



Advanced Airway Management

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Disclosures

-  No financial disclosures . . .
. . . Federal government owns me
-  This course does not make you a pro
-  You took the red pill
-  The rabbit hole is deep
-  Kinesthetics will broaden your mind
-  The only bad question ...

Objectives

-  Highlight a proper airway assessment
-  Why is positioning $2/3$ of the law
-  Review supraglottic (rescue) airways
-  Detailed review of direct laryngoscopy
-  Introduce video laryngoscopy
-  Nuances of mechanical ventilation

Why Invasive Management?

-  Need for mechanical ventilation
-  Depressed level of consciousness
-  Hypoxia or hypoxemia
-  Pending airway collapse
-  Inability to manage secretions

Ground Rules

-  Composure
-  Work through a difficult airway
-  You own the airway
-  Humility always trumps arrogance

Ventilation Assessment



Beard



Obesity



No teeth



Elderly



Snorning

Intubation Assessment



Look



Evaluate 3-3-2



3 fingers between incisors



3 fingers hyoid to mandible



2 fingers thyroid to hyoid



Mallampati



Obstruction/Obesity



Neck mobility



Make Your Choice

Fred

 Ventilation: beard, obese, snores

 Intubation: obese, neck mobility

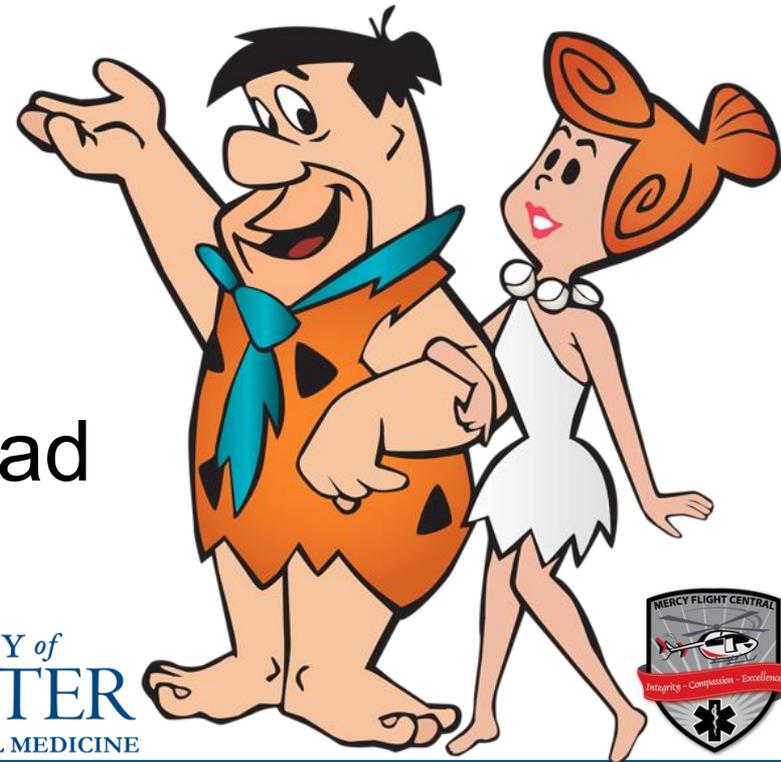
 3-3-0

Wilma

 Ventilation: EASY

 Intubation: looks very bad

 2-0-1 on a good day

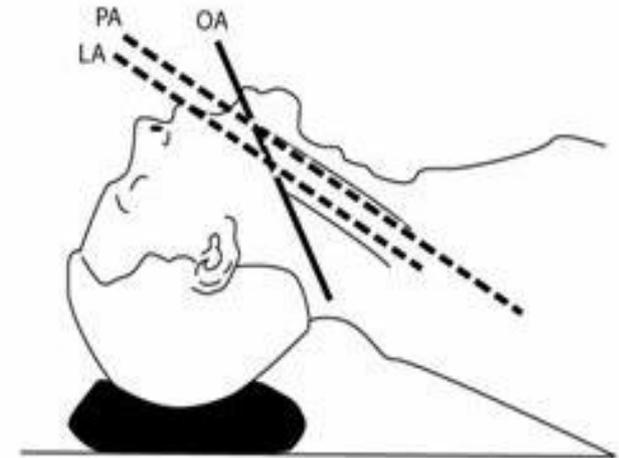
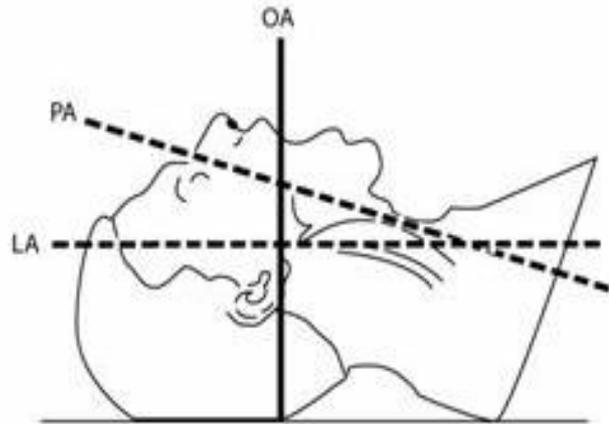
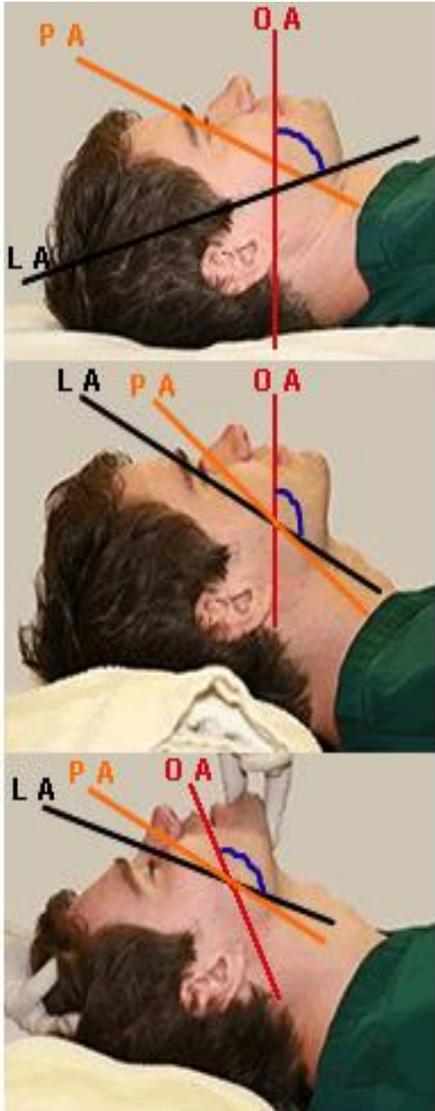


Make Your Choice

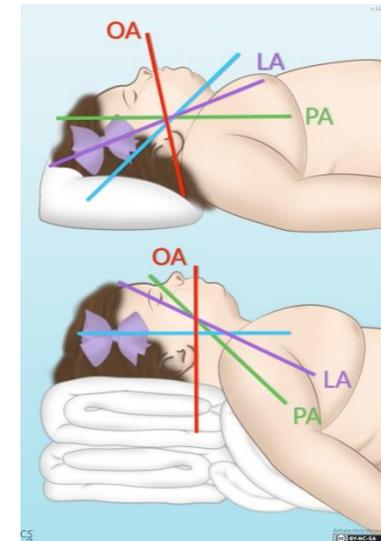
- Roger Ebert – Before
 - Ventilation: obese, elderly, snores
 - Intubation: easy, 3-3-2, obese
- Roger Ebert – After
 - Ventilation: no teeth, elderly, not able to ventilate
 - Intubation: looks terrible, 3-0-0



Aligning the 3 Axes



LA – Laryngeal Axis
PA – Pharyngeal Axis
OA – Oral Axis



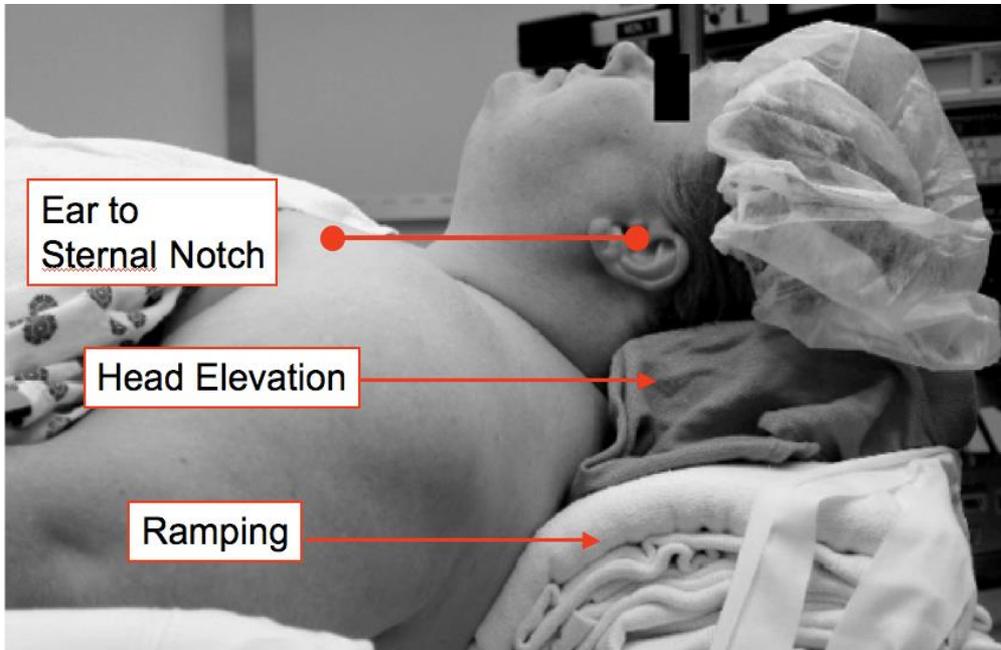
Positioning is $\frac{2}{3}$ the battle



Tragus and sternum



Sniffing position



Apneic Oxygenation

- Is there any benefit?
- Two options
 - High flow nasal cannula
 - CPAP/BiPAP
- We prefer high flow nasal cannula
- Hypoxia vs Hypercapnea

Rapid Sequence Induction

- The right patient population
- The right planning
- The right medications
 - Ketamine 90%, Etomidate 8%, Propofol 2%
 - Rocuronium 80%, Succinylcholine 20%
- The right speed of induction
- The right backup plan

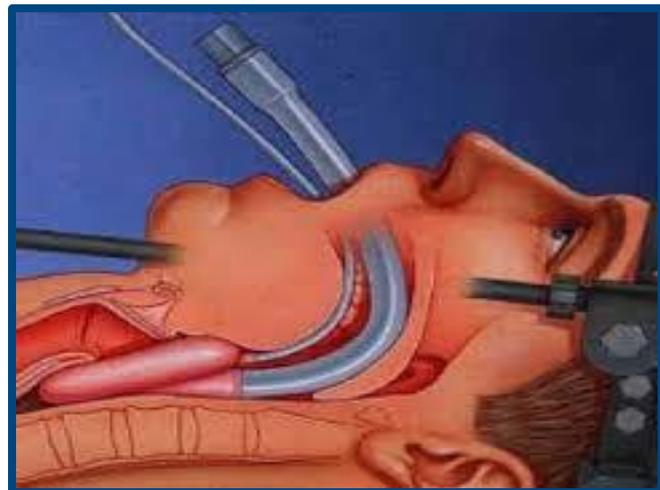


Delayed Sequence Induction

- Population that cannot tolerate preparation
- Adequate dissociation
- Adequate preoxygenation
- When to use neuromuscular blockers
- The money is adequate preoxygenation
- Totally dependent on patient selection

Laryngeal Mask Airway

- Frequently used in anesthesia
- Not a secure airway
- Rescue device for CICO
- Available in most hospital airway carts

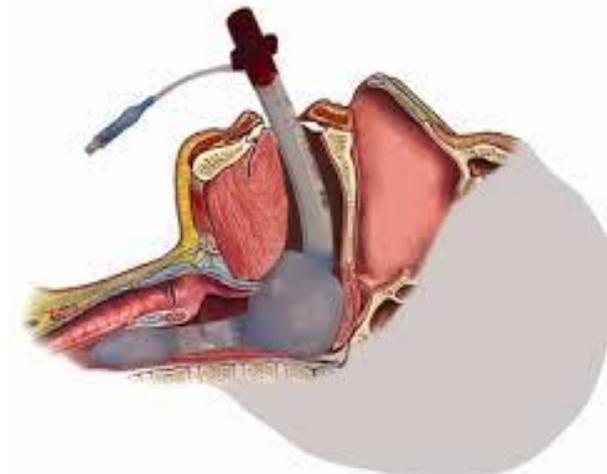


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King Airway

- Primarily used by paramedics
- My mission is to make them obsolete
- Not a secure airway
- Typically removed in the ED



Endotracheal Tube



Endotracheal Tube Tips

-  Writing always at 9 o'clock
-  Bevel tip always at 3 o'clock
-  8.0 mm ID until proven otherwise
-  Use a stylet or bougie every time
-  Press the adaptor every time
-  Be gentle with cuff inflation

Laryngoscope

- Left hand or start over
- Macintosh blade – curved
- Miller blade – straight
- What size is the right size?
- What blade is the right blade



Direct Laryngoscopy

-  Patient is in the proper position
-  Bed is in the proper position
-  You are in the proper position
-  Correct equipment
-  Functional equipment
-  Equipment is immediately available
-  Correct people are ready



Direct Laryngoscopy

-  Pop the mouth open
-  Blade enters the R side of the mouth
-  Sweep the tongue beyond the midline
-  Push to find the anatomy
-  Place the blade in the correct position

Direct Laryngoscopy

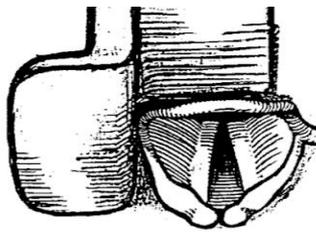
-  Push anteriorly and inferiorly
-  Roll your wrist counterclockwise
-  Place ETT with triangular visualization
-  See the ETT go between the cords
-  To the line or three times ETT ID
-  Avoid the urge to push and pray

Checking the Position

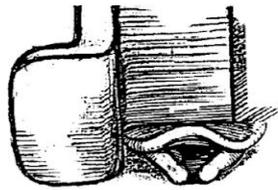
-  Inflate the cuff so you have rebound
-  Ultrasound while placing the ETT
-  Ballottement
-  Auscultation
-  In-line capnography
-  Chest XR

Cormack Lehane Score

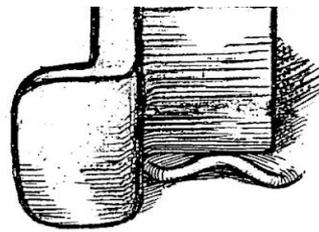
- Grade 1 and 2 = ETT goes in (85-90%)
- Grade 3 = gum elastic bougie (5-8%)
- Grade 4 = difficult airway algorithm



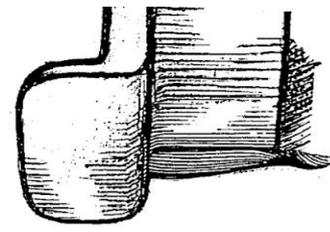
Grade 1



Grade 2



Grade 3



Grade 4

Cormack Lehane – Grade 3

-  Gum elastic bougie
-  Insert just behind the epiglottis
-  Tracheal rings and/or hang up method
-  Railroad the tube down the device
-  Manually displace the jaw anteriorly
-  Corkscrew – gentle forward pressure

Cormack Lehane – Grade 4

- Contamination = suction or supraglottic
- Blade unable to engage = bigger blade
- Floppy epiglottis = Mac to Miller
- Anterior = videolaryngoscopy
- Anterior = supraglottic airway
- CICV or CICO = supraglottic airway
- Supraglottic fails = cricothyrotomy

What is Videolaryngoscopy?





??

Videolaryngoscopy

- Place ETT in the oropharynx
- Locate ETT on the screen
- Pass ETT through cords
- Remove the stylet as you reach cords



What are the Pitfalls?



Contaminated airway



What are the Pitfalls?



Broken equipment



Ever seen the tip break off a MAC blade?



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What are the Pitfalls?



Unintentional OSA surgery



What's wrong with this picture?



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What are the Pitfalls?

- The soft palate really bleeds
- Hyperangulated blades
- Stylets



There are now articles in peer reviewed journals about soft palate injuries from videolaryngoscopy...

What are the Pitfalls?



Seeing is not placing



What are the Pitfalls?



Dislocated arytenoids



Final Pitfall

- Delay to ETT placement
- 1-2-3-4 Airway Rule (from TBI data)

1 • **2** • **3** • **4**

1st pass success is critical

2nd attempt at ETT = **3** x mortality

A single hypoxic event = **4** x mortality

Overview – Cricothyrotomy

- Needle jockeys use needles
- Knife jockeys use knives
- If you can't decide, use a knife
- Cricothyrotomy not tracheostomy
- Practice, then practice more



Ventilation

- One handed vs two handed
- Different size face masks
- Volume in a bag vs volume delivered
- FiO₂
- Average O₂ consumption
 - 3-4 mL/kg/min for 70 kg ideal body weight
 - O₂ consumption = 210-280 mL/min

Mechanical Ventilation



Forrest Bird

Some other guy

Can you name this guy?



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Modes of Ventilation

VC/AC

CMV

SIMV

PRVC

AVC

PSV Pro

PCV

APRV

IMV

VCV

HFOV

CPAP

APC

VS

PC/AC



Modes of Ventilation

Controlled

-  Ventilator initiates
-  Ventilator delivers
-  Entire work of breathing

Assist

-  Patient initiates
-  Ventilator partially delivers
-  Variable assistance with work of breathing

Before we can talk modes

- Trigger – what initiates a breath
- Limit – what limits the ventilator during the inspiratory phase
- Cycle- what ends the inspiratory phase
- Don't get hung up on the names
- Controlled modes are boring- VCV or PCV

Assisted Modes

Pressure Support

-  Pressure limited
-  Flow cycled
-  Patient triggers every breath
-  When triggered, vent increases flow until airway pressure is reached
-  V_t is determined by effort

Airway Pressure Release Ventilation - APRV



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to ~~PEEP~~ ~~BEAT~~ ~~REPEEP?~~

- Expands under ventilated lung units
- Increased FRC
- Reduces venous admixture in alveoli
- Prevents collapse
- Decreases venous admixture
- Increased PV flow increases CO

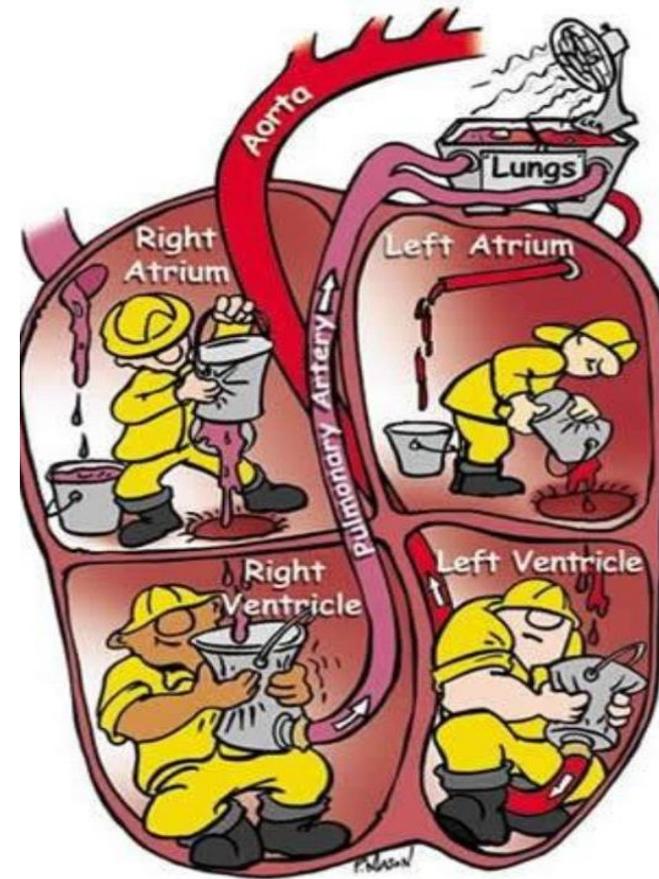


to PEEP or not to PEEP

-  Leads to reduced DO_2 if drop in CO is greater than increase in PaO_2
-  Find the right level that improves O_2
-  Prevents closing of alveoli
-  Avoids over distention and hemodynamic compromise

Hemodynamics of PPV

- Decreases venous return
- Increases RV afterload
- Increases PVR
- Decreased CO
- Afterload drops
- Decreased wall tension
- Improve coronary blood flow



What We Talked About

-  Reviewed a proper airway assessment
-  Discussed the value of positioning
-  Introduced rescue airways
-  Detailed review of direct laryngoscopy
-  Video laryngoscopy as an alternative
-  Provided some background on ventilation



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Thank you for your time . . .



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