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Trust Guideline for Acute Stridor in Children

For Use in:	Children's Assessment Unit (CAU), Children's Wards, Accident & Emergency (A&E), Children's Emergency Department(CHED)
By:	Medical and nursing staff in the above
For:	Children over a month of age with acute stridor or with suspected inhaled foreign body
Division responsible for document:	Children
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Version and Document Control:

Version Number	Date of Update	Change Description	Author
8	23/02/2022	Flowcharts reconstructed, updated to current practice, change of key people	Dr K Grace Kuruvilla, Dr Anjay Pillai

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A. Differential diagnosis of Acute Upper Airway Obstruction in Children

Diagnosis	Key features	Treatment
Viral laryngotracheobronchitis (Croup)	typically affects 6 months -3 years peak incidence at 2 years and in late autumn boys more affected than girls sudden-onset seal-like barky cough, hoarse voice, low grade fever, with or without stridor. may have signs of respiratory distress. symptoms worse at night and with agitation	Glucocorticosteroids are mainstay of treatment with or without nebulised adrenaline
Bacterial tracheitis	average age 4-6 years preceding URTI sick/septic looking child with respiratory distress stridor, hoarse voice, high fever >38.5, productive cough and copious secretions, coexistent pneumonia, pus in trachea at intubation caused by Staph aureus commonly, Haemophilus, Moraxella, Streptococcus and anaerobic organisms	Up to 80% require intubation - assemble experienced team early little or no response to nebulized adrenaline Put local anaesthetic cream early. Management of septic child, IV cultures and antibiotics - Ceftriaxone 80mg/kg/day initially pending cultures
Epiglottitis	peak incidence 1-3 years acute severe airway obstruction by H influenzae B, uncommon currently due to vaccination. sick/septic looking child soft inspiratory stridor, high fever >38.5, rapidly increasing respiratory distress child sits immobile with mouth open, does not wish to lie flat, drooling, unable to swallow	Assemble experienced senior multidisciplinary team early- intubation will be usually required and may be difficult. Put local anaesthetic cream early. IV cultures and antibiotics Ceftriaxone 80mg/kg/day

Foreign body aspiration	peak incidence age <3 years, more common in boys sudden onset choking with coughing, stridor or wheeze, respiratory distress without preceding fever or illness	cough should be encouraged Direct visualisation and removal of foreign body by rigid bronchoscopy under GA may be required
Anaphylaxis	acute onset exposure to triggers itching, urticaria, facial swelling, respiratory and/ or cardiovascular compromise	ABCDE management IM adrenaline
Inhalation injury and burns	history of exposure to smoke carbonaceous deposits around mouth, sputum, singed nasal hair, facial burns, progressive airway compromise or oedema	Early intubation by an experienced team Fluid replacement as per burns guidance
Hereditary angioedema	acute onset localised non-pitting, non-pruritic, non-erythematous angioedema commonly affecting, eyelids, lips and tongue. airway oedema at the level of larynx causes stridor, dysphagia, voice changes	Steps to secure the airway as necessary. Agents to treat allergic angioedema such as adrenaline, antihistamines and steroids will not be effective. Treatment requires infusion of C1 esterase inhibitor
Retropharyngeal abscess	neck pain and swelling may cause dysphagia, trismus, inspiratory stridor, fever and signs of systemic sepsis	Cultures and IV antibiotics May require surgical drainage
Diphtheria	extremely rare, may present at any age, history of inadequate immunisation, recent travel low grade fever, dysphagia, inspiratory stridor, neck pain and swelling, voice hoarseness greyish adherent membranous pharyngitis	nasal and pharyngeal swab cultures IV cultures and antibiotics- Ceftriaxone Administer diphtheria anti- toxin Treat contacts with erythromycin +/- immunisation

Congenital or acquired tracheal or laryngeal abnormalities		Upper airway endoscopy or bronchoscopy allows direct visualization of underlying abnormality

A Clinical algorithm for the Management of presumed viral croup

Consider the differential diagnosis during the physical examination
Treatment decision is based on the history and clinical severity of airway obstruction

B. Clinical algorithm for the management of suspected inhaled foreign body

Objectives

To optimise the management of children presenting with Acute Stridor or with an Inhaled foreign body.

Rationale

Acute Stridor is a common condition seen in children which can be potentially serious. Stridor is a sign of upper airway obstruction, the causes of which are many. Appropriate assessment and treatment is required in order to optimise patient care and prevent morbidity. Croup, also known as laryngotracheobronchitis is a common cause of acute stridor in children. Croup is a clinical diagnosis. Careful history and physical examination are sufficient for confirming clinical diagnosis and ruling out potentially serious differentials.

This guideline was revised following an audit and literature was reviewed to clarify areas in the previous guideline with regards to the type of steroid, the dose and route recommended for viral croup. The guideline is strongly evidence based – see references below.

Notes for use with the clinical algorithms

1. Stridor is caused by partial upper airway obstruction and is typically an inspiratory noise although it can be expiratory also if the obstruction is below the larynx. (Wheeze is a high -pitched whistling expiratory sound which is a sign of lower airway obstruction and narrowing. Stertor is a low-pitched snoring sound and signifies upper airway collapsibility. It is important to distinguish between them as the management is different.)

2. Clinical presentations of croup may range from mild symptoms to impending respiratory failure. Most children with croup have a mild self-limiting illness lasting few days. Complications of Croup include bacterial tracheitis and pneumonia.

3. X-ray of the anteroposterior and lateral neck is not performed in children with typical symptoms and signs of croup. Radiological studies are contraindicated if there is clinical suspicion of epiglottitis or bacterial tracheitis as manipulation of the neck region and agitation may precipitate further airway obstruction.

4. Westley Croup Score has been generally used to assess the severity of croup. Interobserver variability exists when score used in clinical practice but can serve as a helpful guide in scoring of clinical severity and to measure response over time to treatment. The initial Westley score has a strong correlation with length of hospital stay.

Evidence shows that patients with an initial score of 1-2 could safely be treated at home and those with initial score >5 required hospitalisation for further treatment.

5. Repeated frequent observation by the same health professional is important to assess severity, particularly in those cases felt initially to be mild or moderate. This will aid decision making and response to therapy. A baby or child that is deteriorating to the stage of respiratory failure may appear exhausted and "disconnected" from their environment. Hypoxia is always a very worrying sign

6. Mild croup features include seal-like barky cough without stridor at rest or sternal/intercostal recession. A single oral dose of dexamethasone 0.15mg/kg improves symptoms in children with mild croup.

7. In moderate croup there is stridor at rest and sternal/intercostal recession, without agitation or lethargy. A single dose oral dexamethasone 0.15mg/kg is recommended.

   If the child is too unwell a single dose nebulised budesonide 2 mg or single dose IM dexamethasone 0.6mg/kg are possible alternatives. Addition of nebulised adrenaline 1 in 1000, maximum 5 ml undiluted as a single nebuliser is recommended. Children can be safely discharged after 2-4 hours of observation following nebulised adrenaline administration. Nebulised budesonide is preferable in a child with severe hypoxia, respiratory distress, or persistent vomiting. Moderate croup carries a reasonable outlook and symptoms resolve without significant complications.

8. The features of severe croup include stridor at rest, sternal/intercostal recession with agitation or lethargy. Treatment is with combination of corticosteroid plus nebulised adrenaline, oxygen for marked respiratory distress (8-10 lit/min as blow-by or 100% oxygen via a non- re-breather face mask). Prognosis for severe croup is excellent since combination treatment with dexamethasone and nebulised adrenaline dramatically decreased numbers of children intubated, reduced number of days spent in ICU and shortened length of hospital stay.

9. Impending respiratory failure is very rare with intubation required in 1-3% of all croup cases. There is increasing upper airway obstruction, sternal/intercostal recession, asynchronous chest wall and abdominal movement, fatigue, tachycardia and signs of hypoxia due to hypoventilation (pallor or cyanosis) and hypercapnia (decreased level of

   consciousness secondary to rising $PaCO_2$). Intubation is recommended to secure the

   airway for children with impending respiratory failure.

10. Corticosteroids are the mainstay of treatment in mild, moderate and severe croup. In a systematic review, glucocorticosteroids were found to improve symptoms of croup, reduce length of hospital or ED stay, reduce number of admissions for treatment and return visits. Treatment effect is seen within 2 hours with further beneficial effects noted up to10 hours following administration.

The anti-inflammatory effect of dexamethasone can last for 2-4 days, so a second dose in unlikely to be beneficial in most children as croup symptoms show resolution within 3 days of onset. Serious adverse effects were infrequent from use of corticosteroids for croup in children.

11. Dexamethasone dose: A Cochrane systematic review showed there were no significant differences between groups treated with dexamethasone doses ranging between 0.15 to 0.6 mg/kg. Evidence now supports the use of a smaller dose of dexamethasone 0.15mg/kg in croup as it is as effective as the traditionally used dose of 0.6 mg/kg.

12. Type of steroid in croup:

    Evidence shows that dexamethasone reduces the rate of return visits to medical care compared to prednisolone. Children treated with prednisolone initially are more likely to require additional doses to cover the duration of illness in croup.

14: Nebulised budesonide:

    Oral, IM corticosteroids are equivalent or superior to nebulised corticosteroids in moderate to severe croup. Oral dexamethasone is as effective as nebulised budesonide at reducing symptoms and less distressing for the child. There is no evidence of additional benefit with addition of nebulised budesonide to oral dexamethasone compared with either drug used alone.

15. Adding nebulised adrenaline

    In severe and selected cases of moderate croup nebulised adrenaline can be administered with dexamethasone as it provides temporary relief of symptoms of airway obstruction while awaiting the effects of corticosteroid treatment. A clear reduction in stridor and chest recession should be evident within 10 to 30 minutes following administration. The clinical effects of nebulised adrenaline last on average of 1 hour but usually subside 2 hours after administration. No adverse effects (increase BP or heart rate) have been noted when given one dose at a time. Caution should be used with multiple doses of nebulised adrenaline. Careful observation is advisable with continuous ECG and oxygen saturation monitoring if adrenaline treatment is necessary. Anaesthetist should be informed as these children may still deteriorate and require tracheal intubation.

16. In children with croup who do not respond to treatment, other causes of acute stridor should be considered. A refocused assessment and re-evaluation should take place to rule out alternate diagnoses and to assess for pre-existing upper-airway anatomical abnormalities.

17. Treatments with no added benefit:

    Evidence suggests that mist or humidified air are ineffective and can be harmful (scalds, injuries, mould formation, increased agitation of child). Antibiotics, decongestants, beta-2 agonist use have not been studied and their use should be discouraged. Heliox has not been proven to show benefit over standard therapies and is not recommended for use in children.

18. Children with chronic stridor and those with associated failure to thrive should be referred to Paediatric Ear, Nose and Throat clinic. Most chronic stridor are due to laryngomalacia which typically resolves by 18-24 months but is important to exclude other causes.

19. Foreign body obstruction management depends on the site and severity of airway obstruction. Intubation should be considered ONLY when there is impending or actual cardiorespiratory arrest. Otherwise, examination under anaesthetic with rigid bronchoscopy by ENT is the best option.

Scope

The guideline was updated and revised according to current literature review and evidence based best practice.

Clinical audit standards

1. 100% of children presenting with acute stridor (croup) should have Westley score to aid croup severity and documentation.

2. All Children presenting with acute stridor (croup) should be given steroids.

3. Anaesthetist should be informed in all cases of severe croup requiring nebulised adrenaline.

Summary of development and consultation process undertaken before registration and dissemination

The guideline was drafted by Dr Anjay Pillai and Dr K. Grace Kuruvilla on behalf of the guideline development group of the Paediatric Directorate, which has agreed the final content. During its development it has been circulated for comment to: colleagues in paediatrics, ENT, and children's emergency department

Changes made included use of Westley score to aid assessment of croup severity, dexamethasone as preferred oral corticosteroid for croup, steroids to be given in all cases of croup presenting to hospital and children with acute stridor who do not respond to standard treatment consideration should be given to other less common causes of acute stridor as given in the table listed.

Distribution list/ dissemination method

To CAU, Paediatric Wards, A&E, CHED and on the Intranet

8. References

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Also see a parent Information Leaflet for Children with Croup Trustdocs Id: 17068