



The Art of the Airway: Making Critical Decisions

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Objectives:

- Refine Approach to Airway Situations
- Develop Airway Decision Making
 - “Airway Manager Philosophy”
 - Predict the Difficult Airway
- Discuss Interventions
 - More is not always better
 - “First pass” mindset

Challenges in EMS Airway Management

- Are we any good at it?
- Does it matter?
 - “C-A-B”
- Gold Standard?
 - Ventilation or Intubation?
- Outcomes:
 - Does the patient leave the hospital?
 - Did we contribute to harm?

Airway Interventions in EMS

- Basics: Airway Maintained?
 - Reposition? Adjunct needed?
- Breathing Spontaneously?
 - Quality?
- Interventions Needed? Effective Interventions?
 - Bag-valve-Mask
 - Oral/Nasal Airways
- Advanced
- Critical Care?

The Airway Manager (YOU)

- MOST important variable in successful airway management
- *Meaning:*
 - *Control the situation*
 - *WRANGLE the CHAOS*
- *NOT EVERY INTUBATION IS SUCCESSFUL!*
 - *Ouch! Ego hit!*

Patient Factors in airway management

- Sick versus NOT Sick: What is Needed
- Clinical Progression: Where is the situation headed?
- Anatomy challenges?
- Injury/Illness challenges?
- Are interventions:
 - 1) Appropriate to situation?
 - 2) Working as intended?

System Factors in Airway Management

- Basic and Advanced Levels
 - Based on National and State Scope of Practice
- Protocols
 - Advanced scope of practice
- Transport method and distances
- Hospitals: Available resources

System Factor

- Intermediates/AEMT
 - Do not intubate Pediatrics less than 12
 - (How often do we intubate pediatrics?)
- Paramedic level for:
 - Surgical and Percutaneous cricothyrotomy
 - Medication assisted intubation/Paralytics

Educational Factors

- Fewer Opportunities for EMS Students to get exposed to Airway situations
 - What are Paramedic students exposed to?
 - What OR procedures still require ET?

Education Factors: CoAEMSP

- Defined airway competency for Paramedic students
 - Performance Criteria: placing, applying, confirming
 - “Demonstrate critical thinking and clinical judgement regarding total Airway management Decision Making
- From 9/11/13 recommendation on Airway Competency, published on CoAEMSP website

CoAEMSP Recommendation

- Paramedic student should have:
 - NO FEWER THAN 50 (FIFTY) ATTEMPTS at Airway management across all age levels
 - Should be 100% successful in their last 20 attempts
 - May use a combination of simulation and live patient scenarios.

Personal Factors

- Training: What you have been taught
- Competence: What you prove you can perform
- Experience: How many times you perform the skills
 - *Often more than just the number of times...*
- Confidence!!
- Willingness!!

Evidence: A Mixed Bag world wide

- Past 10 years: VAST INCREASE
 - Number and Quality of Studies
 - Number of Airway Options
- Significant Scrutiny to EMS Airway
TECHNIQUE and PROCEDURE
 - Goal: Do NO harm
 - Especially in pediatrics
- Focus on OUTCOMES

Articles

- ***Resuscitation (2011 to 2013)***
- ***Emergency Medicine News***
- ***The Journal of Emergency Medicine***
- ***Annals of Emergency Medicine***

Evidence:

■ EMS Outcomes:

- Canada: (Tallon, et al 2013) ED intubation with better outcomes than Prehospital (observational study)
- Cardiac Arrest as complication of RSI and intubation (1 in 25) (Heffner, et al 2013)
- Less is More: BVM better over ETI and SGA (Baude 2013)

Evidence: Supraglottic airways

- Easier to place: (Reiter 2013)
- Faster
- Requires less skill; skill retention is better
- Carotid blood flow may be decreased
 - “Pig Study” (Segal 2012)

Evidence: ET vs SGA

- No significant difference in:
 - Success Rates (~80%)
 - Median time to placement (@ 20 seconds)
- (Frascone, et al 2011)

Evidence:

EMS Endotracheal Intubation

- ETI associated with better outcomes over SGA (Wang, et al 2013)
- Less experience equals lower success rates (Ruetzler 2011)
- Procedural Experience limited (Wang, et al 2004)
- NOT recommended in children due to complications (Gerritse, et al 2011)

Intubation Safety

- Study in Norway
 - EMS in Europe is heavily physician
 - Compared physician with non-physician EMS providers
 - Fewer failures by physicians

Successful Decision Making

From *Blink* by Gladwell

- Balance Deliberate and Instinctive decision making
- Thin Slicing:
 - “The ability of our unconscious to find patterns in situations and behavior based on very narrow slices of experience”-Gladwell
 - The crashing, critical airway
 - Pediatric code

Training Factors, Building Competence

- Repetition
 - Basics, basics, basics
 - “Basics” of advanced skills
- Building muscle memory
 - Skills: remembered, retained
- Finesse:
 - Sight picture
 - Hand placement
 - Blade choice

Initial Assessment

- Basics:
 - Scene survey, clues
- General Impression
 - Conditions
- Sick versus Not-sick
- Actions needed?

Situations:

- Would these change your decisions?
 - Asthma patient versus cardiac arrest
 - Diabetic versus new seizure
 - Trauma versus medical
- There is NO single, decisive solution..
 - Adapt to problem

Critical Decision Making

- Is airway intervention needed?
 - What type or level needed?
- Starting simple, are the interventions working?
 - Always re-evaluate
 - Can the airway be maintained?
 - Patient movement can compromise the airway
- Rescue Airway needed?
 - All other efforts failed..

Critical Decision Making

- Boyd's Loop
 - Colonel John Boyd, USAF Fighter Pilot
 - "OODA Loop"

Observe

Orient

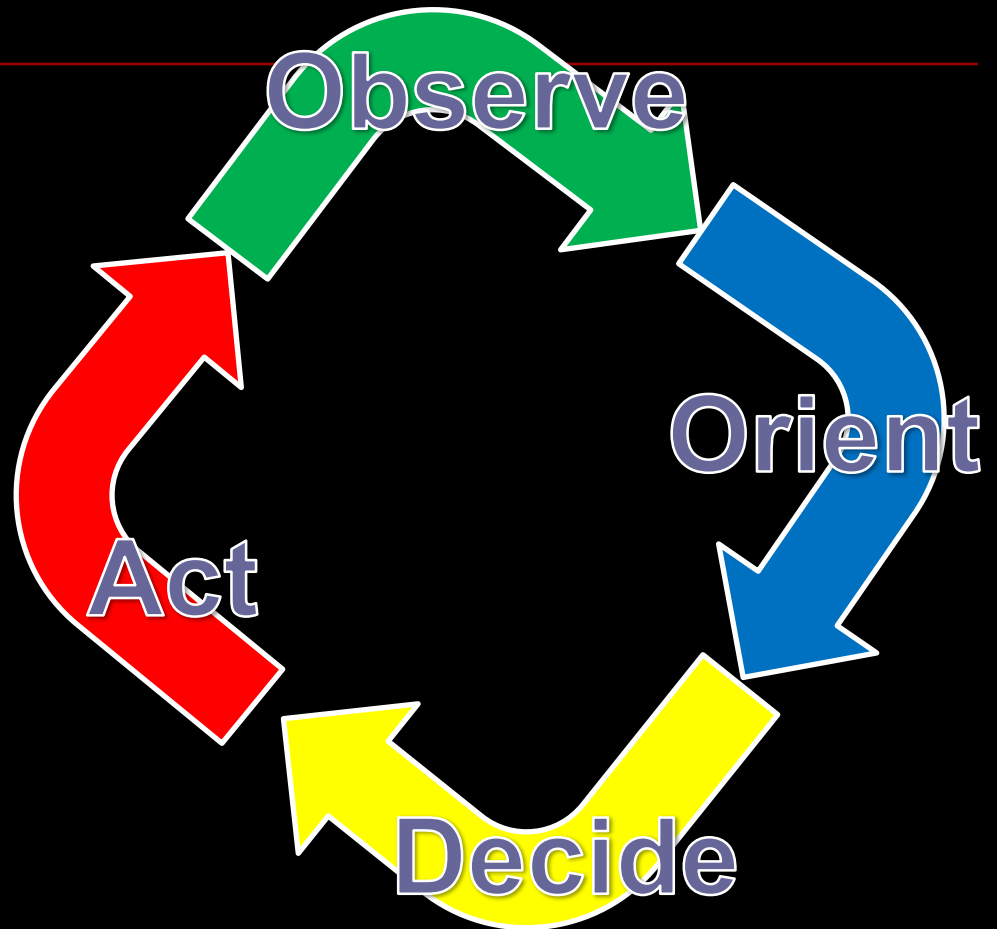
Decide

Act



Boyd's Loop

- Continuous
- Feedback
- Key:
 - Move through



Elements of Basic Airway

- Positioning
- SUCTIONING:
 - Invaluable function
- Bag-Valve-Mask Technique
 - Critical Skill: Key Points?
- Adjuncts:
 - Oral versus Nasal

INTANGIBLE Techniques: Mindset!!

- ***Maintain Oxygenation and Ventilation***
- Intubation is not as important as basic airway skills
- “Devices” in many capacities associated with complications
 - Including video laryngoscopy and bougie

KEEP WHAT WORKS

- Is position helping?
- SUCTION
- Is adjunct working?
- SUCTION
- Good chest rise with BVM?

Three Dimensions of Difficult

- Difficult to Oxygenate and Ventilate
- Difficult to Intubate
- Difficult to perform cricothyroidotomy
- Difficult Extraglottic device

From the “Manual of Emergency Airway Management”, Fourth Edition, by Walls, et al.

Predict the Difficult

- **MOANS:** Difficult to bag-valve-mask ventilate
- **LEMON:** Difficult to visualize and intubate
- **SMART:** Difficult to perform a surgical cricothyroidotomy
- **RODS:** Difficult extraglottic device

From the “Manual of Emergency Airway Management”, Fourth Edition, by Walls, et al.

Airway Images

- Google sources

Is this a difficult airway?

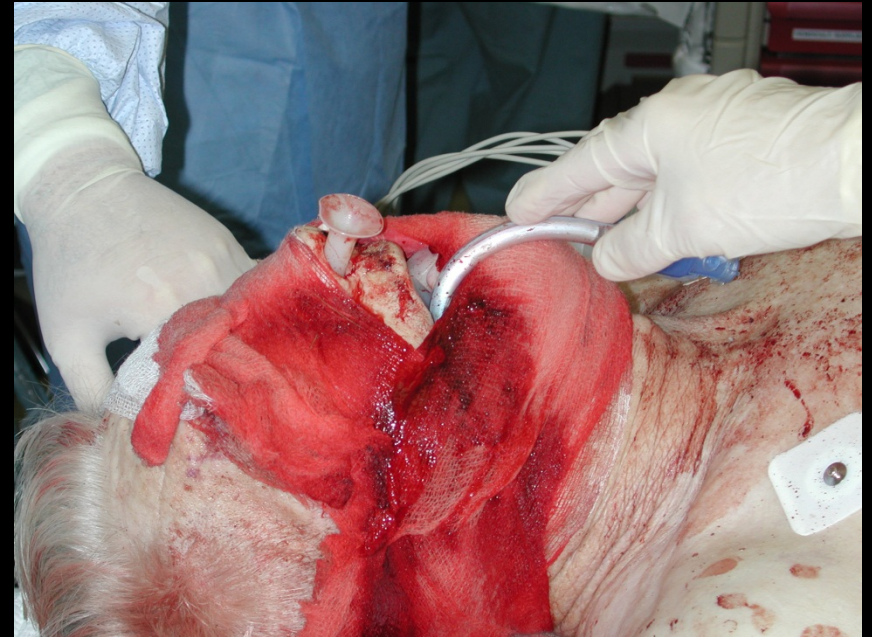


What are the challenges?



Angioedema: Swelling

Destruction of features



What?



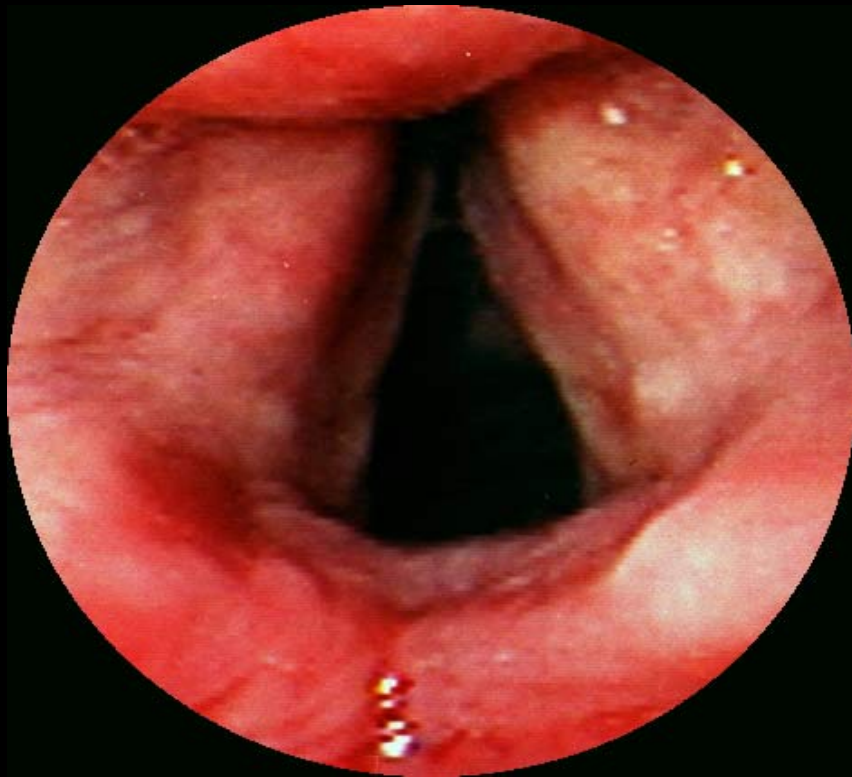
Working the basics...



Difficult Airway

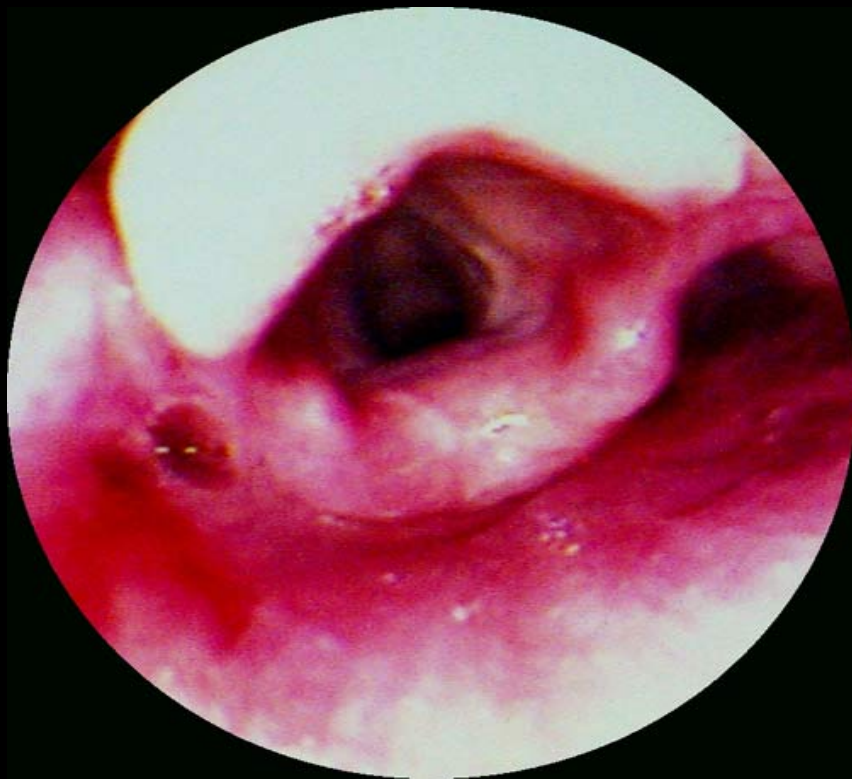


Sight Picture

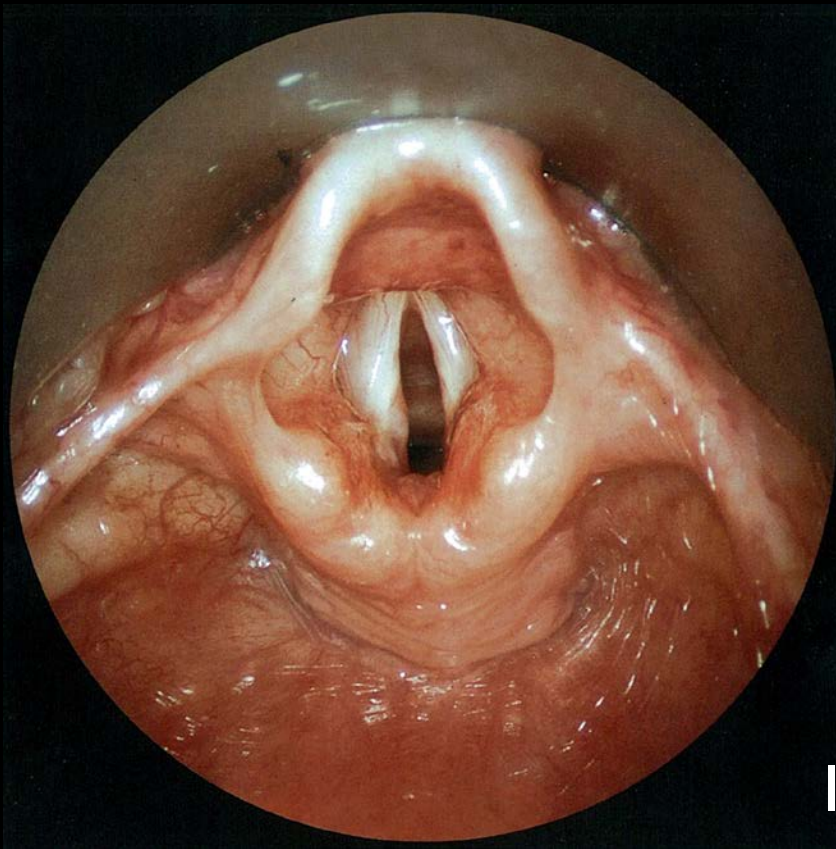


- Blade Control
- Tongue Control
- Landmarks

Would you intubate this?



Is intubation possible?



Is Oxygenation an option?

Would you intubate this?



Airway Techniques

- Positioning
- Ventilation Skills
- Basic Adjuncts
- Advanced Adjuncts
 - Bougie
- Advanced Tools
 - Video Laryngoscopy

Patient Position



Ramp Position



Ramp Position: Google Images



BURP Maneuver

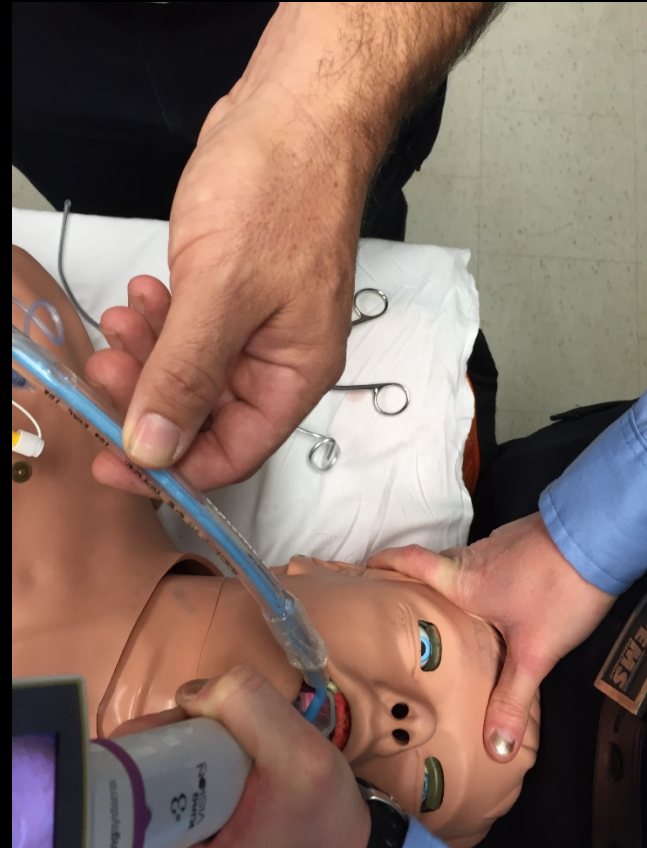
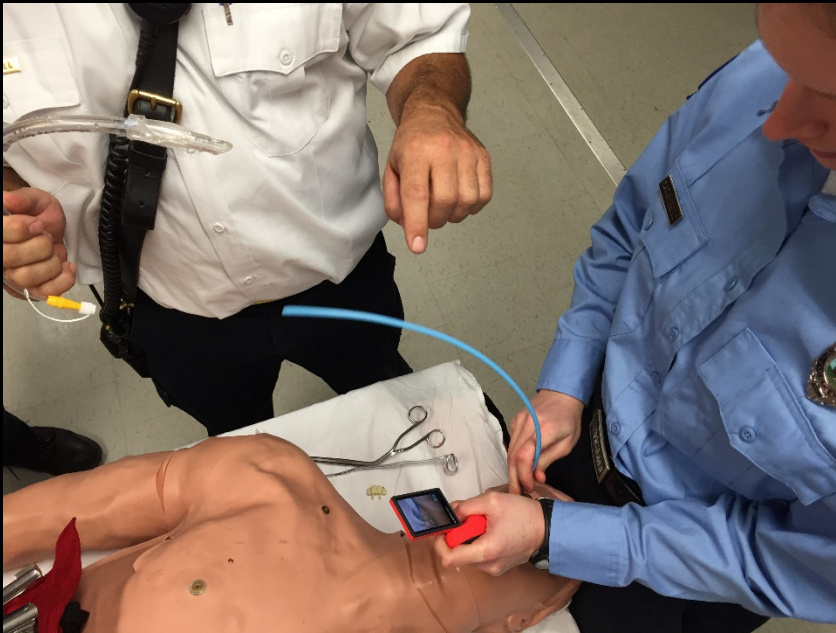
- Backward, Upward, Rightward Pressure
- Applied to thyroid cartilage by intubating medic's right hand or by an assistant.
 - ELM-External Laryngeal Manipulation
- Designed to help align vocal cords and trachea
- Used with cricoid pressure

Bougie/Introducer

- Smaller diameter
- Useful for partial visualization
- Teamwork required: pass tube
- “Extra steps”



Bougie=Teamwork



Bougie introducer

- Preload, or not?
- Feel tracheal rings, or not?
- Curl it into a circle in your kit, or leave it flat in the cabinet?

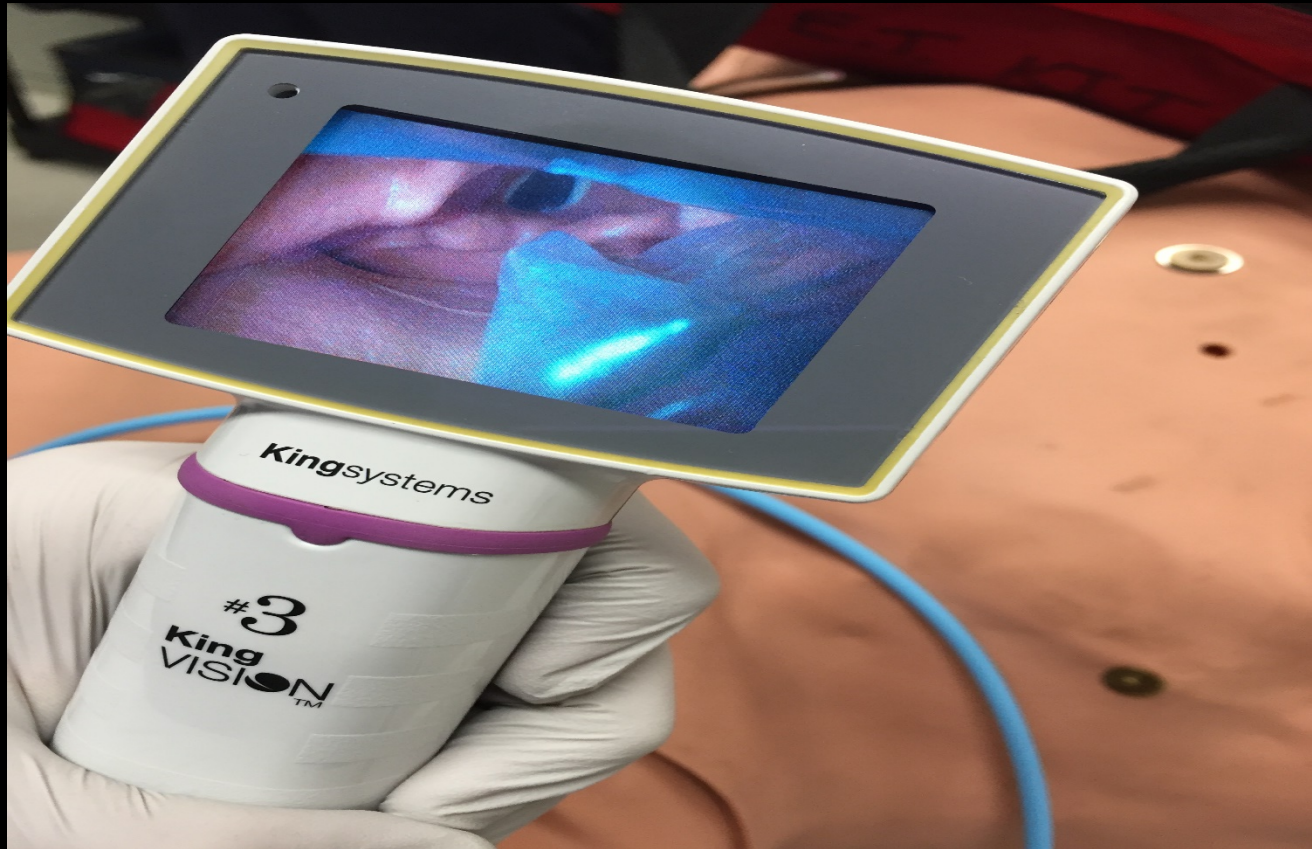
Video Laryngoscopy

**Firefighter proof?
your intubation kit?**

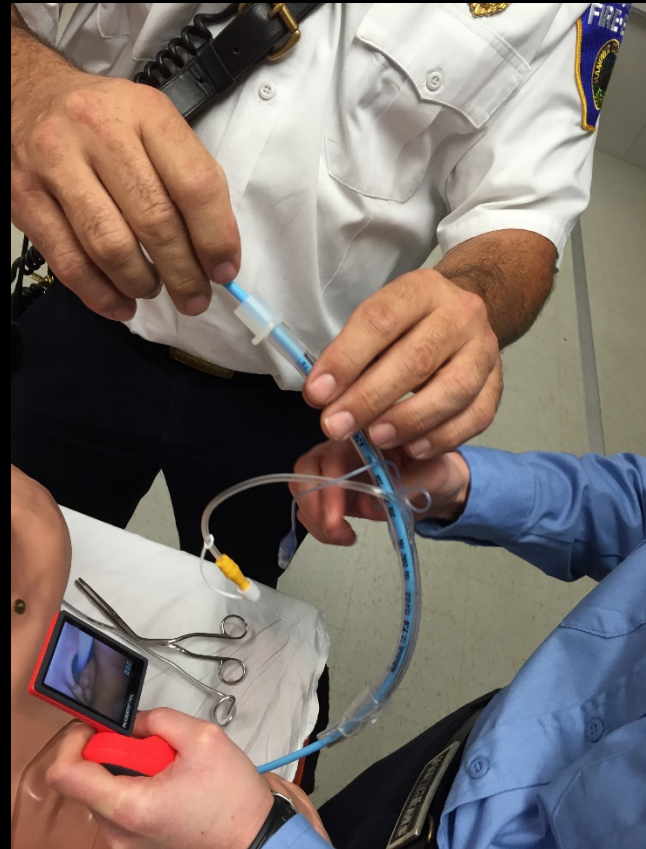
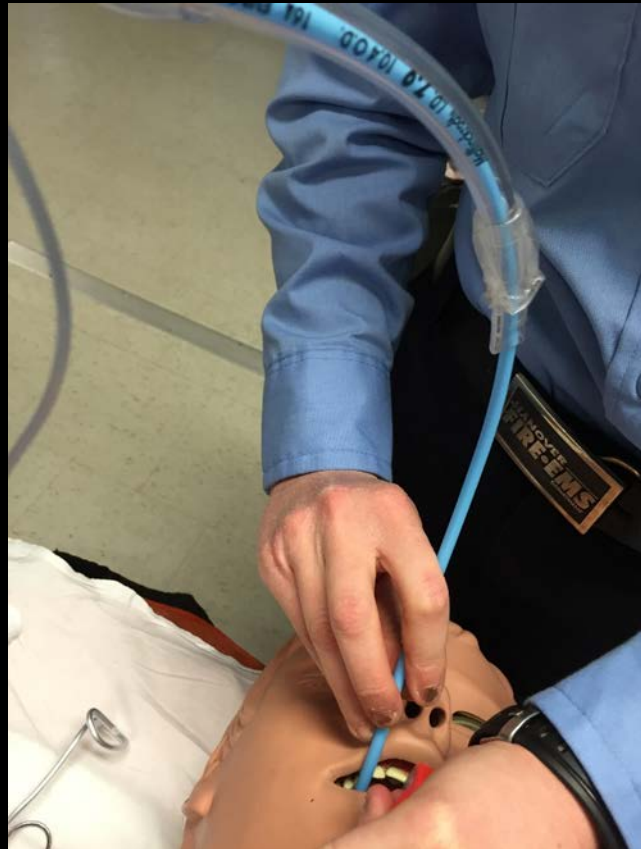
- Pros:
 - Improves visual record of procedure
- Cons:
 - Techniques change
 - May not physically work with every patient
- How many blades?
- Will the device survive in your environment?



Video Laryngoscopy



Bougie/Video Laryngoscope



Integrating two techniques



Video Visualization



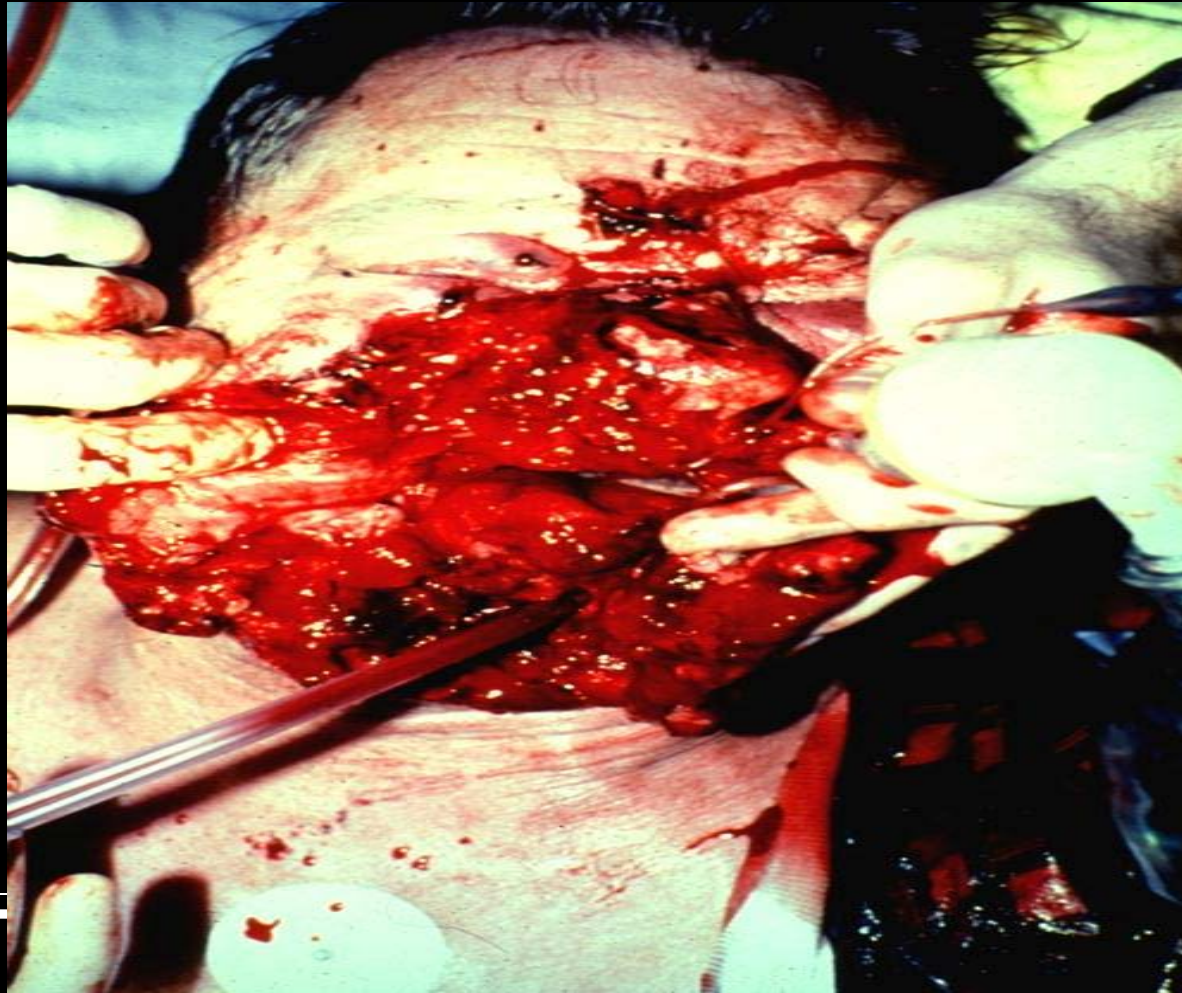
Nasal Intubation: The LOST ART

- Blind insertion, requires breathing patient
- Replaced by CPAP and RSI as options
- Two outcomes:
 - Works like a charm
 - Miserable MESS!
- Loathed by nurses and respiratory therapists

Rescue Airways: Plan B, C, and D

- Difficult conditions
 - Intubation attempts have failed
 - Conventional Intubation not safe or delay care
- Complement, but do not replace endotracheal intubation skills
- Less invasive vs. more invasive
 - King LTS Airway
 - Surgical Cricothyroidotomy

Yep, probably so...



Confirmation of Intubation

- “Gold Standard” is direct visualization
- Capnography
- Clinical Findings
- Every available method to verify the tube placement should be used

Capnography 2015

- AHA Guidelines
 - Class I, LOE A
 - 100% Sensitive, 100% Specific
- Quantitative, continuous, waveform capnography
 - Monitor position of airway devices
 - Quality of CPR
- “CAB”
 - Circulation-Airway-Breathing

Capnography

- ALL patients requiring Airway Management
 - Guides resuscitation
 - Quality of ventilations
- REQUIRED for Advanced Airways
 - Endotracheal Tubes
 - King
 - Surgical Airway

Capnography

- Quantitative, graphical measurement of **EVERY INTUBATED PATIENT..**
- American Society of Anesthesiologists (ASA) standards:

- *Every patient receiving anesthesia shall have adequacy of ventilation continuously evaluated*
- *Continual monitoring for the presence of expired carbon dioxide shall be performed unless invalidated by the nature of patient, procedure, or equipment*
- *Continual EtCO₂ analysis, in use from the time of ET placement, until extubation/removal or transfer ...shall be performed using a quantitative method, such as capnography, capnometry, or mass spectrometry*

Quantitative..

RSI is to EMS

What ***Use of Force*** is to Law
Enforcement

Rapid Sequence Intubation

- **RSI is defined as a technique** where a potent sedative or induction agent is administered virtually simultaneously with a paralyzing dose of a neuromuscular blocking agent **to facilitate RAPID TRACHEAL INTUBATION.**

Prior to RSI

- Nasal intubation common for the breathing patient in need of airway management
- Surgical Airway more common
- Anesthesiologist requested for definitive airway management
- Two medication methods
 - SEDATION only or PARALYTIC only used
 - Both of these techniques have significant complications

Goals of EMS RSI

- Early and rapid control of the airway in compromised patients
 - Head Injury/ increased ICP
 - Multi-Trauma
 - Respiratory Failure
- Increase success in intubation
 - Create the “optimal” intubating conditions
 - Prevent aspiration

What RSI is NOT

■ Behavior Control

- Requires differential diagnoses
- *there is a balance between what is performed for safety and what is needed to maintain oxygenation*

■ “Simple”

- Requires complete understanding of the consequences
- Do not become complacent

RSI Reality

- Patient population is often sicker if airway intervention required
- Trauma population often more compromised
- There should be NO “elective” RSI in EMS
 - KNOW WHY
- Decisions should be based on sound clinical judgment and experience

Known Complications of EMS RSI

- Prolonged on scene times
- Higher rates of hypoxia
- Increased incidence of hyperventilation
- Poor documentation
- AND THE KILLER
 - Unrecognized esophageal intubation

RSI Lessons Learned

- In field, patients requiring this procedure are sicker/more compromised
- Teamwork is *VITAL*
 - Establish a plan and communicate well
 - Control the situation
 - “Pit Crew RSI”, October 2015 *EMS World Magazine*
- Know the pitfalls and what can go wrong.

RSI Realities

- RSI is more for medical than trauma
 - Trauma has more indications, less opportunity
- Departments will average less than they imagine
 - Once the “novelty” wears off

RSI Research

- Debate on Efficacy
 - Need versus skill required
- Debate on Medications
 - Induction agent: Etomidate v. Versed
 - Paralytic Agent: Sux v. Roc
 - Combination of Agents superior to sedation alone

Three Criteria for Intubation

1. Is there a failure of airway maintenance or protection?
2. Is there a failure of ventilation or oxygenation?
3. What is the anticipated clinical course?

From the Manual of Emergency Airway Management, 4th
Edition, by Walls, Murphy, 2012

1. Is there a failure of airway maintenance or protection?

- Can “Maintain” a “patent” airway
 - Awake, alert; level of consciousness provides protection against aspiration
- Severely ill, trauma compromised, or otherwise unconscious
 - Protective mechanisms weakened or lost
 - Aspiration = increased morbidity and mortality

1. Is there a failure of airway maintenance or protection?

- Gag Reflex Present?
- Physical Destruction of Airway?
- Physiologic compromise?

2. Is there failure of ventilation or oxygenation?

- Oxygenation of vital organs: primary function of the respiratory system
 - **Ventilation** is the movement of air/oxygen into the lungs
 - **Perfusion** is the oxygenation of the cells through the alveoli
 - **Gas exchange**: In with the good, out with the bad
 - Is the bad leaving?
- **Ventilation versus perfusion:**
 - Is what you are putting in getting to the cells?

2. Is there failure of ventilation or oxygenation?

■ Example: Status asthmaticus

- Protect and maintain their UPPER airway even in extremis
- Fatigue leads to respiratory failure with resultant hypoxemia
- Airway and tissue inflammation

■ Example: Pulmonary edema

- Benefit from positive pressure (CPAP, BiPAP)
 - Fluid pushed out of the alveoli
- Ventilation and perfusion is mis-matched

2. Is there failure of ventilation or oxygenation?

■ Non-Invasive Ventilation

- Works when patient breathing
- Ineffective when ventilations slow from fatigue

■ Is there a reversible cause?

- H's and T's from AHA
- Overdose
- Tension Pneumo

3. What is the expected clinical course?

- Where is this situation going?
- How might the patient deteriorate?
- What will happen at the next level of care?
- Will the work of breathing be overwhelming in the face of multiple, major injuries?
- Are interventions working?

Examples:

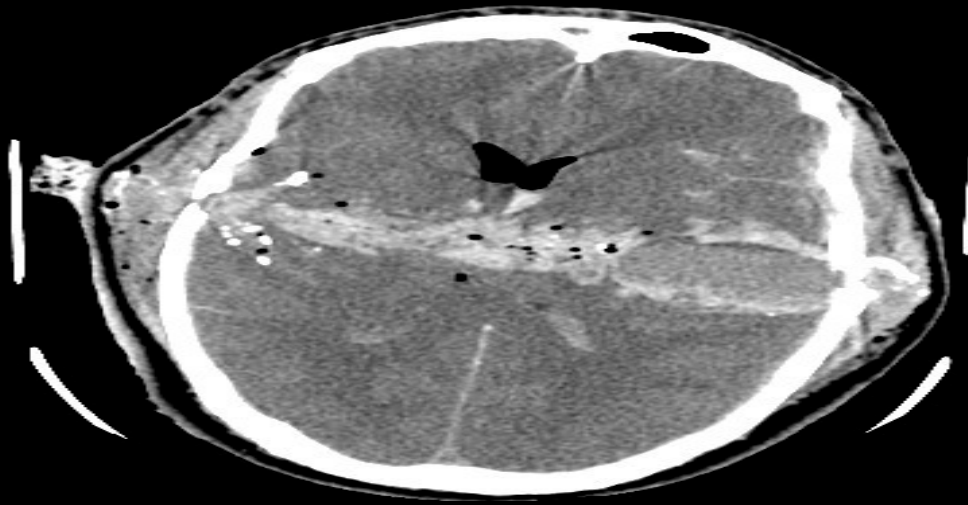
- Trauma
- Burns
- Post-arrest
- Asthma vs. COPD

3. What is the expected clinical course?

- 18 year old motorbike racer with a rope injury to his neck
 - Stridorous?
 - Obvious swelling?
 - Able to speak?

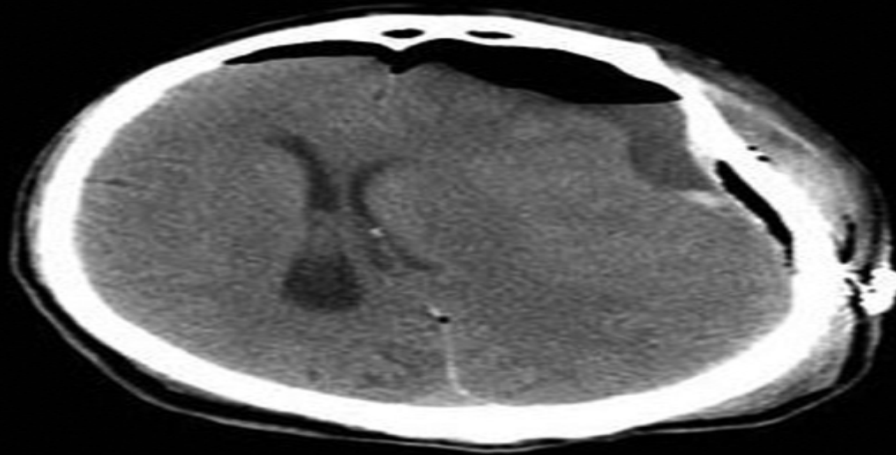
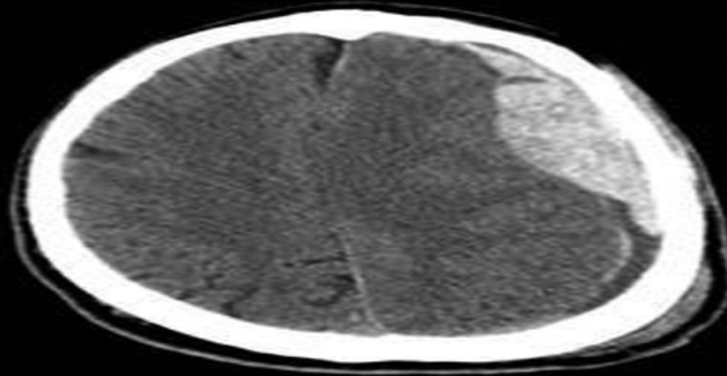


3. What is the expected clinical course?

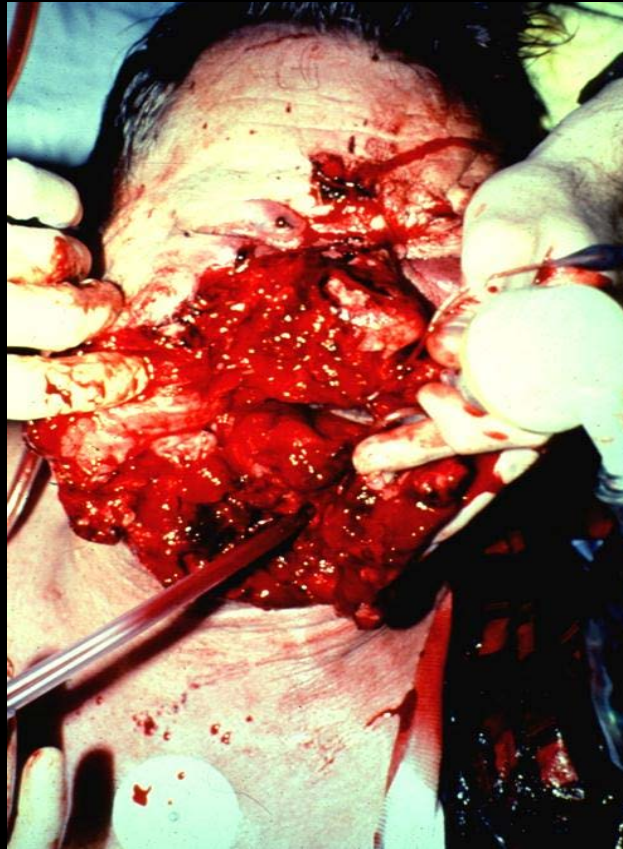


Patient is still breathing?

What is the expected clinical course?



3. What is the expected clinical course?



Making the Airway Decision

- What do you have?
- What are your resources?

The Seven “P’s” of RSI

From *Manual of Emergency Airway Management*, 4nd Edition,
Walls, Murphy, 2012

- Preparation
- Pre-Oxygenation
- Pre-Treatment
- Paralysis with induction
- Protection and Positioning
- Placement with Proof
- Post-Intubation Management

Preparation:

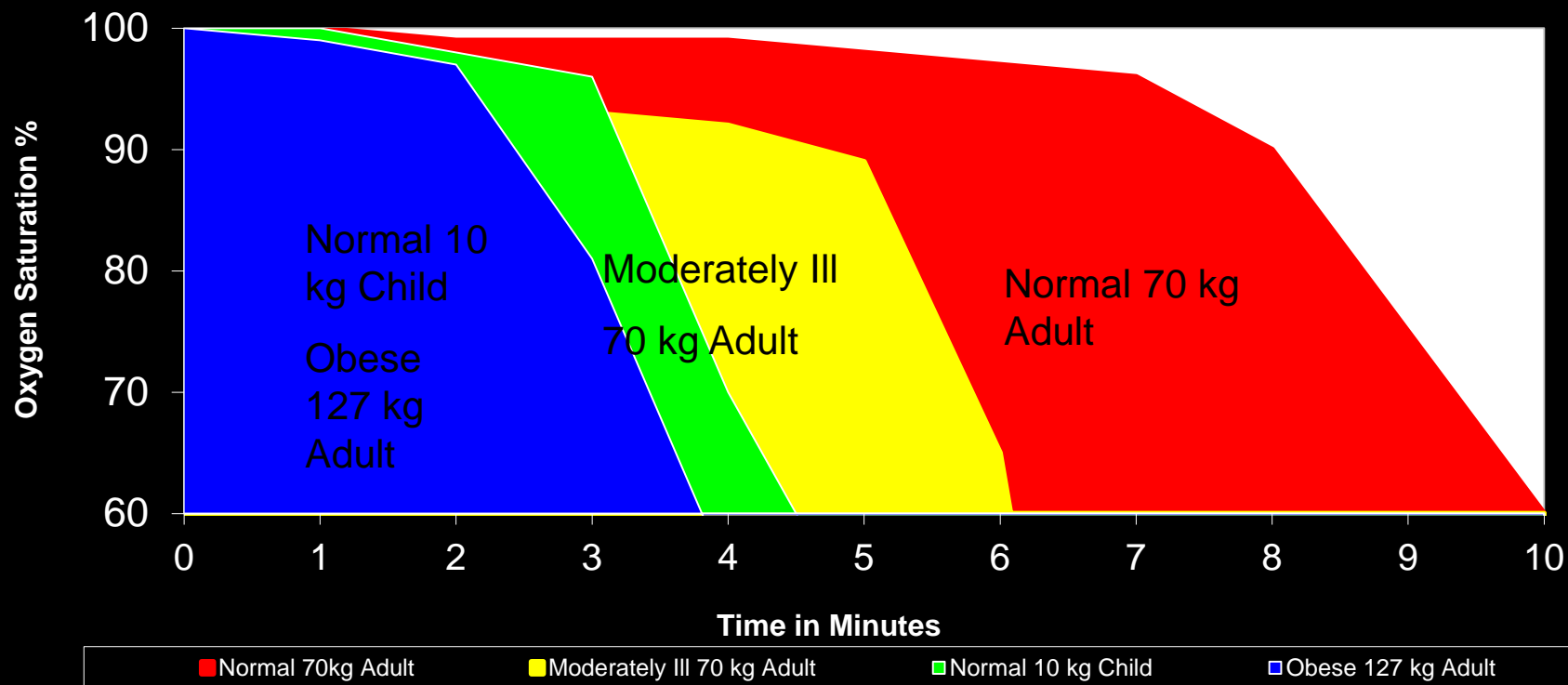
- Provider
- Equipment
- Patient
- Predict the Difficult Airway

Pre-Oxygenation

- Build an Oxygen Reservoir
- Permits several *minutes* of apnea without arterial desaturation
- Time to desaturation depends on many patient factors including pathology
- Essential to a “*NO BAGGING*” principal of RSI (once medications administered)

2. Pre-Oxygenation

Desaturation Curve



3. Pre-Treatment

- Goal:
 - Reduce negative effects of RSI meds and laryngoscopy
- Limited value in Crisis
- Blunt ICP

4. Paralysis WITH Induction

- Sedation agent/amnestic
- Neuro-muscular blockage agent
 - Type dependent on resources
- Doses often weight dependent
- TIME: Onset time key to success
 - Requires WAITING for onset time
- Attempt intubation after complete paralysis

5. Protection and Positioning

- Avoid Bagging/limit gastric insufflation
- Manual stabilization of C-spine
 - Removal of collar permits mandible movement
- Position provider/room to work
- Raise head of stretcher if possible
- Medical: “sniffing position”
 - Ramp up

6. Placement with Proof

- GOAL: First Pass Success!!
- Direct Visualization
- Capnography Waveform
- Physical Signs
- If BVM measures fail, or King LTD does not provide adequate ventilation, perform immediate surgical cricothyroidotomy

RESCUE AIRWAY

- Always have a plan!
- Identify what works.
- Common Rescue Airways:
 - Combitube
 - King LT
 - LMA, I-LMA
 - Surgical Cric should be the last resort.



7. Post-Intubation Management



- Secure ETT with commercial device
 - Thomas or Ambu holders
- Place C-collar to stabilize neck
 - Even in medical cases
- Transport to appropriate medical facility
 - Communicate with hospital early
- **DEFINITIVE CARE**

7. Post Intubation Management

- Pain Management
 - Fentanyl
- Continued Sedation
 - Midazolam if BP tolerates
- Continued Paralysis if needed
 - Extended transport times
- Gastric tube as soon as convenient
 - May be considered early for gastric distention in difficult airway

***It is NOT acceptable to
transport a PARALYZED
patient without sufficient
SEDATION***

How would you like to be AWARE
than you cannot breath and had
ABSOLUTELY NO CONTROL over
your own body?

Case Study 1

- MVC-car into a tractor trailer at interstate speed unrestrained 20 y.o. male driver – steering wheel deformity and windshield starred
- Altered LOC, laceration to face, deformity to left leg, chest tender
- Vitals: BP=100/60, HR=136, R=38, SaO2=90%
- GCS E3, M5, V3,



Case Study 2



- Female patient found unresponsive in bathroom
- Left side posturing, right side flaccid
- Vitals: R=8 irregular and gurgling, BP=170/110, HR=56, SaO₂=92% on room air
- Left pupil dilated

Case Study 3

- 56 year old obese male with lower extremity paralysis from motorcycle accident. No other apparent injury
- Vitals: 162/76, 24, 110, 96% on room air
- GCS: E4, M6, V4
- Patient is complaining of extreme lower back pain and is agitated and combative.

Case Study 4



- MVC, single patient restrained driver
- Altered LOC
- Injuries to match mechanism
- Entrapped in cab

Indication for Airway Management?



Case Study 4

- Rapid Extrication
- BLS measures
 - O2
 - NP
 - Suction
- Obvious facial injuries
- Vitals:
 - HR=110, BP=150/100
 - R=12, SaO2=95%
 - GCS=E2, M3, V2



Case Study 5

- MVC-car into a tree 45 mph,
- Patient=unrestrained, 18 y.o. driver
 - steering wheel deformity and windshield starred
 - Vitals: BP=140/92, HR=136, R=38
 - GCS E3, M6, V4
- Awake-c/o severe right sided chest pain
- Slurred speech, 5 cm laceration to mid forehead-bleeding controlled, right ant. Chest tender to palpation, left side lung sounds diminished

Case Study 6

- 24 year old asthmatic patient in ED
- Prior history of intubation
- On continuous albuterol nebulizers, plus steroids (enter your asthma protocol)
- No longer in tripod position, still has accessory muscle use, eyes glassy
- Vitals: BP=100/40, HR=140, R=16*, SaO2=91% with NRB and nebulizer

Case Study 7

- Male patient with gunshot to face
 - Entry and exit wounds in cheeks
 - Obvious destruction of upper palate
- Awake, responsive to commands, cannot communicate verbally
 - Swelling in face, early signs of raccoon's eyes
- Vitals:
 - HR=100, BP=132/68, SaO2=100% w/NRB

Case Study 8

- MVC: mini-van pulled in front of tractor trailer
- Male patient unconscious, airway opened by police
- Vitals: BP=90/p, HR=140, R=8 irregular, SaO2=UTO
- Trapped by lower extremities
 - Extended extrication



Case Study 8 Complications

- Patient required repackaging prior to RSI (Delay)
- Intubation was single attempt
 - confirmed by visualization, auscultation, and **qualitative** End-tidal CO2 detector (colormetric)
- Patient developed **immediate Bradycardia**
 - Required re-confirmation of ET placement
 - Atropine 0.5mg administered
 - Ventilation volume increased
- Ventilator stated increased difficulty in bagging
 - Bilateral needle decompression

Case Study 9

- 65 year old respiratory distress
- Tachycardic, Tachypneic, Hypertensive
 - Marked increased work of breathing
 - Cyanotic
- History of COPD and CHF
- Treatments:
 - CPAP
 - Nebulizer beta-agonists (Albuterol/Atrovent combo)
 - Transdermal veno-dilators (Nitroglycerin)

Case Study 9



Case Study 9

- CPAP: Respirations decrease
- Level of Consciousness decreases?
 - Sleeping?
- Is patient better?
- Clinical Course?

Case Study 10

- 52 year old Asthmatic:
- Initial TX: Oxygen and Nebulizer treatment
- Arrest: Patient apneic and pulseless
 - PEA: slow rate of 40
 - Compressions and BVM, IO access and meds
 - King Airway inserted
 - Capnography of 55mmHg, large waveform
- Difficult to bag with King; no pulses still

Case Study 10

- What is the problem?
 - Failure: Airway maintenance?
 - Failure: Oxygenation and ventilation?
 - Clinical Course?
- Crew Actions:
 - EXCHANGE King Airway for oral endotracheal tube via direct visualization and bougie
 - Increase rate and volume (TIGHT to bag)
 - Improved heart rate and capnography

Current Events:

- Intubated, waking pediatric patient
 - Pink, frothy sputum?
 - Unsecure ET tube?
- 7 day old choking on formula
- Le Forte III fractures with a NP airway
 - Successful RSI

The Airway Plan: 7 P's Modified

- **Prepare:** yourself, your equipment, and your patient
- **Pre-oxygenated:** QUALITY, not quantity
- **Position with protection:** patient and provider; cricoid pressure
- **Plan:** *If this, then that*
- **Perform and place:** watch tube go through the cords
- **Proof:** Capnography
- **Post-intubation management:** ETT holder and c-collar

The decision you make, makes a difference

Tube or not to tube

King versus ET

BLS or ALS

Summary

- Airway is MORE than just skill
- The WHOLE of skills, experience, and application is essential
 - Sometimes, being in place...
- Science versus Art
 - The Art of Medicine..

Reasons why...

- From entrapped in an accident...



- ...To walking across the stage for graduation

Personal Credits for pictures and Information:

- Chief Jethro Piland
 - Hanover Fire EMS
- John Green, (Ret)
 - Chesterfield Fire EMS
 - Flight Paramedic, EMS Medflight 1
- Hanover Fire EMS RSI Program

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THANK
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ANY QUESTIONS?

