

QUẢN LÝ ĐƯỜNG THỞ KHÓ Ở TRẺ EM

BSCKII. ĐẶNG THẾ UYÊN
BỆNH VIỆN TRUNG ƯƠNG HUẾ

NỘI DUNG

- Đặt vấn đề
- Sinh lý & giải phẫu đường thở ở trẻ em
- Yếu tố tiên lượng đường thở khó ở trẻ em
- Các kỹ thuật kiểm soát đường thở ở trẻ em
- Đường thở khó ở trẻ em
- Kết luận

ĐẶT VẤN ĐỀ

- Sự khác biệt về sinh lý, giải phẫu đường thở -> nguy cơ biến chứng nhiều hơn so với adult
- Tỷ lệ biến chứng gặp ở người GM có <100ca/yo gấp 5 lần hơn ở người có > 200ca/yo
- Tỷ lệ đường thở khó # 0.25-3%/quần thể trẻ em
- Có nhiều phương tiện, dụng cụ để kiểm soát đường thở khó được phát triển trong gần 1 thế kỷ qua, nhưng kiểm soát đường thở khó vẫn còn là **“THÁCH THỨC”** đối với người GMHS



Khác biệt về sinh lý trẻ em vs người lớn

- Trương lực phó giao cảm
 - Trẻ khóc lớn
 - Tình trạng an thần, lo lắng
 - Trẻ không hợp tác
 - Ngưng thở do chưa trưởng thành
 - Tiêu thụ O₂ cao: 6ml/kg/phút vs 3ml/kg/phút ở người lớn
- => Dự trữ O₂ kém -> dễ thiếu O₂

How Does An Immature Nervous System Predispose To Hypoxia?

Parasympathetic tone

- hypoxia causes bradycardia
- bradycardia causes hypotension
- bradycardia worsens hypoxia

Children easily sedated

- immature neurons
- less myelination
- weak blood-brain barrier
- little prior exposure to drugs
- ↑ risk respiratory depression



Scared children cry

- ↑ secretions
- ↑ airway irritability
- ↑ risk laryngospasm
- ↑ risk wheezing
- ↑ airway edema

Children uncooperative

- can't follow instructions
- struggle and fight
- stress ↑ metabolic rate

Apnea of prematurity

- the more premature, the greater the risk
- altered ventilatory responses to:
 - hypoxia
 - hypercarbia
 - sleep
- can be made worse if the infant is stressed, cold or ill
- apnea → hypoxia → bradycardia → worse hypoxia

Khác biệt về sinh lý trẻ em vs người lớn

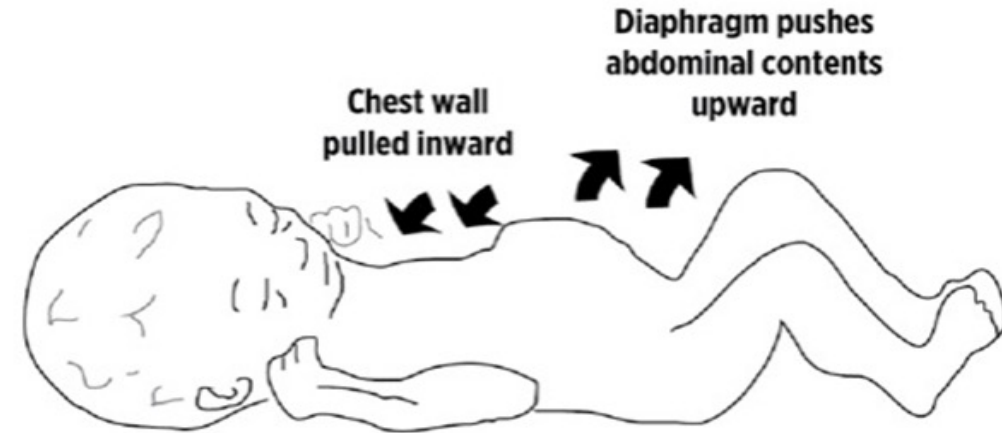
- Giảm độ giãn nở thành ngực
- Trẻ thở bụng
- Giới hạn vận động thành ngực do stress và tắc nghẽn một phần
- Suy yếu cơ hô hấp sớm
- Giới hạn thể tích lồng ngực

Chest wall more compliant

- decreased elastic recoil
- exhalation requires work

Abdominal breather

- abdomen rises as diaphragm descends
- stomach distention limits TV



Rocking chest wall motion common with stress and even partial obstruction

- Chest collapse on inhalation limits lungs' expansion
- Increased work of breathing
- Harder infant tries to breathe, the less efficiently he breathes

Chest wall more box-like

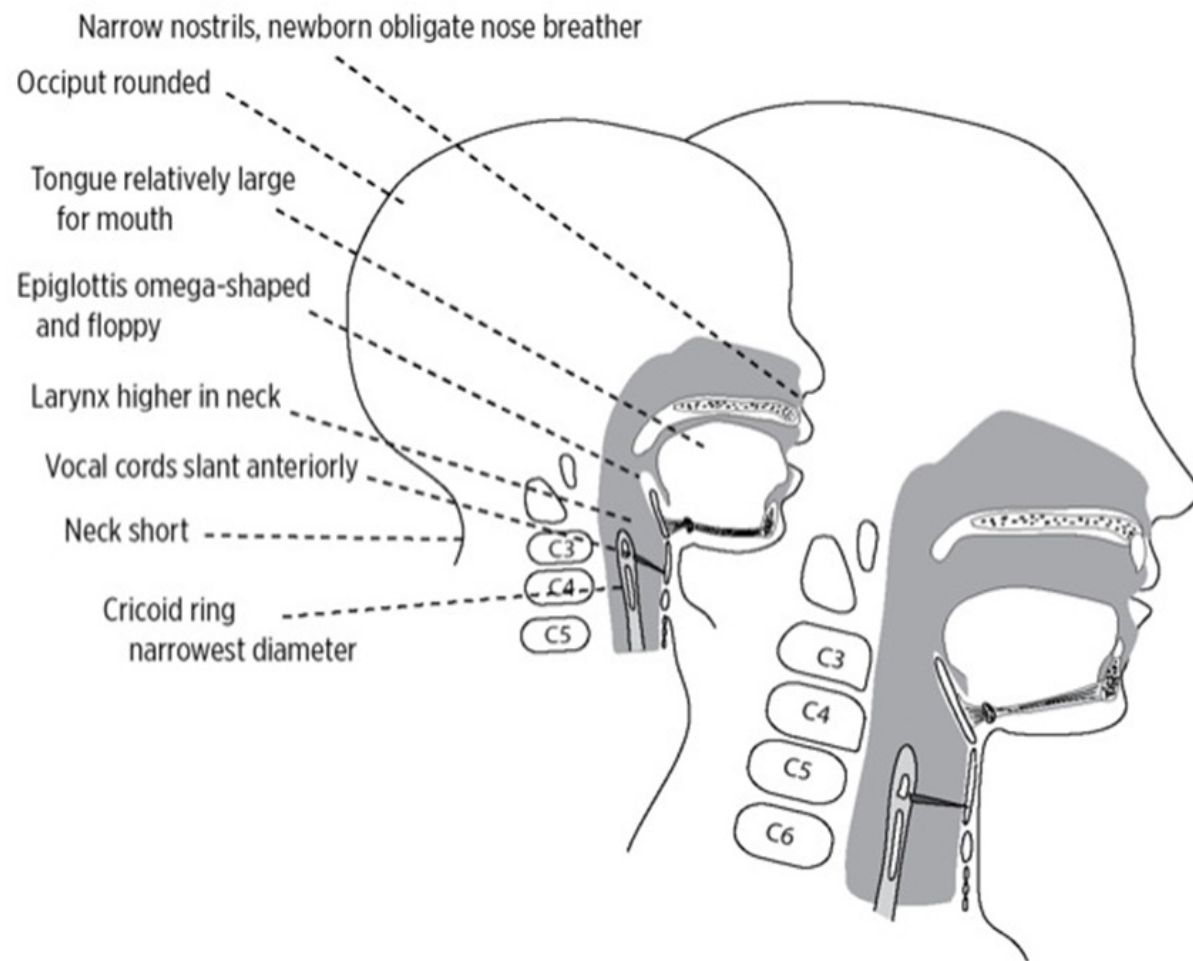
- rib angles mechanically inefficient
- limited lung expansion
- limited TV increases
- ↑ alveolar ventilation is respiratory rate dependent

Muscles of ventilation tire easily

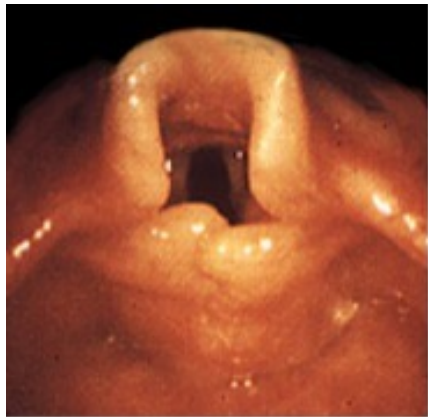
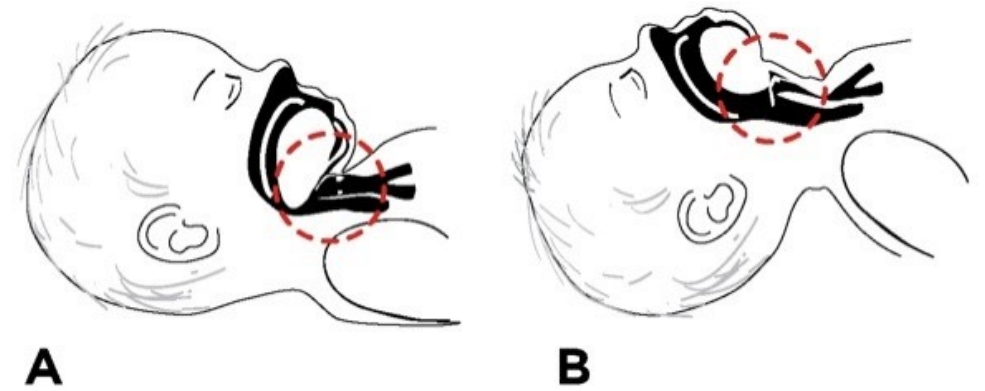
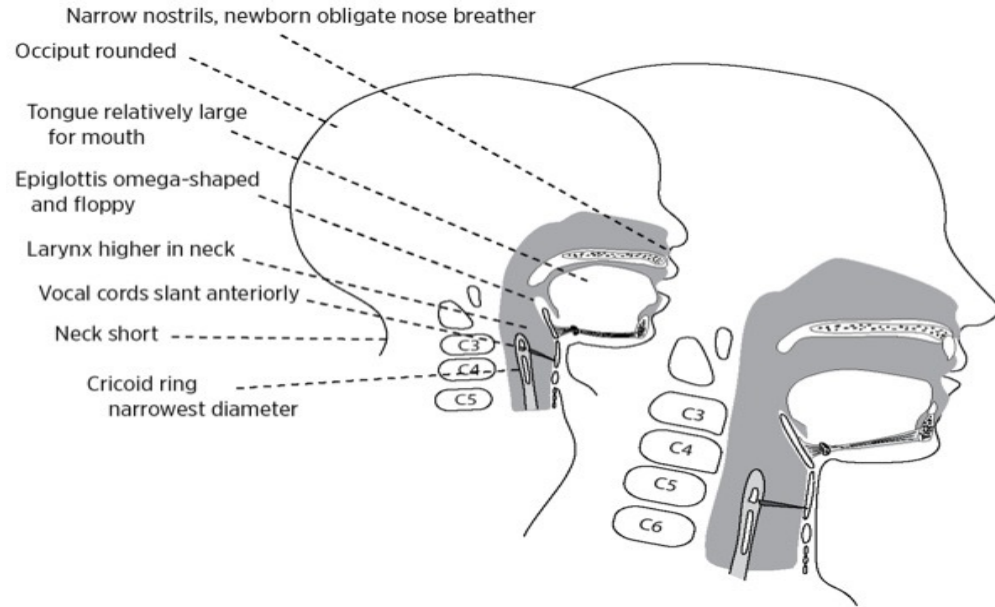
- Fatigue leads to respiratory failure

Khác biệt về giải phẫu trẻ em vs người lớn

- Giải phẫu đường hô hấp ở trẻ nhỏ khác với trẻ lớn & người lớn -> khó đặt nkq
- Lưỡi trẻ có kích thước lớn so với vùng mũi hầu -> tắc nghẽn đường thở & khó đặt nkq
- Thanh quản nằm cao (C3/C5) -> đặt nkq bằng đèn lưỡi thẳng dễ hơn
- nắp thanh quản ngắn, dày, gập góc -> khó điều chỉnh lưỡi đèn
- Khí quản trẻ nhỏ dạng hình nón, vị trí hẹp nhất là sụn nhẫn -> dễ phù nề



Khác biệt về giải phẫu trẻ em vs người lớn



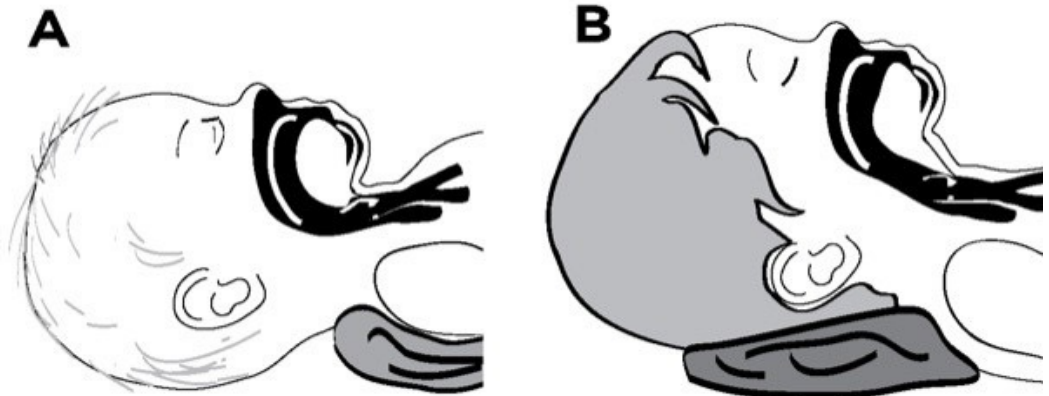
Infant



Toddler



Adult



Adult vs Children Upper Airway

Adult vs pediatric airway

Anatomy of adult airway

Anatomy of pediatric airway

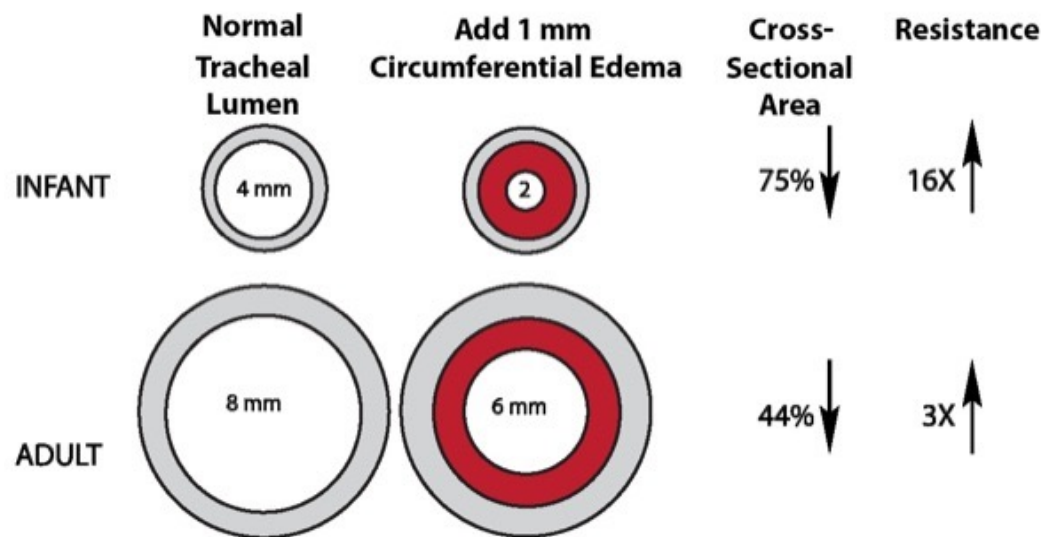
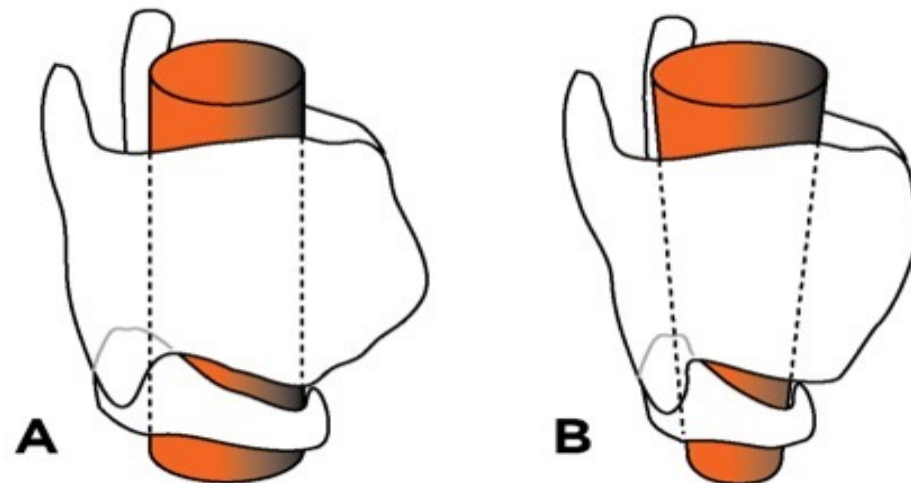
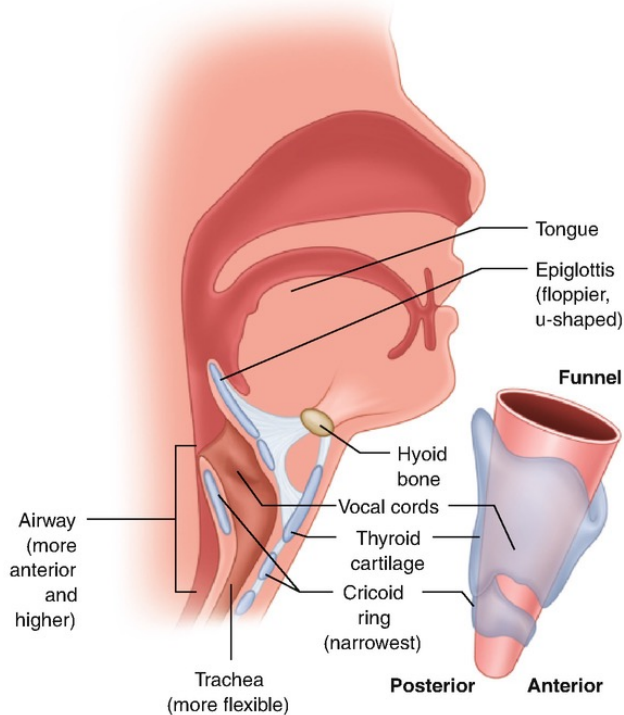
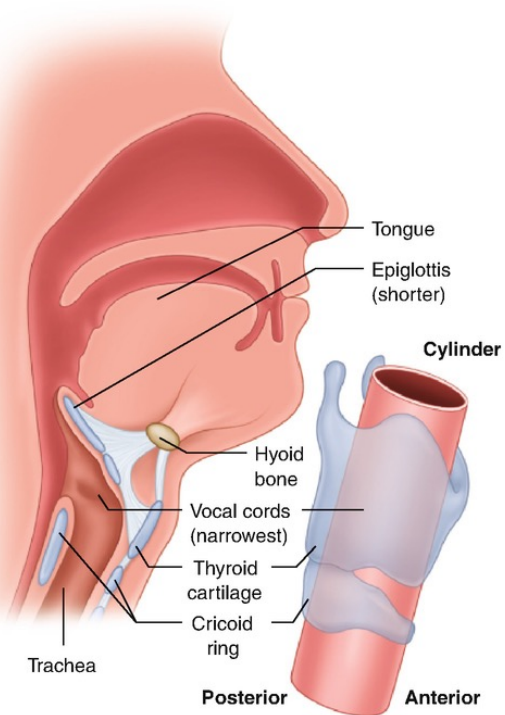
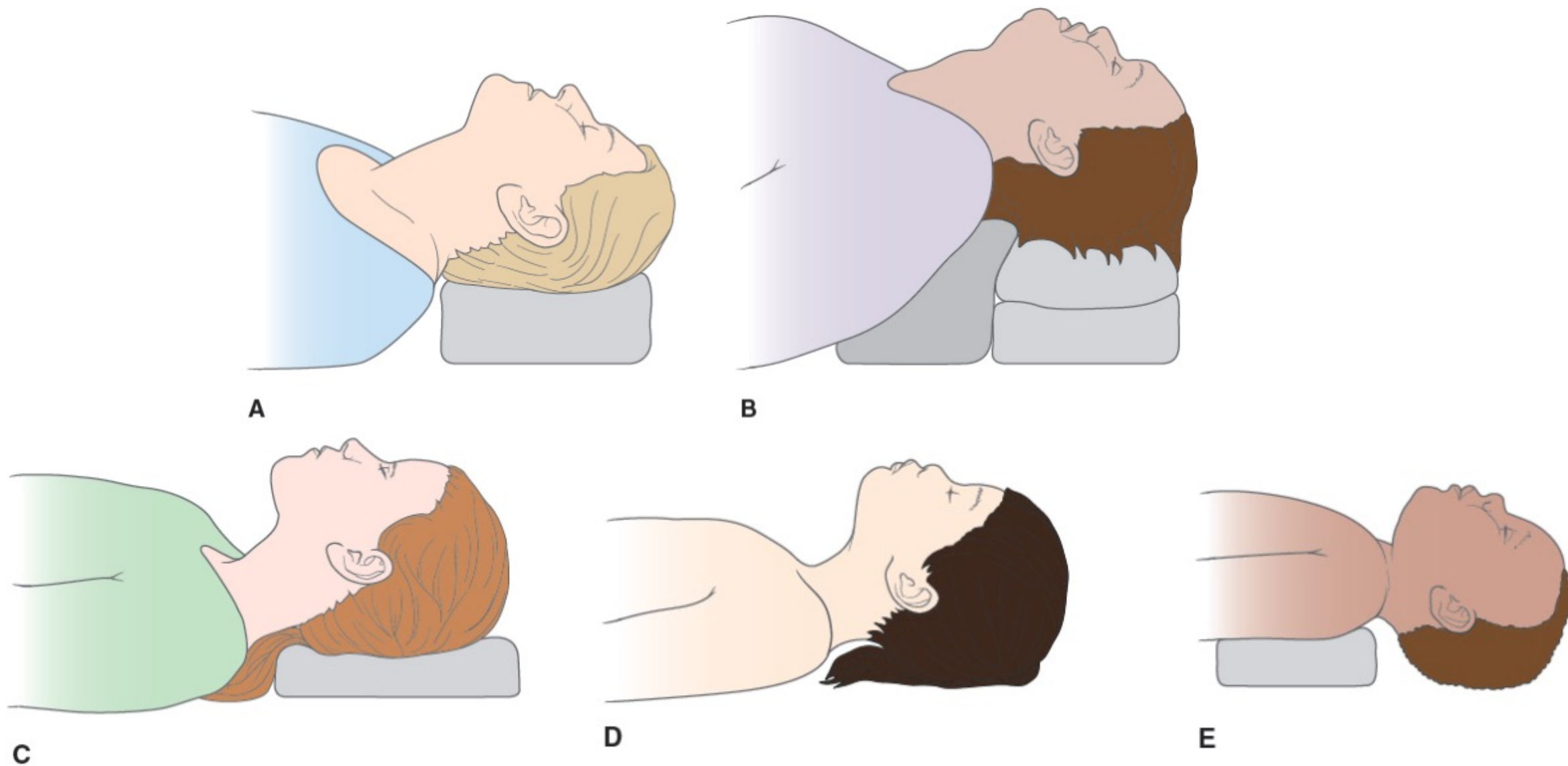


Figure 12.7: Optimal head and neck position for opening the upper airway. A: Normal size adult. B: Morbidly obese adult. C. 8-year old child. D. 3-year-old child. E. Newborn child.



ƯU ĐIỂM VÀ NHƯỢC ĐIỂM CÁC DỤNG CỤ KIỂM SOÁT ĐƯỜNG THỞ

	ƯU ĐIỂM	NHƯỢC ĐIỂM
Soi thanh quản trực tiếp	Sử dụng rộng rãi	Yêu cầu thẳng trục để bộc lộ khí quản, yêu cầu mở miệng tốt, nhiều biến chứng, sử dụng lực để bộc lộ khí quản
Video soi thanh quản	Dễ sử dụng, ít dung lực, dự phòng cho đường thở khó	Yêu cầu mở miệng trung bình, dễ bị che tầm nhìn do máu, chất tiết, thời gian đặt nội khí quản dài hơn
Mask thanh quản	Thiết bị giải cứu, sử dụng như một thiết bị đường thở ban đầu, khuyến cáo mạnh trong đường thở khó	Yêu cầu khả năng mở miệng lớn, nguy cơ sặc khi dạ dày đầy
Ống nội soi mềm	Sử dụng trong trường hợp giới hạn khả năng mở miệng, có thể phối hợp với mask thanh quản	Thành thạo kỹ thuật, giá cả cao, cần tối ưu trong trường hợp nhiều máu, chất tiết
Cây luồn NKQ quang học	Thời gian học cách sử dụng ngắn hơn ống nội soi mềm	Không sử dụng bằng đường mũi, khó tối ưu trong trường hợp máu, chất tiết nhiều

Lượng giá đường thở khó ở trẻ em

Table 1 Cormack and Lehane scale

Grade 1	Full view of glottic structures
Grade 2	Only posterior commissure is visible (rest of the glottic structures are invisible)
Grade 3	Only the tip of epiglottis is visible (rest of the glottic structures are invisible)
Grade 4	None of the glottic structures are visible

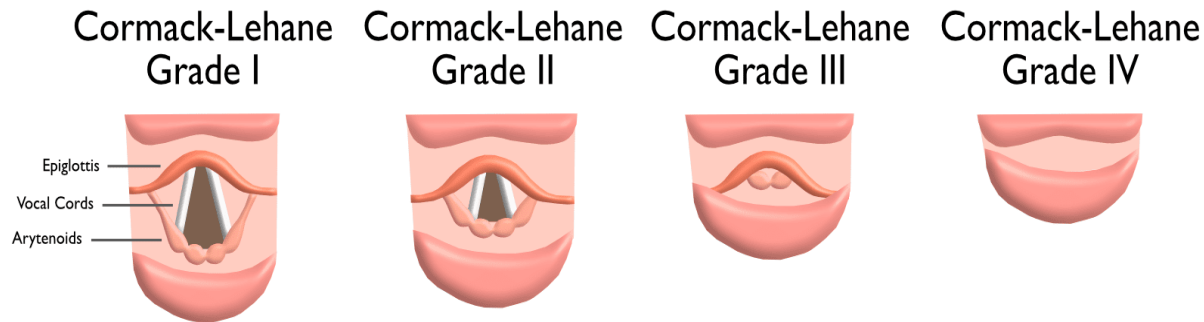
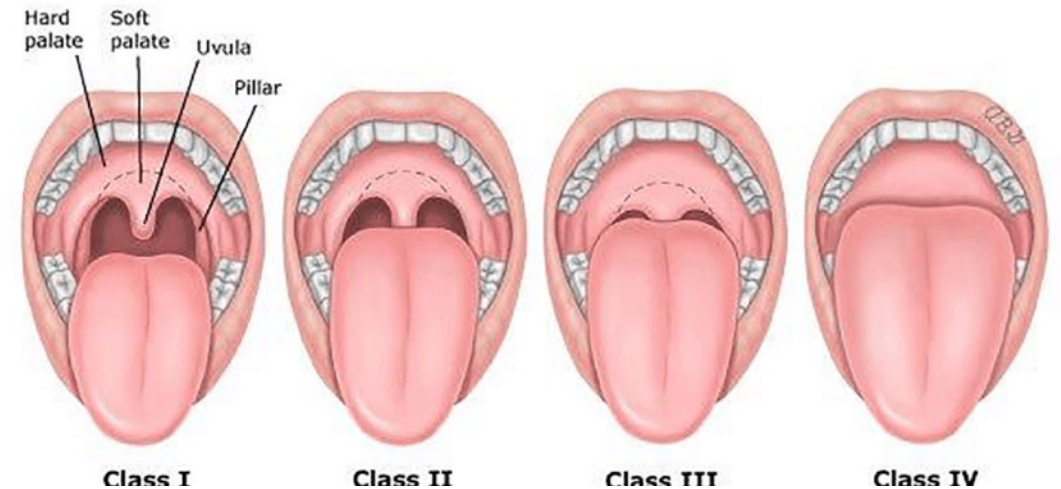


Table 3 The Mallampati scoring system^a

Class	Anatomical features seen
Class 1	Complete visualization of the soft palate, uvula, and tonsillar pillars
Class 2	Complete visualization of the soft palate with partial visualization of the uvula and tonsillar pillars
Class 3	Visualization of only the base of the uvula and the soft palate. No visualization of the distal uvula or tonsillar pillars
Class 4	No visualization of the soft palate, uvula, or tonsillar pillars



Đánh giá nguy cơ đường thở khó ở trẻ em

Table 2 Physical features suggestive of a difficult pediatric airway

Physical feature/action	Clinical finding predictive of difficult airway
Upper incisor length	Longer–lesser available space for laryngoscope blade and endotracheal tube
Alignment of incisors	Overriding of maxillary incisors or underriding of mandibular incisors
Protrusion of mandible	Inability to protrude the mandibular incisors in front of maxillary incisors
Mouth opening	Distance between upper and lower incisors with full mouth opening: less than two fingerbreadths. ^a Mallampati grade 3 or 4 view (see ► Table 4)
Palate	High arch or narrow
Submandibular space	Narrow, indurated, or firm
Thyromental distance	Decreased to less than 3 finger breadths ^a
Length of neck	Short
Neck size	Increased circumference
Head and neck range of motion	Limited mobility (flexion, extension, and lateral rotation)

^aFor evaluation in a child, one should use the child's own fingers.

Đánh giá nguy cơ đường thở khó ở trẻ em

Table 4 Questions to consider during the airway evaluation

1. Does this patient have a potential difficult airway?
a. Past medical history
b. General appearance of face, mandible, and maxilla
c. Is there an identifiable syndrome?
d. Assessment by the Mallampati and other airway scoring systems
2. Can ventilation be maintained with a bag-valve-mask device?
a. Will an oral or nasal airway be needed to maintain and/or improve bag-valve-mask ventilation?

3. Can the glottic structures be visualized using direct laryngoscopy?
a. Will I need indirect laryngoscopy?
b. Should I have the difficult airway cart on hand
4. What if I fail to achieve bag-valve-mask ventilation?
a. Can a supraglottic device be placed?
b. If needed, can an emergent surgical airway be established?
5. Will I get help if needed?
a. Operating room personnel to summon help
b. Additional anesthesiologists to provide assistance or advanced airway management
c. Surgeon to establish a surgical airway

Các yếu tố tiên lượng đường thở khó

Table 1. Predictors of an expected difficult airway^{4,19}

Predictors of an expected difficult airway	
Soft tissue pathologies	Tumours Abscess Scars Post radiation therapies Burns, trauma
Maxilla-facial malformations	Hypoplasia of the mandible Retrognathia/micrognathia Facial asymmetries (including ear anomalies) Mandibular joint ankyloses (reduced mouth opening)
Mouth, tongue and teeth anomalies	Microstomia Macroglossia Cystic hygroma Overbite
Cervical spine pathologies	Reduced movement, e.g. Klippel-Feil syndrome Instability, e.g. Downs syndrome, rheumatoid arthritis, mucopolysaccharidosis
Airway obstruction	Obstructive sleep apnoea Stridor Infective processes, e.g. epiglottitis, laryngotracheitis, abscess Bleeding post tonsillectomy Anaphylaxis Airway foreign body
Specific syndromes, e.g. Pierre Robin, Treacher Collins, Goldenhar	
History of difficult airway	

Thông khí bằng mask (BMV/bag-mask ventilation)

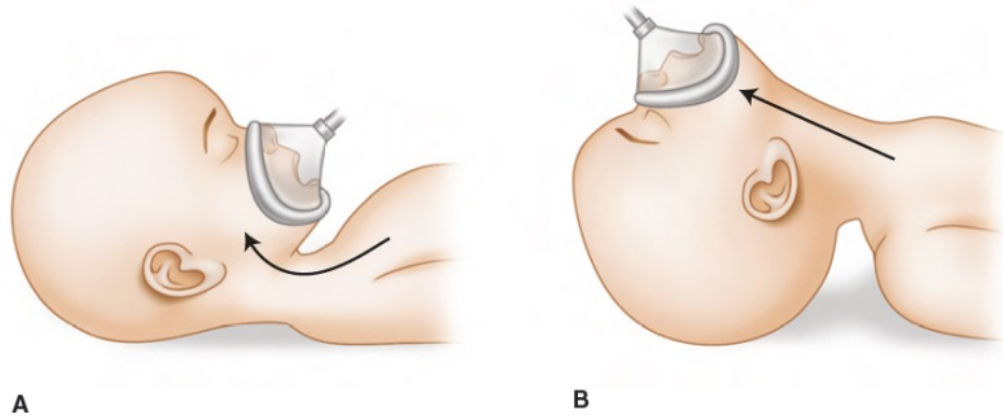
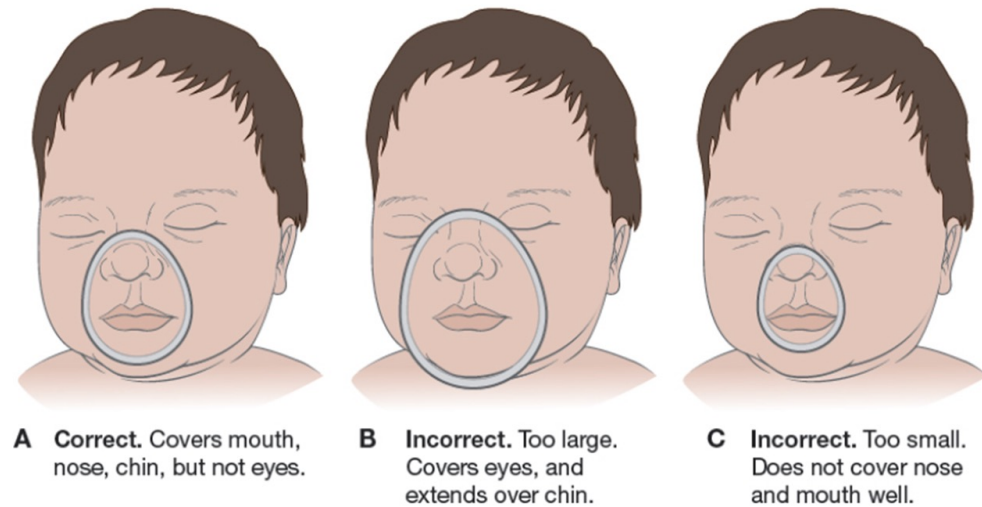


Figure 26.1: A: *Bad* bagging. Fast cadence. B: *Good* bagging. Squeeze, release, release. Part A demonstrates the flexed position causing obstruction, whereas Part B demonstrates extended position that relieves obstruction.



A Correct. Covers mouth, nose, chin, but not eyes.

B Incorrect. Too large. Covers eyes, and extends over chin.

C Incorrect. Too small. Does not cover nose and mouth well.

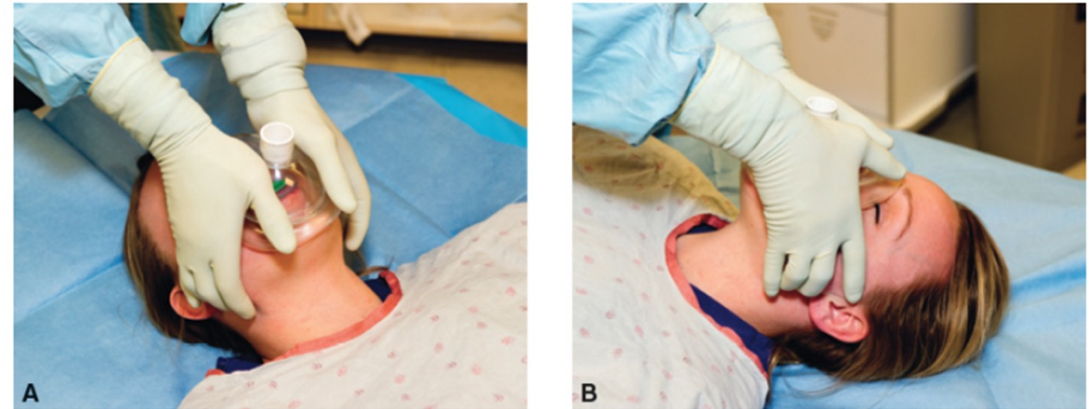


Figure 12.5: Thenar mask grip. This is the only mask grip that allows maximal mandibular advancement and should be the “go to” face mask grip in emergency care settings. It can be performed from the head of the bed (A) or from the patient’s side (B).

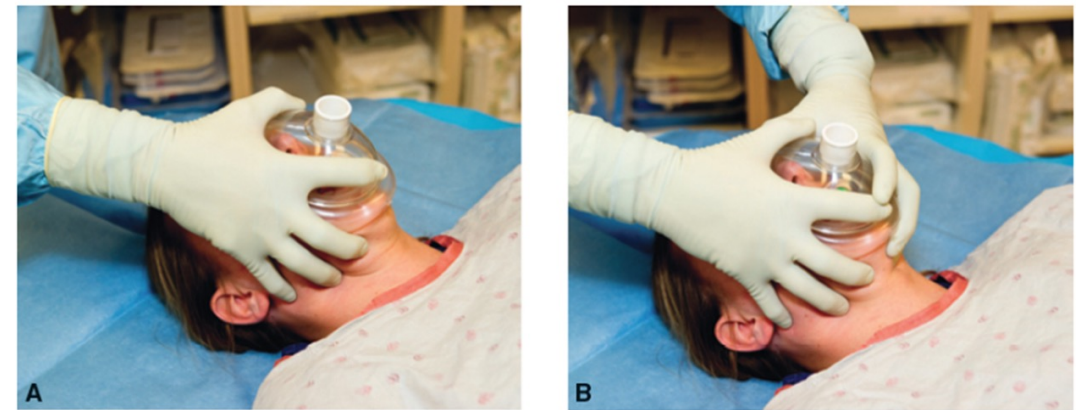


Figure 12.6: A: Single-handed mask hold with the “EC” grip. B: Two-handed mask hold with the conventional, double “ED” grip.

Kiểm soát thông khí qua NKQ

- Direct Laryngoscope (DL)
- Video Laryngoscope (VL)
- Supraglottic Airway (SGAs)
- Flexible fibroptic bronchoscope (FFB)
- Optical stylet

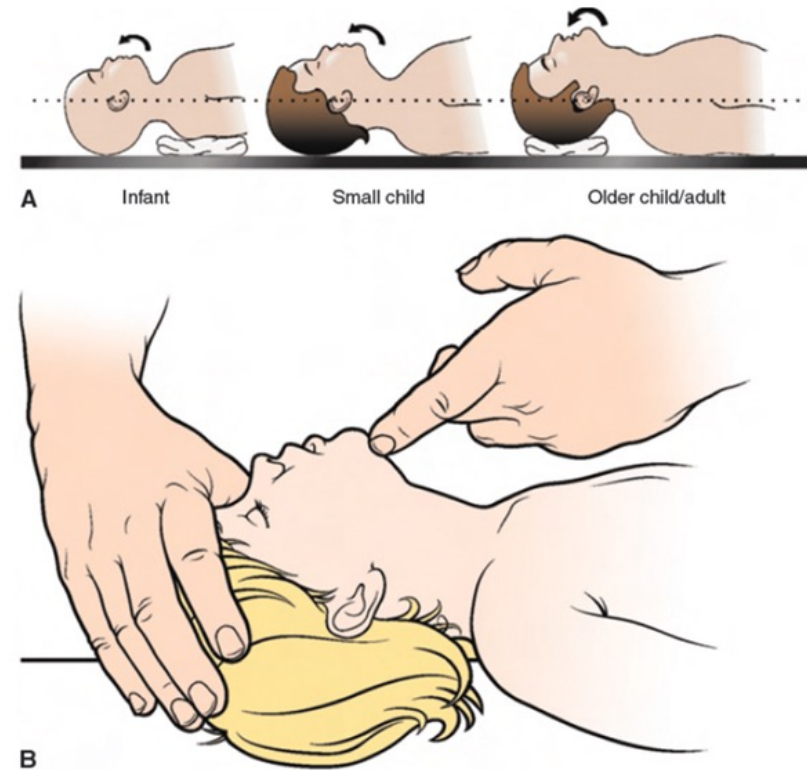


Figure 26.2: A: Clinical determination of optimal airway alignment, using a line passing through the external auditory canal and anterior to the shoulder B: Application of the line to determine optimal position. In this small child, the occiput obviates the need for head support, yet the occiput is not so large as to require support of the shoulders. Note that a line traversing the external auditory canal will pass anterior to the shoulders. With only slight extension of the head on the atlanto-occipital joint, the sniffing position is achieved.

Laryngoscopy



Laryngoscopes



MSLVL5D

Used for direct viewing of laryngeal structures

Consists of two parts: -

Handle

- Available in a variety of sizes: - standard, short, paediatric, angle-adjusted, etc
- Provides batteries to power the light source – colour coded system: -
 - Black = standard- bulb is situated on the blade and activated when blade is opened into the intubating position
 - Green = fibreoptic – bulb is situated in the handle and transmits light along a glass fibre bundle on the blade when the blade is opened into the intubating position

Blades

- Designed to, when traction is applied, facilitate viewing of laryngeal structures

Commonly Used Blades

Macintosh	Miller	McCoy	Polio
<ul style="list-style-type: none"> Curved Blade Most commonly used blade in UK practice American, German & left-handed versions are available Reverse Z-shape allows tongue to be swept out of the way on laryngoscopy Available in sizes from neonate to adult 	<ul style="list-style-type: none"> Straight Blade Most commonly used straight blade American & German versions are available Tip lifts epiglottis directly Does NOT allow tongue to be swept out of the way Available in sizes from neonate to adult 	<ul style="list-style-type: none"> Modified Macintosh blade with a levered tip Allows tip to flex and list epiglottis with minimal force 	<ul style="list-style-type: none"> Modified Macintosh blade on a mount at 135° (rather than standard 90°) Initially used for intubation of patients with polio in iron lungs Now used where neck motility is limited or large breasted patients

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Accessories

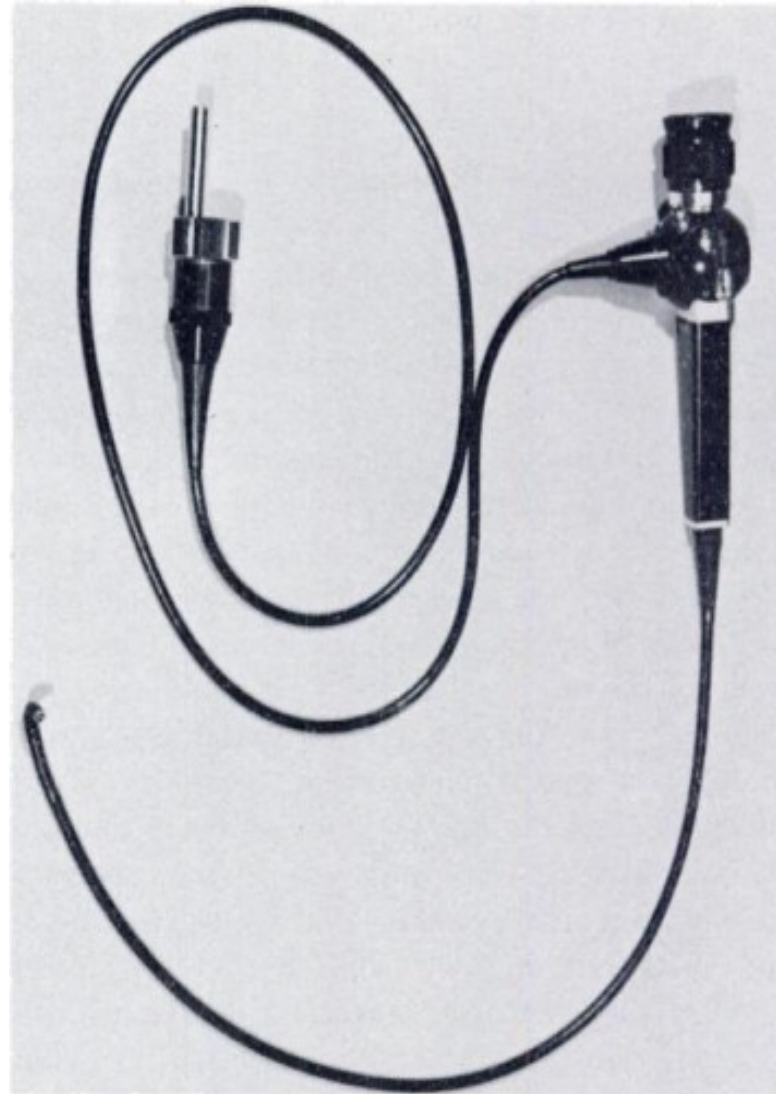
Reusable blade

- Flexible tip blade
- Large adult
- Medium adult
- Prdiatics
- Neonate
- Premature

Disposable blade

- Pediatrics
- Medium adult
- Large adult
- Disposable blade

SGAs/Flexible fiberoptic bronchoscope/Optical stylet



Kỹ thuật Needle Cricothyrotomy

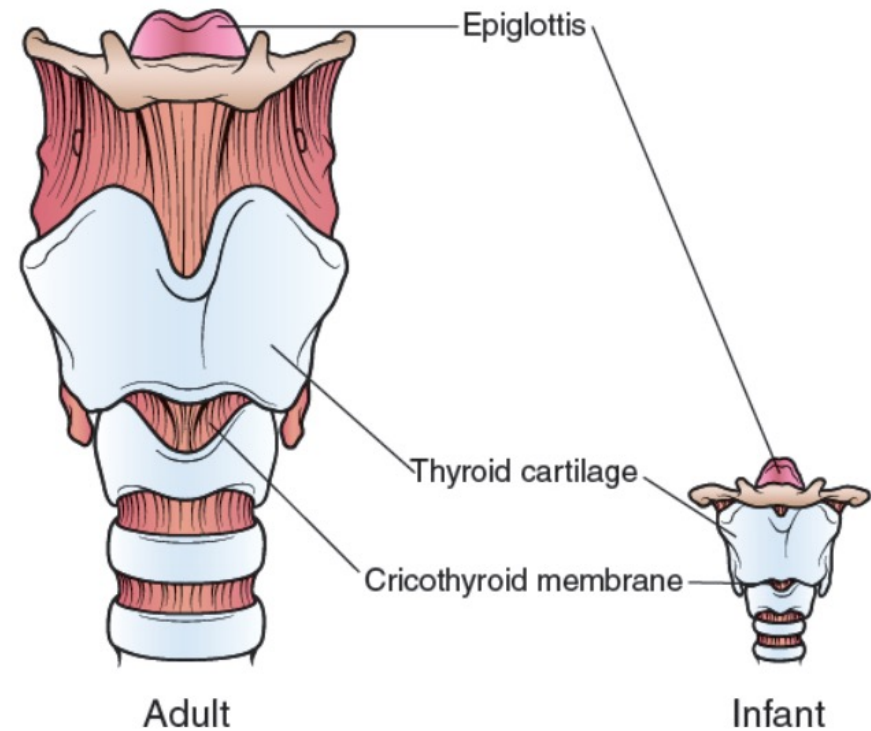
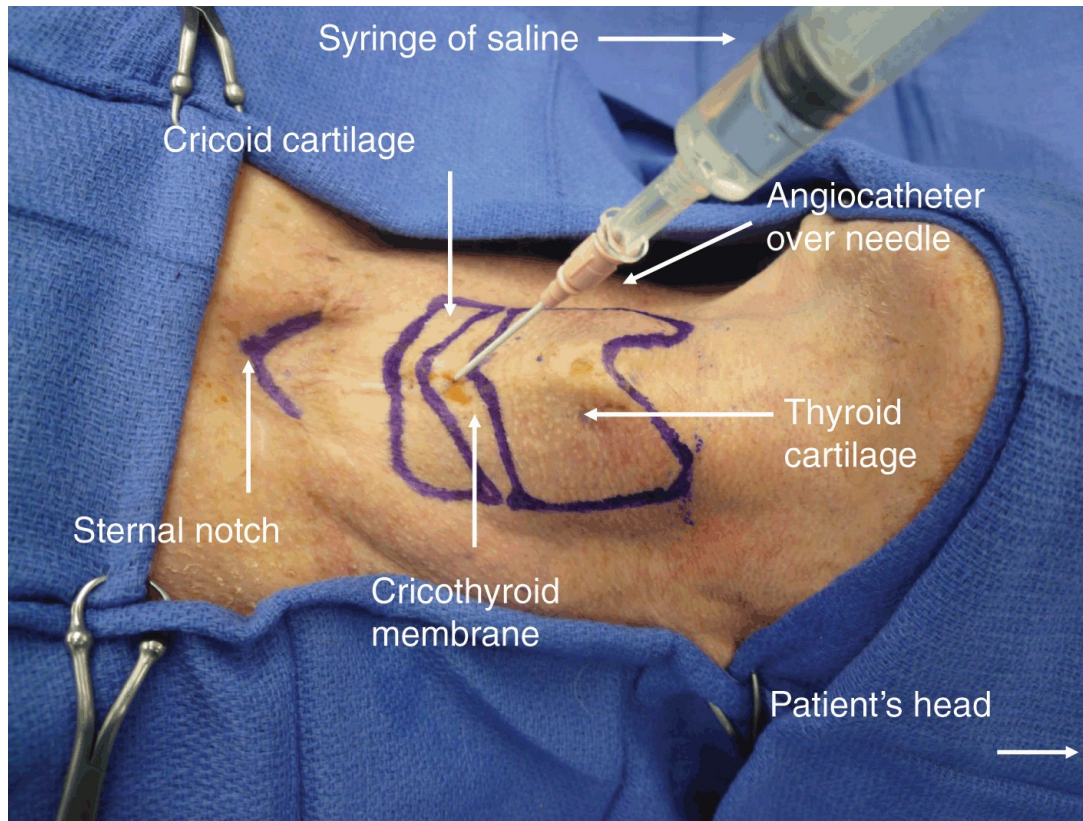


Figure 26.4: Cricothyroid membrane. Comparative size of the adult (left) versus pediatric (right) cricothyroid membrane. Note that not only is the larynx smaller but also the actual membrane is proportionately smaller in comparison, involving one-fourth to one-third the anterior tracheal circumference versus two-thirds to three-fourths in the adult. This pediatric drawing is that of a toddler, which accommodates a 4.5-mm ETT.

Các kỹ thuật kiểm soát đường thở khó

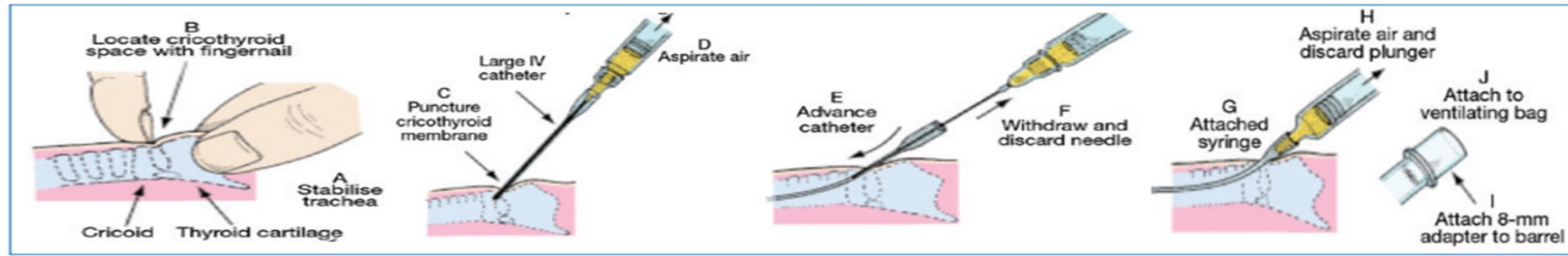


Figure 6. Technique of percutaneous needle cricothyrotomy³

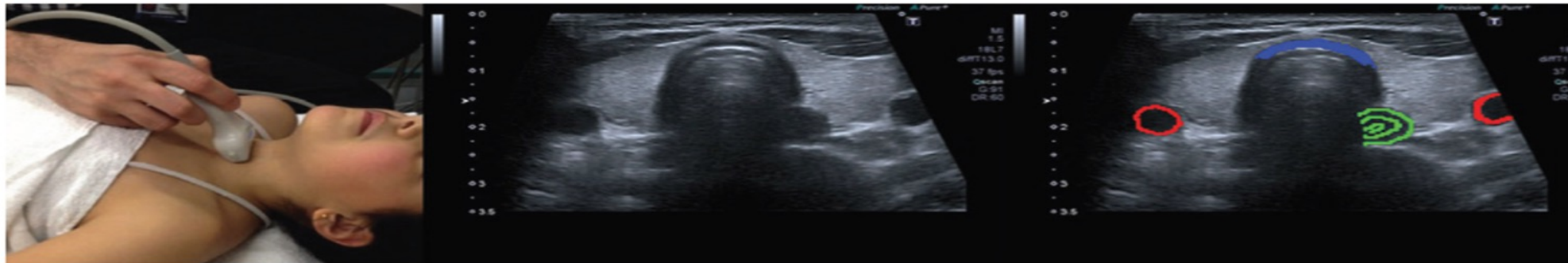


Figure 7. Ultrasound of transverse view of trachea
Tracheal ring (blue), oesophagus (green) and carotid arteries (red)²⁹

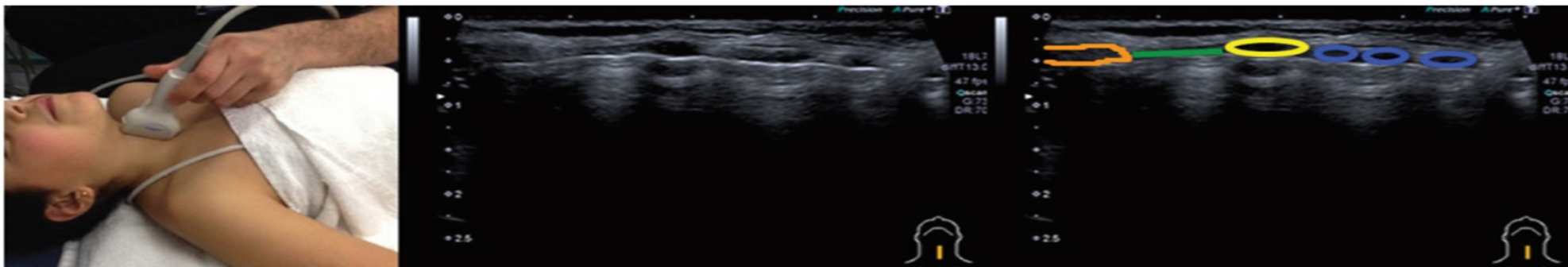


Figure 8. Ultrasound of the longitudinal view of the trachea
Thyroid cartilage (orange), CTM (green), cricoid cartilage (yellow), tracheal rings (blue)²⁹

Bảng kiểm kỹ thuật đặt nkq khó ở trẻ em

Table 3. Suggested intubation checklist^{21,22}

TEAM	EQUIPMENT	PATIENT
<ol style="list-style-type: none">1. Verbalise indication for intubation2. Allocate roles<ul style="list-style-type: none">- team leader- 1st/2nd intubator- intubators' assistant- drugs administrator- monitoring patient- runner- who will perform surgical airway3. Confirm intubation plan<ul style="list-style-type: none">- PLAN A, B, C, DWho do we call for help? Time keeper	<ol style="list-style-type: none">1. Check equipment<ul style="list-style-type: none">- tracheal tubes- oro- and nasopharyngeal airway- direct/indirect laryngoscope- suction- supraglottic device- flexible fiberoptic- surgical access kit2. Apply monitors (SpO₂, waveform ETCO₂, ECG, NIBP)3. Check drugs<ul style="list-style-type: none">- reliable IV/IO access- induction agent, relaxant, pressor/inotrope, sedation	<ol style="list-style-type: none">1. Airway assessment2. Optimise position<ul style="list-style-type: none">- < 1 yr: towel under shoulders- > 8 yr: towel under head3. Optimise preoxygenation<ul style="list-style-type: none">- 3 mins or ETO₂ > 85 %- consider other forms of supplemental oxygenation4. Optimise patient<ul style="list-style-type: none">- fluid/pressor/inotrope- aspirate NGT

Các bước kiểm soát đường thở khó

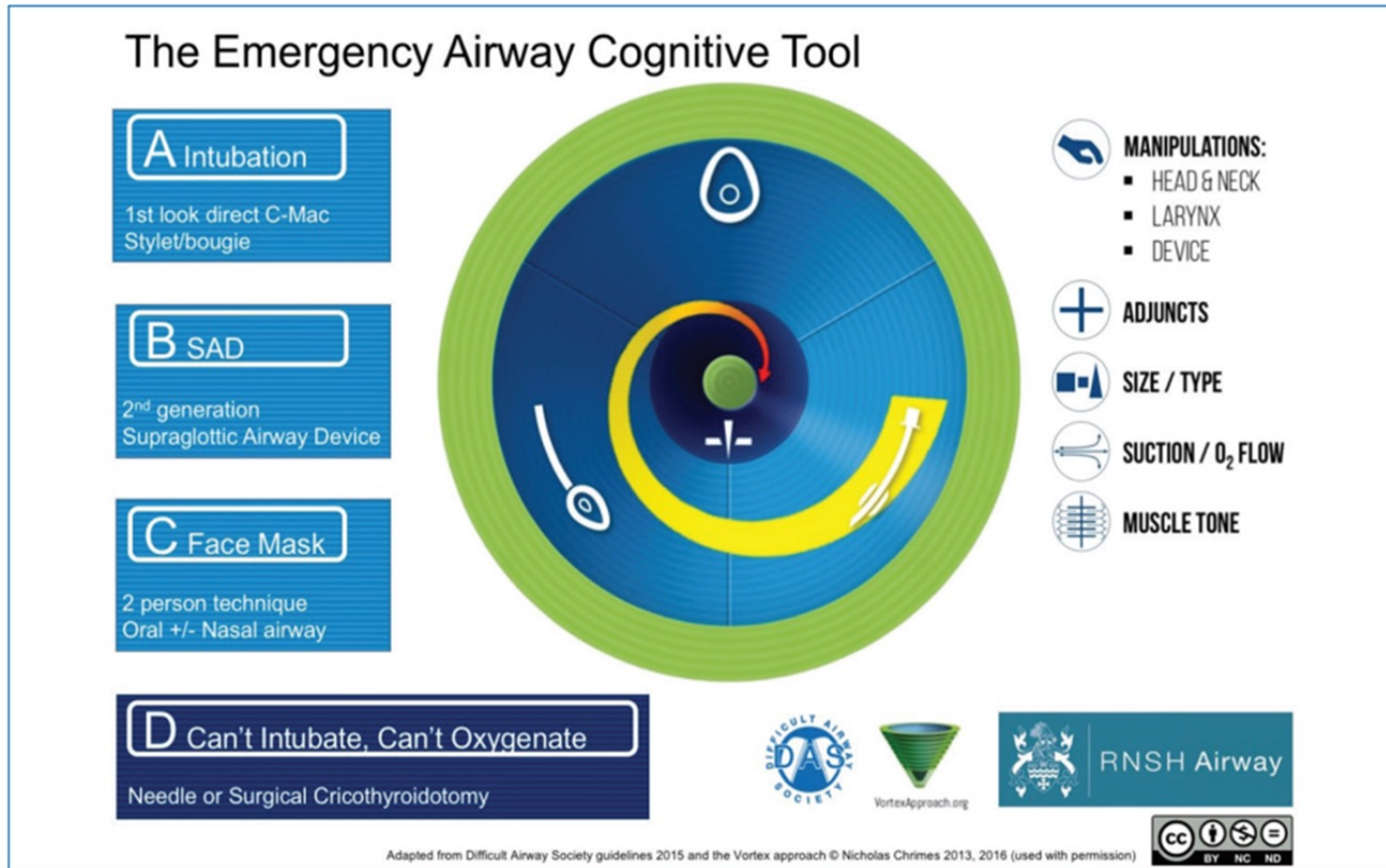


Table 2. Simplified airway algorithm²¹

PREPARATION – ASSESS, CHECK, PLAN, OPTIMISE

PLAN A – INITIAL INTUBATION STRATEGY

- direct or indirect laryngoscopy, e.g. video laryngoscopy assisted by usage of bougie, stylet or wand

PLAN B – SECONDARY INTUBATION STRATEGY

- fiberoptic bronchoscopy ± supraglottic airway device
- rigid bronchoscopy

PLAN C – MAINTAIN OXYGENATION & VENTILATION

- facemask with oropharyngeal or nasopharyngeal airway
- supraglottic airway device
- high flow nasal cannula or modified Trumpet manoeuvre

PLAN D – RESCUE TECHNIQUE FOR 'CAN'T INTUBATE, CAN'T VENTILATE

- needle or scalpel cricothyroidotomy
- surgeon prepped and ready for surgical airway

Figure 2. Vortex implementation tool (superior and lateral aspects)



4. QUẢN LÝ ĐƯỜNG THỞ KHÓ KHÔNG DỰ ĐOÁN TRƯỚC VÀ CẤP CỨU

Lưu đồ xử trí đường thở khó: trẻ em

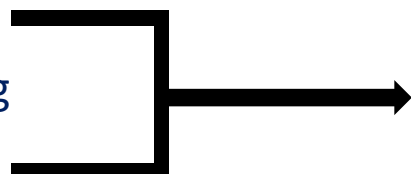
Nghi ngờ đặt đèn soi thanh quản khó

↓ Có

Nghi ngờ thông khí khó với mặt nạ mặt, dụng cụ trên thanh môn

↓ Có

Không



ĐẶT NỘI KHÍ QUẢN SAU KHI KHỞI MÊ

Thất bại

Thành công

TỐI ƯU OXY MÁU TRONG KHI ĐẶT NKQ

Cân nhắc đặt NKQ tỉnh/an thần
Chuyển đến Trung tâm cao hơn nếu khả thi

Đặt NKQ tỉnh

Đường thở chắc chắn với tiếp cận đường thở xâm nhập

Thành công

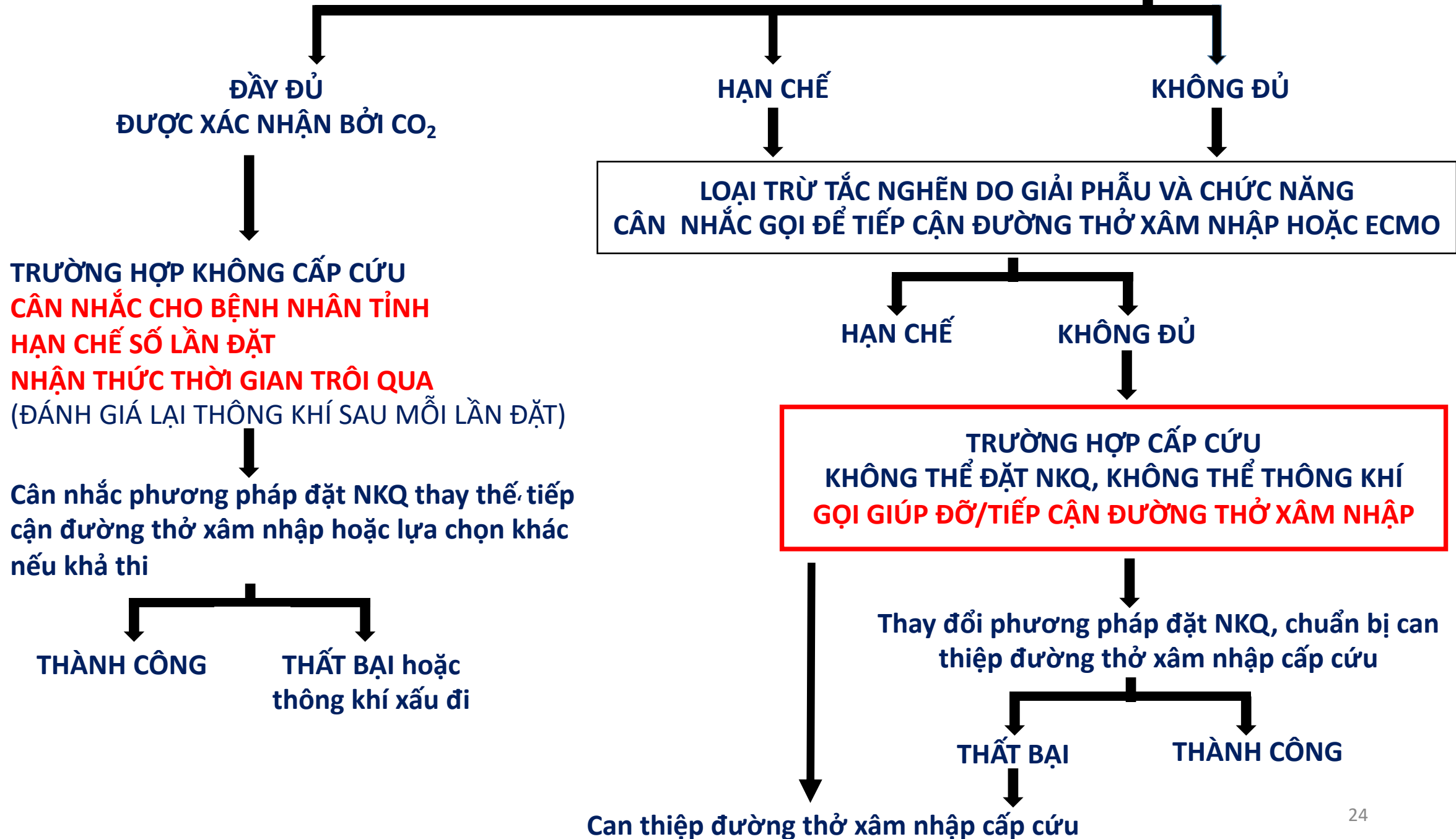
Thất bại

Cân nhắc các lựa chọn khác

Hoãn phẫu thuật, ngừng an thần nếu được sử dụng

**HẠN CHẾ SỐ LẦN ĐẶT ĐẢM BẢO MÊ ĐỦ SÂU
Cân nhắc gọi giúp đỡ**

Đánh giá oxy máu/thông khí với mặt nạ mặt/dụng cụ trên thanh môn





Difficult mask ventilation (MV)—during routine induction of anaesthesia in a child aged 1 to 8 years



Difficult MV



Give 100% oxygen



Call for help

Step A. Optimise head position

Check equipment

Depth of anaesthesia

Consider the following:
 (i) Adjusting chin lift/jaw thrust
 (ii) Inserting shoulder roll if <2 years
 (iii) Neutral head position if >2 years
 (iv) Adjusting cricoid pressure if used
 (v) Ventilating using two-person bag mask technique

Consider changing:
 (i) Circuit
 (ii) Mask
 (iii) Connectors
 If equipment failure is suspected, change to self-inflating bag and change to x machine promptly

Consider deepening anaesthesia
 Use CPAP

Step B. Insert oropharyngeal airway

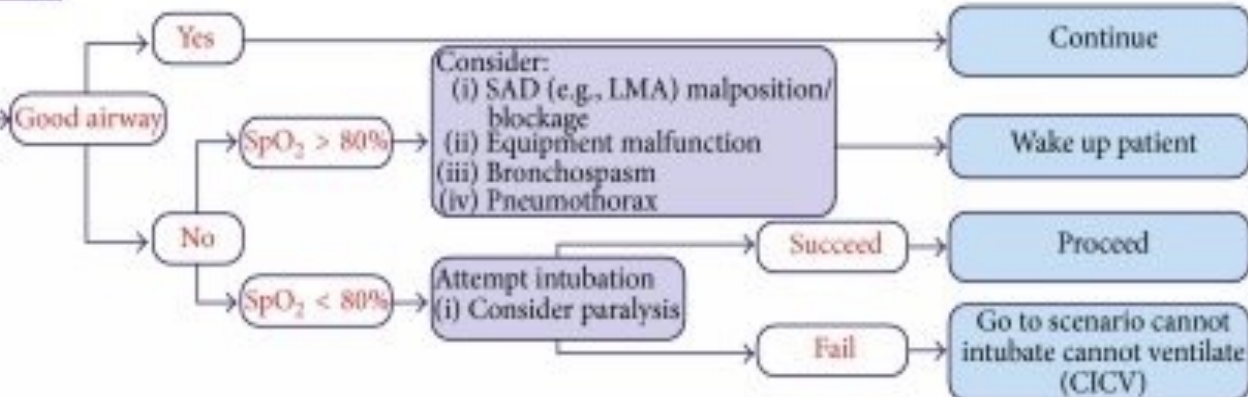
Call for help again if not arrived

Assess for cause of difficult mask ventilation
 (i) Light anaesthesia
 (ii) Laryngospasm
 (iii) Gastric distension—pass OG/NG tube

Maintain anaesthesia/CPAP
 Deepen anaesthesia (propofol first line)
 (i) If relaxant is given, intubate
 (ii) If intubation is not successful, go to unanticipated difficult tracheal intubation algorithm

Step C. Second-line: insert SAD (e.g., LMA)

(i) Insert SAD (e.g., LMA)—not >3 attempts
 (ii) Consider nasopharyngeal airway
 (iii) Release cricoid pressure



SAD = supraglottic airway device



Unanticipated difficult tracheal intubation – during routine induction of anaesthesia in a child aged 1 to 8 years



Difficult direct laryngoscopy



Give 100% oxygen and maintain anaesthesia



Call for help

Step A Initial tracheal intubation plan when mask ventilation is satisfactory

Ensure: Oxygenation, anaesthesia, CPAP, management of gastric distension with OG/NG tube

Direct laryngoscopy – not > 4 attempts

Check:

- Neck flexion and head extension
- Laryngoscopy technique
- External laryngeal manipulation – remove or adjust
- Vocal cords open and immobile (adequate paralysis)

If poor view – consider bougie, straight blade laryngoscope* and/or smaller ETT

Succeed

Tracheal intubation

Verify ETT position

- Capnography
- Visual if possible
- Auscultation

If ETT too small consider using throat pack and tie to ETT

If in doubt, take ETT out

Failed intubation with good oxygenation

Step B Secondary tracheal intubation plan

Call for help again if not arrived

- Insert SAD (e.g. LMA™) – not > 3 attempts
- Oxygenate and ventilate
- Consider increasing size of SAD (e.g. LMA™) once if ventilation inadequate

Succeed

- Consider modifying anaesthesia and surgery plan
- Assess safety of proceeding with surgery using a SAD (e.g. LMA™)

Unsafe

Safe

Postpone surgery
Wake up patient

Safe

Proceed with surgery

Failed oxygenation e.g. SpO₂ <90% with FiO₂ 1.0

- Consider 1 attempt at FOI via SAD (e.g. LMA™)
- Verify intubation, leave SAD (e.g. LMA™) in place and proceed with surgery

Succeed

Failed intubation via SAD (e.g. LMA™)

Postpone surgery
Wake up patient

- Convert to face mask
- Optimise head position
- Oxygenate and ventilate
- Ventilate using two person bag mask technique, CPAP and oro/nasopharyngeal airway
- Manage gastric distension with OG/NG tube
- Reverse non-depolarising relaxant

Succeed

Failed ventilation and oxygenation

Go to scenario cannot intubate cannot ventilate (CICV)

Following intubation attempts, consider • Trauma to the airway • Extubation in a controlled setting

*Consider using indirect laryngoscope if experienced in their use

SAD = supraglottic airway device

Failed intubation
inadequate ventilation

Give 100% oxygen

Call for help

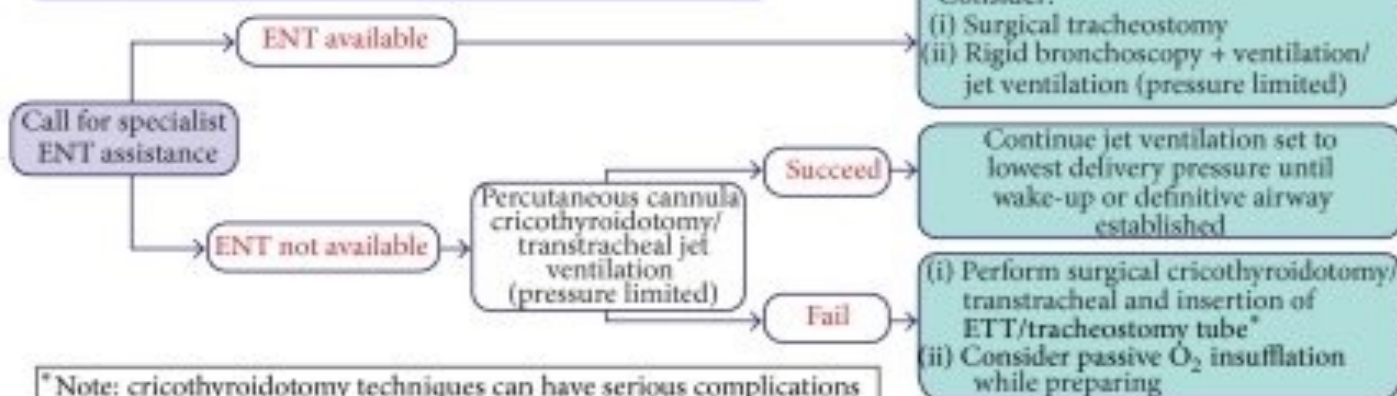
Step A. Continue to attempt oxygenation and ventilation

- (i) FiO₂ 1.0
- (ii) Optimise head position and chin lift/jaw thrust
- (iii) Insert oropharyngeal airway or SAD (e.g., LMA)
- (iv) Ventilate using two-person bag mask technique
- (v) Manage gastric distension with an OG/NG tube

Step B. Attempt wake-up if maintaining SpO₂ >80%

If rocuronium or vecuronium is used, consider sugammadex (16 mg/kg) for full reversal

Prepare for rescue techniques in case child deteriorates

Step C. Airway rescue techniques for CICV (SpO₂ <80% and falling) and/or heart rate decreasing


Call for help again if not arrived

Cannula cricothyroidotomy

- (i) Extend the neck (shoulder roll)
- (ii) Stabilise larynx with nondominant hand
- (iii) Access the cricothyroidotomy membrane with a dedicated 114/16-gauge cannula
- (iv) Aim in a caudad direction
- (v) Confirm position by air aspiration using a syringe with saline
- (vi) Connect to either
 - (a) adjustable pressure limiting device, set to lowest delivery pressure
 - or
 - (b) 4Bar O₂ source with a flowmeter (match flow l/min to child's age) and Y connector
- (vii) Cautiously increase inflation pressure/flow rate to achieve adequate chest expansion; wait for full expiration before next inflation
- (viii) Maintain upper airway patency to aid expiration

Liều các thuốc thường sử dụng trong đặt NKQ

TABLE 25.3 Drugs—Pediatric Considerations		
Drug	Dosage	Pediatric-Specific Comments
<i>Premedications</i>		
Atropine	0.02 mg/kg	An option <1 y of age
<i>Induction Agents</i>		
Midazolam	0.3 mg/kg IV	Use 0.1 mg/kg if hypotensive
Etomidate	0.3 mg/kg IV	
Ketamine	2 mg/kg IV, 4 mg/kg IM	
Propofol	2-3 mg/kg IV	
<i>Paralytics</i>		
Succinylcholine	2 mg/kg IV	Have atropine drawn up and ready
Vecuronium	0.2 mg/kg IV	May increase to 0.3 mg/kg of vecuronium for RSI (0.1 mg/kg for maintenance of paralysis)
Rocuronium	1.0 mg/kg IV	For RSI

IM, intramuscularly; IV, intravenous; RSI, rapid sequence intubation.

Một số dị tật bẩm sinh gây ra đường thở khó ở trẻ em

Table 1: Syndromes in children associated with difficult airways with key airway features observed

Syndrome	Airway Features
Pierre Robin sequence	Micrognathia; glossoptosis (backward displacement of tongue); airway obstruction at rest; and improves with age
Treacher Collins	Micrognathia; limited mouth opening; airway obstruction at rest; and worsens with age (in spite having mandibular distraction)
Goldenhar syndrome	Micrognathia; hemifacial macrosomia; occipitalization of atlas; and limited mouth opening
Mucopolysaccharidoses (Hunter's and Hurler's syndromes)	Accumulation of mucopolysaccharides in various tissues, including airway; short, immobile neck; cervical instability, airway obstruction at rest; difficult mask ventilation and tracheal intubation; and worsens with age
Apert syndrome	Midface hypoplasia; possible choanal stenosis; progressive calcification of cervical spine; and airway obstruction
Down syndrome	Macroglossia; atlantoaxial instability; and pharyngeal hypotonia
Crouzon syndrome	Midface hypoplasia; maxillary hypoplasia; short neck; and restricted neck movement
Pfeiffer syndrome	Midface hypoplasia and airway obstruction
Klippel-Feil syndrome	Fusion of variable number of cervical vertebrae and limited neck movement
Beckwith-Wiedemann syndrome	Macroglossia
Freeman-Sheldon syndrome	Circumoral fibrosis and microstomia

KẾT LUẬN

- *Quản lý đường thở khó ở trẻ em vẫn còn là một thách thức đối với người GMHS -> cần phải lập kế hoạch + chuẩn bị đầy đủ phương tiện trước khi đặt nkq khó*
- *Hypoxie là nguyên nhân gây tử vong chứ không phải do không đặt được nội khí quản. Do đó, ưu tiên hàng đầu là cung cấp O2 trong trường hợp đặt nội khí quản thất bại*
- *Đặt nội khí quản khó, đặc biệt là tình huống không đặt được nkq và không thể thông khí là hiếm và khi xảy ra thì không có các dấu hiệu báo trước nên luôn phải có kế hoạch quản lý đường thở khó ở trẻ em*