

# **2017 Emergency Medicine Airway Course - BASICS**



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# [ Course Outline ]

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- Who / why / when / etc
- Airway assessment
  - How to predict trouble
  - How to stay out of trouble
- Rapid sequence intubation
  - Drugs / physiology / etc

# [ ED Airway Management ]

## **Logistics:**

- Dying patients
  - Need to do something fast
  - Physiology already marginal
- Little time
  - Frequently no time to optimize physiology
- Little information
  - ? Full stomach / ? Tank empty
- Little margin for error
- Can't cancel the case

# [ ED Airway Management ]

## What you will need:

- Rapid assessment skills
- Preparation
- Technical proficiency
- Communication
- Calm under pressure
- The ability to *anticipate* trouble

# Stepwise Assessment Goals

**Step 1**

Is Intubation Required?

**Step 2**

Will It Be Difficult?

**Step 3**

Best Technique?

**Step 4**

Will Physiology Suffer?

**Step 5**

Best Rescue Strategy?

# Assessment Goals

## **#1: *Is intubation required?***

- Failure to protect the airway
- Head injury with a GCS  $\leq 8$
- Inadequate oxygenation
- Inadequate ventilation
- Anticipated course

**Associated question:** Is it required right now, in 3 minutes, or sometime in the next 30 minutes

# [ Assessment Goals ]

## **#2: *Will it be difficult?***

- Difficult bag-mask ventilation?
- Difficult laryngoscopy?
- Difficult cricothyroidotomy?

# [ Assessment Goals ]

## **#3: *Best technique?***

- RSI the standard
- Other options do exist:
  - Awake or sedative-assisted intubation
  - Blind nasotracheal intubations
  - Alternative technique as the 1° approach
  - Surgical airway as the 1° approach
  - Double set-up



# [ Assessment Goals ]

## **#4: *Will physiology suffer?***

- Hypoxemia
  - Aspiration
  - Airway injury
  - Hypo/hypertension
  - Tachy/bradycardia
  - ↑ Cardiac demand
  - ↑ ICP
- Drug-related:
  - Hyperkalemia
  - Myoclonus
  - Rigid chest
  - Adrenal insufficiency

# [ Assessment Goals ]

Ask yourself... does your patient have:

- A risk of aspiration?
- Altered airway anatomy?
- Cardiovascular instability?
- Shock (obvious or occult)?
- Intracranial hypertension?
- Cervical spine injury?

# [ Assessment Goals ]

## **#5: *Best Rescue Technique?***

- Essential to contemplate before beginning the process
  - Watch the third years
  - Never start an airway without a back-up plan
  - Here we have everything / most places don't.
- Mastery of 2-3 of these will get you out of almost every jam

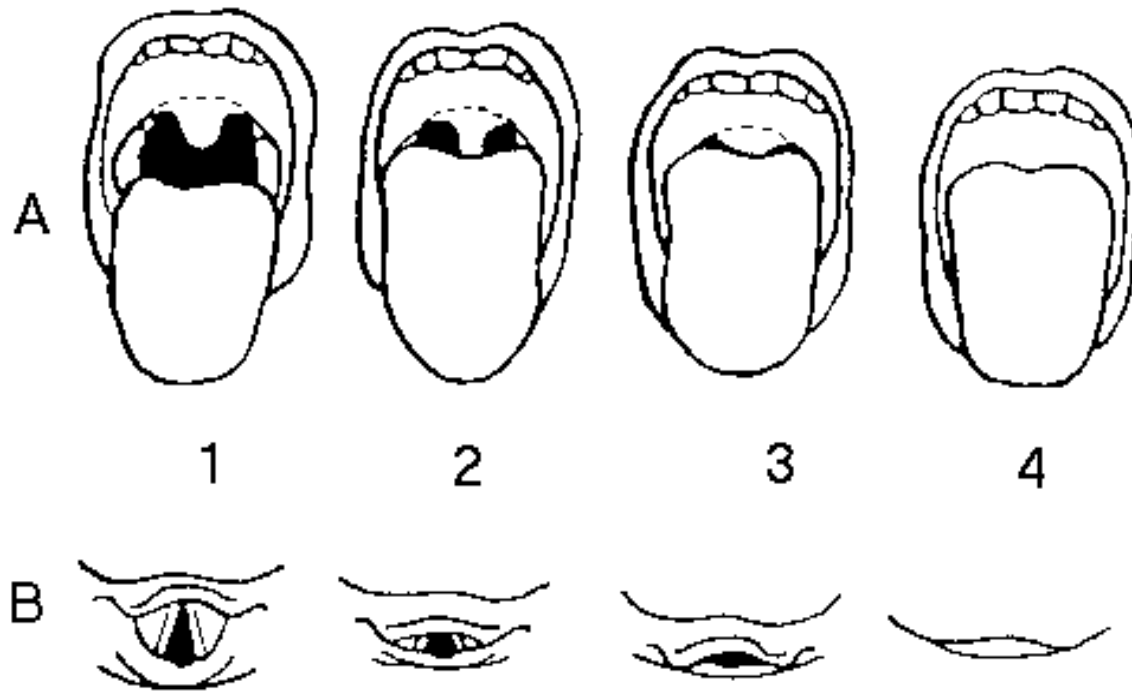
**Can We Predict The  
Difficult Airway?**



# Predicting The Difficult Airway

- Long upper incisors and/or prominent overbite
- Interincisor distance <3 finger breaths
- Mandibular floor distance <3 finger breaths
- Thyromental distance <2 finger breaths
- Mallampati score >2
- Highly arched palate
- Large, thick tongue
- Short, thick neck
- Inability to touch chin to chest/extend head

# [Mallampati



# Predicting The Difficult Airway

	N	Sensitivity	Specificity
Mallampati Score	41,193	49%	86%
Thyromental Distance	29,132	20%	94%
Sternomental Distance	1,085	62%	82%
Mouth Opening	20,614	22%	97%

- Meta-analysis of 35 studies assessing airway difficulty [n=50,760]
- **5.8%** incidence of difficult airway

Shiga T. *Anesthesiology* 2005; 103:429-437.

# [ Predicting The Difficult Airway ]

- Difficult mask ventilation **“MOANS”**
- Difficult laryngoscopy **“LEMON”**
- Difficult cricothyrotomy **“SHORT”**



# [ Predicting The Difficult Airway ]

Difficult bag-valve-mask?

- **M**ask seal
- **O**besity [BMI >26 kg/m<sup>3</sup>]
- **A**ged [Age >55]
- **N**o teeth
- **S**tiff [Asthma, COPD, ARDS]

# [ Predicting The Difficult Airway ]

Difficult laryngoscopy?

- **L**ook externally
- **E**xamine (3-3-2)
- **M**allampati
- **O**bstruction
- **N**eck Mobility

# [ Difficult Airway Assessment ]

Difficult surgical airway?

- S urgery
- H ematoma
- O bese
- R adiation
- T umor

# [ Look At The Airway ]



# [ Look At The Airway ]



# [Examine The Airway ["3-\_-"]]





# [Examine The Airway ["\_3-"]]



# [Examine The Airway [“\_-\_-2”]





# [ **E**xamine The Airway ["3-3-2"] ]

**Mouth Opening <3**

Most oral techniques  
will be difficult

**Mandible <3**

The tongue will  
get in your way

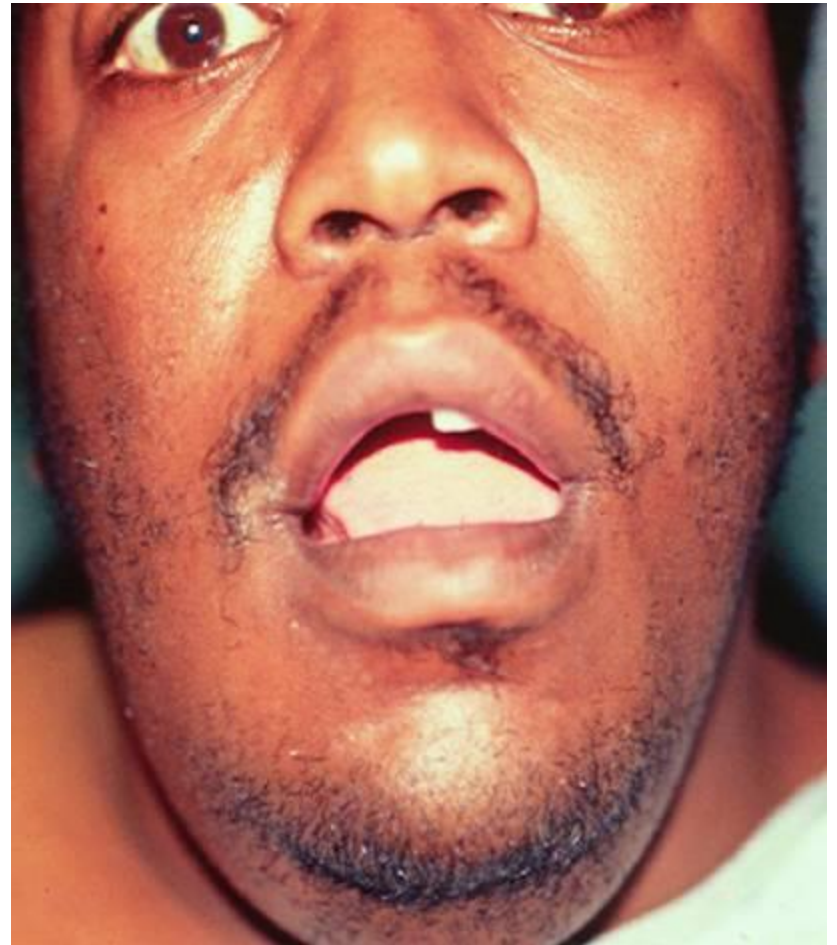
**Thyromental <2**

The airway will be  
anterior

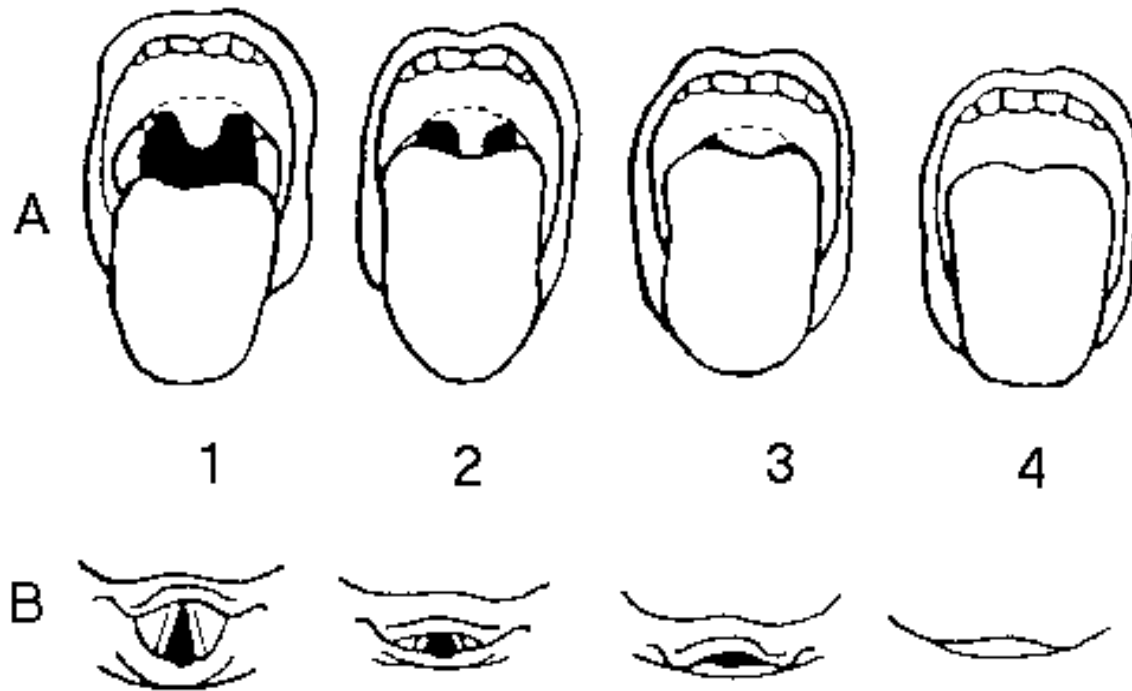
# [Examine The Airway]



# [Examine The Airway]



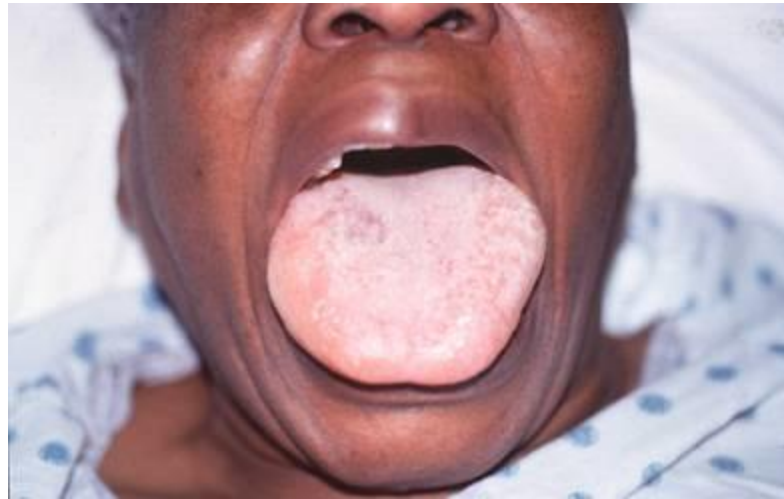
# [Mallampati



# [ Mallampati ]



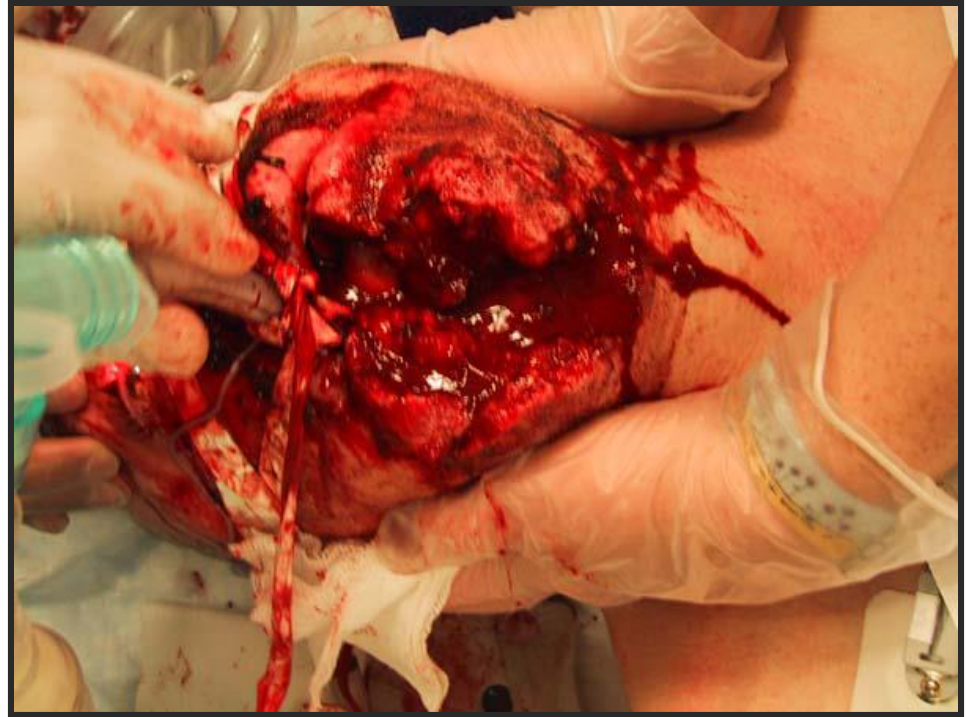
**Mallampatti II**



**Mallampatti IV**

# [Obstruction]

- Tongue
- Blood
- Vomitus
- Edema
- Foreign body
- Tumor





# [ Neck Mobility ]



# [ Testing The LEMON Law ]

Comparison of a 10-point LEMON Score to the Cormack Score for grading visualization of the glottis in 156 ED patients.

<b>Cormack 1</b>	“Easy Intubation”	<b>114 [73%]</b>
<b>Cormack <math>\geq 2</math></b>	“Difficult Intubation”	<b>42 [27%]</b>



# Testing The LEMON Law

<b>Look</b>	Injury, big teeth, large tongue, beard
<b>Examine</b>	“3-3-2” bedside measurement
<b>Mallampati</b>	Score $\geq 3$
<b>Obstruction</b>	Any condition causing obstruction
<b>Neck Mobility</b>	Limited neck mobility

# [ Testing The LEMON Law ]

Criteria most highly associated with difficult intubation:

- Large incisors
- Inter-incisor distance <3 fingerbreadths
- Thyromental distance <2 fingerbreadths

**“Big teeth, small mouth, short neck...”**

# [ Difficult Airway Assessment ]

Difficult surgical airway?

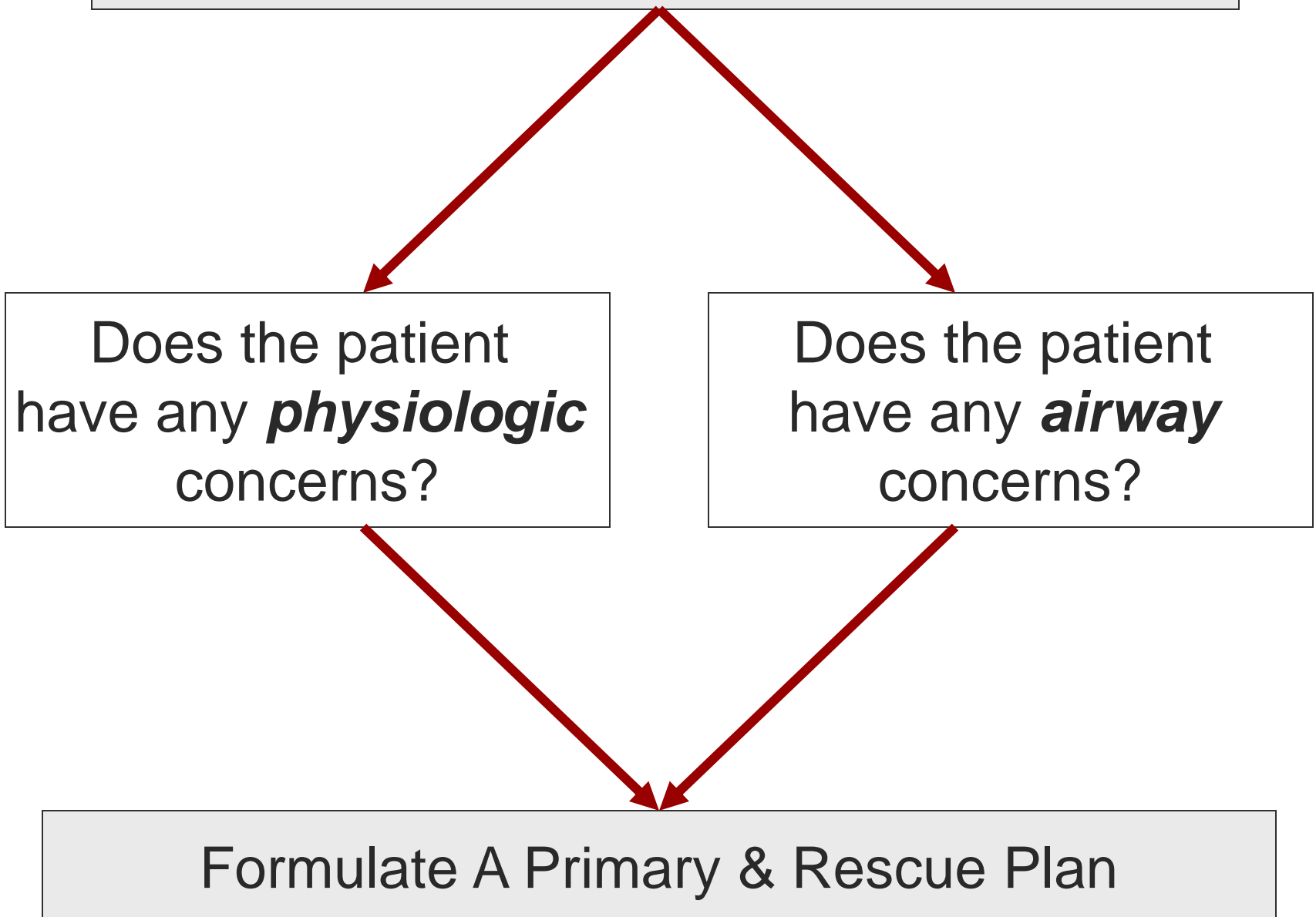
- S urgery
- H ematoma
- O bese
- R adiation
- T umor

# Will Physiology Suffer?

## What should you worry about...?

<b>#1</b>	Head injury with a blown pupil...
<b>#2</b>	Asthmatic in severe distress...
<b>#3</b>	Stab wound to the chest...
<b>#4</b>	NERH stroke patient with pneumonia...
<b>#5</b>	Acute smoke inhalation...
<b>#6</b>	Agitated aspirin overdose...

# How Can We Anticipate Trouble?



# [ Logistics ]

- Everyone on the team has a job
- All drugs drawn up & sequenced
- Agreed upon back-up plan

## **Within One Arm's Length:**

End tidal CO<sub>2</sub> detector, oral airway, 2 smaller endotracheal tubes, Bougie, equipment for your rescue plan...

# [ Rapid Sequence Intubation ]



# [ Rapid Sequence Intubation ]

RSI involves the rapid and simultaneous administration of a short-acting sedative and a neuromuscular blocking agent to facilitate intubation and decrease the risk of aspiration.



# [ Rapid Sequence Intubation ]

## Goals:

- Immediate muscle relaxation
- Decreased risk of aspiration
- Sedation and amnesia
- Attenuation of physiologic reflexes

# [ Rapid Sequence Intubation ]

The 9 P's of RSI:

**P**reparation

**P**reoxygenation

**P**retreatment

**P**aralysis and sedation

**P**rotection with **P**ositioning

**P**lacement with **P**roof

**P**ost-intubation management

# [ Rapid Sequence Intubation ]

## **P**reparation:

- Equipment
- The patient
- The operator (that means you!)
- A back-up plan

***90% of airway disasters are due to inadequate preparation!***

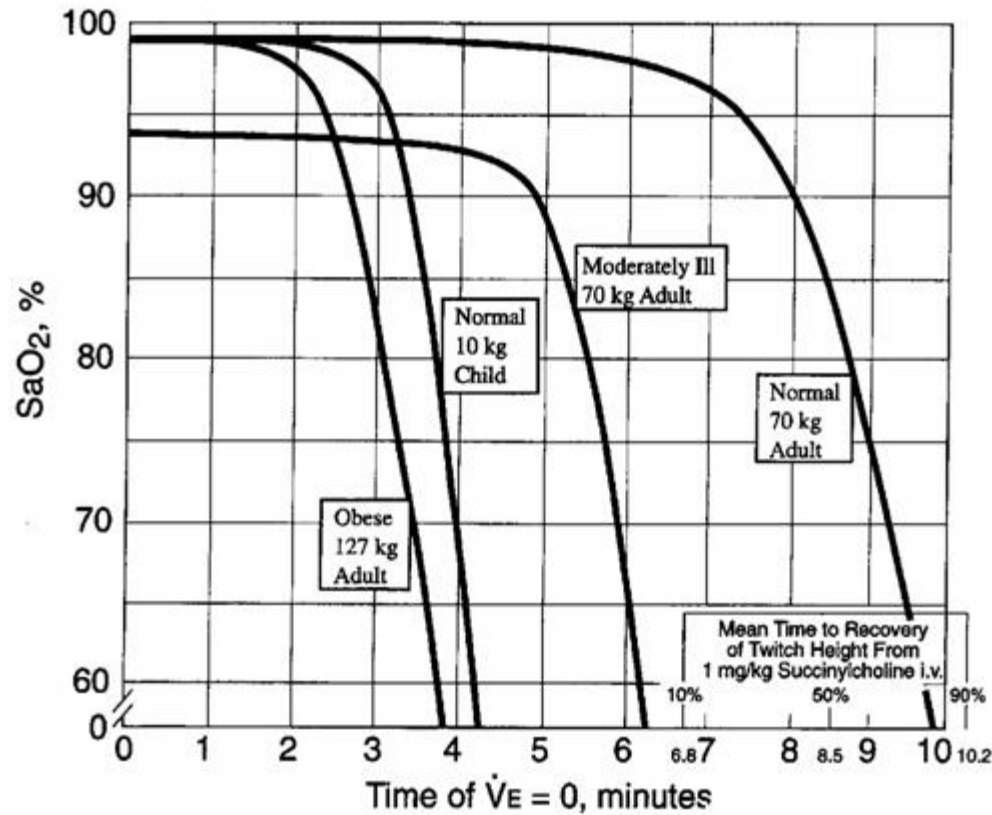


# [ Rapid Sequence Intubation ]

## **P**reoxygenation:

- Goal: 3-7 minutes of apnea protection
- Nitrogen 'reservoir' replaced by oxygen
- May be difficult to achieve in patients with acute or chronic lung pathology
- Avoid bagging unless the patient is hypoxemic [ $\text{SaO}_2 < 90\%$ ]

# TIME TO HEMOGLOBIN DESATURATION WITH INITIAL $F_{AO_2} = 0.87$



# [ Preoxygenation ]

## Good:

- In the healthy, well pre-oxygenated adult...

...you have 6-8 minutes

## Not so good:

- Children
- The obese
- Limited reserve
- Sepsis
- Pregnancy

# [ Preoxygenation ]

Anesthesia study [n=56] comparing:

3 Minutes of spontaneous breathing 100% FIO <sub>2</sub>
3 Vital capacity breaths
8 Vital capacity breaths

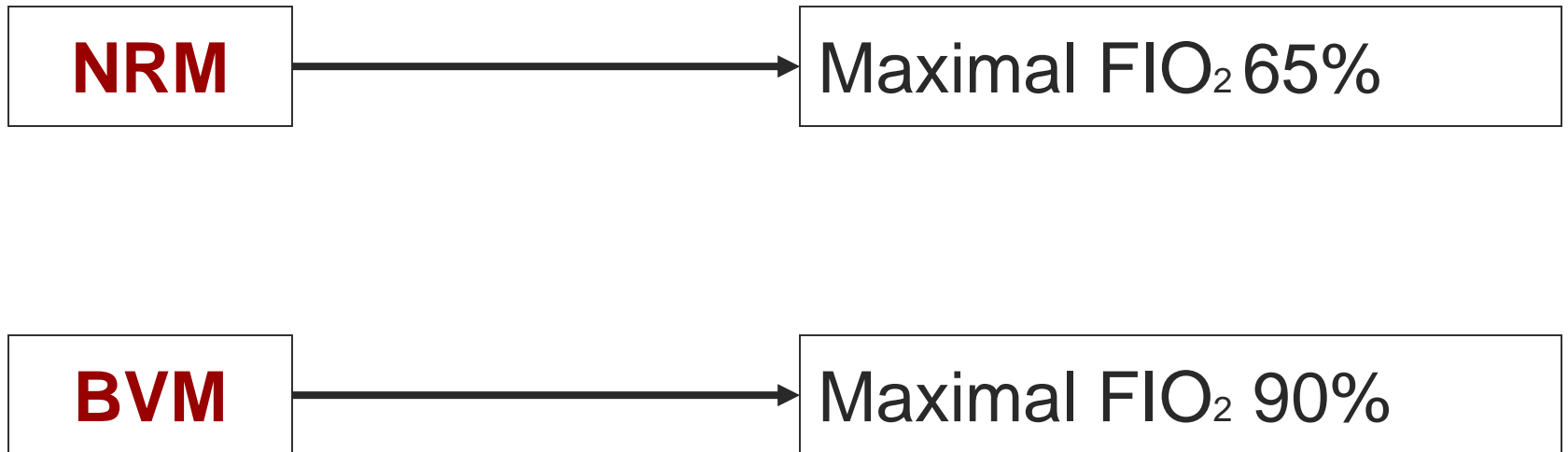


# [ Preoxygenation ]

Time to desaturation <95%:

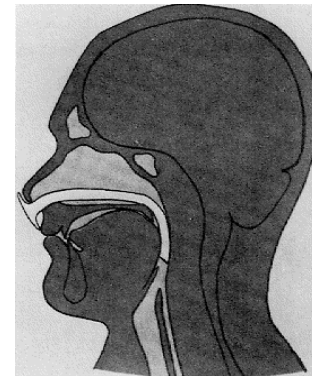
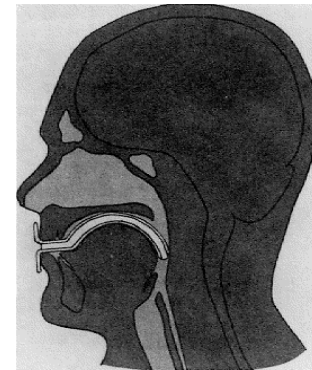
8 Vital Capacity Breaths	<b>5.21 min</b>
3 Minutes Of Spontaneous Breathing	<b>3.73 min</b>
4 Vital Capacity Breaths	<b>2.78 min</b>

# [ Preoxygenation ]



# [ Don't Forget The Basics! ]

- Clear the airway
- Good mask seal
- Chin lift, jaw thrust
- Oral / nasal airway



# [ Rapid Sequence Intubation ]

## **P**aralysis and sedation:

- Goal - optimal intubating conditions 1<sup>st</sup> try
- Synergy between agents is important

***“The patient is already obtunded... should I skip the induction agent?”***

# [ Succinylcholine ]

- Remains the drug of choice for the ED
- 1.5 mg/kg (don't skimp)
- Adequate paralysis in 45 seconds
- Clinical duration 6-8 minutes
- The dark side:
  - Fatal hyperkalemic risk
  - Bradycardia & asystole [children, 2<sup>nd</sup> dose]

# Fatal Hyperkalemic Risk

## Up-Regulation

- Burns, crush
- UMN [eg: stroke]
- LMN [eg: SC injury]

**Mortality 11%**

## Myopathy

- Muscular dystrophy
- Rare idiopathic

**Mortality 30%**

# [ Use In Renal Failure ]

- Most common ED contraindication
- When given to patients with known renal failure, succinylcholine increases the serum potassium 0.5-1.0 mEq/L
- Dysthymias are very uncommon

Schow AJ. ***Anesthesia Analog*** 2002; 95:119.

Thapa S. ***Anesthesia Analog*** 2000; 91:237.

# [ Rocuronium ]

- Ideal non-depolarizer for the ED
- Kinetics:
  - Onset at 60 seconds
  - Duration of action 45 minutes
- Recommended dose: **1.2 mg/kg**



# Rocuronium Or Succinylcholine?

Analysis of 37 studies [n=2690] comparing intubating condition. Two conclusions:

**#1:**



Succinylcholine superior overall

**#2:**



No difference when rocuronium given at the highest dose [1.2 mg/kg]

# [ RSI Paralytic Agents ]

Is The Patient At Risk For An Important Succinylcholine-Related Complication?

**NO**

**YES**

Succinylcholine 1.5 mg/kg

Rocuronium 1.2 mg/kg

# Which Induction Drug Is Best?



# RSI Sedative Essentials

## Midazolam

[0.2-0.3 mg/kg]

- Good amnestic
- Better drugs for the head
- Hypotension underappreciated

## Thiopental

[3-5 µg/kg]

- Strong cerebroprotection
- Hypotension a big risk

# RSI Sedative Essentials

## **Propofol**

**[0.5-1.2 mg/kg]**

- Similar to thiopental
- Hypotension a major risk
- No apparent advantage in RSI

## **Ketamine**

**[1-2 mg/kg IV]**

**[2-4 mg/kg IM]**

- Bronchodilator
- Cardiac stimulation
- ICP controversy (historical)

# [ Ketamine In Head Injury ]

- Several authors have questioned the historical dogma
- Ketamine is potentially advantageous in hypotensive head injury patient
- No data in the ED RSI population

Himmelseher S. ***Anesthesia Analog*** 2005; 101:524.

Sehdev RS. ***Emerg Med Australia*** 2006; 18:37.

# RSI Sedative Essentials

## **Etomidate**

**[0.15-0.3 mg/kg]**

- The “ideal” ED sedative
- Excellent cerebro-protection
- Hemodynamics rarely altered
- Transient cortisol suppression
- Supply issue currently

## Etomidate And Adrenal Function

- Transient adrenal suppression
  - 4-12 hours
- Some studies say this is important, some do not.
- Maybe more important in sepsis patients?

THM: No patient-oriented outcomes have argued Against etomidate. If they are hypotensive, however, That is a good time to use Ketamine



# [ Translation Into Practice ]

## Competing Concerns

```
graph TD; A[Competing Concerns] --> B[Use Etomidate]; A --> C[Don't Use Etomidate];
```

### Use Etomidate

- Septic patients get hypotensive
- Hypotension is bad
- Etomidate works best in shock

### Don't Use Etomidate

- Septic patients need cortisol
- Etomidate stuns the adrenals
- Adrenal insufficiency is bad

**Ketamine is a great alternative, although no prospective data**

# [Rapid Sequence Intubation]

## **P**rotection and **P**ositioning:

- Cricoid pressure taught for decades
- Recent data questions the notion that cricoid pressure prevents aspiration
- Cricoid pressure may worsen our view
- Which maneuver[s] are important?

# [ Which Maneuvers Is Best? ]

Cadaver study comparing visualization of the glottis using:

- No pressure
- Cricoid pressure
- BURP
- Bimanual laryngoscopy

**1,530 Comparative  
Sets**

Levitan RM. ***Ann Emerg Med*** 2006; 47:548.

# [ Which Maneuvers Is Best? ]

## Results:

- No pressure worst overall
- Bimanual laryngoscopy best overall
- Cricoid pressure most likely to worsen glottic visualization
- BURP usually helps, but can hurt

[ GET THE HEAD OFF THE BED !! ]



# [ Best Head Postion ]

- 456 patients underwent laryngoscopy in both the sniffing position and with simple head extension
- Glottic exposure graded with the Cormack scale

# [ Best Head Postion ]

- In the majority of intubations head position did not impact the glottic view
- In obese patients and in those with limited neck mobility, the **sniffing position** significantly improved glottic visualization

# [ Rapid Sequence Intubation ]

## **P**lacement and **P**roof:

- A direct view of tube passing through the cords remains the best method of assuring proper placement
- All other surrogate methods have pitfalls
- Objective confirmation the standard in the field, in the ED, and in the OR





# [ Misplaced ETT? ]

Citation	N	Misplaced
Katz SH <i>Annals</i> 2001	108	25%
Jemmet M <i>AEM</i> 2003	109	12%
Jones JH <i>AEM</i> 2004	208	5.8%

# [ Things not covered ]

- 5 Drug inductions / pretreatment
- Passive apneic oxygenation
- Ramp position
- Post intubation care
  - Sedation & analgesia
  - Positioning

# [Take Home Essentials]

- #1:** Airway is the most important / complicated part of the job. You need to be ***GREAT*** at it.
- #2:** Know how to anticipate / minimize trouble
- #3:** Know your drug / device choices
- #4:** “*Be good, fast, and smooth*”