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 $\frac{2}{3}$ 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
- Snoring
Intubation Assessment

- **L**ook
- **E**valuate 3-3-2
  - 3 fingers between incisors
  - 3 fingers hyoid to mandible
  - 2 fingers thyroid to hyoid
- **M**allampati
- **O**bstruction/Obesity
- **N**eck 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
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
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

Check your equipment

Position the patient

Assess for difficulties

Right, midline, lift, anatomy

Place blade

Now the screen

GLOVES??
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?
What are the Pitfalls?

- Unintentional OSA surgery
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)

- 1st pass success is critical
- 2nd attempt at ETT = 3 \times \text{mortality}
- A single hypoxic event = 4 \times \text{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?
Modes of Ventilation

VC/AC	SIMV	PRVC
PSV Pro	CMV
VCV	PCV
CPAP
PC/AC
APC
AVC
IMV
HFOV
VS
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

Oh Crap

Oh crap

Oh crap
to PEEP or not to PEEP?

- Expands under ventilated lung units
- Increased FRC
- Reduces venous admixture in alveoli
- Prevents distal airway collapse
- Decreases venous return
- Increased PVR which decreases 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
Thank you for your time . . .

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