

# TRAUMA AIRWAY MANAGEMENT

## A CASE-BASED DISCUSSION

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January 12<sup>th</sup>, 2022

# DISCLOSURES

- Airway Management Education Center, LLC. - Partner
- Wolters Kluwer – Editor/Royalties
- UpToDate – Emergency Medicine – Editor/Royalties



# OBJECTIVES

- What makes trauma patients difficult?
- Intubating the unstable trauma patient
- Managing upper airway distortion
- Rescue oxygenation strategies
- Failed airway management in trauma

WHAT MAKES  
TRAUMA  
CHALLENGING?

Impaired visualization

Hemodynamic instability

Situational chaos

Agitation

# IMPAIRED VISUALIZATION

**Cervical collars**

**Blood/Vomit**

**Distortion**

# HEMODYNAMIC INSTABILITY



# SITUATIONAL CHAOS

Trauma Team activation

Resuscitation Priorities

Procedural needs



AGITATION

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SHOCK

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HYPOXIA

---

INTOXICATION

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PAIN



CASE #1  
TRUCK VS. OCTOGENARIAN

- 89-year-old crossing the street with a walker
- Uhaul truck going 50 mph in a 25 mph
- Patient is thrown 30 feet into a concrete barrier
- EMS arrives, places c-collar.
- No access upon arrival, on facemask oxygen

CASE #1  
TRUCK VS.  
OCTOGENARIAN

A – Facial trauma. SaO<sub>2</sub> 91% on NRB mask


B – RR 20, decreased BS left side

C – Cool, clammy. BP 84/39. HR 121

D – GCS 10, moaning, screaming

E – Clothes removed

# PRIORITIES?

- A.) Intubate immediately for hypoxia
- B.) Secondary survey to identify injuries
- C.) Blood, IV access, needle chest, increase  $\text{FiO}_2$  
- D.) Wrap the pelvis

**Airway First?**

CASE #1  
TRUCK VS.  
OCTOGENARIAN

A – Facial trauma. SaO<sub>2</sub> 91% on NRB mask

B – RR 20, decreased BS left side

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## PHYSIOLOGIC DERANGEMENT

Blood loss

Poor  
cardiovascular  
reserve

Induction  
vasoplegia

Positive  
pressure  
ventilation

# Cardiac Arrest



ELSEVIER

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

# Resuscitation

journal homepage: [www.elsevier.com/locate/resuscitation](http://www.elsevier.com/locate/resuscitation)



EUROPEAN  
RESUSCITATION  
COUNCIL

Clinical paper

## **Peri-intubation cardiac arrest in the Emergency Department: A National Emergency Airway Registry (NEAR) study**

*Michael D. April<sup>a,b,\*</sup>, Allyson Arana<sup>c</sup>, Joshua C. Reynolds<sup>d</sup>, Jestin N. Carlson<sup>e</sup>, William T. Davis<sup>b,c,f</sup>, Steven G. Schauer<sup>b,c,f</sup>, Joshua J. Oliver<sup>b,g</sup>, Shane M. Summers<sup>b,h</sup>, Brit Long<sup>b,f</sup>, Ron M. Walls<sup>i,j</sup>, Calvin A. Brown 3rd<sup>i,j</sup>, For the NEAR Investigators*

**Table 3 – Primary analysis comprising multivariable logistic regression model assessing association between *a priori* candidate variables and peri-intubation cardiac arrest (n = 14,766).**

	Odds Ratio (95% CI)
Age, years	1.0 (1.0–1.0)
Sex: female vs. male	1.4 (0.9–2.1)
Weight, kg	1.0 (1.0–1.0)
Indication: medical vs. traumatic	1.0 (0.7–1.6)
Pre-intubation shock: yes vs. no	6.2 (4.5–8.5) <sup>a</sup>
Pre-intubation oxygenation: hypoxemia vs. normoxemia	3.1 (2.0–4.8) <sup>a</sup>
Intubation need emergent: yes vs. no	1.8 (1.2–2.7) <sup>a</sup>
Initial impression of difficult airway: yes vs. no	0.9 (0.7–1.3)
Difficult airway characteristics: yes vs. no <sup>b</sup>	1.1 (0.9–1.4)
Laryngoscope type: video vs. direct	0.9 (0.7–1.2)
Pre-treatment – vasopressors: yes vs. no	0.5 (0.2–1.3)
Pre-treatment – fentanyl: yes vs. no	0.9 (0.2–3.1)
Paralytic agent: none vs. succinylcholine	0.5 (0.2–1.2)
Paralytic agent: rocuronium vs. succinylcholine	1.2 (0.9–1.7)
Suspected sepsis: yes vs. no	0.7 (0.4–1.0)
Induction agent: ketamine vs. etomidate	1.6 (1.0–2.5)
Induction agent: none vs. etomidate	2.0 (0.7–6.1)
<i>C-statistic/ROC AUC</i>	0.81

Abbreviations: AUC-area under the curve; ROC-receiver operator curve.

<sup>a</sup> Confidence interval does not include 1.

<sup>b</sup> Difficult airway characteristics coded as yes if the patient had at least one of the following: reduced neck mobility, Mallampati score greater than 1, reduced mouth opening, airway obstruction, facial trauma, and blood or vomit in airway.



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

**Resuscitation**

journal homepage: [www.elsevier.com/locate/resuscitation](http://www.elsevier.com/locate/resuscitation)



Clinical paper

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Shock Index > 0.8?



**Resuscitate  
Then  
Intubate**

## PLAN OF ACTION

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IV, O2, Monitor: Volume lines if possible.

---

10-15 minute resuscitation (uncrossmatched blood).

---

Increase oxygen flow rate to flush (50 lpm).

---

Needle left chest.

---

Reassess → Shock-sensitive RSI with chest tube.



**½ dose etomidate**

FLUSH RATE OXYGEN?

# Flush Rate Oxygen for Emergency Airway Preoxygenation



Brian E. Driver, MD\*; Matthew E. Prekker, MPH, MD; Rebecca L. Kornas, MD; Ellen K. Cales, MD; Robert F. Reardon, MD

\*Corresponding Author. E-mail: [briandriver@gmail.com](mailto:briandriver@gmail.com), Twitter: [@brian\\_driver](https://twitter.com/brian_driver).

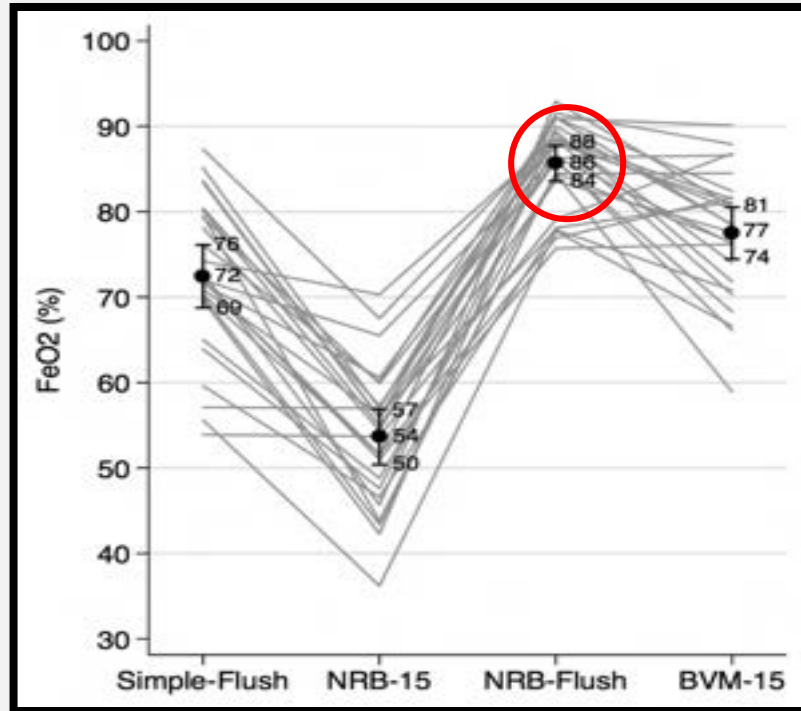


# Flush Rate Oxygen for Emergency Airway Preoxygenation

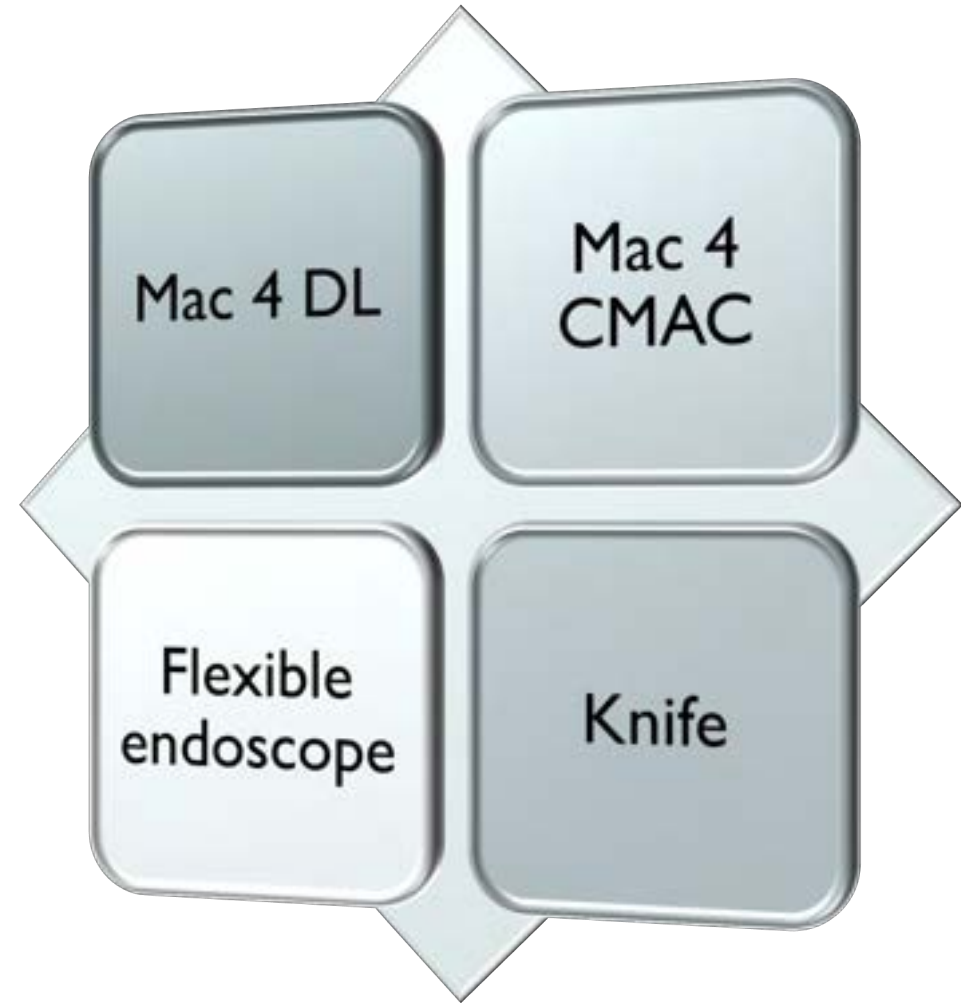


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\*Corresponding Author. E-mail: [briandriver@gmail.com](mailto:briandriver@gmail.com), Twitter: [@brian\\_driver](https://twitter.com/brian_driver).

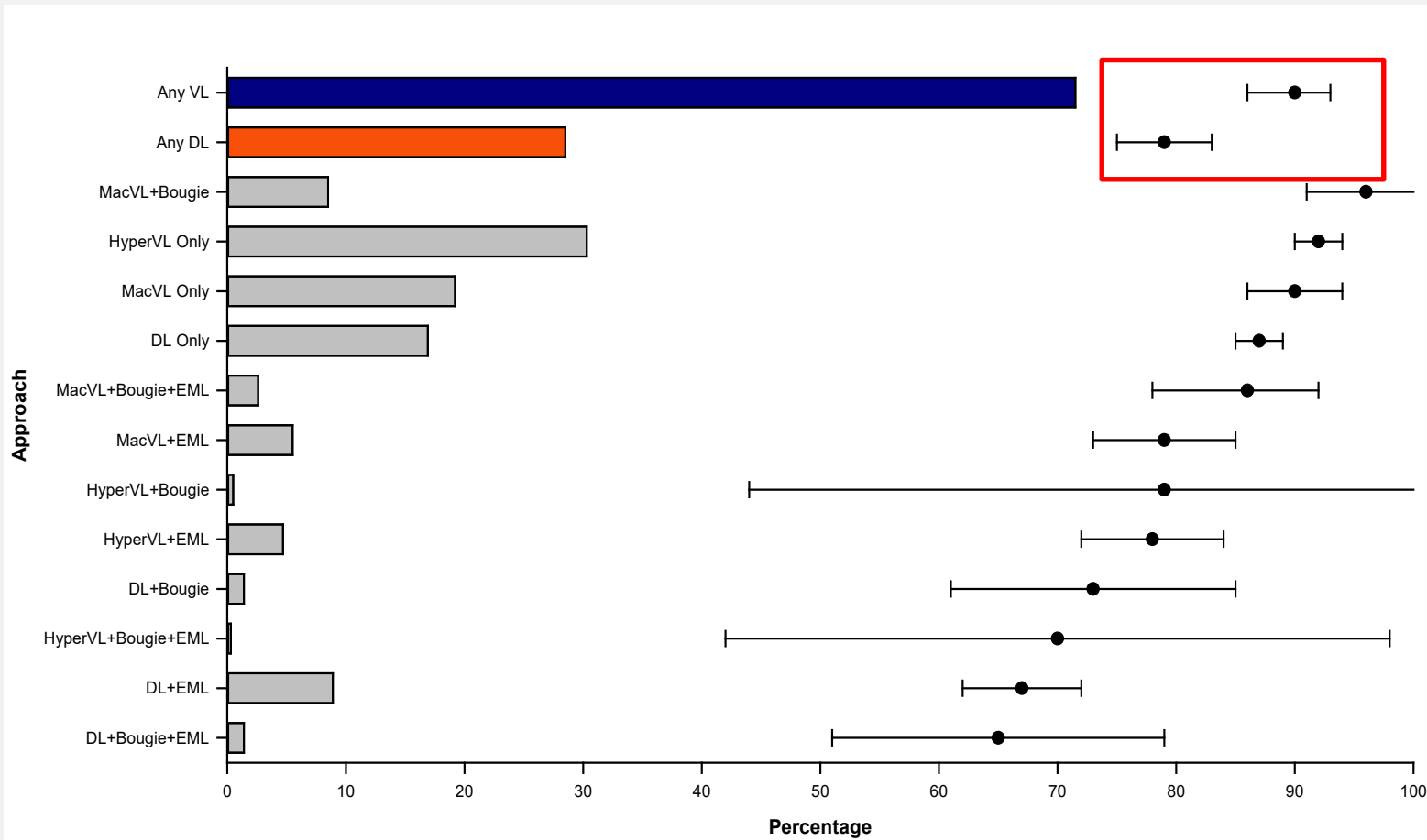


WHICH DEVICE?



Video Laryngoscopy is Associated With First-Pass  
Success in Emergency Department Intubations for  
Trauma Patients: A Propensity Score Matched  
Analysis of the National Emergency Airway  
Registry

Stacy A. Trent, MD, MPH\*; Amy H. Kaji, MD, PhD; Jestin N. Carlson, MD; Taylor McCormick, MD; Jason S. Haukoos, MD, MSc;  
Calvin A. Brown III, MD; on behalf of the National Emergency Airway Registry Investigators



Proportion of attempts (N = 3,999)  
 First Pass Success (95% CI)

Yes,  
 even if  
 the  
**Airway**  
 is  
**bloody**



## CALVIN'S CRITICAL CONCEPTS

Instability is the biggest risk

Resuscitate before you intubate

Shock sensitive RSI

Video laryngoscopy is THE tool to use.



## CASE #2

### PHEASANT HUNTING GONE AWRY

- 17-year-old presents with neck swelling and dyspnea.
- Bird hunting with friends in Franklin, NH
- Shot in the neck with bird shot
- Swelling progressing steadily but not rapidly
- Starting to have trouble handling secretions
- Feeling short of breath

CASE #2  
PHEASANT  
HUNTING GONE  
AWRY

A – Left neck swelling. SaO<sub>2</sub> 99%. Trismus

B – RR 28, lungs clear


C – Warm, good pulses. BP 124/89. HR 121

D – GCS 15, MAEW

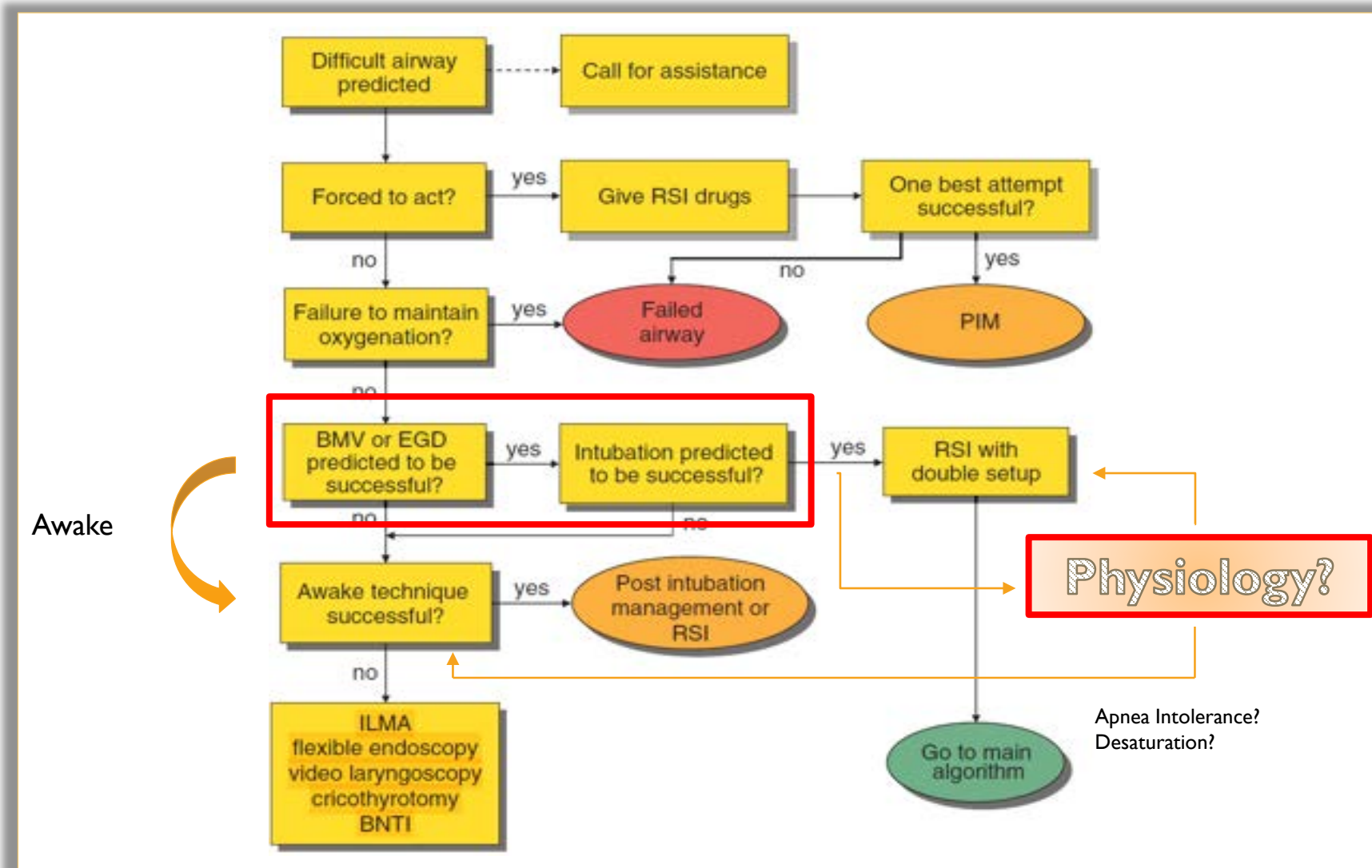
E – Upper clothes removed – no other injury



# PRIORITIES?

- A.) Urgent RSI with VL for progressive swelling
- B.) Awake flexible endoscopic evaluation and intubation 
- C.) Resuscitate with blood because of instability
- D.) Immediate cricothyrotomy as intubation is doomed to failed

# THE DIFFICULT AIRWAY ALGORITHM



# TOOLS YOU WILL NEED



# MEDS YOU WILL NEED





# AWAKE INTUBATION RECIPE

No  
Needles

Glycopyrolate  
0.2 mg IV

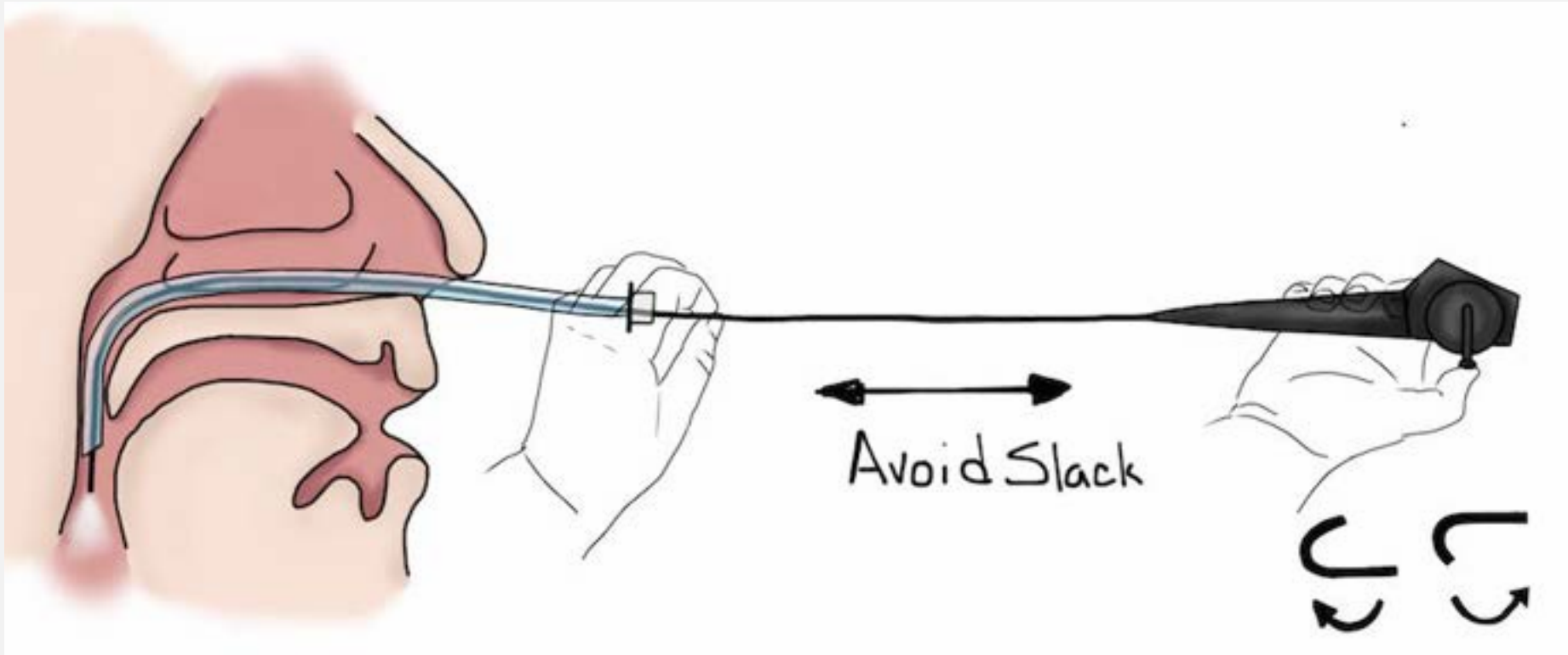
15 minutes

Afrin  
2 sprays

4% Aqueous Lidocaine  
3-5 cc *Nebulized*

4% aqueous Lidocaine  
3-5 cc *Atomized*

5% lidocaine paste  
1" on base of tongue



Subtotal Nasotracheal Intubation FIRST!

## CALVIN'S CRITICAL CONCEPTS

Airway distortion can confound orotracheal intubation.

Obstruction is minor – awake VL

Obstruction is advanced – often flexible endoscope

If there is no time → FTA RSI followed by cric.



## CASE #3 THERMAL AIRWAY INJURY

- 79-year-old presents with stridor and respiratory distress.
- Rescued from house fire 3 hours ago.
- No burns but inhaled super-heated air
- OSH wanted to intubate → patient refused.
- Patient arrived sounding like...



CASE #3  
THERMAL  
AIRWAY INJURY

A – Stridulous. SaO<sub>2</sub> 99% on FM oxygen

B – RR 28, lungs scattered wheezing

C – Warm, good pulses. BP 184/89. HR 121

D – GCS 15, MAEW

E – Upper clothes removed – no other injury

# PRIORITIES?

- A.) Immediate RSI and VL with 5-0 ETT
- B.) Awake flexible endoscopic evaluation with likely intubation
- C.) Place an iGel/LMA and attempt to ventilate
- D.) Immediate cricothyrotomy as intubation is doomed to failed

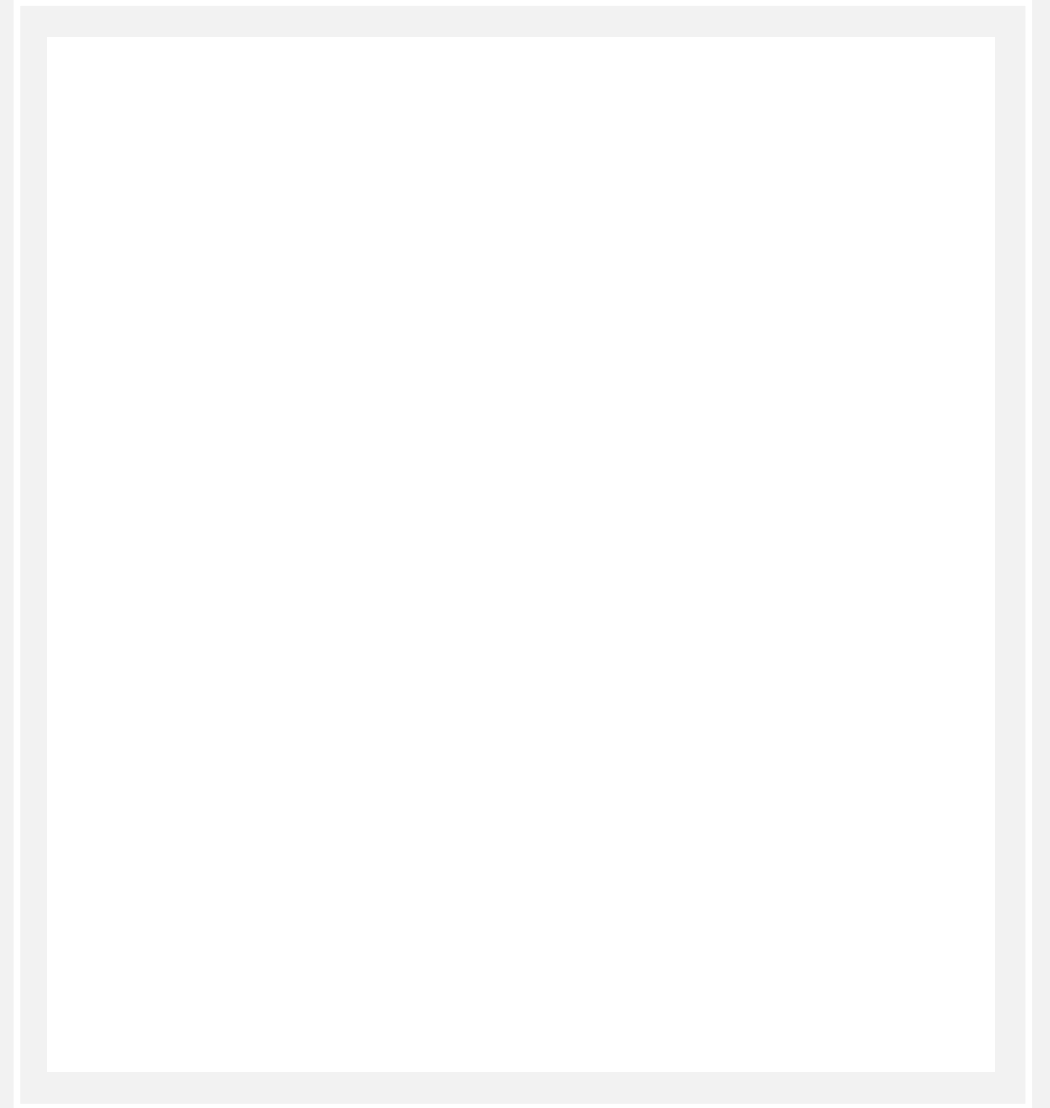


Significant swelling

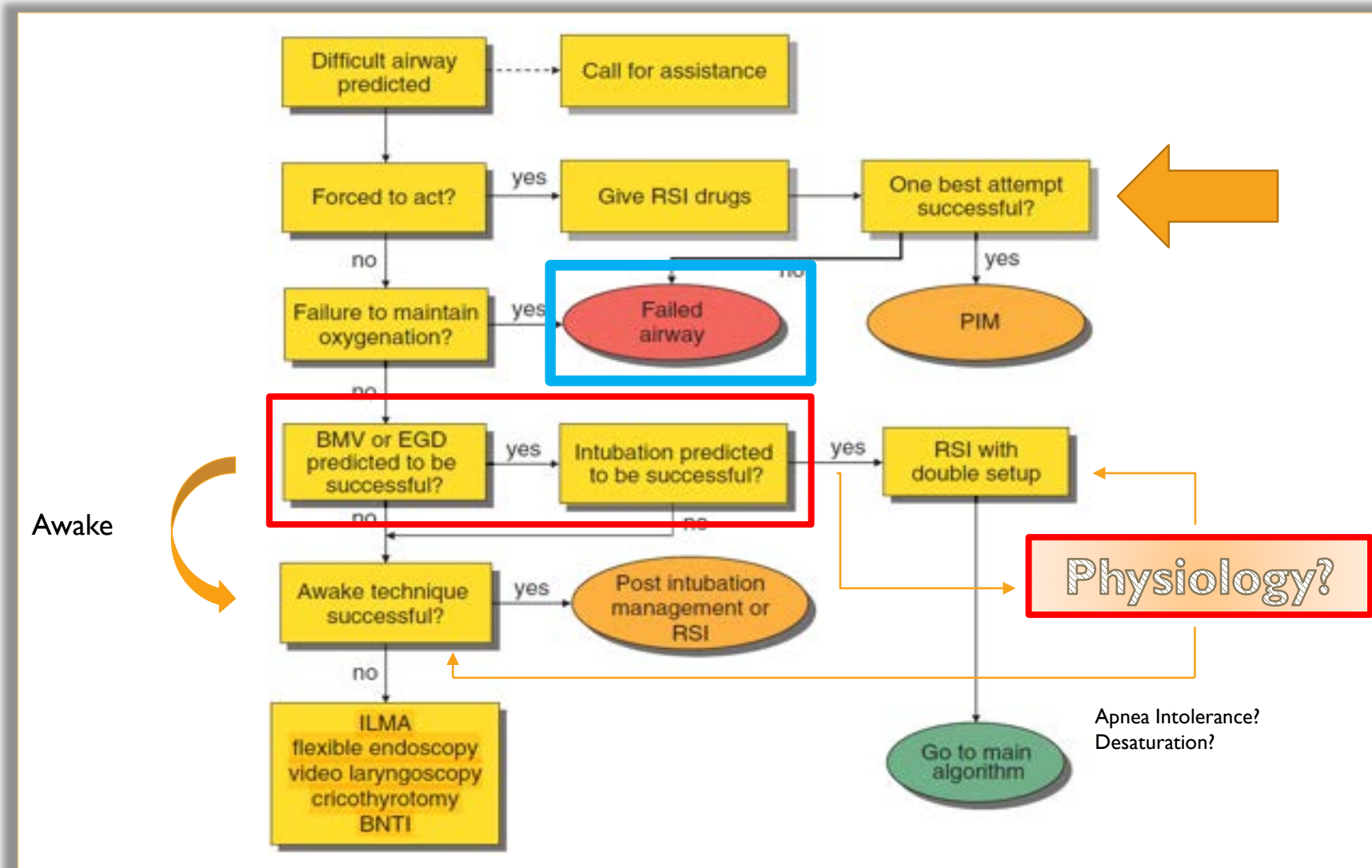
Inspiratory stridor

Then.....she obstructs, is tugging to breathe but clearly there is no air movement.

**What next???**



# THE DIFFICULT AIRWAY ALGORITHM





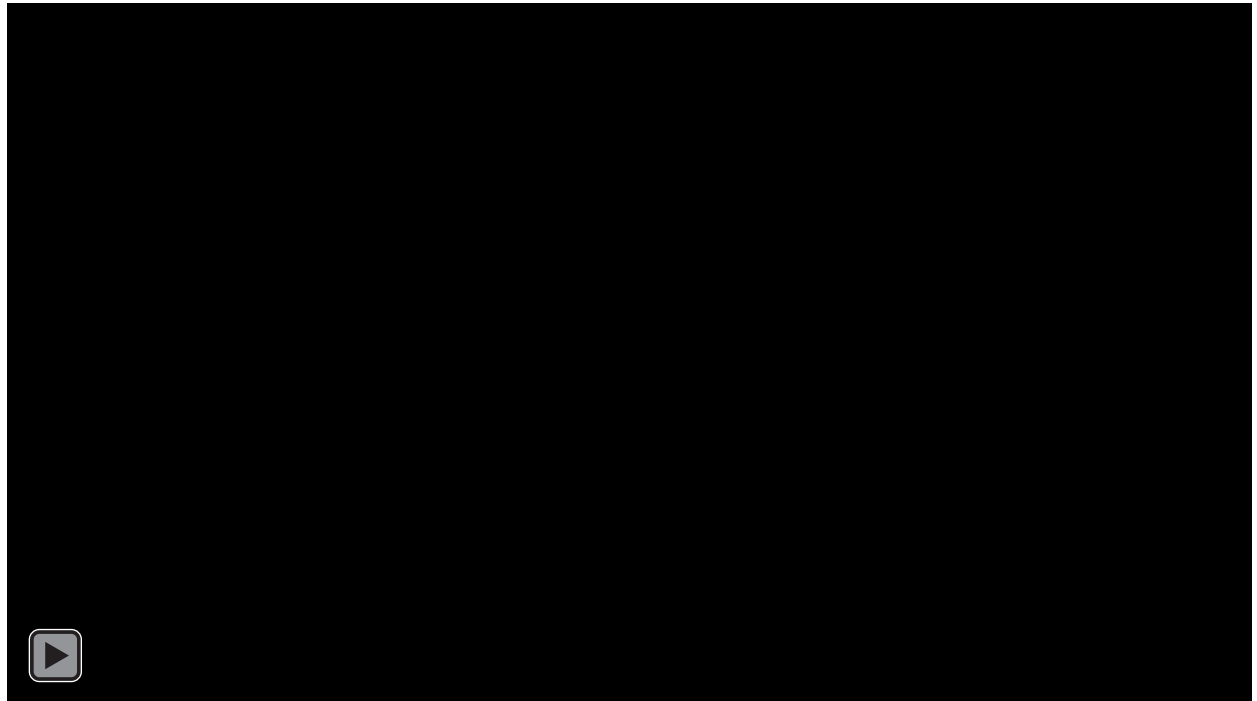
# Cricothyrotomy

# CRICOTHYROTOMY PROCEDURE

- Our strongly held opinion of the best method:
  - 1) Open surgical technique: 3 to 6 cm vertical skin incision, horizontal CTM stab incision with #10 or #20 scalpel, rotate blade into sagittal plane.
  - 2) Pass bougie\* (15F, males; 10F, females) into airway.
  - 3) Pass cuffed ETT (6.0 mm, males; 4.5 mm females).
  - 4) Inflate cuff, remove bougie.
  - 5) \*consider trach hook first if high BMI

# CRICOTHYROTOMY

Recommended  
Technique



Open, Bougie-assisted Cricothyrotomy (BAC)

## CALVIN'S CRITICAL CONCEPTS

Cl:CO → Cric

Performed in < 90 seconds

Bougie-aided

\*\*\* Getting yourself to do it is the biggest hurdle.



## CASE #4 MY LEG HURTS

- 36-year-old presents with altered mental status and right leg pain.
- Drinking, fell from 3<sup>rd</sup> floor balcony onto pavement.
- 280 lbs. Bearded. R open femur fracture.
- Screaming in pain, hard to control. C-collar placed.

CASE #4  
MY LEG HURTS

A – SaO<sub>2</sub> 99%. Agitated. Maintaining airway


B – RR?? Lungs clear. No chest trauma

C – BP 104/72. HR 101. R open femur,  
swelling thigh compartment

D – GCS 13. Moving everything x R leg

E – Clothes cut off.

# PRIORITIES?

- A.) Intubate to facilitate workup 
- B.) Ortho consult and gentamicin for open fracture
- C.) Central access for fluids/blood
- D.) CT scan to identify internal injuries

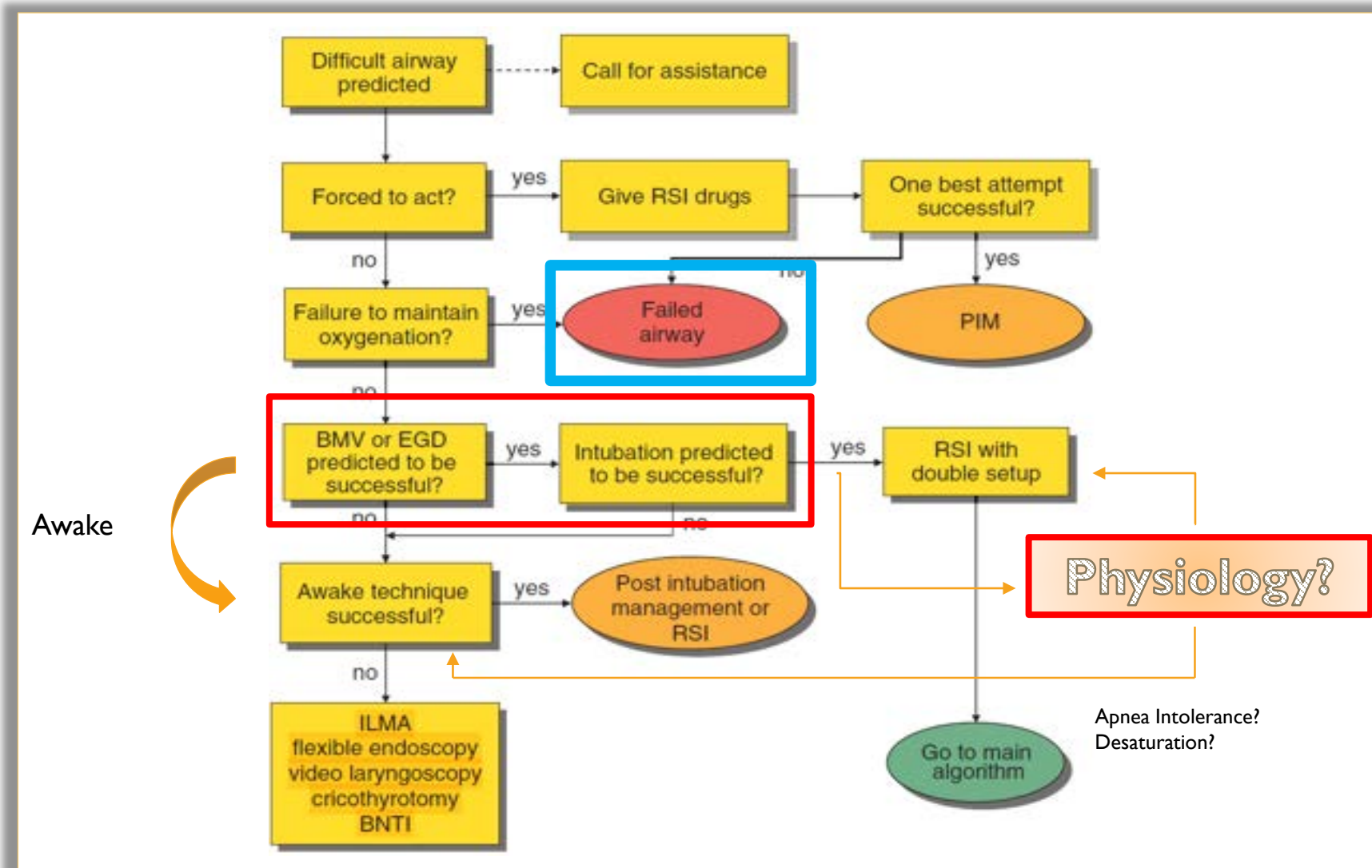
## RSI WITH DOUBLE SETUP

- GVL yields CL 2a view.
- Can't navigate chords with ETT.
- Sats slowly drop into upper eighties.
- Attempts at bagging → confounded by habitus and beard.
- SaO<sub>2</sub> – 84% slowly dropping

**What next?**



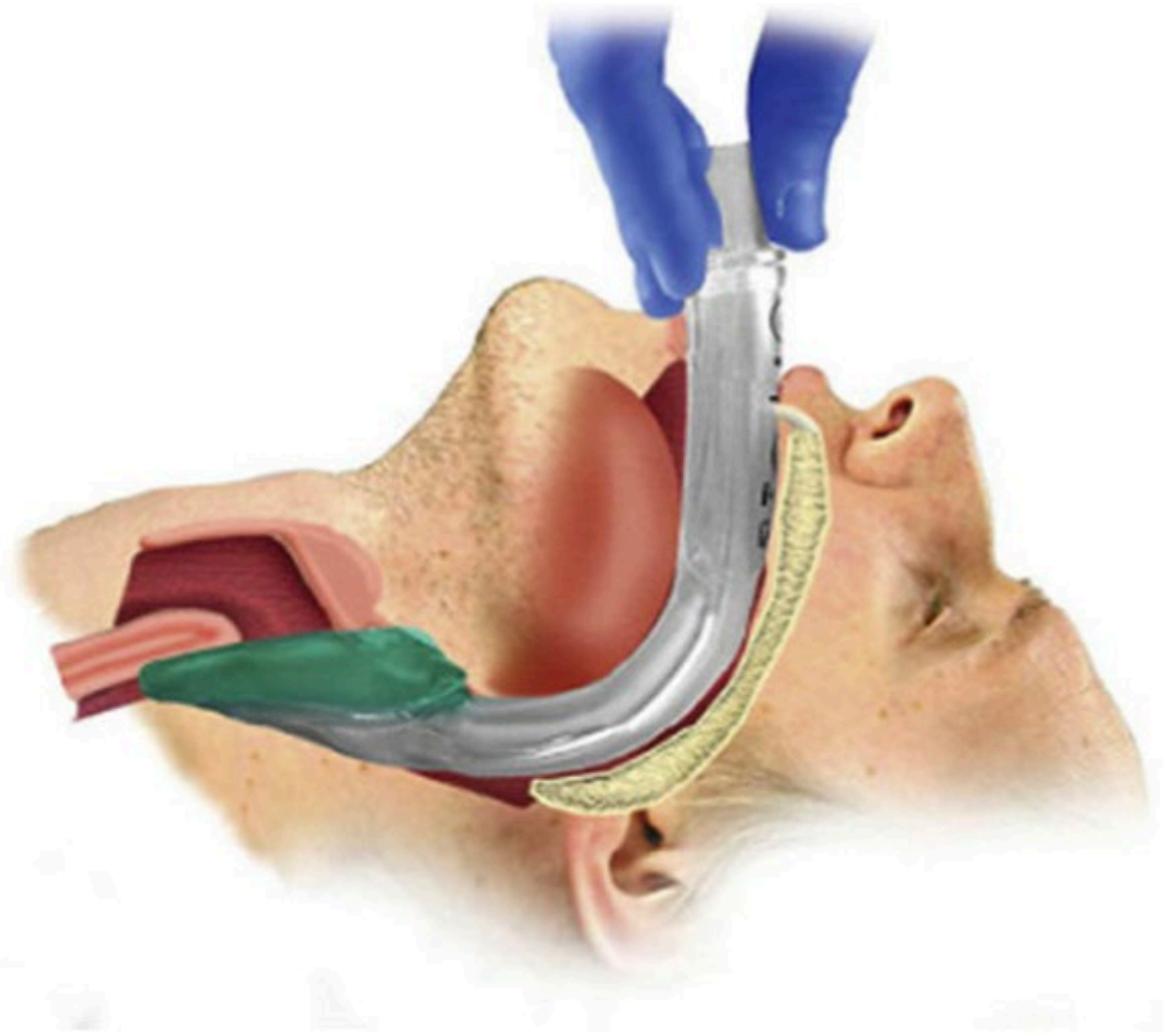
# THE DIFFICULT AIRWAY ALGORITHM



## HOW DO YOU RESCUE THIS AIRWAY?

- A.) Cricothyrotomy
- B.) Place a size 5 iGel
- C.) Switch to DL
- D.) Call for help





IGEL IN SITU

AIRWAY/EXPERT CLINICAL MANAGEMENT

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# Managing the Out-of-Hospital Extraglottic Airway Device

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0196-0644/\$-see front matter

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<https://doi.org/10.1016/j.annemergmed.2019.03.002>

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## WHY AN EGD?

- Oxygen is most important
- Can facilitate endotracheal intubation
- Can stay in place for 4 hours
- Blindly and easily placed
- Successful when placed
- Might save the patient from getting a cric

0.3%

## CALVIN'S CRITICAL CONCEPTS

EGD is an underutilized reoxygenation tool. Highly successful when placed.

Consider when bagging is challenging.

If sats continue to drop → Cric



**THE END**

Questions?