

# Pediatric Airway

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## Objectives

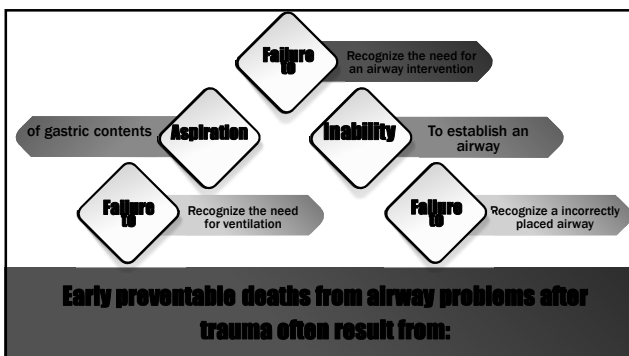
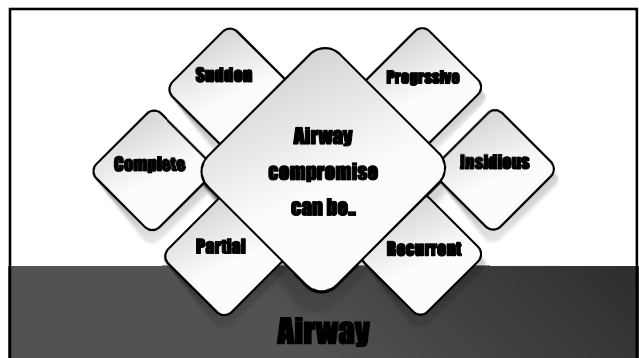
- Identify the clinical situations in which airway compromise is likely to occur
- Brief AP of Peds Airway
- Recognize the s/s of acute airway obstruction
- Describe the techniques for establishing and maintaining a patent airway

### Decision Making

*What do I need to accomplish?*



- 1 How aggressive should we be?
- 2 What is your back-up plan?
- 3 What is the long-term picture?



## BLS vs. ALS (Prehospital)

We think intubation is easy

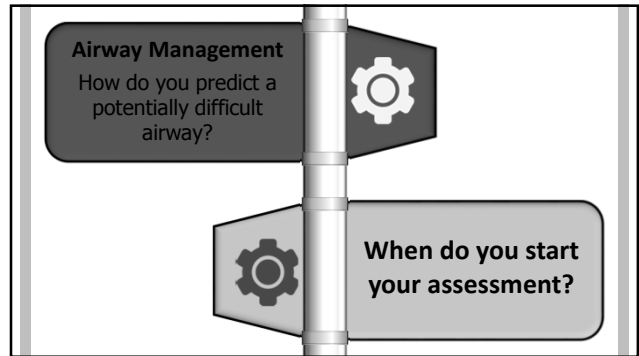
We are not good at it..  
(EMS success rate as low as 70%)

We can Manage many Patients with BLS

RSI can kill patients

## Should we be intubating ANY pediatric patients?!?!

Jury is still out, but some states already forbid it.



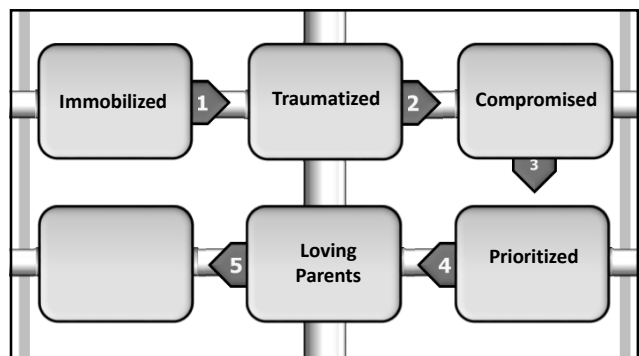
## Ideal conditions for intubation

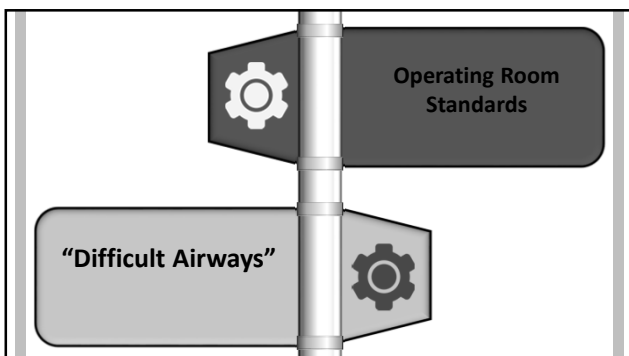
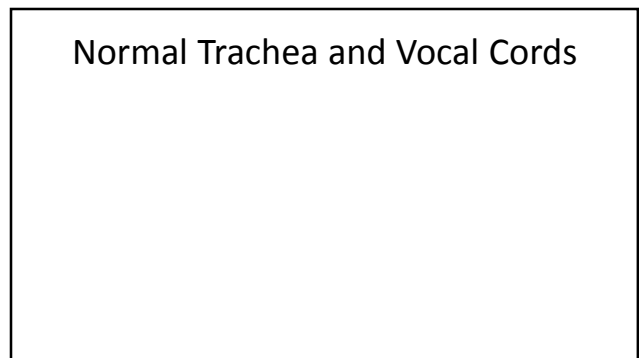
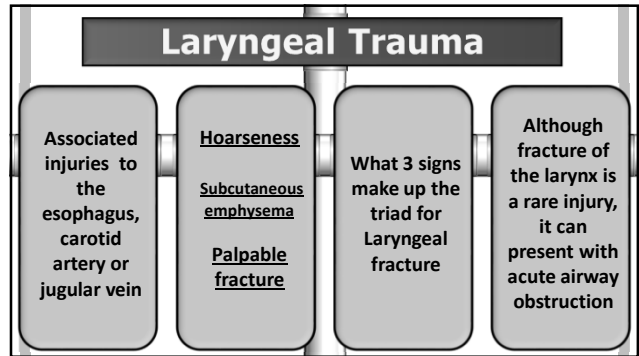
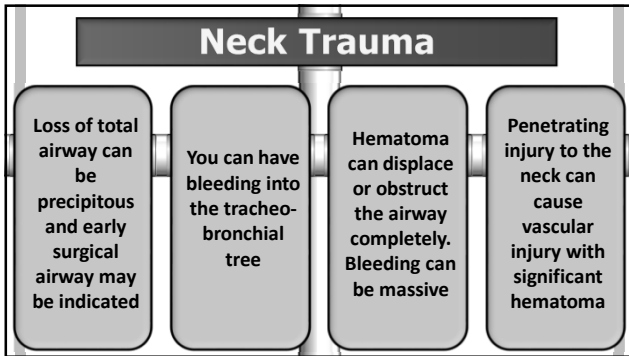
- Ideal Lighting, positioning, etc.
- Plenty of assistance
- Time to prepare, plan, discuss
- Option to abort
- Empty stomach
- Back up available.

## Ideal Pt. for intubation

- Intact, clear airway
- Wide open mouth
- Pre-Oxygenated
- Intact respiratory drive
- Normal dentition/good oral hygiene
- Clearly identifiable and intact neck and face
- Big open nostrils
- Good neck mobility
- Greater than 90 KG, Less than 110 kg.

How many of our patients are like that?





- ### Some Predictors of a Difficult Airway
- C-spine immobilized trauma patient
  - Dentures
  - Protruding tongue
  - Limited jaw opening
  - Short, thick neck
  - Limited cervical mobility
  - Prominent upper incisors (“buckteeth”)
  - Face, neck, or oral trauma
  - Receding mandible
  - Laryngeal trauma
  - High, arched palate
  - Airway edema or obstruction
  - Beard or facial hair
  - Morbidly obese

### Additional Predictors: Medical History

- Joint disease
- Acromegaly
- Thyroid or major neck surgeries
- Tumors, known abnormal structures
- Genetic anomalies
- Epiglottitis
- Previous problems in surgery
- Diabetes
- Pregnancy
- Obesity
- Pain issues

### Obesity or Obstruction

- Obesity
  - ◆ Heavy chest
  - ◆ Abdominal contents inhibit movement of the diaphragm
  - ◆ Increased supraglottic airway resistance
  - ◆ Billowing cheeks
  - ◆ Difficult mask seal
  - ◆ Quicker desaturation

### Mask Seal

- Small Hands
- Wrong Mask Size
- Oddly Shaped Face
- Bushy Beard
- Blood/Vomit
- Facial Trauma

### Obesity or Obstruction

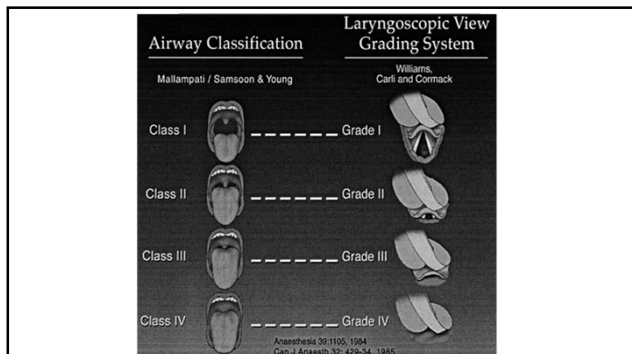
- Obstructions
  - ◆ Foreign Body
  - ◆ Angioedema
  - ◆ Abscesses
  - ◆ Epiglottitis
  - ◆ Cancer
  - ◆ Traumatic Disruption/Hematoma/Burns

### What lies beneath?



### More problems



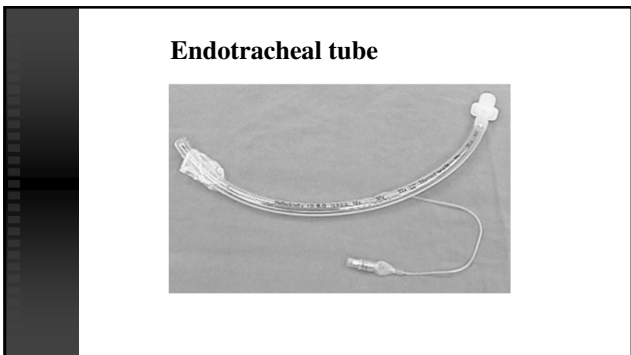
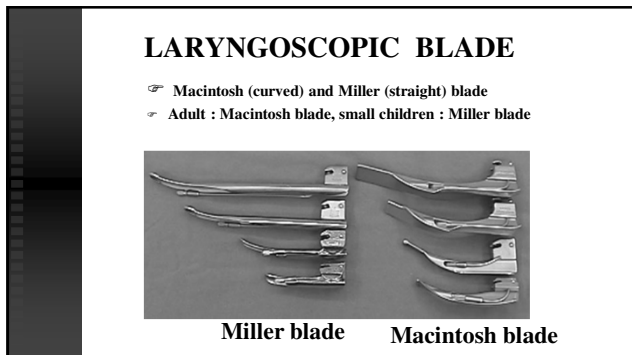


**Before intubation**

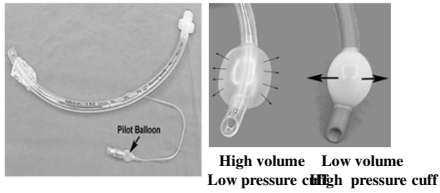
- Is there another means of getting our desired results BEFORE we attempt Direct Oral ETT? (Especially if we RSI)
- CPAP ?
- PPV with BVM or Demand Valve?
- Nasal ETT?
- Do we have all the help we need, all Airway equipment with us? (Suction?)

**Plan "A": (ALTERNATE)**

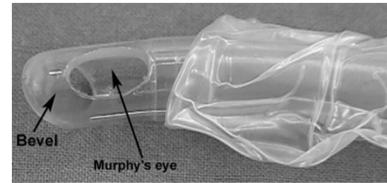
- Different Length of blade
- Different Type of Blade
- Different Position



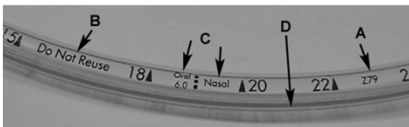
**Material : Red rubber or PVC**  
**Endotracheal tube cuff**



**Bevel**  
**Murphy's eye**



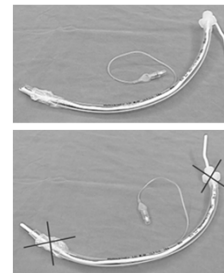
**Tube markings**



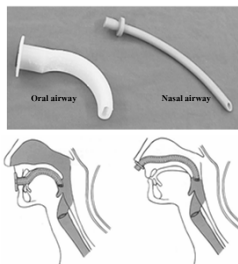
- ☞ Z-79
- ☞ Disposable (Do not reuse)
- ☞ Oral/ Nasal
- ☞ Radiopaque marker

**Other equipment**

**3.1**  
**Stylet**



**Oropharyngeal or nasopharyngeal airway**




Depth of ET tube:  
 Mid-trachea or  
 below vocal cords  
 Adult:  
 Male = 23cm  
 Female = 21cm

Children  
**Oral endotracheal tube**  
 (Age/2) + 12 (cm)  
**Nasal endotracheal tube**  
 (Age/2) + 15 (cm)



**Plan "B"**




Can you ventilate with a BVM?

What helps you with BVM?

Glidescope

LMA

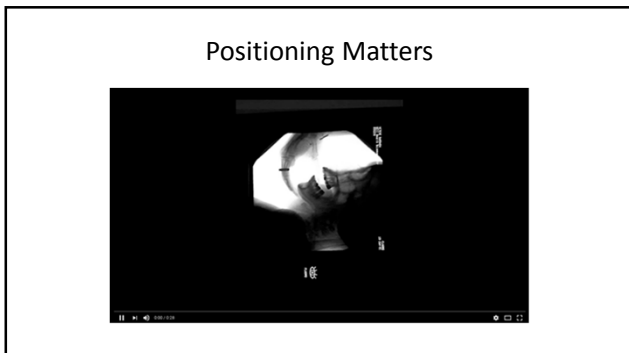
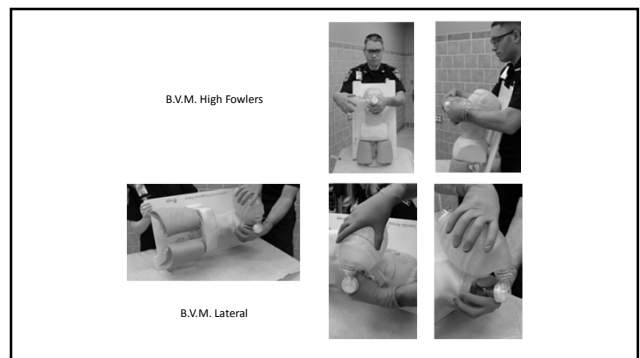
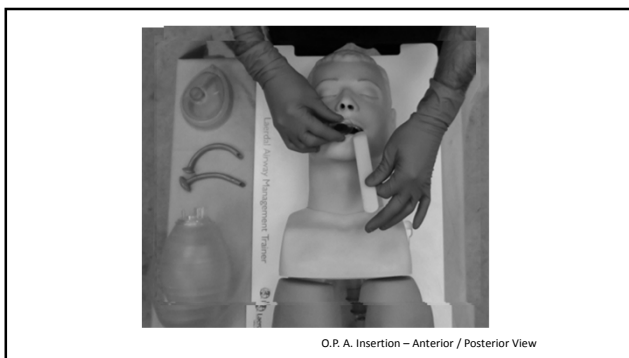
**Plan "C"**



If you can't intubate the patient?

Needle?

Surgical?



- Steps to Secure Airway**
- **Preoxygenation**
    - ◆ Use 100% O<sub>2</sub>
      - ◆ BVM- ineffective breathing
      - ◆ NRB- effective breathing
    - ◆ Passive Apneic Oxygenation
      - ◆ High-flow oxygen delivered by nasal cannula at 15/lpm during the apneic phase of endotracheal intubation

### Airway Clear?

- Blood
- Vomitus
- Teeth (“chicklets”)
- Epiglottis
- Dentures
- Tumors
- Impaled Objects

### Pretreatment

- Administration of drugs to minimize the adverse effects of intubation
  - ◆ L-Lidocaine
  - ◆ O-Opiates
  - ◆ A-Atropine
  - ◆ D-Defasciculating dose

### Pretreatment

- Lidocaine
  - ◆ 1.5 mg/kg 3 minutes prior to intubation
  - ◆ Blunts bronchospastic reaction in asthma / COPD
  - ◆ Decreases ICP



### Pretreatment

- Opiates - Fentanyl
  - ◆ Blunts sympathetic response
  - ◆ lowers ICP
  - ◆ lower myocardial oxygen demand
  - ◆ Provides analgesia



### Pretreatment

- Atropine
  - ◆ Use in all children under 1 and all under 10 receiving succinylcholine
  - ◆ 0.02mg/kg (minimum 0.1 mg, max 1mg) 3 minutes prior to manipulation
  - ◆ Blunts reflex bradycardia
  - ◆ Controls secretions



Paralytics: Succinylcholine (Anectine)	
Dosing	1-1.5 mg/kg; usual dose 100-200mg
Onset	Rapid, 5-10 minute duration
Issues	SE: muscle fasciculation's, HTM, brady, hyperkalemia, Malignant hyperthermia



Paralytics: Norcuron (Vecuronium)	
Dosing	0.1mg/kg
Onset	2-3 minutes, last 30-90 minutes
Issues	Minimal side effects, maintenance dose of 0.01mg/kg every 15-25 min

Paralytics: Nimbox (Cisatracurium)	
Dosing	0.1 – 0.15mg/kg Repeat dosage 0.03 mg/kg
Onset	2-3 minutes, last 40-50 minutes
Comparison	Shorter recovery time compared to vec

Sedation: Etomidate	
Dosing	0.2-0.4 mg/kg given over 30-60 seconds
Onset	2-3 minutes, last <15 minutes
Issues	Give once, then move on to other sedative Give over 30-60 seconds

Other Meds	
Fentanyl	Indications of pain, 50-200 mcg IV
Versed	0.1 mg/kg IV
Valium	3-5mg IV Push

**Let's talk about Ketamine**

- RAPID CONTROL - onset IM 1-2 minutes
- Give right through clothing or nasally
- 5 mg/kg provides dissociation for 20 – 30 minutes • **CAREGIVER SAFETY!**
- NO respiratory depression
- NO hypotension (inhibits catecholamine re-uptake) • High minute ventilation buffers acidosis
- This allows soft restraints / transport / work-up / treatment to commence

**Rapid Sequence Intubation**

**Hemodynamic consequences of ketamine vs etomidate for endotracheal intubation in the air medical setting.**

- Retrospective, 50 Ketamine pts, 50 Etomidate pts
- All successfully intubated
- Vital signs similar in both groups
- No significant difference in complications

- The analgesia zone: 1-2mg/kg • No effect on perception or emotion
- Good analgesia
- No monitoring required
  - Full dissociation: >0.8 mg/kg / 4-5 mg/kg IM

What about all the bad side effects?

Ketamine can cause Laryngospasm?

**TRUE** CORRECT!

**FALSE** INCORRECT

What about all the bad side effects?

Ketamine can cause Laryngospasm?

**TRUE**

-0.3% (22 cases in 8,283 patients)  
Treatment is easy, fast and free!!

What about all the bad side effects?

Ketamine can cause Hyper-salivation?

**TRUE** CORRECT!

**FALSE** INCORRECT

What about all the bad side effects?

Ketamine can cause Hyper-salivation?

**TRUE**

1 case in 950 patients

What about all the bad side effects?

Ketamine can cause Vomiting?

**TRUE** CORRECT!

**FALSE** INCORRECT

What about all the bad side effects?

**Ketamine can cause Vomiting?**

**TRUE**

-10% after recovery  
(decreased to 5% with ondansetron)

What about all the bad side effects?

**Ketamine has drug interactions?**

**TRUE** INCORRECT

**FALSE** CORRECT!

No Evidence of this

What about all the bad side effects?

**Ketamine can cause Hypertension and ICP?**

**TRUE** CORRECT!

**FALSE** CORRECT!

Transient, no TX required

**New way to give**

- Mix dose with 100 NS and run in over 15 minutes VS Slow IVP
- Study found that pain was equally treated but the IV drip had no feeling of "unreality" or anxiety/agitation

**Protection and Position**

- Sellick's
- BURP - Backward, Upward, Rightward Pressure
- ELM - External Laryngeal Manipulation

**Position**

- "Ear at the sternal notch"

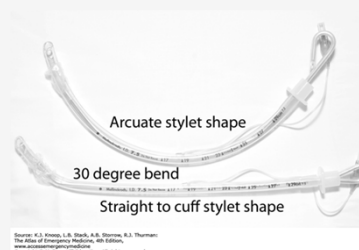
## Technique



- Grip
  - ◆ avoid the “death grip”
  - ◆ use fingers for precision movements
  - ◆ use shoulder for leverage
  - ◆ lift toward the ceiling over patient’s feet

FIGURE 22.16

**Stylet Shape.** Straight to cuff with a 30-degree bend is the optimal stylet shape as this offers the most ETT tip control and view of the glottic opening. (Photo contributor: Lawrence B. Stack, MD.)



Source: F. J. Knapik, L.R., Bagley, A.B., Storz, R.J. Thoracic: The Atlas of Emergency Resuscitation, 4th Edition.  
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## Indications

- Failed airway management
- Obstructed airway
- Maxial facial (or other) trauma preventing a traditional approach

*Can't Ventilate - Can't Intubate*

## The Surgical Airway

and things we forgot to mention . . .

- You may know the patient
- You may be in an undesirable position
- Their anatomy may be distorted
- They may bleed profusely
- You may lose ALL visual reference
- They may continue trying to breathe or swallow

Confirmation of tube placement

“ I think I'm in . . . ”

Complication of failing  
to VENTILATE  
**DEATH**

...or worse!

### Postintubation Management

- Bradycardia is due to esophageal intubation and hypoxemia until proven otherwise
- Sedation
- Paralysis

### Postintubation Management

- Monitor tube depth
  - ◆ Pediatric airway - use collar
- Reassess tube after moving patient or any clinical change
- Ventilator management / Bagging

- 1 Oxygenation and ventilation are the top priorities
- 2 Airway management does NOT mean intubation: It means patency, adequate ventilation and appropriate oxygenation
- 3 Be an Expert at bag-valve-mask (BVM) ventilation

- 4 Equipment: Know your equipment, have backups (laryngoscope blades, bulbs, handles and adjuncts)
- 5 Know @ least one rescue ventilation technique. (can't intubate/can't ventilate) scenario, most basic being 2 person BVM ventilation, next LMA, etc.
- 6 Don't let your ego get in the way: Can be dangerous for the patient, partner and your career. Your goal is excellent care and positive outcomes, not skill accumulation

- 7 Invest time in learning airway skills: Regularly devote training and practice to airway management
- 8 Use CAPNOGRAPH & end tidal CO2 detector in confirming every intubation
- 9 Documentation

**Case #1**  
**What is that?**

- Age?
- M or F?
- What's wrong?

20 y/o male  
Self-inflicted injury to the neck  
  
Found sitting in the front seat of a car  
Awake and alert  
Had used a battery operated skill saw on his wrist  
and neck

Maintaining his own airway – breathing through  
his neck – 20 cm laceration  
Pulsatile bleeding controlled with direct pressure  
What else you want to know?  
What is the most important thing with this  
patient?

VS 104/63, 117, 14, 100% on NRM  
  
Immediately taken to the OR  
  
Near-complete transection of trachea  
Complex esophageal injury  
Internal jugular vein injury  
Radial artery injury

D/C to Inpatient in STL  
Tracheostomy removed  
OR for wrist debridement and repair of  
Flexor tendons of ulna/radius as well as index as  
3 digits – microscopic repair of median and  
ulnar nerves and ulnar artery

**Case #5**  
**Barbwire Boy**



**The call**

- Dispatched to a field with 3 patients
- Size it up
- 3 Patients
  - What else you want to know?

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