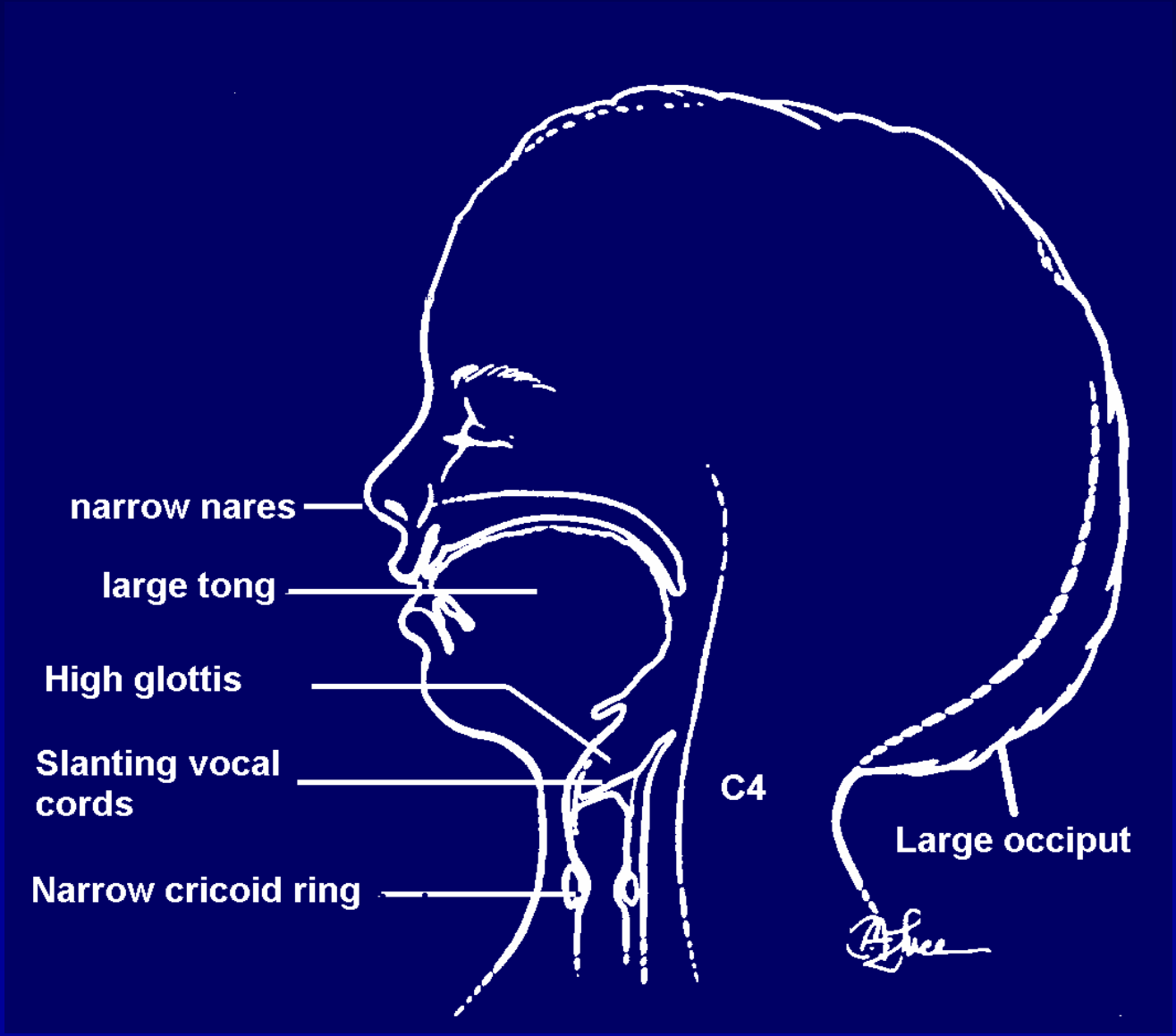
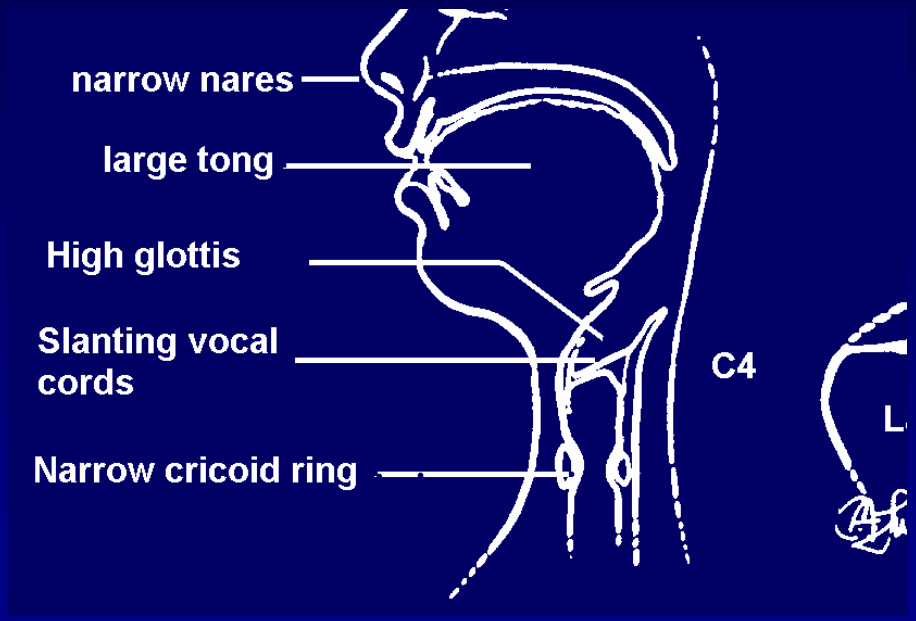
Airway Management

European Resuscitation Council

Anatomic characteristics





- ✓ At birth : epiglottis close to posterior wall of pharynx (C1)
- ✓ Touches the soft palate: path between nose and glottis
- ✓ Small face, narrow mandible and mouth fully occupied by large tongue

Newly-born & Infants (6 w to 4 mo)
OBLIGATE NOSE BREATHERS

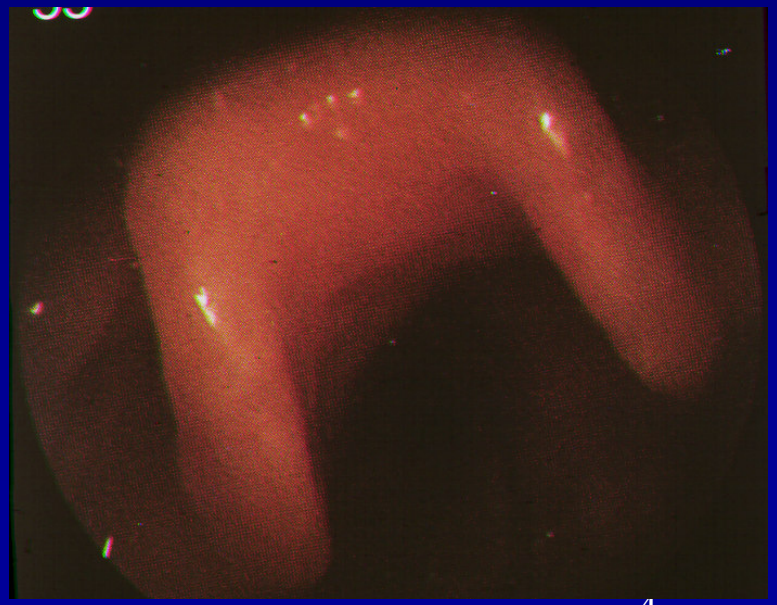
Larynx

Cephalic position of larynx (C2-C4)

- ✓ Epiglottis long, rigid, U shape
- ✓ protrudes toward pharynx anterior wall (45°)
- ✓ Short and concave VC
- ✓ Anterior attachment of VC lower than posterior
- ✓ Narrowest part = cricoïd (8 y)

Size of ETT = cricoïd

Complicated view plan

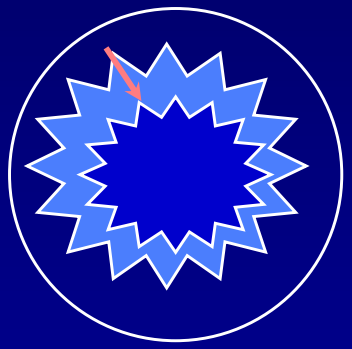


Poiseuille Law : laminary flow

$$R = \frac{8\,l\,n}{\pi r^4}$$

R = resistance
l = length of tube
ν = gas viscosity
r = radius of tube

Oedema



d=16 mm

diameter decreasing : 2 mm

d=4 mm

Section decreasing : 25 %

Resistance rising : 1.7 X

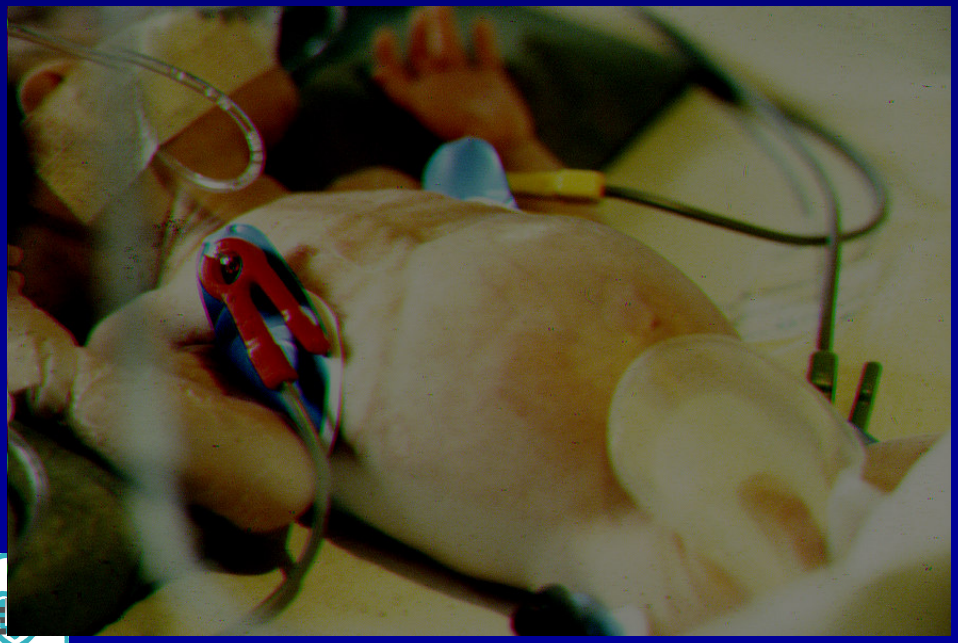
Section decreasing : 75 %

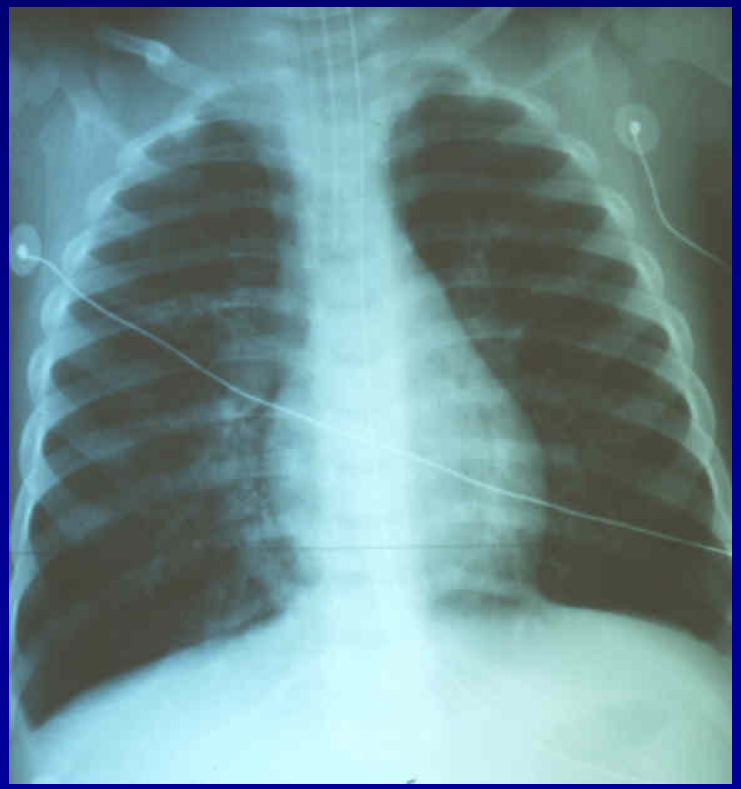
Resistance rising : 16 X

✓ Thoracic cage

- Maintain stability of the cavity during breathing
- More compliant than lung in infants
- Paradoxical respiratory movement during inspiration (reducing lung volume)

- ✓ Diaphragmatic participation 30%
  - Decreased by compression
    - (abdomen, thorax or lung)
  - non compensated by compliant rib cage
  - May lead to respiratory insufficiency





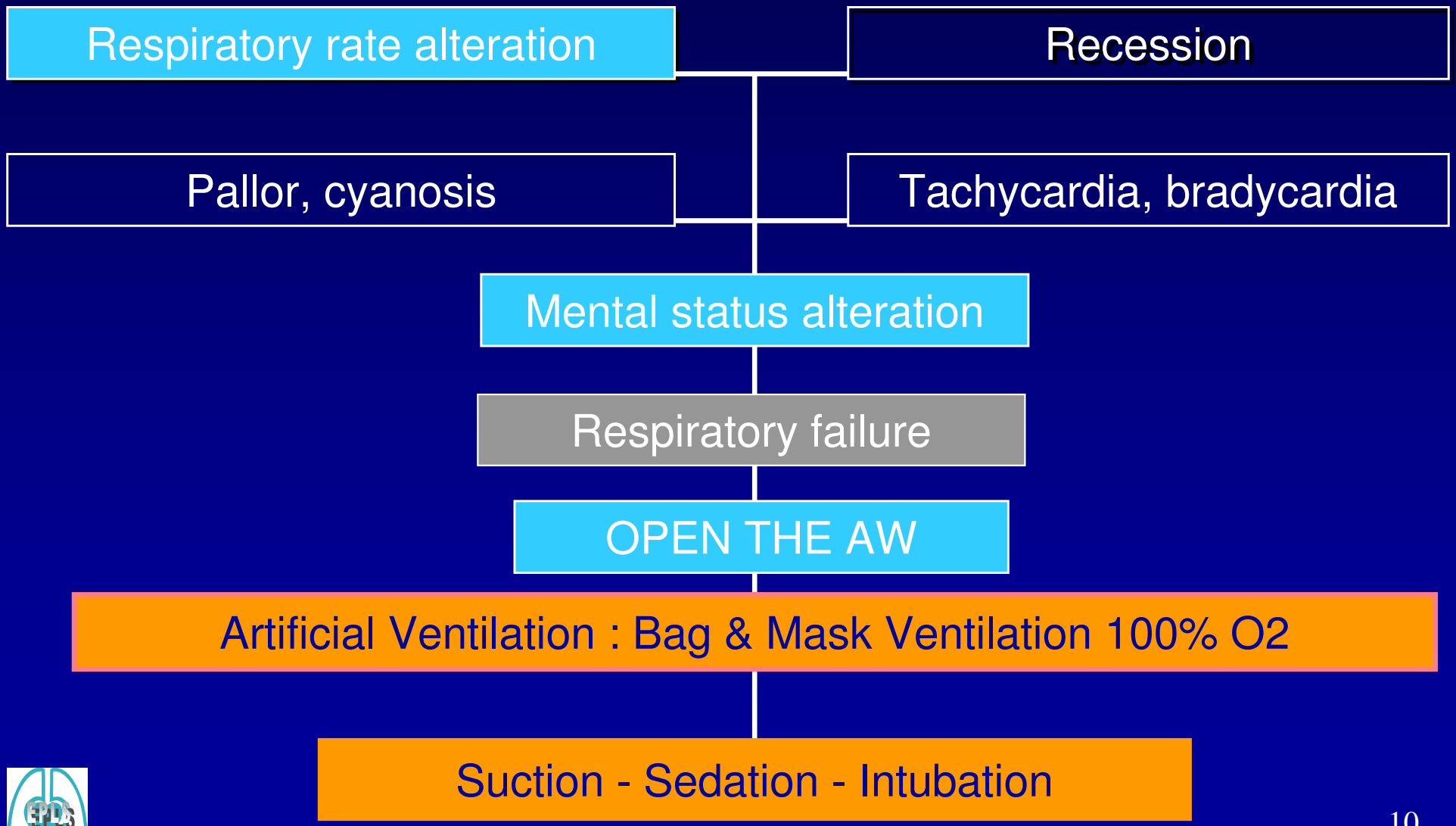
Spontaneous breathing

- ✓ Conscious child
  - Comfortable position adopted by the child
    - The best for airway opening
  - Oxygen at the highest available concentration
  - No stress
    - parents allowed to stay
    - adjunct accepted by the child

✓Decreased consciousness

- risk of obstruction
  - by fall of soft tissues (tongue…)
  - absence of clearance of secretion (vomit, blood)
- airway opening (jaw thrust, head tilt/chin lift)
- Suction
- Adjuncts
  - oropharyngeal airway
  - Nasopharyngeal airway

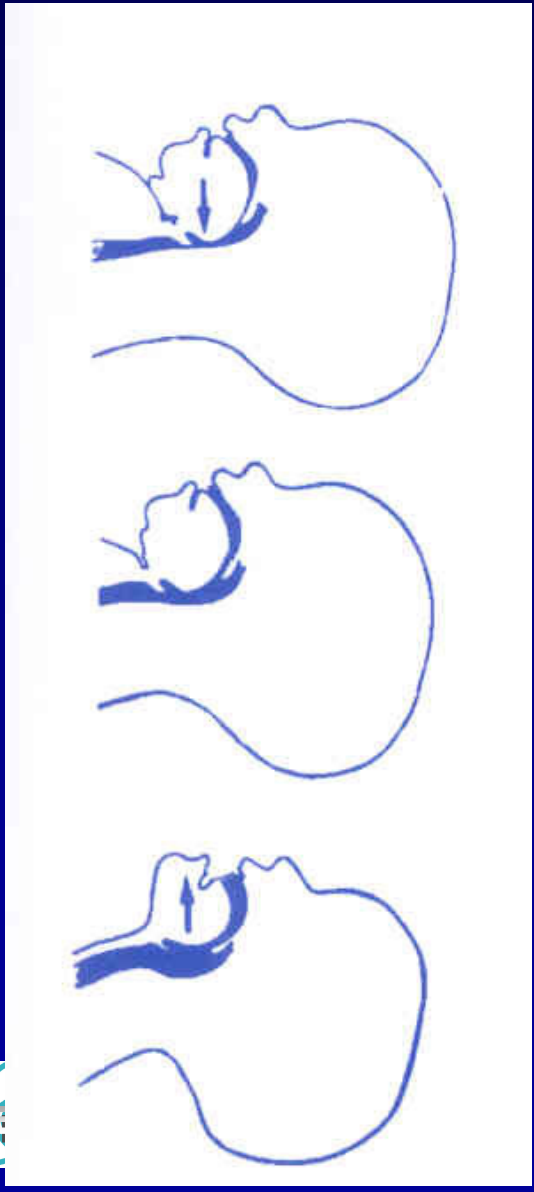
Respiratory failure?



Oxygen administration

- ✓Nasal tube
- ✓Nasal prongs (40-60%)
- ✓Head box (98%)
- ✓Oxygen tent
- ✓Masks
  - simple
  - With reservoir

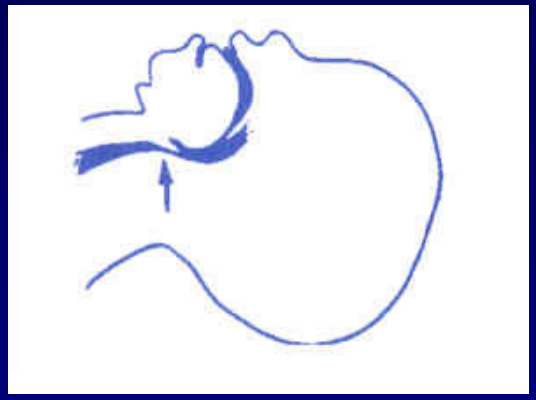
Position of head and neck



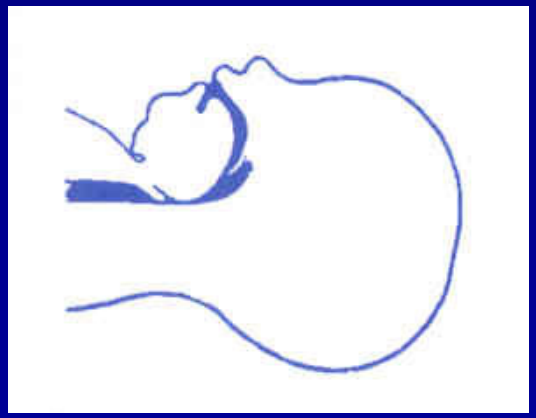
unconscious : fall of oro-Φ soft tissue

Extension

Extension and jaw thrust

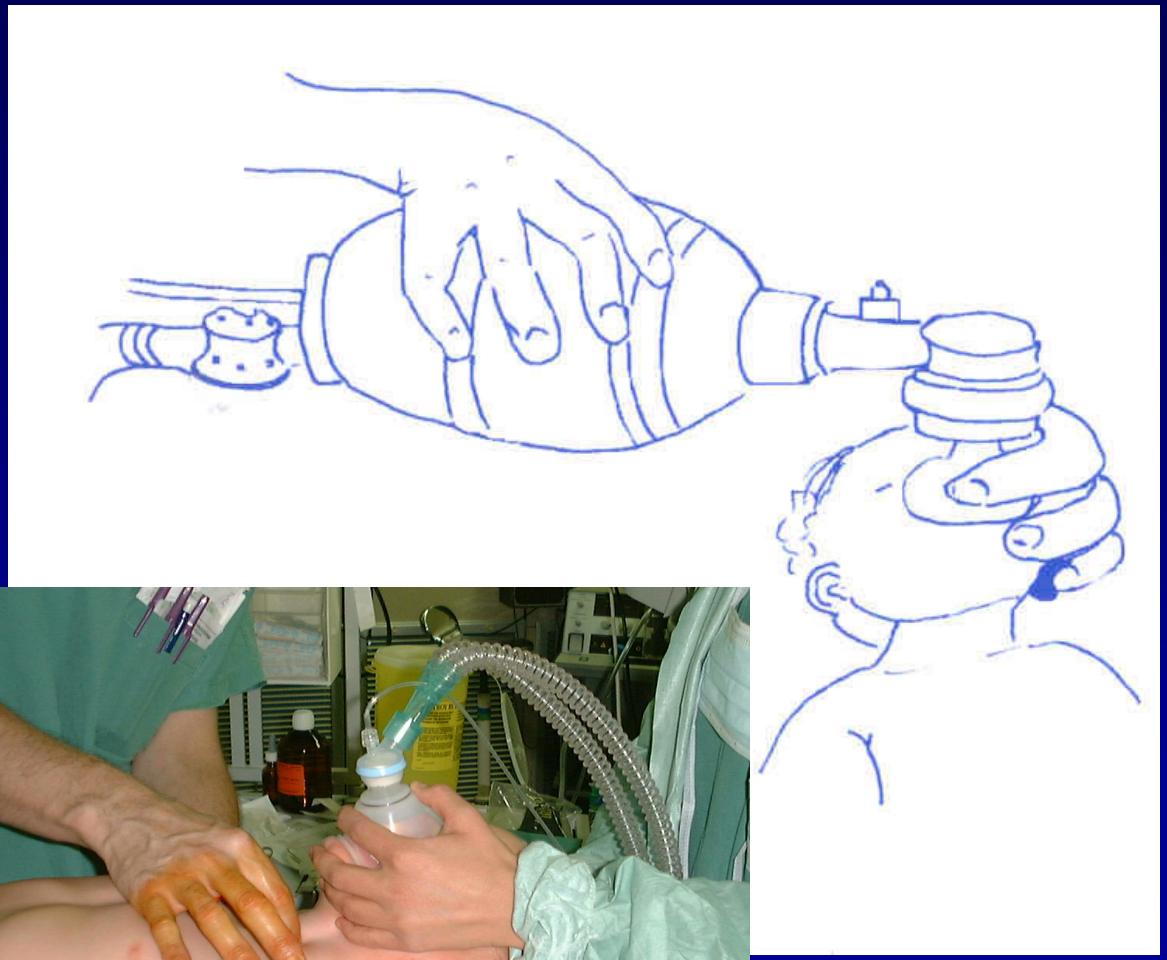


Hyper extension



Flexion

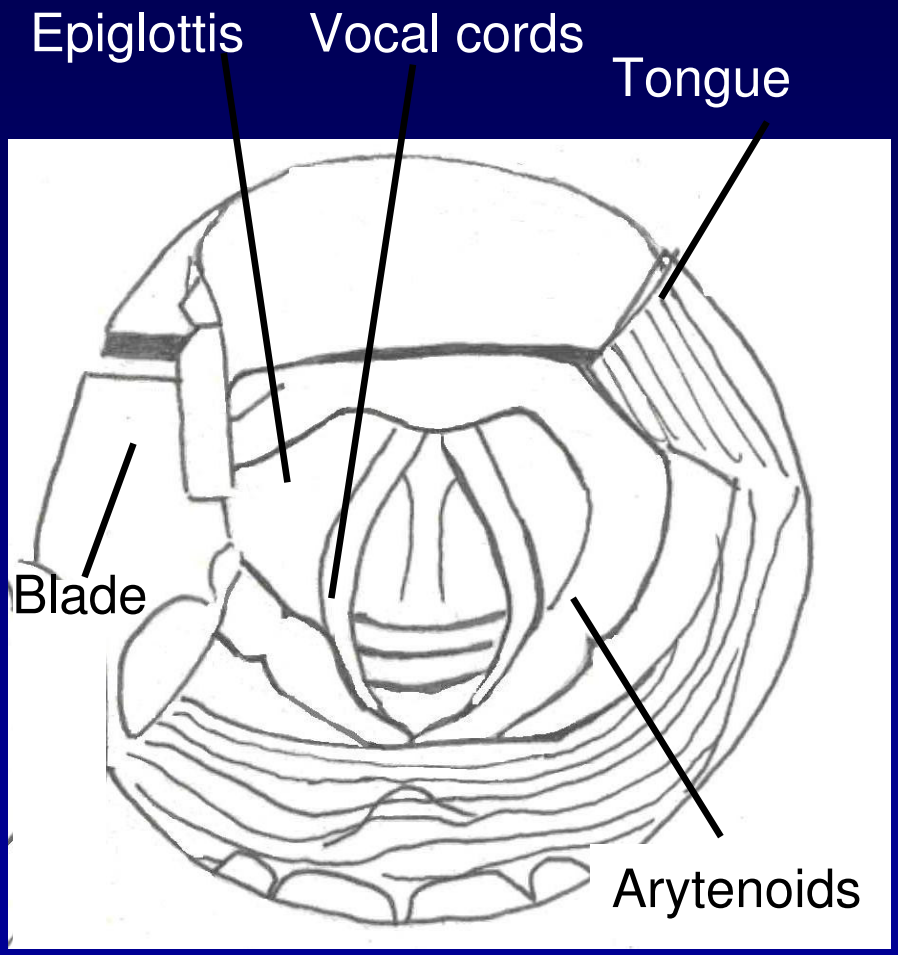
Bag and mask ventilation

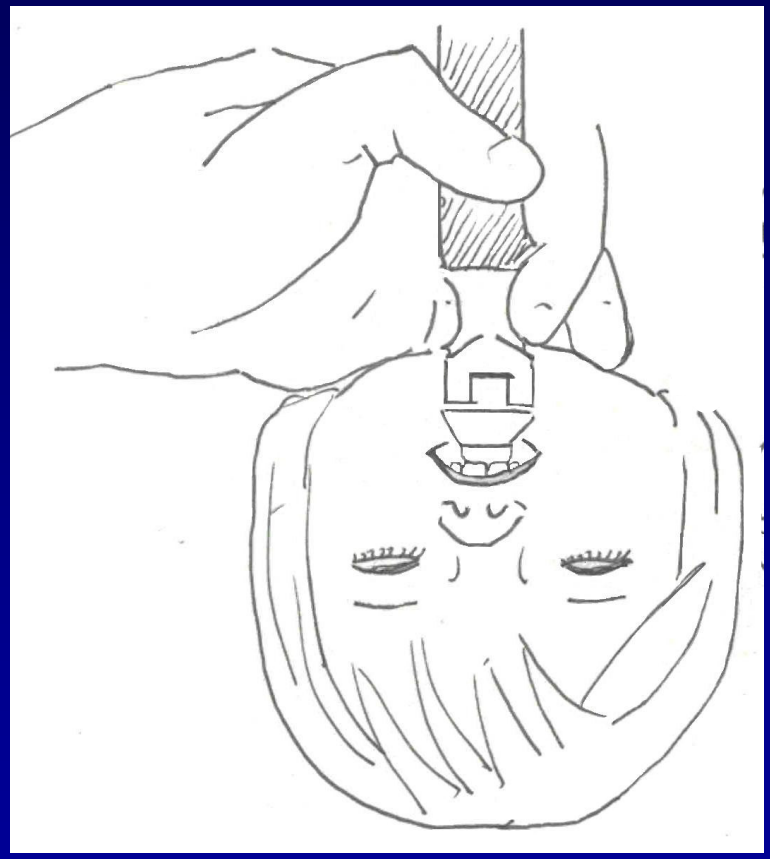


< 2 y : neutral position

> 2 y : C spine extension, 2 cm under the head & neck

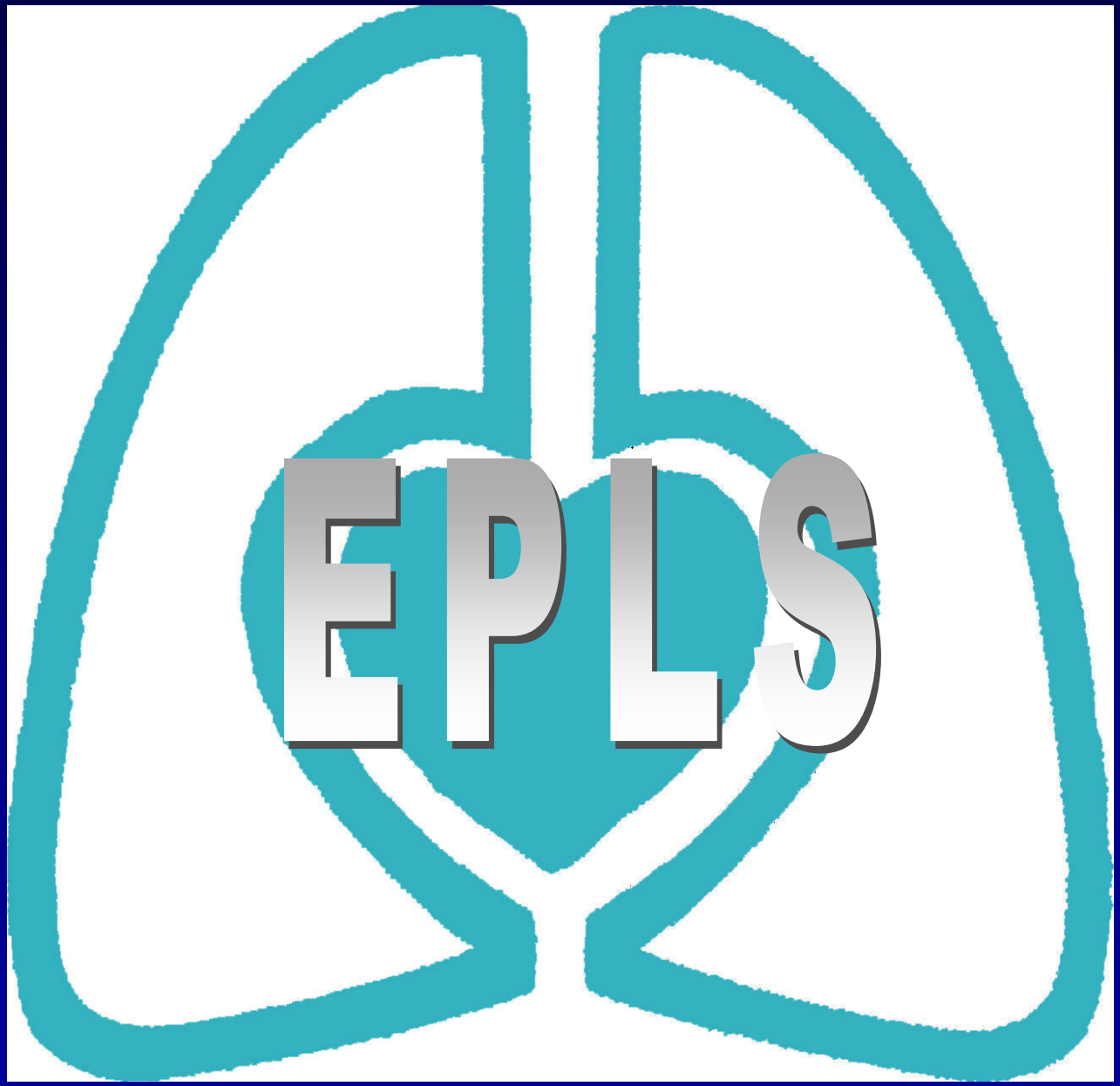
Oral intubation





Precaution

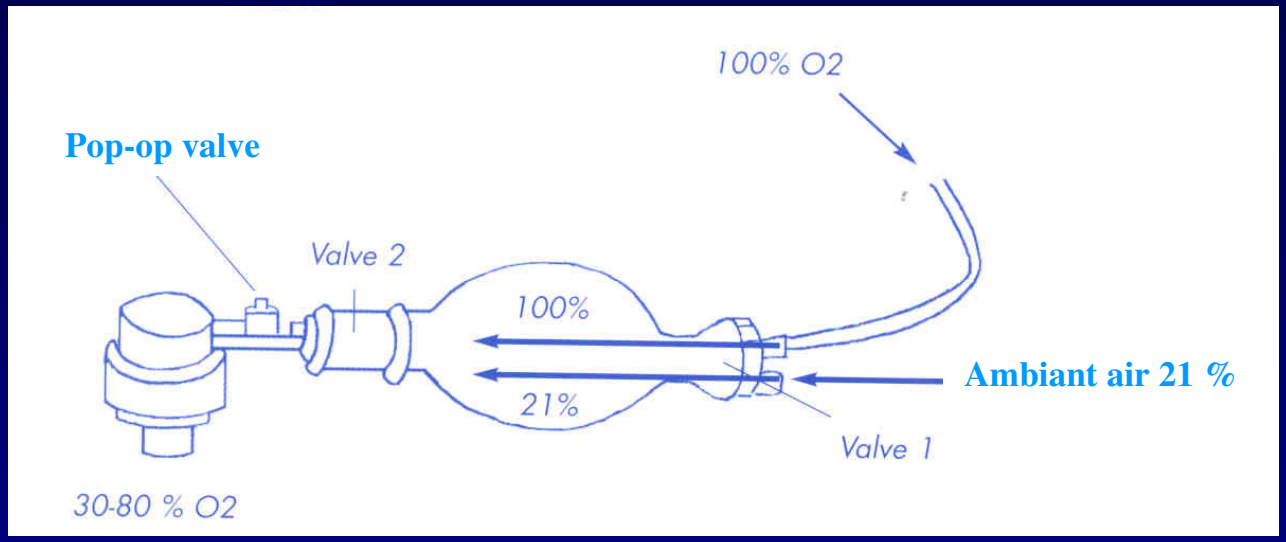
- ✓Good expertise is needed to intubate a child
- ✓Teaching in OR is required
- ✓Mannequin intubation does not give sufficient expertise


EPLS


EPLS

Mask

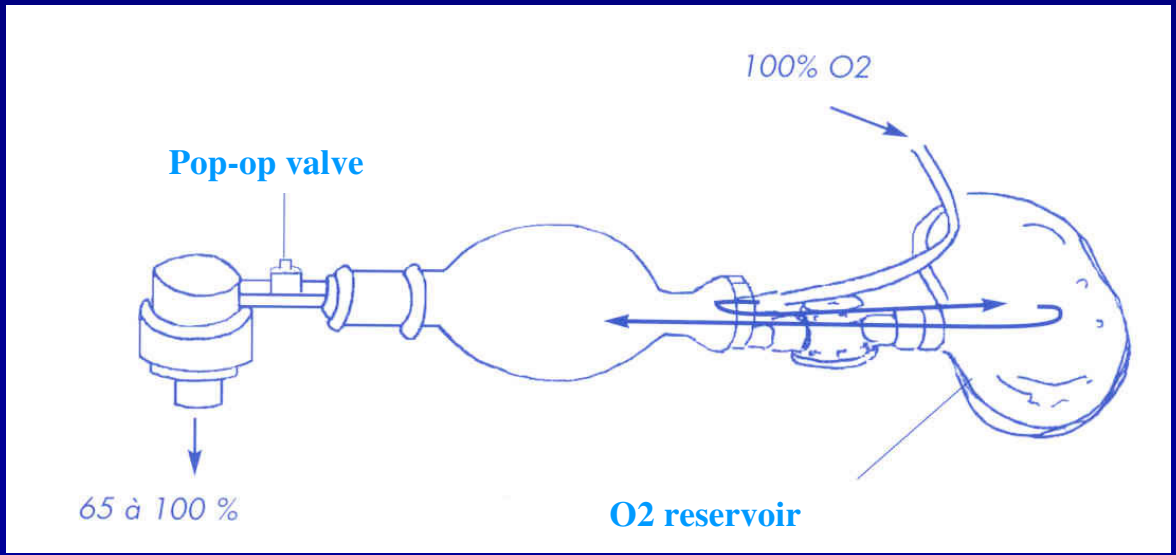
Self-inflating bag



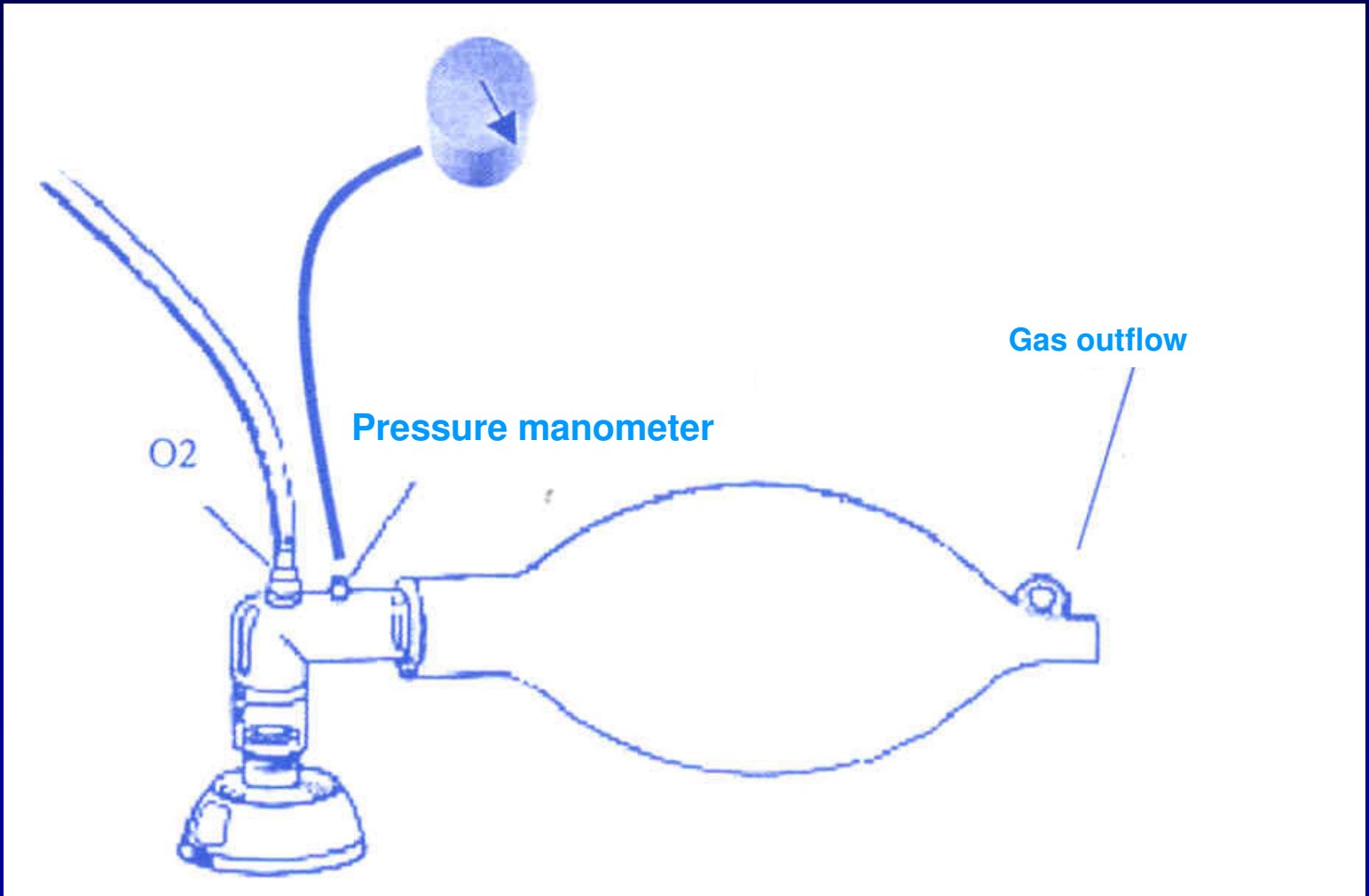
(< 3 kg : 250 ml)

< 40 kg : 500 ml

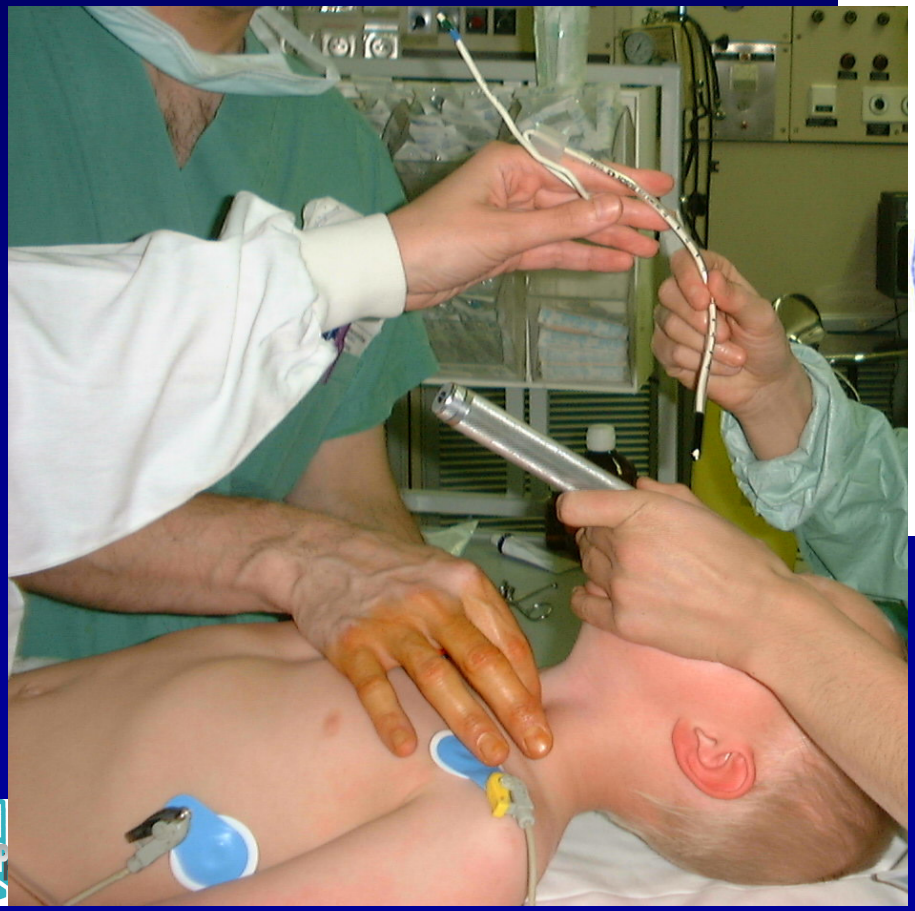
Adulte : 1 l

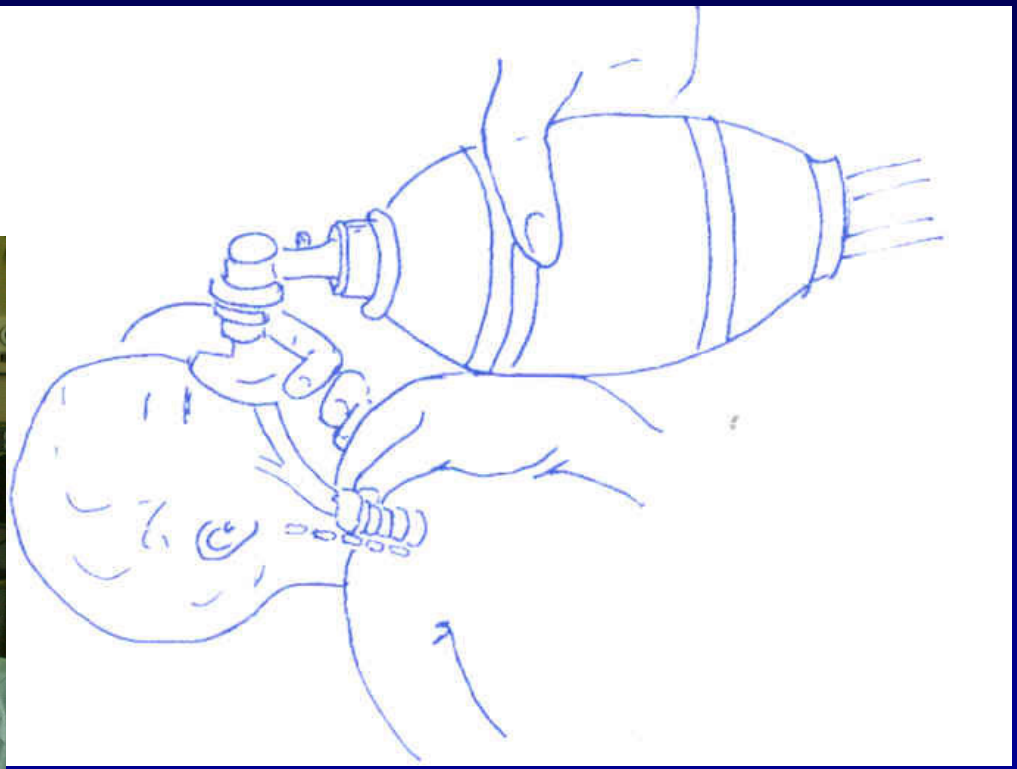


Anesthetist flow inflating bag



Sellick manœuvre





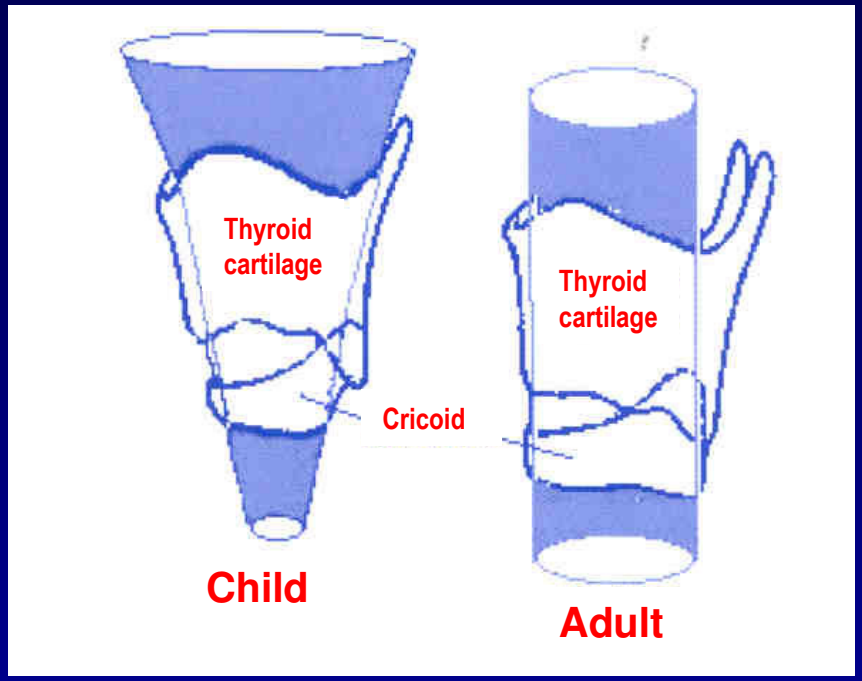
Intubation

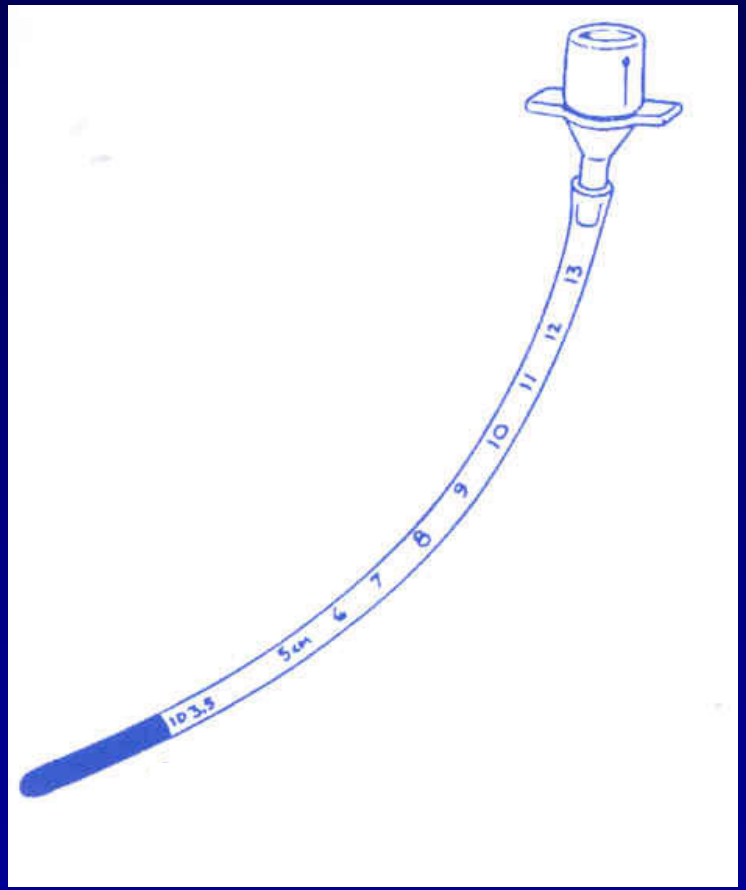
- ✓ BMV ineffective
- ✓ AW to secure
- ✓ Prolonged ventilation expected
  - Severe UAO
  - Inappropriate central breathing control
  - Absent (poor) AW protective reflexes
  - excessive respiratory effort leading to exhaustion
  - Need for high pressure
  - transport

Equipment

- ✓ Monitoring SpO2, HR, BP
- ✓ Medications prepared for the weight of child
- ✓ Bag and mask, oxygen connexion
- ✓ Laryngoscope and blade
- ✓ Tubes of calculated size & 1-2 sizes smaller
- ✓ Stylet, magill forceps
- ✓ Suction , tape to secure tube
- ✓ Capnography

Endotracheal tube





Constant diameter , transparent

< 8 y : cricoid = natural cuff

> 8 y: high vollume low pressure cuffed tube

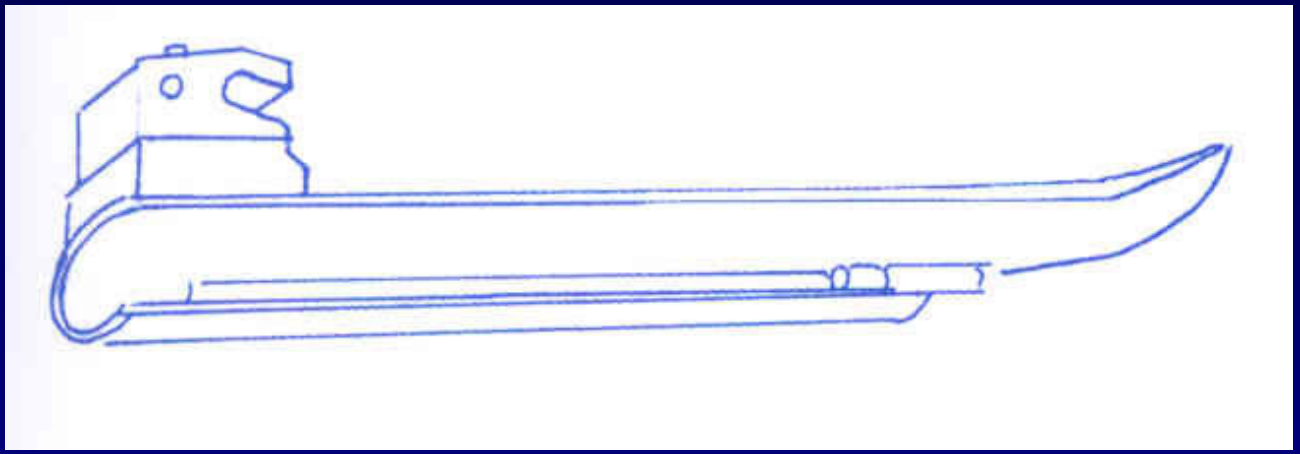
Choice of ETT

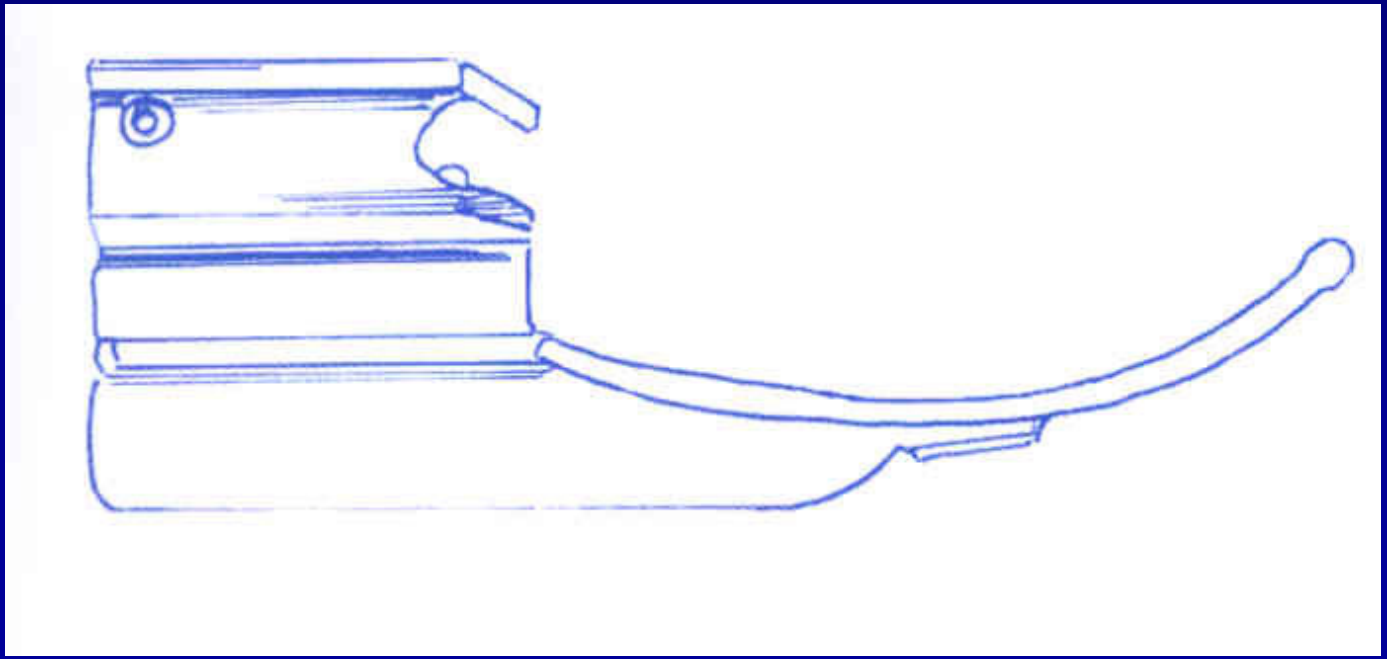
internal $\varnothing$ mm

Newly-born	2,5 à 3,5
Infants	3,5 à 4
Children	$\frac{\text{Age}}{4} + 4$

external $\varnothing$ = size of little finger

Blades





Rapid sequence of induction

- ✓ CI: CRA or deep coma
- ✓ To avoid complications linked to intubation

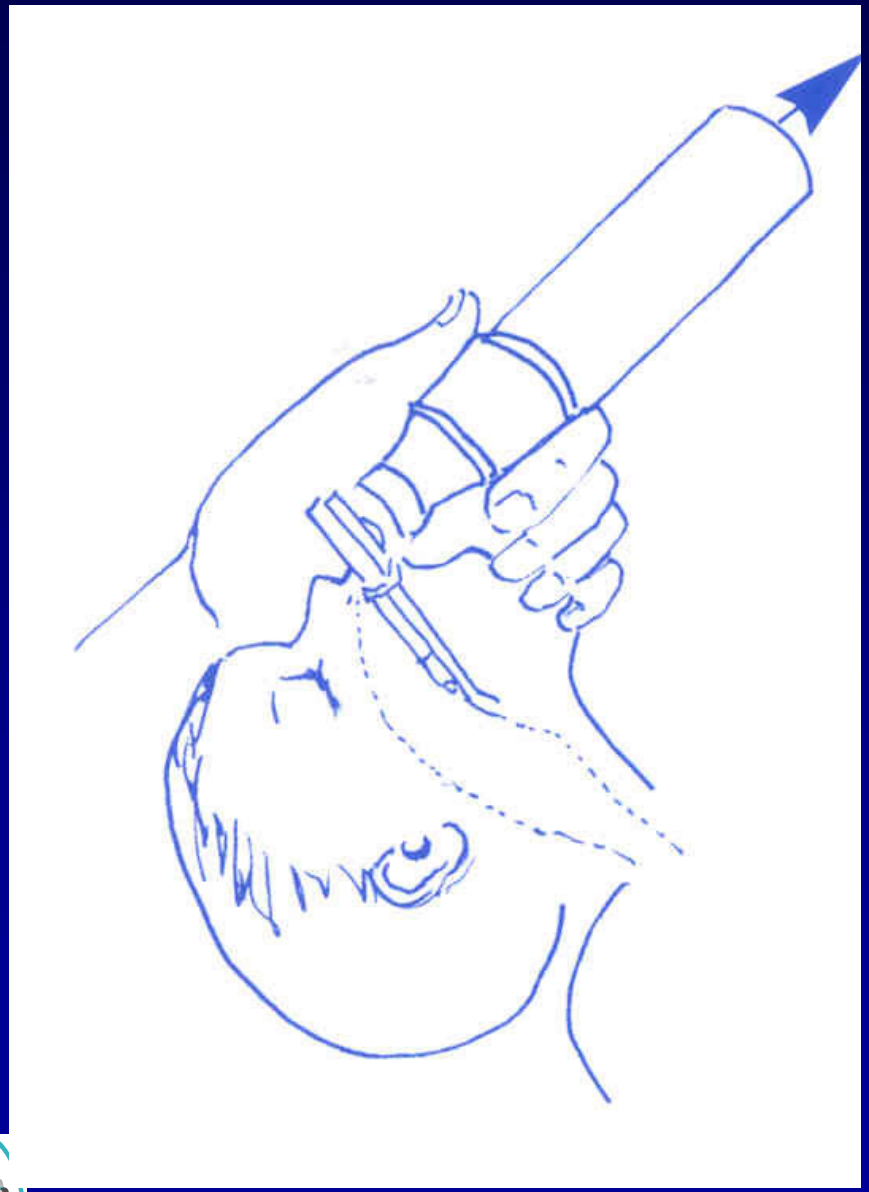
  hypoxia, pain, arrhythmia, hypertension, hyperICP, AW trauma, gastric fluid reflux and aspiration, psychological trauma & death

- ✓ relative CI : lack of experience, risk failure, facial or laryngeal oedema, AW patency child ’s tonus dependent

RSI

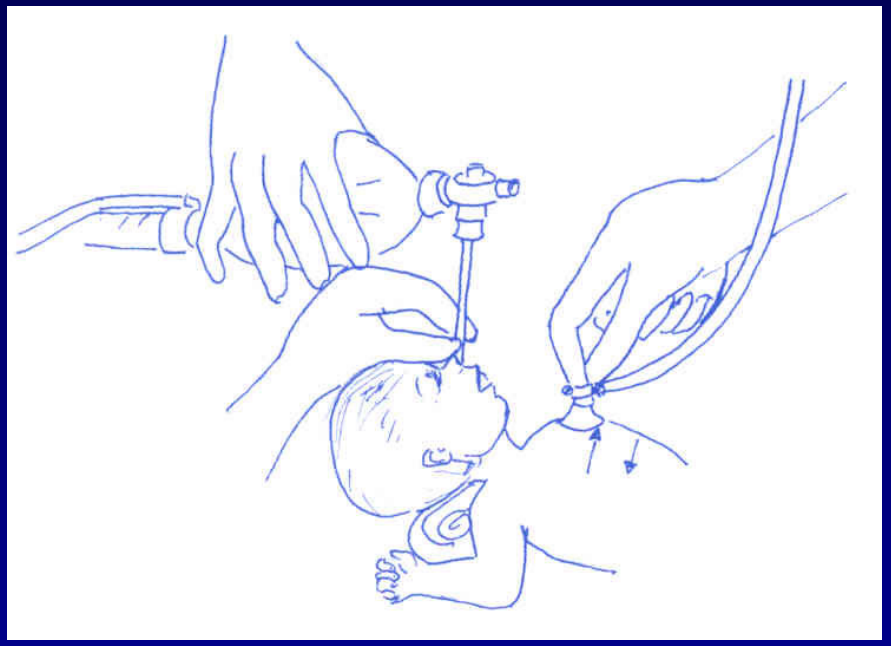
- ✓ AMPLE , head and neck exam
- ✓ Monitoring SpO2, HR, BP, ET CO_2
- ✓ Oxygenation during 3 min w/o Positive P
- ✓ Premedication
  - Atropine
  - Opiate
  - Precurarisation if succinylcholine
- ✓ Sedation : ethomidate, fentanyl, midazolam, ketamine
- ✓ Curarisation : Rocuronium, succinylcholine, vecuronium
- ✓ Sellick manœuvre
- ✓ Intubation
- ✓ Verify ventilation

Intubation



Verify intubation

- Check chest rise
- Auscult axillary area (both sides)
- Auscult stomach
- Observe gastric distension



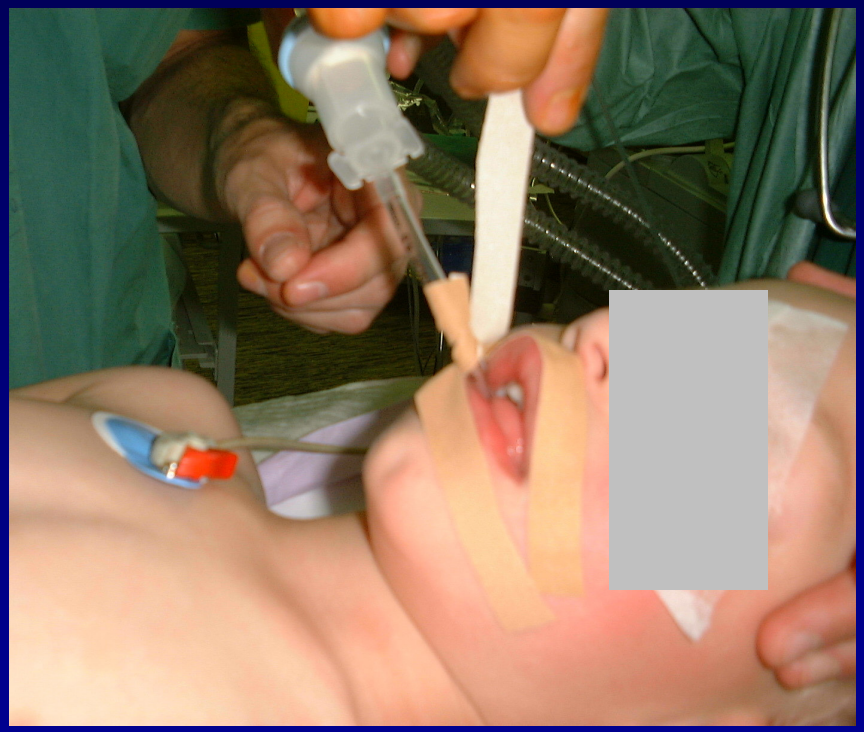
Oral lenght : < 1 y : 6 + age in year

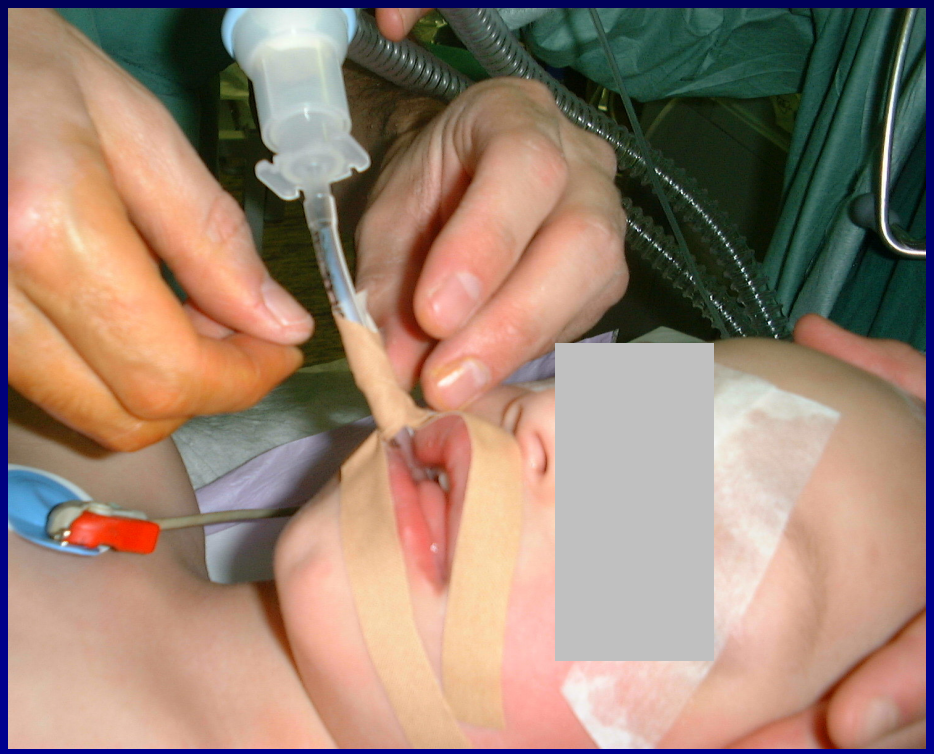
1-12 y : 3 X internal diam

> 12 y : 19-23 cm

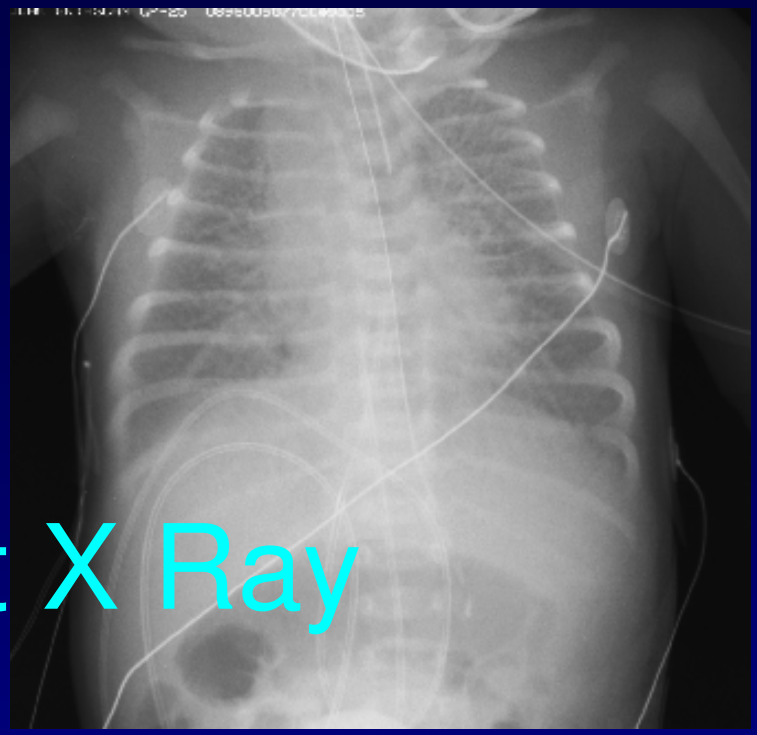
Verify exhaled CO2

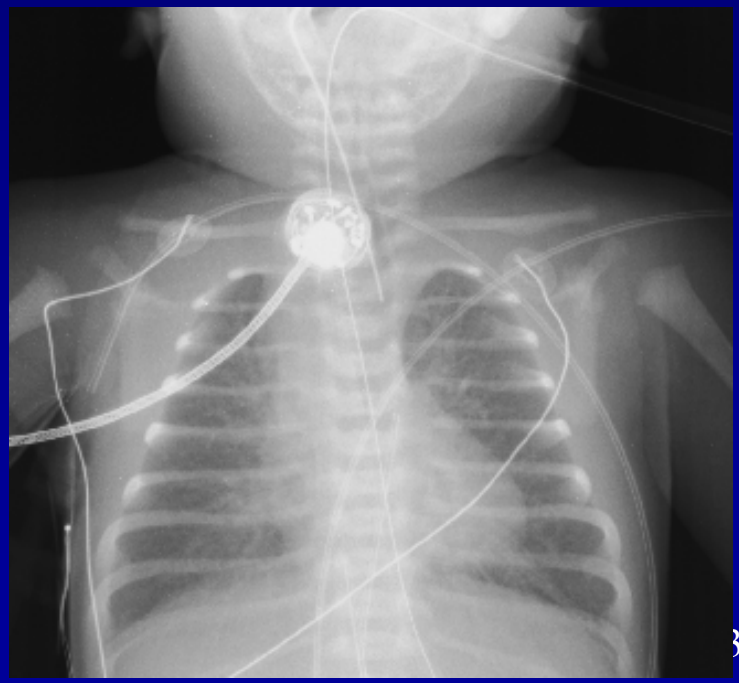
Don’t forget to secure the tube





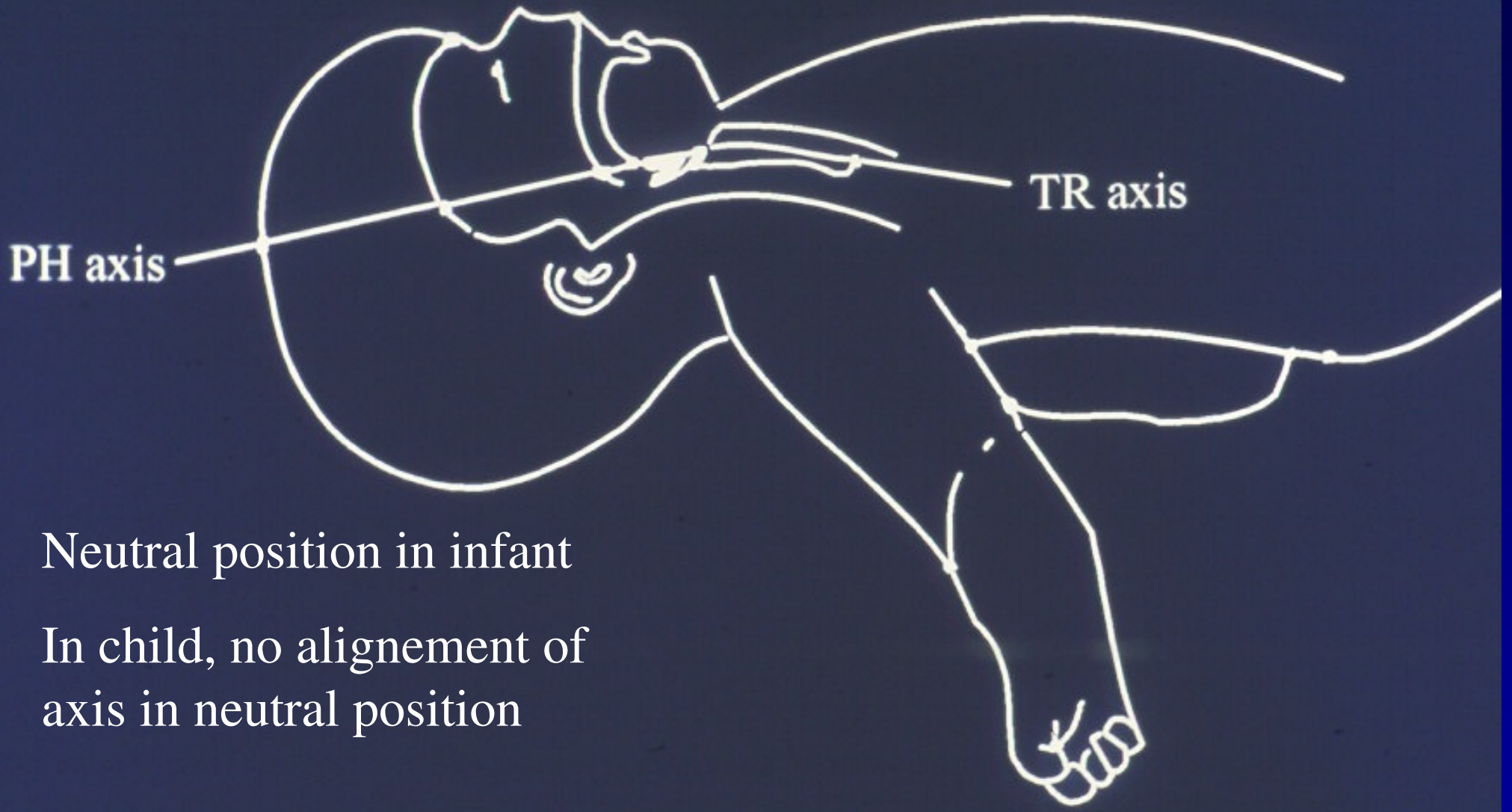
Do a chest X Ray





Dimensions of larynx related to age

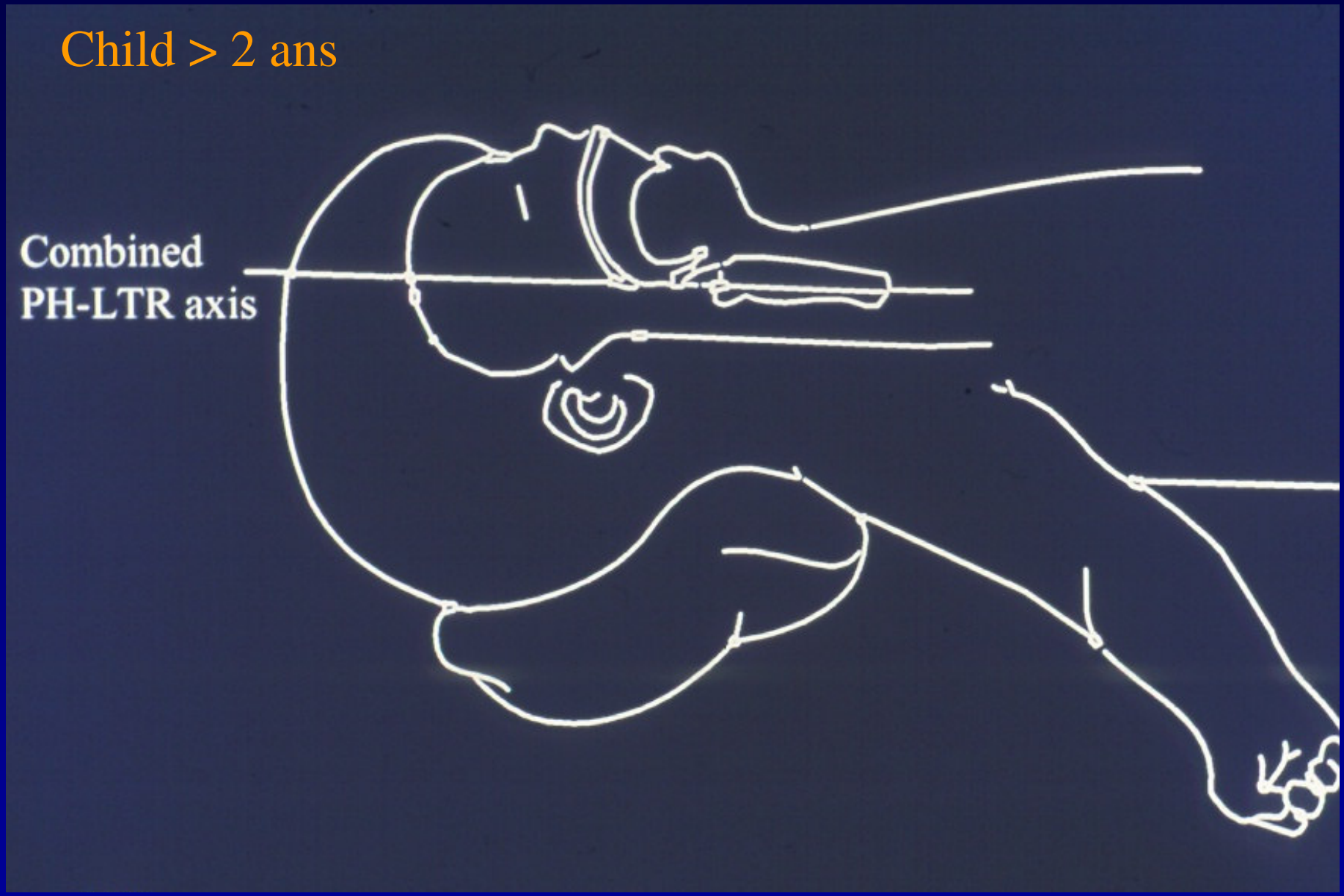
	Antero-posterior diameter of glottis	**larynx**	**glottis Situation**
Newly-born	**7 mm**	**5 - 7 cm**	**C2 - C4**
6 mo	**8,2 mm Cricoïd Ext 5.5 Int 4.5**	**7 cm**	
12-18 mo		**8,1 cm**	
12 y	**18 mm**	**11 cm**	**C5 - C6**



Neutral position in infant

In child, no alignement of axis in neutral position

Child > 2 ans



Combinaison of oral, pharyngeal & tracheal axis: elevation of the head under the occiput - shoulders on table