



Department of Anesthesia Techniques
Title of the lecture: - anesthesia for pediatric



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Anesthesia for pediatric

(Practical Anesthesia)

3^{ed} stage

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Pediatric Anesthesia

has differing anesthetic requirements. physiological, anatomic, and pharmacological characteristics of each group.

Neonate (0–1 months)

Infant (1–12 months)

Toddlers (12–24 months)

young children (2–12 years of age)

Anatomical & Physiological Differences

Physiological

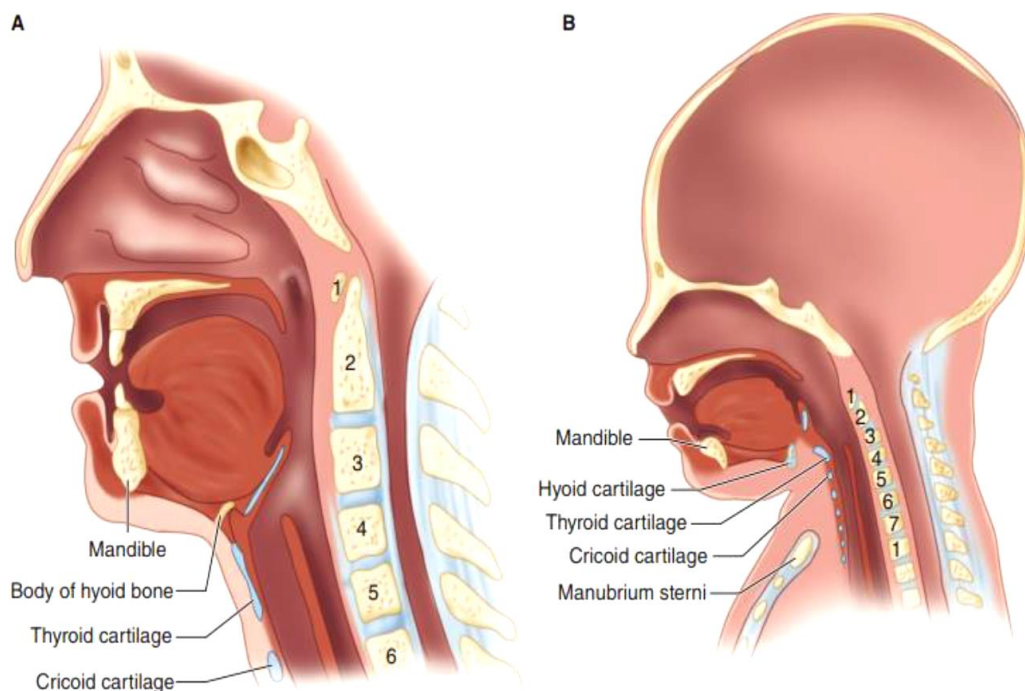
1. Reduced BP, Increase HR
2. Reduced FRC, Increased RR
3. Increased metabolic rate
4. The neonate has limited responses to

cold (vasoconstriction rather than shivering) and there is an increased propensity to bradycardia

Age	Respiratory Rate	Heart Rate	Arterial Blood Pressure	
			Systolic	Diastolic
Neonate	40	140	65	40
12 months	30	120	95	65
3 years	25	100	100	70
12 years	20	80	110	60

Anatomic

Larger head, Small mandible, shorter neck, Shorter trachea and High larynx, Difficult venous and arterial cannulation, Greater resistance to airflow, Thin skin.



Pharmacological

1. Immature hepatic biotransformation pathways.
2. Decreased blood protein for drug binding
3. more rapid induction and recovery from inhaled anesthetic
4. Increased minimum alveolar concentration

Total body water

1. 70% to 83% of weight in premature babies and neonates.
2. 60% of weight in infants.

Pediatric patient's weight can be approximated based on age

< 1 month ~ 3 kg

1-12 months ~ (0.5 x age in months) + 4

1-5 years ~ (2 x age in years) + 8

6-12 years ~ (3 x age in years) + 7

>12 years ~ Highly variable



Pediatric Airway Management

1. The Jackson Rees modification of the Ayre's T piece is the breathing system used for children
2. It has been designed to be lightweight with a minimal apparatus dead space. The apparatus may be used for both spontaneous and controlled ventilation.



Ayre's T-piece

E



Jackson-Rees modification

F



Tracheal intubation for children over 1 year:

- Appropriate tube internal diameter (ID) can be approximately estimated by the formula: $\text{age} / 4 + 4$.
- Appropriate tube length in cm. can be approximately estimated by the formula: $\text{age} / 2 + 12$ oral (+15 for nasal). In infants:

Generally, cuffed tubes are used only in children above the age of 8 years.

Why prefer un-cuffed tube in Pediatric patients under 8 years?

1. Because the airway and larynx in Pediatric are funnel-shaped and therefore the trachea is narrow.
2. Because the trachea in Pediatric is soft tissue, it cannot bear the high pressure of the cuffed tube, and it can lead to ischemia or necrosis.

Laryngeal mask airway (LMA): They are useful in short procedures with spontaneous ventilation. Approximate sizes are:

(1) for less than 6.5 kg.	(2.5) for 20-30 kg.
(2) for 6.5-20 kg.	(3) for 30 kg and above.

Preoperative Assessment for pediatric

1. **Respiratory examination:** nasal drainage (clear or discolored yellow/green) as well as cough (dry or productive and color of sputum). focuses on determining the presence of abnormal air movement, including absent breath sounds, wheezing, or coarse breath sounds.
2. **Neurological examination:** should focus on the child's activity level and note any anomalies such as weakness of extremities, or abnormal appearance.
3. **cardiovascular examination:** auscultation of the heart sounds, noting that heart murmurs are common in newborns.

Fasting Guidelines

Premedication

Induction of Anesthesia: it is divided into three types:

1. Inhalation Induction of Anesthesia: has a number of advantages in children. It is painless and it is successful on the first attempt (whereas intravenous cannulation has failure).
2. Intravenous Induction
3. Intramuscular Induction: IM injection of ketamine may be the best option in these circumstances.

Fluid and Blood Management:

A. Intravenous Fluid Requirements: in fasting children are usually determined using the 4-2-1 rule, the hourly infusion rate is calculated as:

- ✓ 4 mL/kg for the first 10 kg
- ✓ 2 mL/kg for the second 10 kg
- ✓ 1 mL/kg for each additional kilogram

B. Blood Loss Replacement and Transfusion

Blood loss is replaced with crystalloids (without glucose). (eg, 3 mL of lactated Ringer's injection for each 1ml of blood lost) or colloid solutions (eg, 1 mL of 5% albumin for each milliliter of blood lost).

- 1- In Physiological Differences in pediatric all true except one:
 - a) Reduced BP, Increase HR
 - b) The neonate has high responses to cold
 - c) Reduced FRC, Increased RR
 - d) Increased metabolic rate
- 2- Pharmacological Differences in pediatric than in adult all true except one:
 - a) Increased blood protein for drug binding
 - b) Immature hepatic biotransformation pathways.
 - c) more rapid induction and recovery from inhaled anesthetic
 - d) Increased minimum alveolar concentration
- 3- the breathing system used for children is:
 - a) Mapleson D and his modification Bain system
 - b) Mapleson A and his modification Lack system
 - c) Mapleson B
 - d) Ayre's T piece and his modification Jackson-Rees
- 4- Anatomical Differences in pediatric than in adult all true except one:
 - a) Small mandible
 - b) shorter neck Shorter trachea
 - c) Thic skin.
 - d) Difficult venous and arterial cannulation