician triage about further medical care decisions will be ongoing while initial croup supportive care and triage has begun at home. If an office setting is appropriate, after medical evaluation, specific care is likely to include nebulized saline or perhaps epinephrine and corticosteroids. The corticosteroids can be administered orally, by injection or perhaps



nebulized. One or perhaps two to three doses / days of corticosteroids will be recommended. The delivery technique will lie at the discretion of the administering physician.

One genuine curiosity about croup symptoms is that after the initial airway humidification has taken place at home, if improvement has been modest or absent, the decision to seek care urgently (remember its mostly nocturnal) is made and transit to urgent care is engaged. This is seasonal, so when the family exits the home to get in the car (Texas has little mass-transit), cold winter air exposure is common. Many times, by the time the family reaches urgent care, the stridor and respiratory distress that provoked the decision to seek urgent care has passed. Whether the cold air was a factor in the improved symptoms or the effects of airway humidification were delayed enough that the cold air "seemed curative" is a matter of ongoing debate. Likely, this issue will remain a piece of pediatric lore for some time to come. This is an observed enough phenomenon that some physicians will suggest intentional cold air exposure after the airway humidification (if unsuccessful) in hopes the second modality will be helpful.

If the patient is more severely ill, initial stabilization may take place in an office setting, but further care may be needed in an emergency room setting. Again, corticosteroids and airway humidification will be part of the treatment protocol. The use of epinephrine to diminish airway edema and swelling will be more likely in the more severely ill child. Improvement in airway compromise can be swift and significant, but tends to be short lived. The longer term (> 2 hours) course of a croup illness is not influenced by nebulized epinephrine and carries with it the possibility that the original symptoms will return after two hours as the effects of nebulized epinephrine "wear off". As a consequence, most facilities using nebulized epinephrine will have some protocol of observation in place if nebulized epinephrine is utilized to watch for return of symptoms. Improvement based on the administration of corticosteroids by any modality will be measured over a few to several hours. Since croup symptoms can be progressive over the short term (usually measured in hours), as that initial dose of nebulized epinephrine "wears off", the symptoms may be more significant than before the initial dose of nebulized epinephrine was administered. Because of these concerns of returning/worsening symptoms, and the knowledge that the corticosteroids may not have "kicked-in" yet at two hours, office use of nebulized epinephrine will often lead to prolonged period of observation and potentially transfer to a hospital-based facility to do so. Obviously, in distress, be that an office or emergency room, oxygen and pulse oximetry will be part of the therapeutic regimen.



This all sounds sort of dire as an illness, but should be taken in some degree of context. Remember that it is a common illness. If it gets started in a room at daycare, many of those exposed will develop croup symptoms. Some will have such mild symptoms that medical intervention will be unnecessary. Of those presenting to the office setting, roughly one in thirty will be judged so ill, that emergency room care will be needed. Of those triaged to, or presenting to, the emergency room for care, roughly one in twenty will be judged ill enough to require overnight (or longer) hospital observation. Of this select group, perhaps as few as one in ten will be ill enough to have that observation / intervention occur in an intensive care setting. As you can see, across the board, the number of infants and children with life threatening symptoms with croup is quite small.

Refer to the list above, as each child is an individual, when trying to judge at the inception of the illness, which child needs more decisive intervention. Since the airway is involved, to err on the conservative side and have too many children medically evaluated is a far superior decision to the decision to wait or deny care to even one child who'd have benefited from medical care.

This "croup thing" has, as have many pediatric illnesses, been touched by and significantly influenced by childhood vaccines. In the mid 1980's, a vaccine for a much more (than viral croup) harrowing bacterial laryngeal infection became available, was improved upon by a second generation of vaccine and fortunately has been so widely accepted and administered to our infants, that this form of laryngeal infection is today little more than a historical remnant. Vaccine vigilance, even with this illness, gone from our children's lives, for more than thirty years remains a lurking threat. Ten years or so ago, when a brief shortage of this vaccine occurred, less than a year was needed before this bacterium (*Haemophilus influenzae*) made its return, infants were sickened and an unfortunate few died in the United States. We have a four decade long success story with infections caused by this bacterium. Rejoice in our success, but remember that it comes only through continued vigilance. Those among us who would decry this success, have lived so short a time and learned so little in those years about this matter that their voices cannot be those we listen to. Be wise, do your part, vaccinate your babies and children and embrace and share the joy of two generations of Americans whose lives have been forever impacted and improved by this amazing science.

"He who does not learn from history is doomed to repeat it."