

Today's Talk

Goals:

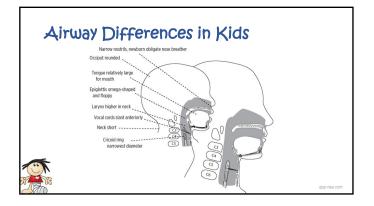
- Identify best practices for positioning and suctioning the conscious child.
- Describe techniques to optimize ventilation of the unconscious child.
- Understand the challenges and risks to pediatric prehospital intubation.

Disclosures • None

The Pediatric Airway

99% of pediatric airways in the out-of-hospital environment can be managed with:

- Positioning
- Suctioning
- Adjunct Use (OPA/NPA)
- Bag Valve Mask Ventilation









Positioning

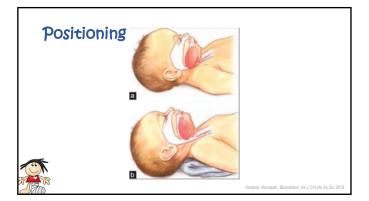


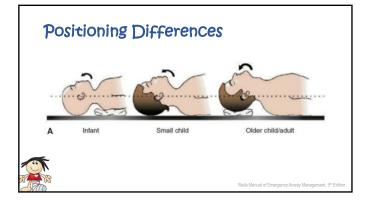
The Problematic Airway

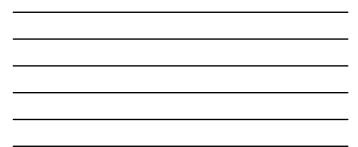
• Prominent adenoids, tonsils and a big tongue

- Loss of upper airway space
 Obstruction during spontaneous ventilation
 Difficulty with BVM
 Sedatives result in loss of upper airway tone = upper airway obstruction







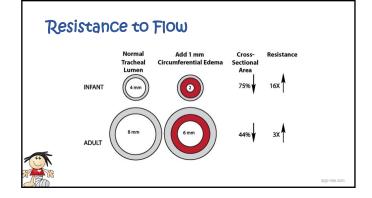


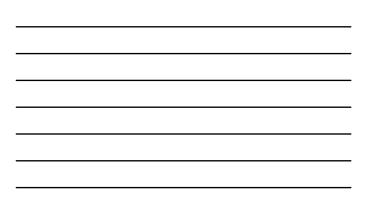
The Breathing Child

- The nose/pharynx responsible for **50%** of airway resistance • Noses shorter, flatter, with small nares
- Obligate nasal breathers until ~ 5 months of age









The Breathing Child

- Compliant but non-ossified chest wall
 - Intrinsic muscle tone required to maintain lung volume and prevent chest wall distortion

 - More likely to experience respiratory muscle fatigue, atelectasis and failure
- ${\boldsymbol{\cdot}}$ Calcification of larynx and trachea not until teens
- Flexible cartilaginous rings dynamically obstruct with negative pressure ventilation









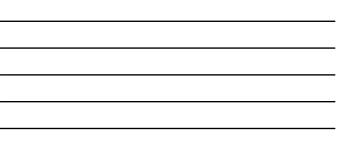
Yes!

- Unable to remove their own secretions
- Secretion removal for children with bronchiolotis



- Able to clear secretions Cough or blow nose
- Concern for croup or epiglottitis
- Trauma to face (basilar skull fracture)





Suctioning Using a Bulb Syringe

• For infants < 6 months



NP Suctioning

- Measure from tip of nose to earlobe
- You need:
 - Clean gloves

 - Suction catheter
 Facemask with shield / surgical mask with eye protection
 - Surgi-lube
 - Saline drops



Suctioning

- Place 2-3 saline drops in each nostril
- Lubricate tip of catheter with surgi-lube
- Insert catheter to measurement
- Initiate suction
- Pull back slowly while moving the catheter in a circular motion

Never suction more than 5-10 seconds at a time



Would YOU Like It Up YOUR Nose?

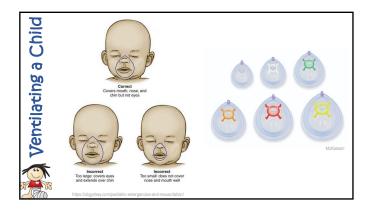
- Position of comfort until set up and ready to go
- Restrain only just before and during suctioning
- Explain procedure to parents if they are present
- Child will scream and cry • Make sure you have enough help prior to starting
- Comfort wrapping/swaddling "like a burrito" or "angel wrap"
- Singing, music, videos, distraction

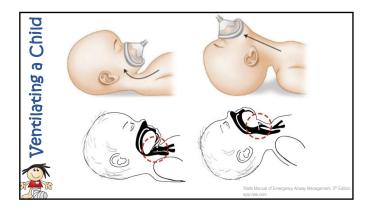


BVM Ventilation

- Small, fixed tidal volumes relative to body size • Susceptibility to iatrogenic barotrauma
- Mask seal and mask technique CRITICAL
- Both VOLUME and RATE of breath delivery important



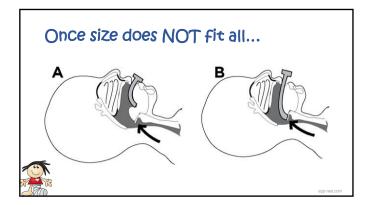


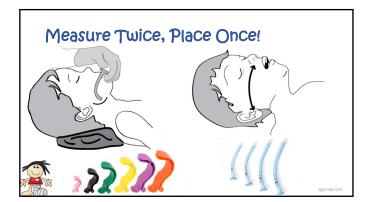


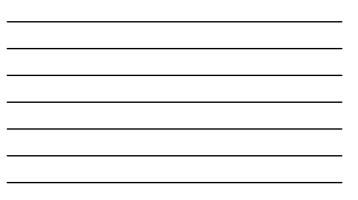


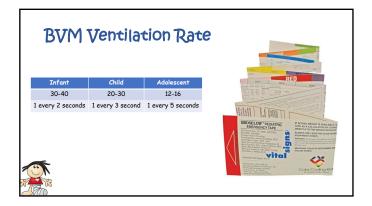


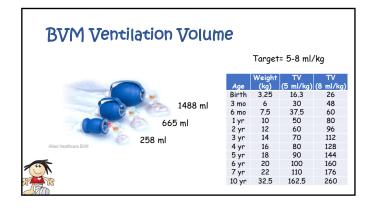












Physiologic Differences in Kids

- Oxygen consumption greater than adult 6 vs 3 mL/kg/min
- Lower functional residual capacity = rapid desaturation

\cdot CO₂ production increased

- 100-150 vs 60 mL/kg/min
 Since TV (mL/kg) is consistent across ages, RR is higher in infants to maintain the minute ventilation necessary

Prehospital Paramedic Endotracheal Intubation Effect of Out-of-Hospital Pediatric Endotracheal Intubation on Survival A C Maria Bogor Samo Bruce Carol 3 Sama Panoh Marro Dobor Frankl Jamo

For o

No difference in survival BVM: 123/404 [30%] ETI: 110/416 [26%] OR 0.82; [0.61-1.11]

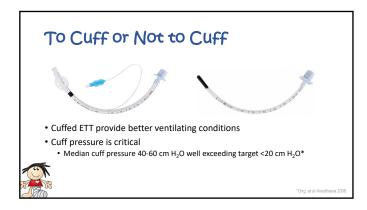
No difference in neurologic outcome BVM: 92/404 [23%] ETI, 85/416 [20%] OR 0.87; [0.62-1.22]

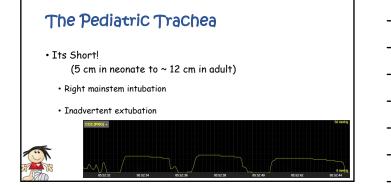
| compare forestably to an eVT that shows the second probability of the | Marianne Guuche, MD | Context Endstracted intubation (270 is | aidely-used for airway management of chil |
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| <text><text><text><text><text><text></text></text></text></text></text></text> | | dren in the out-of-hospital setting, depits | a lack of controlled trials demonstrating |
| Text - 1 and training - 1 and trai | | | |
| <text><text><text><text><text><text></text></text></text></text></text></text> | | boated with bag-valve-mask ventilation i | BUMJ with those of patients treated with |
| Table 11 and 12 and | Carol S. Gunter, BSN, MPA | RVM followed by ETI. | |
| <text><text><text><text><text><text></text></text></text></text></text></text> | Suzanne M. Goodrich, BN, MSN | Design Controlled clinical trial, in which | patients were assigned to interventions b |
| <text><text><text><text><text></text></text></text></text></text> | Pamela D. Poors, BN | | |
| <text><text><text><text><text></text></text></text></text></text> | Maureen D. McCollough, MD, MPH | | |
| <text><text><text><text></text></text></text></text> | Deborah P. Henderson, PhD, RN | Participants: A latid of 830 correctory patients aged 12 years or younger or esh maked in which has them 45 has only another standard size and any second at 12 years or younger or esh | |
| A sense of the sen | Franklin D. Pratt, MD | able for follow-up. | |
| A single strategies of the single strategies o | James S. Seidel, MD, PhD | Interventions Patients were assigned to With followed by FTI (seen dust as a FTI | receive either BVM.(odd-days; n = 410) o |
| A set of the set of th | ventilation (EVM) and ende- | Main Outcome Measures Sunivol to | hospital discharge and responseical statu |
| $\label{eq:section} = A days matrix and a section of a days matrix and a days matrix a$ | both widely used in the out- of hospital setting in caring for criti- cally ill or inpared children, there has | 404 (30%) and the ETI group (310/416) dence interval ICE, 0.63-1.13) or in the | D6%D (odds ratio (OR), 0.82, 95% confl ate of achieving a good reupolastical out |
| compare transmitty to air-111 Li- structure and a record management to be a simple papered sources notes of peri- metry may be not. As the explanate transmitty of the papered sources notes of peri- metry may be not. As the explanate transmitty of the papered sources notes of peri- metry may be not. As the explanate transmitty of the papered sources notes of peri- metry may be not period. The papered sources notes of peri- metry may be not period. The papered sources notes of period. The paper of period sources of the particular based of the period. The papered sources notes of period. The paper of period sources of the per | outcomes of pediatric or adult pa- tients treated with these 2 procedures. | medic scope of practice that already inclu- relogical outcome of pediatric patients tre | des BVM did not improve survival or neu aled in an urban EMS system. |
| under la rever management tech- tering tappered sources are deter transport and the second second second second second second transport and the second second second second second second second second | commany functionly to man. TT ad- | ABRA 2010;262783.790 | ana jatu so |
| 1721. It is user unsergious y utgaritation (172), frequency, of comming, and particular (172), frequency, of | vanced airway management tech- niques (pharyngeal tracheal tumen, la- ryngnal mack, and ecophageal tracheal combination esophageal-tracheal tabe) among adults and thildren, as mea- sared by P.O. and P.O.y. values on ar- | area ETI vary from SPicto 100%, depend- ing on the parient's presenting illustra or impary, the age of the parient, education level of the buildscare recorder, and use | intubation. ¹⁰ Despite the fact that serve spective studies comparing the survey of patients trouted with/IVM and ITT has generally found no difference, some in tonigators have suggested that ITT ma |
| the out of hospital setting. ¹⁴⁷ Ote study Dotoan J. Con. AD, Constitue to Advance Basel: Dood Bhari, HD | (ID), frequency of voniting, and pa- tient eurorem. ¹ There have been a number of descrip- tive studies of ITI in the out-of-hospital | ciltate intubation. ¹⁴⁹ Major complications of ETL, such as esophageal insubation, hwebeen reported in as little as 1.9% and as many as 17% of pediatric patients in the out-of-hospital setting. ¹⁵⁷ Otte study | Author Artifications are introd of the order of the article Comparising Solidon and Solidon and Solidon and Artificial Article and Solidon and Artificial Artificial press Wettlers, 1999 W. Cassers, Bio L. Linteres (ASSISS in and Ingual Chellonian Honor Balling Solidon and Ingual Chellonian Honor Balling Defended I. Cass. MC Consulty Biology, MOM, Advances Based, Concel Bans, IND. Chellane Balling Defended I. Cassella, Bans, IND. Chellane Balling Balance, MC Transfer Galaxies, Balan Solidon, Balana Balances, MC Transfer Galaxies, Balan Solidon, Balances Advances Solidon and Solidon and Solidon and Articles Advances and Transfer Galaxies Advances and Transfer Galaxies Advances and Transfer Galaxies Advances and Transfer Galaxies Advances |

Prehospital Paramedic ETI • Large ground system* 66% overall FPS • 53% infant FPS • 56% cardiac arrest FPS Many systems have removed Pediatric ETI

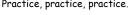


| | Syndrome | Airway implication |
|---------------------|--|--|
| | Pierre robin sequence | Micrognathia, glossoptosis, cleft palate |
| | Goldenhar syndrome | Micrognathia (unilateral), cervical dysfunction |
| A | Treacher Collins syndrome | Micrognathia, small oral opening, zvgomatic hypoplasia |
| adea des! | Apert syndrome | Limited cervical motion, macroglossia, micrognathia, midface hypoplasia |
| 00,000 | Hunter and Hurler syndromes | Cervical dysfunction, macroglossia |
| dded Challenges! | Beckwith-Wiedemann syndrome | Macroglossia |
| | Freeman-Sheldon syndrome | Circumoral fibrosis, microstomia, limit cervical motion |
| | Down syndrome | Atlantooccipital abnormalities, small oral cavity, macroglossia |
| | Klippel-Feil syndrome | Cervical fusion |
| | Hallermann-Streiff syndrome | Microstomia |
| | Arthrogryposis | Cervical dysfunction |
| | Cri-du-chat syndrome | Micrognathia, laryngomalacia |
| - | Edwards syndrome | Micrognathia |
| Ā | Fibrodysplasia ossificans progressiva | Limited cervical motion |





Avoid Pediatric Peril Practice, practice, practice... Positioning Suctioning • Adjunct Use (OPA/NPA)



Bag Valve Mask Ventilation

