


EMS Pediatric Respiratory Emergencies

Satellite Conference and Live Webcast
Tuesday, March 25, 2014
10:00 – 11:30 a.m. Central Time

Produced by the Alabama Department of Public Health
 Video Communications and Distance Learning Division

Faculty

Ann Klasner, MD, MPH
Professor of Pediatrics
Pediatric Emergency Medicine
University of Alabama at Birmingham



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Disclosure


- Did provide disclosure information
- Does not intend to discuss an unapproved / investigative (“off - label”) use of a commercial product / device and has no significant financial relationship(s)

Pediatrics By The Numbers

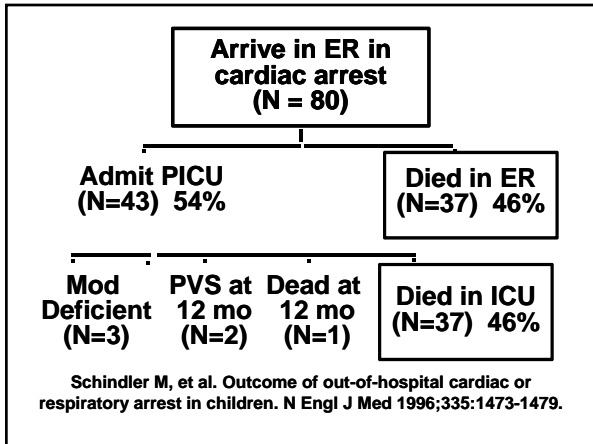
- 30% of the population
- < 10% of all EMS Calls
- Low density areas (rural) could mean very few encounters

Why is This Topic Important?

- Almost all pediatric “codes” are of respiratory origin



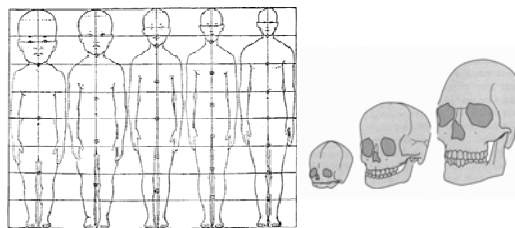
Internal Data. B.C. Children’s Hospital, Vancouver. 1989



Objectives

- Identify airway differences in children that impact ventilation
 - Anatomy / Physiology
- Define respiratory distress and failure
- Outline management priorities based on assessment of severity of illness
 - Use of positioning and adjuncts
- Apply knowledge in case - scenarios

Anatomy



Anatomy: Nose

- Nose = 50% of total airway resistance at all ages
- Infant:
 - Blockage of nose = respiratory distress



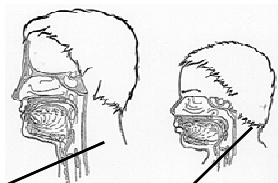
Mouth Nose

Anatomy: Tongue

- Large
- Loss of tone with sleep, sedation, CNS dysfunction
- Frequent cause of upper airway obstruction

Anatomy: Larynx

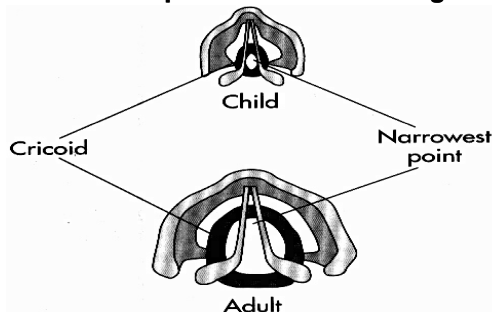
- High position
 - Infant : C 1
 - 6 months: C 3
 - Adult: C 5 - 6
- Anterior position



C 5-6 C 2-3


Anatomy: Larynx

- Narrowest point = cricoid cartilage




**Physiology:
Size and Effect of Edema**

Infant



Adult



Poiseuille's law

$$R = \frac{8nl}{\pi r^4}$$

If radius is halved, resistance increases 16 fold

**Other Scary Pediatric Findings
(Congenital Conditions)**



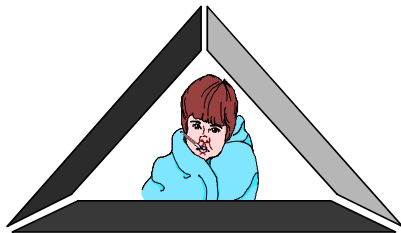
Trisomy 21 – large tongue; cervical issues; obesity



Pierre Robin – micrognathia, large tongue

Pediatric Assessment Triangle

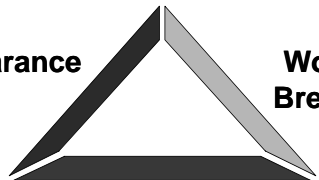
- The triangle is a rapid way to determine physiologic stability



Pediatric Assessment Triangle

Appearance

Work of Breathing



Circulation to Skin

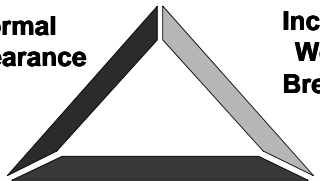
Respiratory Distress

- Any degree of airway obstruction or impairment of breathing causing increased work of breathing

Triangle: Respiratory Distress

Normal Appearance

Increased Work of Breathing



MEANS RESPIRATORY DISTRESS

Increased Work of Breathing

- Tachypnea
- Tachycardia
- Grunting
- Stridor
- Head bobbing
- Nasal flaring
- Facial expression
- Body position
- Agitation
- Retractions
- Access muscles
- Wheezing
- Sweating
- Prolonged expiration
- Apnea
- Cyanosis

Tachypnea

- Normal respiratory rate for age
 - Birth 30 - 60 / min
 - 1 month 20 - 40 / min
 - 1 year (toddler) 20 - 30 / min
 - 6 years (school) 16 - 20 / min
 - Puberty 14 - 16 / min

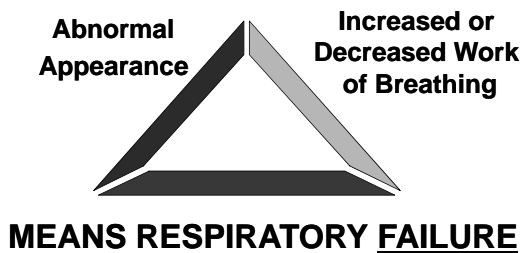
Impending Respiratory Failure

- Reduced air entry
- Severe work
- Cyanosis despite O₂
- Irregular breathing / apnea
- Altered consciousness
- Diaphoresis

Respiratory Failure

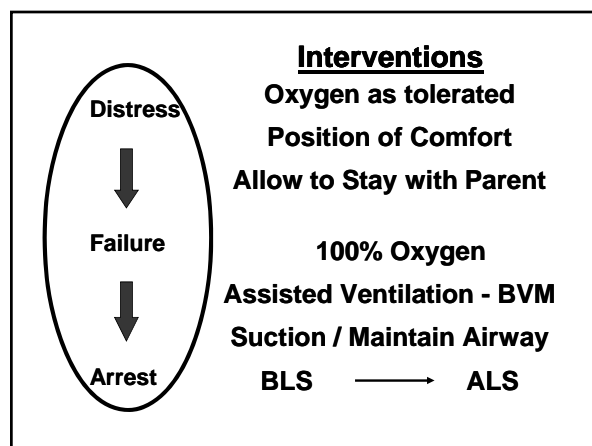
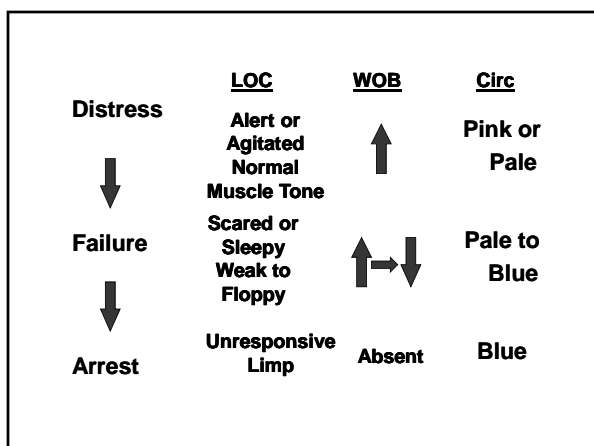
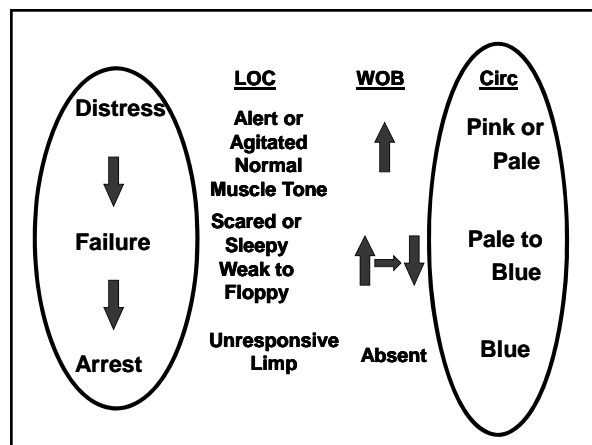
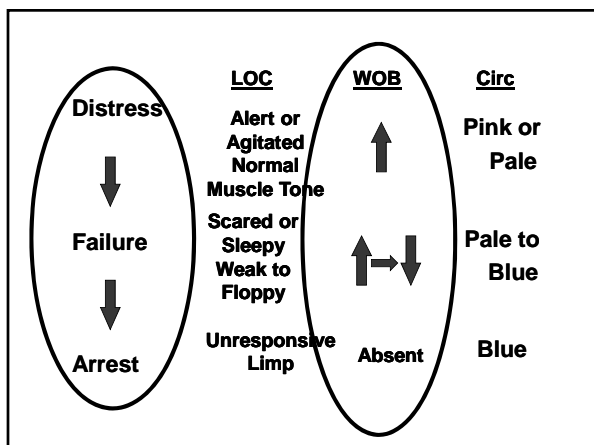
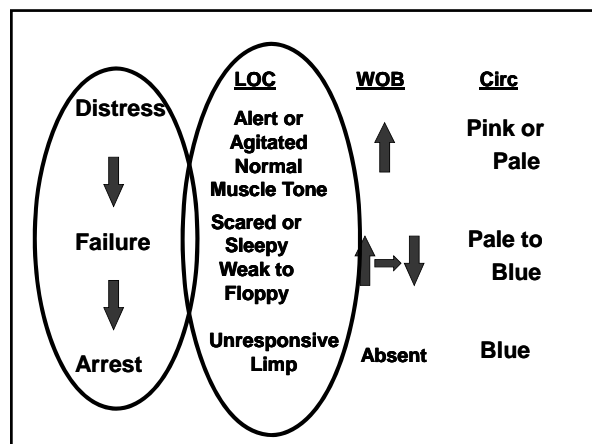
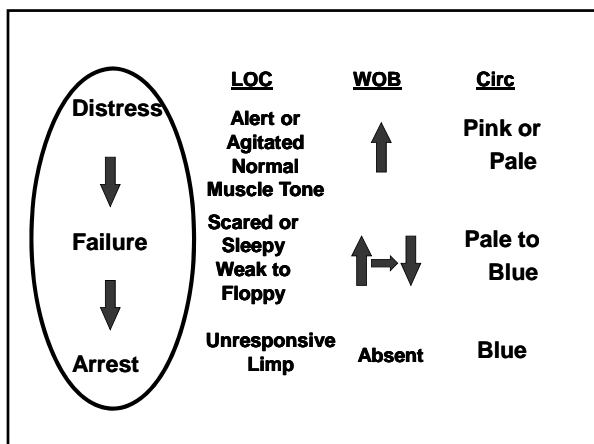
- Child's ability to maintain oxygenation and ventilation is not adequate to respond to the intensity of the distress

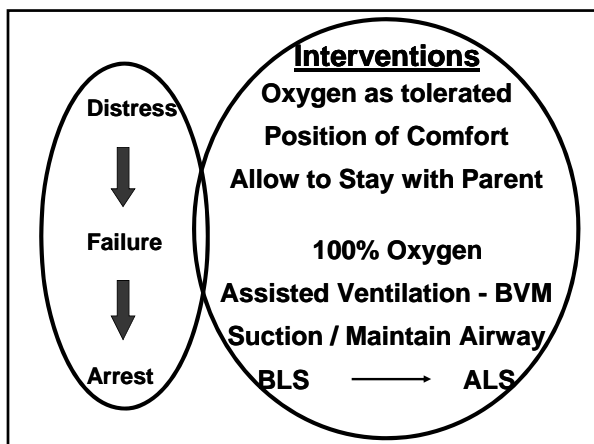
Triangle: Respiratory Failure



Respiratory Progression

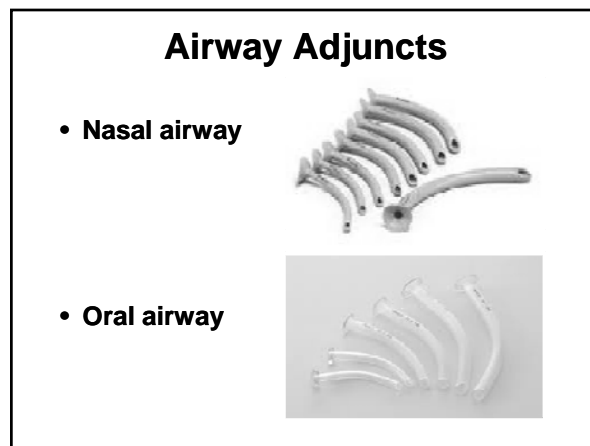
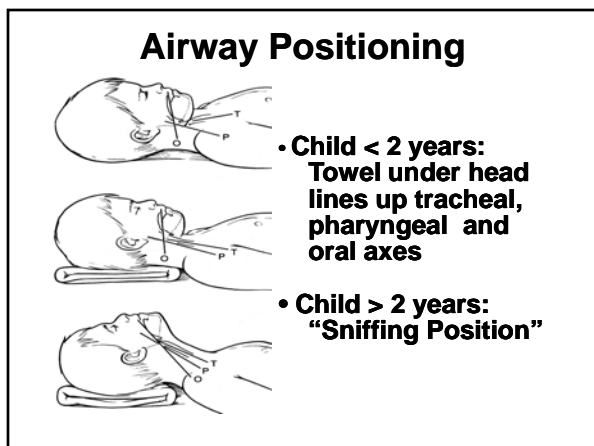
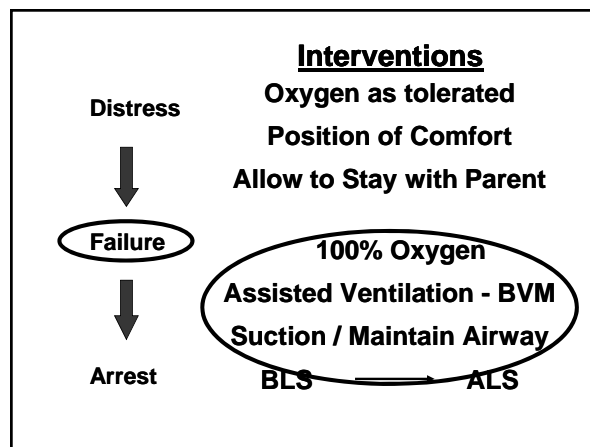
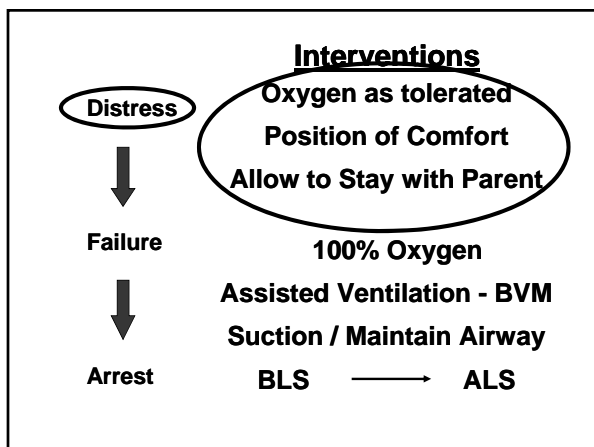






Understanding Anatomy Can Help You Provide Better Interventions in The Care of a Child

- Examples:
 - Positioning
 - Airway adjuncts


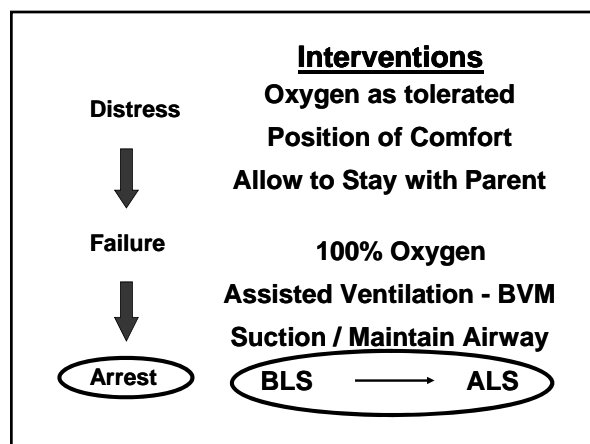
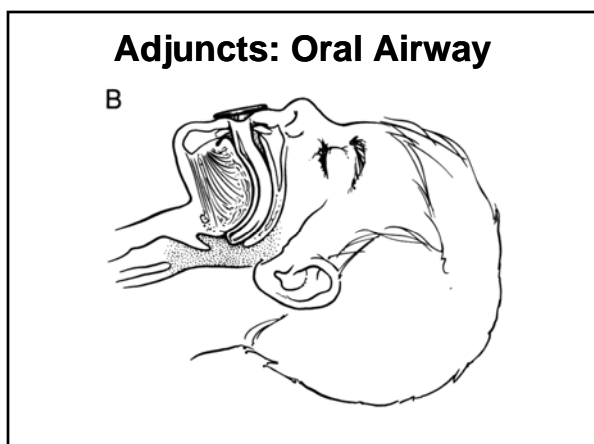
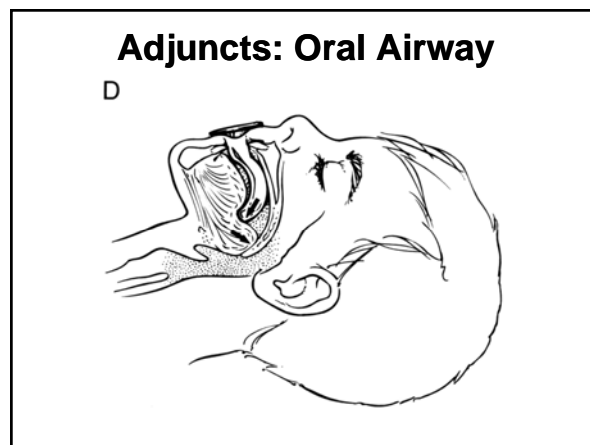
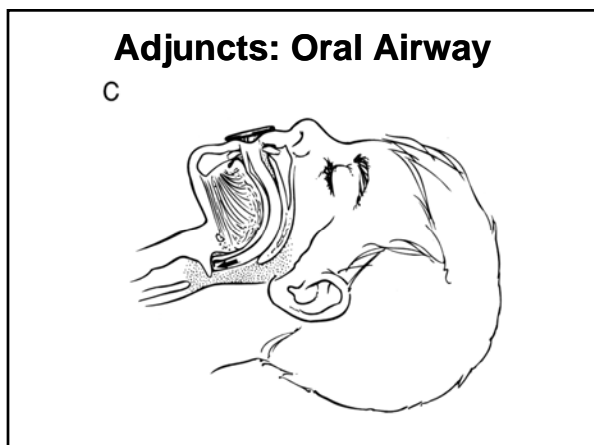
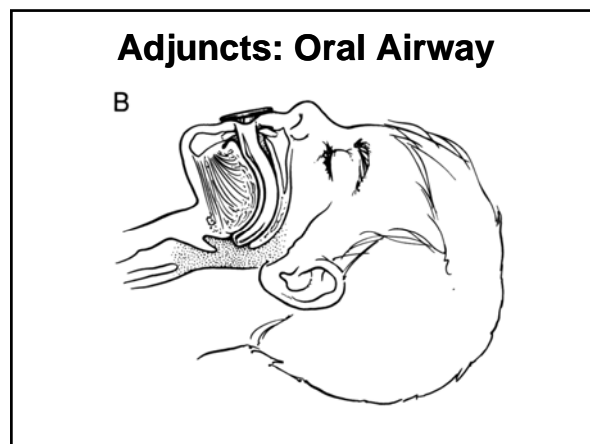


Nasopharyngeal Airway

Length:
Nostril to Tragus

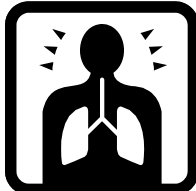
Contraindications

- Basilar skull fracture
- CSF leak
- Coagulopathy

Respiratory Noise

- **Inspiratory (Upper)**
 - Nose
 - Snoring
 - Stridor
- **Expiratory (Lower)**
 - Wheezing
 - Crackles



Causes of Airway Obstruction

<p>UPPER</p>	<ul style="list-style-type: none"> • Croup • Foreign Body • ALOC
<p>LOWER</p>	<ul style="list-style-type: none"> • Infection • Asthma • Foreign Body • Smoke Inhalation

Interventions for Airway Obstruction

<p>UPPER</p>	<ul style="list-style-type: none"> • Croup • Foreign Body • ALOC 	<p><i>Limit Agitation</i> <i>Airway</i> <i>Maneuvers</i> <i>Airway Adjuncts</i> <i>BLS → ALS</i></p>
<p>LOWER</p>	<ul style="list-style-type: none"> • Infection • Asthma • Foreign Body • Smoke Inhalation 	<p><i>Oxygen</i> <i>Inhaler</i> <i>Aerosol</i> <i>Epi ?</i></p>

Scenario

- **Dispatch:** Babysitter states 3 year old having trouble breathing
- **Scene:**
 - Find 15 year old babysitter outside house in tears waving at you frantically
 - As you enter the home you note numerous beer cans and music blaring

Scenario

– 3 year old found on couch with a slightly older child standing next to him

Patient Information

- **Appearance**
 - Child appears sleepy and has no reaction to your presence
- **Work of Breathing**
 - Is making weak attempt to breath but does not seem to be moving any air
- **Circulation**
 - Appears pale and lips are blue

Scenario

- **Dispatch:** Mother states 6 month old has had a cold and is having problems breathing
- **Scene**
 - Father is waiting at the door and escorts you to the mother who is standing while rocking the infant in her arms trying to console it

Scenario

- They state the baby will not take the bottle, has been very fussy and hot, and seems to be struggling to breath

Patient Information

- **Appearance**
 - Infant appears fretful but is consolable in mom's arms
 - It cries and struggles if you attempt to approach it or mom stops rocking
- **Work of breathing**
 - Nasal flaring and intercostal retractions are noted

Patient Information

- The infant makes a wimpering noise on every expiration
- **Circulation**
 - Appears pink, feels very warm and capp refill < 2 sec

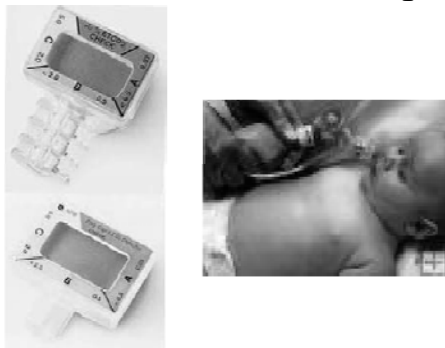
BVM is Effective in Pediatrics

- Gausche M, et al. "Effect of Out-of-Hospital Pediatric Endotracheal Intubation on Survival and Neurological Outcome: A Controlled Clinical" JAMA. 2000;283:783-790.
- Gerritse BM, et al. "Should EMS-paramedics perform paediatric tracheal intubation in the field?" Resuscitation. 2008;79(2)225-229.

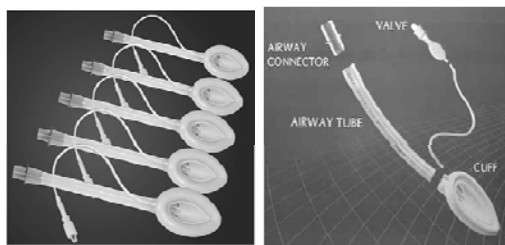
BVM is Better in Adults -???

- Hasegawa K, et al. "Association of Pre-hospital Advanced Airway Management with Neurologic Outcome and Survival in Patients with Out-of-Hospital Cardiac Arrest (OHCA)." JAMA. 2013;309:257-266.
 - Japan; 649,654 adults with OHCA
 - Negative association between advanced airway management and neurologically favorable survival after cardiac arrest

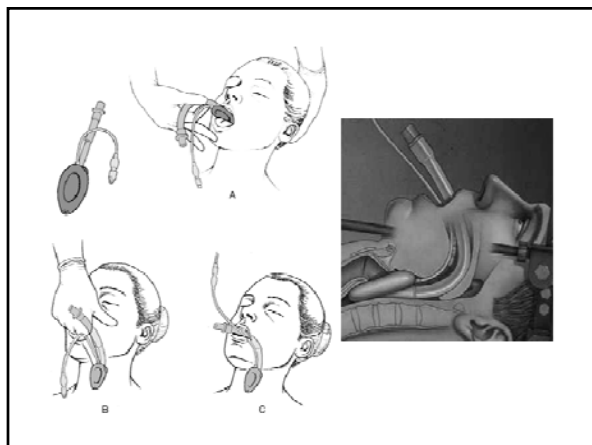
End Tidal CO2 Monitoring



Laryngeal Mask Airway (LMA)



- Chen L, Hsiao A "Randomized Trial of Endotracheal Tube Versus Laryngeal Mask Airway in Simulated Prehospital Pediatric Arrest" *Pediatrics* 2008; 122:e294-e297.



Summary

- Children have anatomical differences that impact on ventilation and require an age specific approach by providers
- Providers must recognize signs of respiratory distress and failure in children of all ages
- Interventions should be prioritized based on severity of illness

For More Information

Ann E. Klasner, MD, MPH
Pediatric Emergency Medicine
University of Alabama at Birmingham

aklasner@peds.uab.edu
205-638-9587