

PAEDIATRIC STRIDOR/ THREATENED AIRWAY

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Background Information

Definitions of levels of care (in this guideline)

- Level 1: Community healthcare worker/non-doctor
- Level 2: Medical doctor
- Level 3: ENT Surgeon

Difficult breathing in a pediatric patient can be due to obstruction at the supraglottic, glottic and/or subglottic level. Fast moving air through a narrow area creates a high pitched sound known as stridor.

Immediately assess the severity of obstruction using the guide below. The differential diagnosis can include laryngomalacia, croup, epiglottitis, retropharyngeal or peritonsillar abscess, subglottic stenosis, foreign body, aspiration of caustic material, amongst others.

Signs and severity:

Characteristic high pitched airway noise (stridor) with accompanying respiratory distress/work of breathing. Classically supraglottic pathology presents as inspiratory stridor, whereas glottic and subglottic pathology can present as biphasic stridor, and tracheobronchial pathology presents as expiratory stridor.

Mild respiratory distress

- Stridor only when agitated/crying but resolves at rest (may require stethoscope to auscultate)
- Minimal physical examination signs

Moderate respiratory distress

- Stridor at baseline, audible without stethoscope
- Nasal flaring, tracheal tugging, intercostal, subcostal, and substernal recessions

Severe respiratory distress

- Loud stridor at baseline with associated pausing/gasping
- Cyanosis (perioral blue), lethargy from increased work of breathing
- Severe nasal flaring, tracheal tugging, intercostal, subcostal, and substernal recessions +/- tripodding (adopting a tripod position)

Examination and Investigations

General:

- Examine respiratory status of child via targeted physical examination, if severe, move immediately to management
- Auscultation of larynx, tracheal and lungs for stertor (low-pitched noise similar to snoring) versus stridor (high-pitched noise)
- Antero-posterior/lateral chest X-ray to assess for pulmonary pathology (pneumonia, foreign body, etc) and also to evaluate subglottis for croup.

Level 1:

- Perform targeted physical exam and if severe, move directly to management
- Look in mouth to ensure no foreign body
- Reposition child as needed (if obstructing from glossoptosis/macroglossia (a tongue that is falling backwards or a very large tongue), consider prone position)
- Obtain targeted vital signs (SpO2-if available, temperature, heart rate, respiratory rate)

Level 2:

- Perform targeted physical exam and if severe, move directly to management
- Auscultation of larynx, tracheal and lungs for stertor (low-pitched noise similar to snoring usually due to obstruction of the tongue or higher) versus stridor (high-pitched)
- Anteroposterior/lateral chest X-ray to assess for pulmonary pathology (pneumonia, foreign body, etc) and also to evaluate subglottis for narrowing
- Blood gas can help determine severity of respiratory distress

Level 3:

- Perform targeted physical exam and if severe, move directly to management
- Perform bedside flexible laryngoscopy if patient stable enough
- If necessary, consider bringing the patient to a controlled environment and performing an operative direct laryngoscopy/bronchoscopy for further evaluation, intubation, airway sizing, or possible immediate intervention if an acute pathology is encountered (see management-level 3)

Management

General:

- If moderate to severe, provide oxygen and conservative protective measures while transporting to an adequate hospital
- Conservative measures:
 - Keep child calm and as comfortable as possible
 - Positioning to upright, decubitus or prone may help, try these positions.
 - If in hospital, connect to SpO2 monitor and provide support O2 via nasal cannula, facemask, positive pressure as needed.
 - If obstruction is perceived to be at the nasopharyngeal/oropharyngeal/oral cavity, place nasal trumpet (nasopharyngeal airway) to bypass obstruction
- If severe, consider invasive airway (laryngeal mask airway, intubation, tracheostomy)

Level 1:

- Consider conservative measures as listed above
- If foreign body suspected in the oral cavity, perform finger sweep in the mouth to remove foreign body
- Stimulate child to ensure awake, alert
- If croup suspected, administer supportive cares (humidified O2, IV fluids, systemic steroids ie dexamethasone, nebulised adrenaline / epinephrine)
- Keep nil per oral until transfer to higher level care if possible

Level 2:

- Connect any available SpO2 monitor/pulse oximeter
- Obtain IV access (consider IO if unable to obtain IV)
- If area of obstruction is known, consider following mechanisms to bypass obstruction
 - Nasal congestion
 - Nasal decongestant drops/spray, suctioning
 - Glossoptosis/macroglossia- (tongue falling back or being too large)
 - Nasal trumpet (nasopharyngeal airway) and side-lying / prone positioning
 - If severe, consider tongue stitch to pull tongue forward until stabilized
 - Difficulty maintaining bag-mask ventilation
 - Jaw thrust
 - Oral airway +/- nasal airway
- Provide supplemental O2 as needed to maintain saturations above 90%
 - Nasal cannula, facemask, Venturi mask, non-rebreather mask, bag mask, LMA, intubation
 - Consider adjuncts such as Heliox, racemic epinephrine (adrenaline), systemic steroids (ie. dexamethasone)
- If necessary, use laryngoscope to expose airway and place an age-appropriate breathing tube (endotracheal tube (ETT) Size: (age/4 + 4))
- **Only to be done if no other option and airway loss is imminent.** If obstructing and unable to ventilate and/or intubate, consider needle cricothyrotomy (figure 1) to bypass airway
 - Saline flush on a 14 gauge needle/angiocatheter used to enter airway (confirm airway placement by pulling back on the saline flush and seeing bubbles once in the airway). Once airway placement established, connect angiocath directly to anesthetic circuit via 3cc syringe with ETT connector
 - Can ventilate through this method until cricothyrotomy formalized by otolaryngologist

Level 3:

- Perform airway stabilizing procedures in the operating room depending on pathology and area of obstruction identified (ie. ETT versus trach)
- **Discussion with anesthesia team:**
 - Comfort levels with pediatric anesthesia can vary based on location and institution. It is important to discuss the plan ahead of starting the procedure.
 - Ideally, general anesthesia should be induced to maintain spontaneous breathing reserving apnoea and paralysis to only after the airway has been established
 - Pediatric spontaneous breathing during bronchoscopy can significantly increase the safe operative time
 - The vocal cords can be anaesthetised with 1% lidocaine applied directly during the initial direct laryngoscopy
- Utilize age-appropriate ventilating rigid bronchoscope as necessary to maximize visualization and provide simultaneous respiratory support
- Please see this video for appropriate instrument selection and technique:
 - https://www.youtube.com/watch?v=3Oxe2Q6DZ_Y
- Consider LMA as an adjunct airway (can intubate through LMA)
- If necessary utilize balloon dilation in order to open an immature subglottic or tracheal stenosis to allow for intubation
- Consider tracheostomy in children who are unable to be intubated due to exposure or stenosis

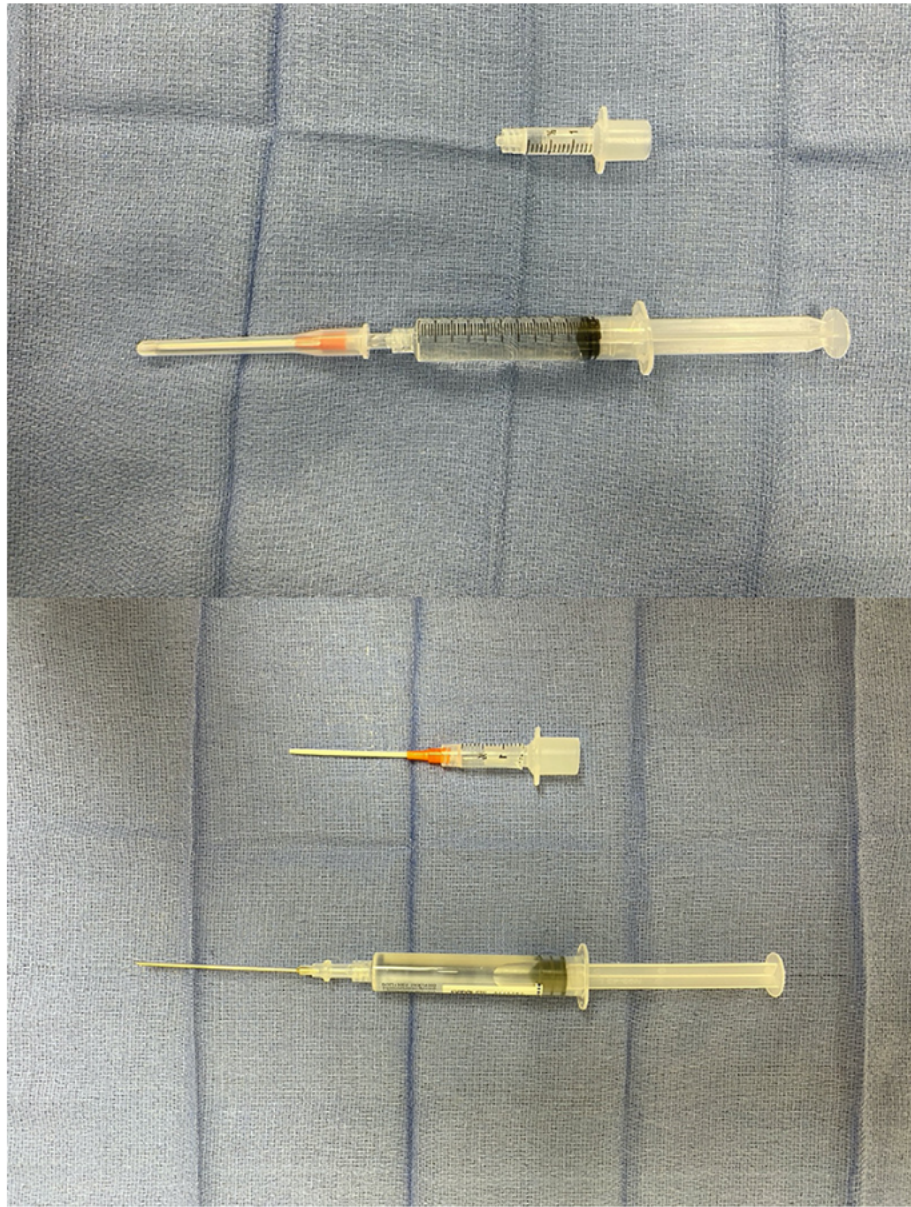


Figure 1. Needle cricothyrotomy kit assembly. A saline flush connected to a 14-gauge angiocatheter is used to enter the airway. This is connected to a 3 ml saline syringe to the end of a size 7 endotracheal tube.

Figure from: Jayawardena ADL, Ghersin ZJ, Mirambeaux M, Bonilla JA, Quiñones E, Zablah E, Callans K, Hartnick M, Sahani N, Cayer M, Hersh C, Gallagher TQ, Yager PH, Hartnick CJ. A Sustainable and Scalable Multidisciplinary Airway Teaching Mission: The Operation Airway 10-Year Experience. *Otolaryngol Head Neck Surg.* 2020 Nov;163(5):971-978. doi: 10.1177/0194599820935042. Epub 2020 Jun 30. PMID: 32600113