the difficult airway course™ EMS

"Basic" Airway Management

Critical and Hardly Basic

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Medical Director, Rio Rancho and Corrales Fire Departments

University of New Mexico Health Science Center, Albuquerque

Medical Director, *The Difficult Airway Course: EMS*

Associate Editor, *The Walls Manual of Emergency Airway Management*

Disclosure

Partner in the Airway Management Education Center (AMEC) purveyor of the

Difficult Airway Course: EMS™

Essentials of Airway Management

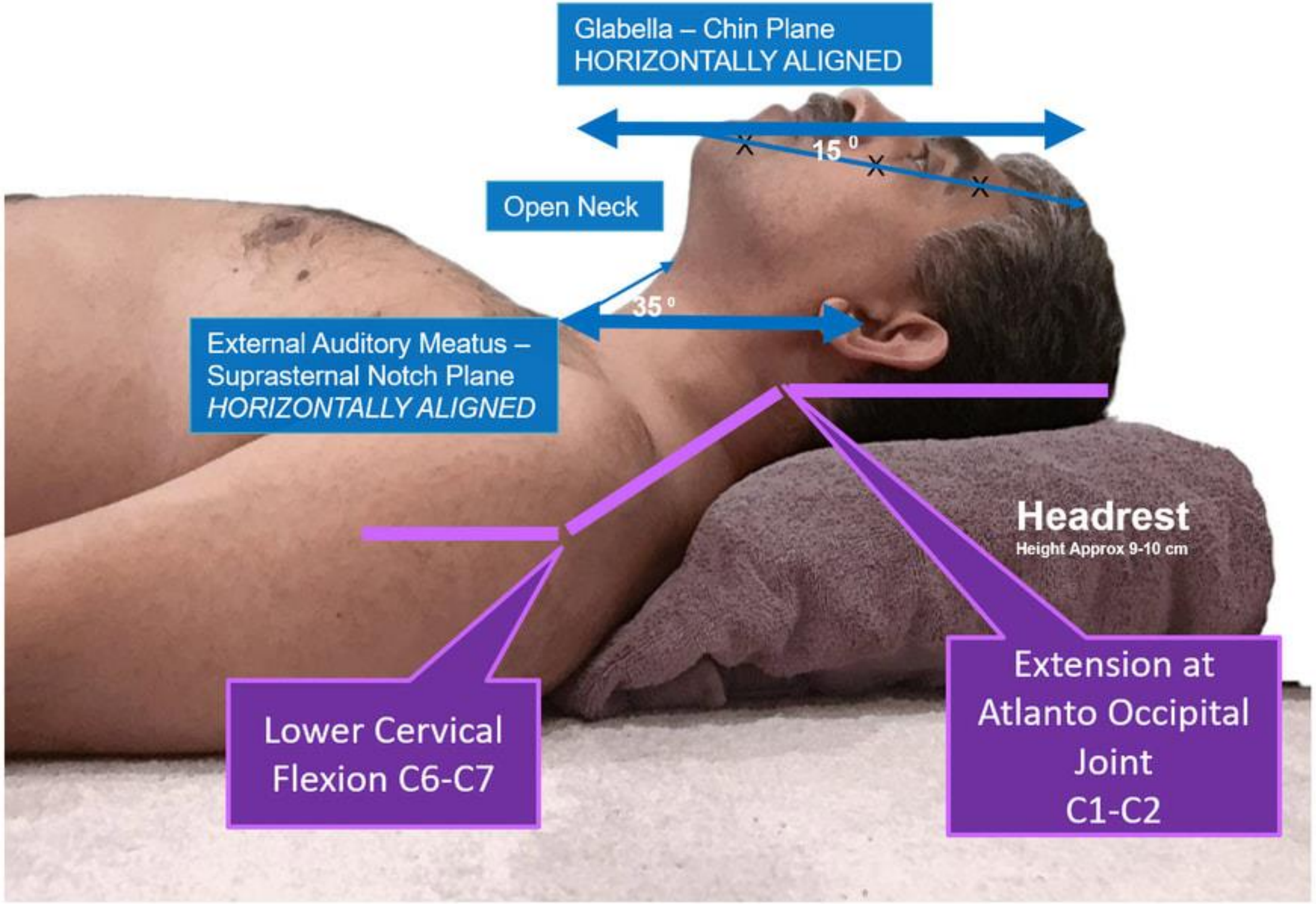
Fundamentals of Airway Management

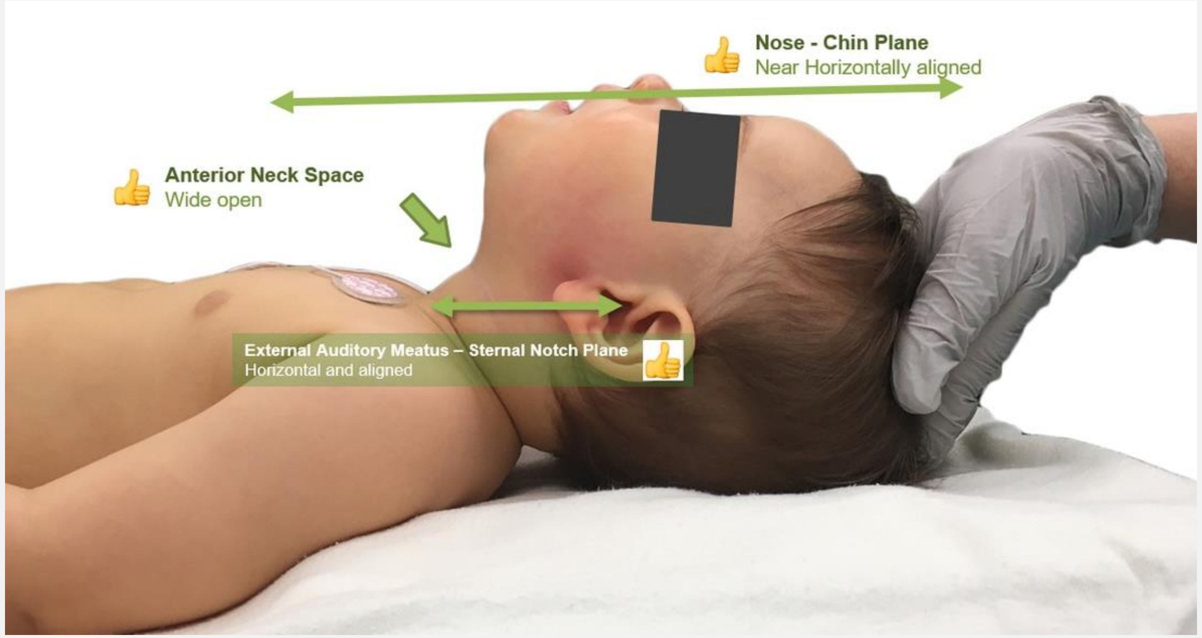
POSITIONING IS ADVANCED AIRWAY MANAGEMENT

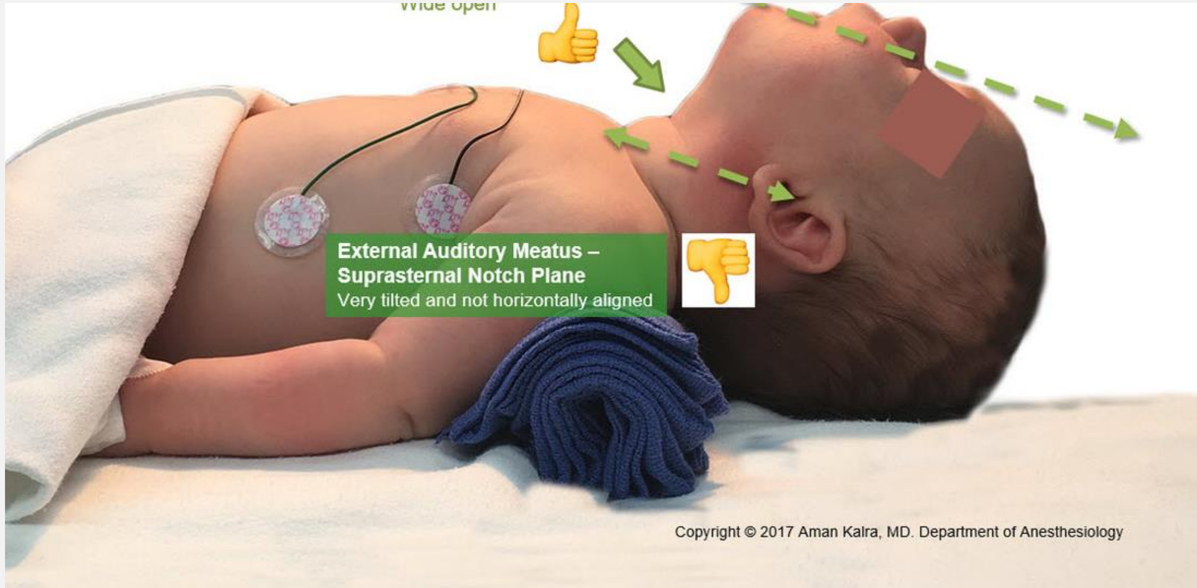
1. Open the airway
2. Prevent aspiration
3. Improve respiratory physiology
4. Set up for next steps including intubation

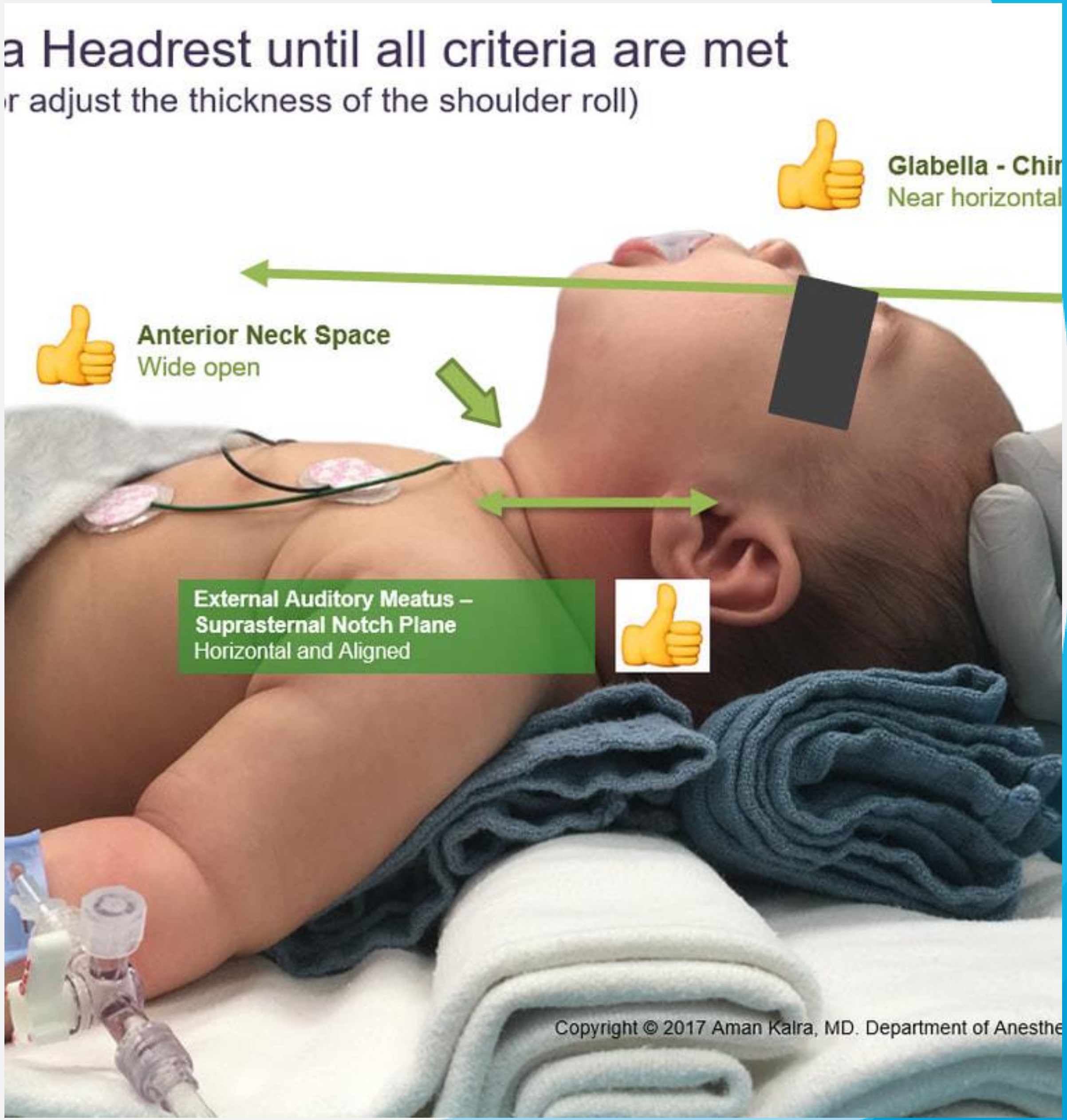
Lateral recumbent

The Classic "Sniffing Position" in Adults

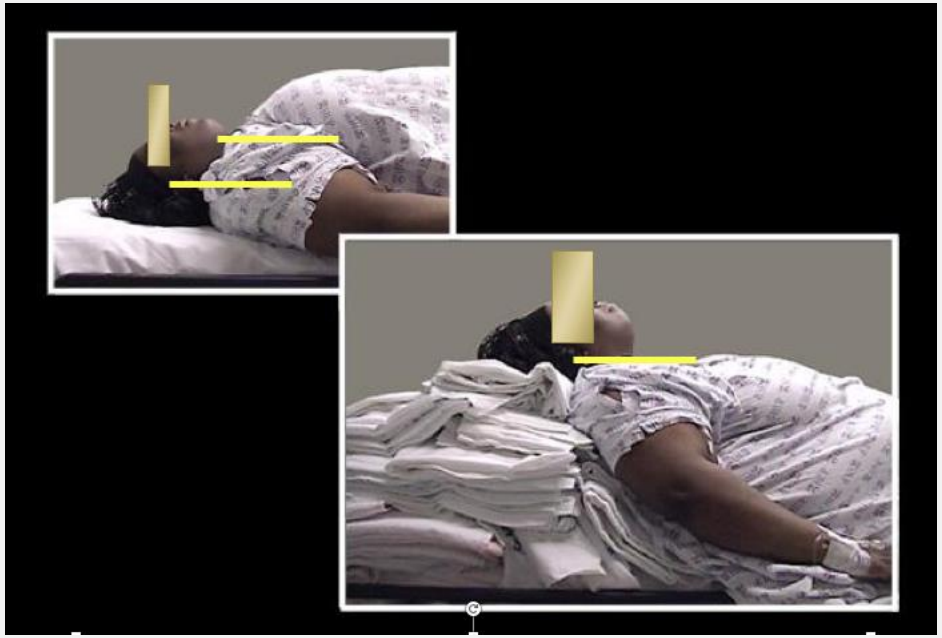



Nose - Chin Plane
Near Horizontally aligned
Anterior Neck Space
Wide open
External Auditory Meatus – Sternal Notch Plane
Horizontal and aligned


External Auditory Meatus –
Suprasternal Notch Plane
Very tilted and not horizontally aligned
Copyright © 2017 Aman Kalra, MD. Department of Anesthesiology


Headrest until all criteria are met
adjust the thickness of the shoulder roll)
Anterior Neck Space
Wide open
External Auditory Meatus –
Suprasternal Notch Plane
Horizontal and Aligned
Copyright © 2017 Aman Kalra, MD. Department of

Ramped Position



AirwayCam Technologies

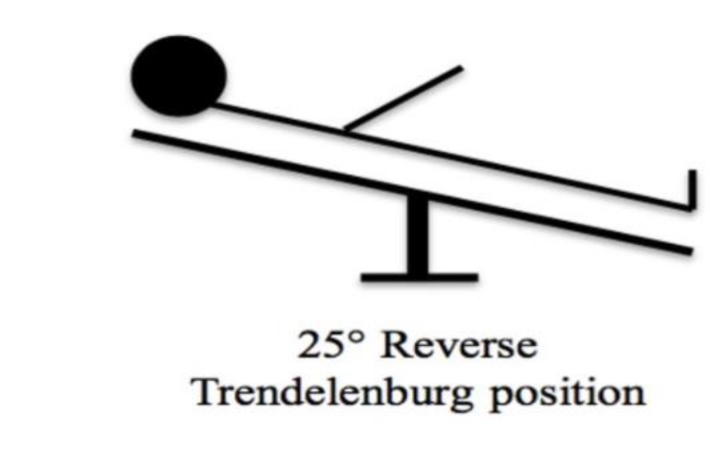
EDExam.com

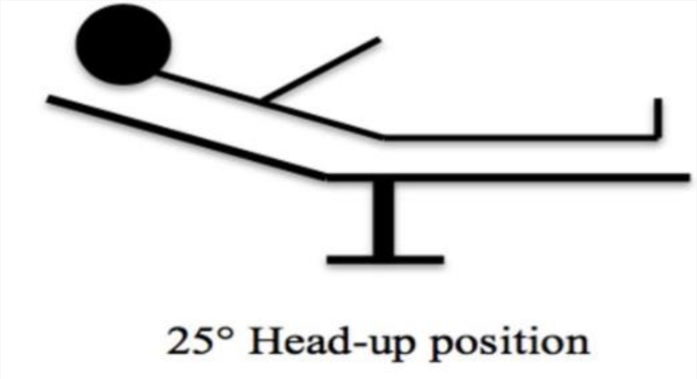
An Easier way to “RAMP”

Advanced Ramped Position

Photo courtesy of Erik Laurin, MD

Reverse trendelenburg 25^0 Head up





Anne-Sophie Falempin et al. BMJ Open 2019;9:e029761

Mask Ventilation – the most important medical procedure

And one of the hardest!

Bag-Mask Ventilation (BMV) Mastery

Four Critical Factors to Optimal BMV

1

Fully Open Airway

+

2

Tight Mask Seal

+

3

Deliver Appropriate volume

+/- PEEP

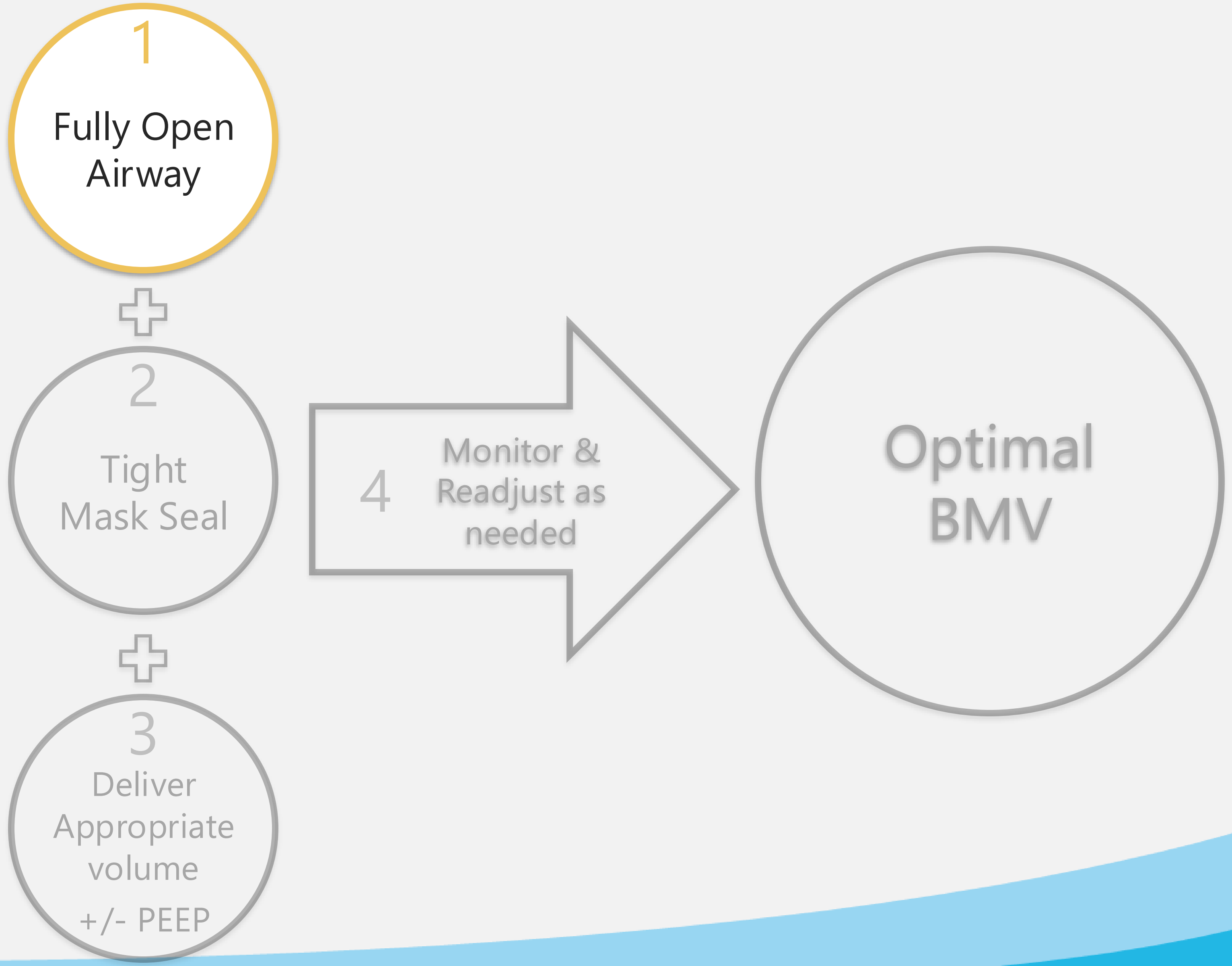
4

Monitor & Readjust as needed

Optimal BMV

Bag-Mask Ventilation (BMV) Mastery

Open Airway



Bag-Mask Ventilation (BMV) Mastery

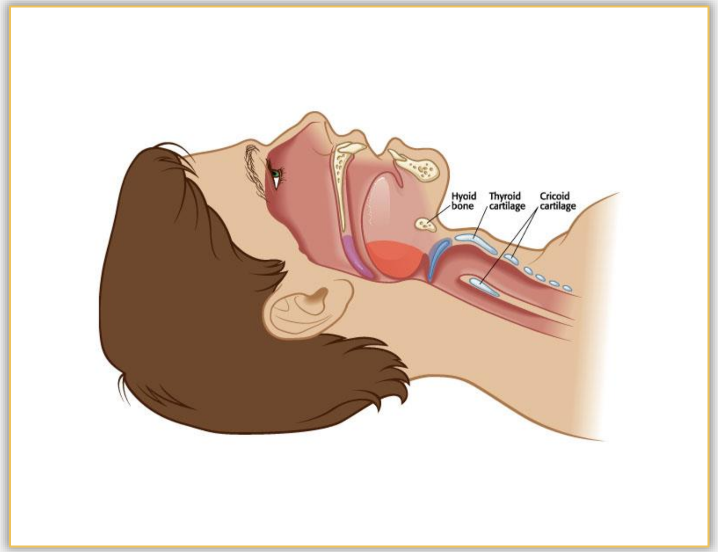
Open Patient Airway

- Air follows path of least resistance

- If airway not MAINTAINED wide open the air will go down the esophagus rather than into lungs
  - Positioning
  - Move the jaw forward
  - Add adjuncts

  - Tongue is the enemy =>>>>>

- Create resistance where you don’t want air to go
  - Cricoid pressure

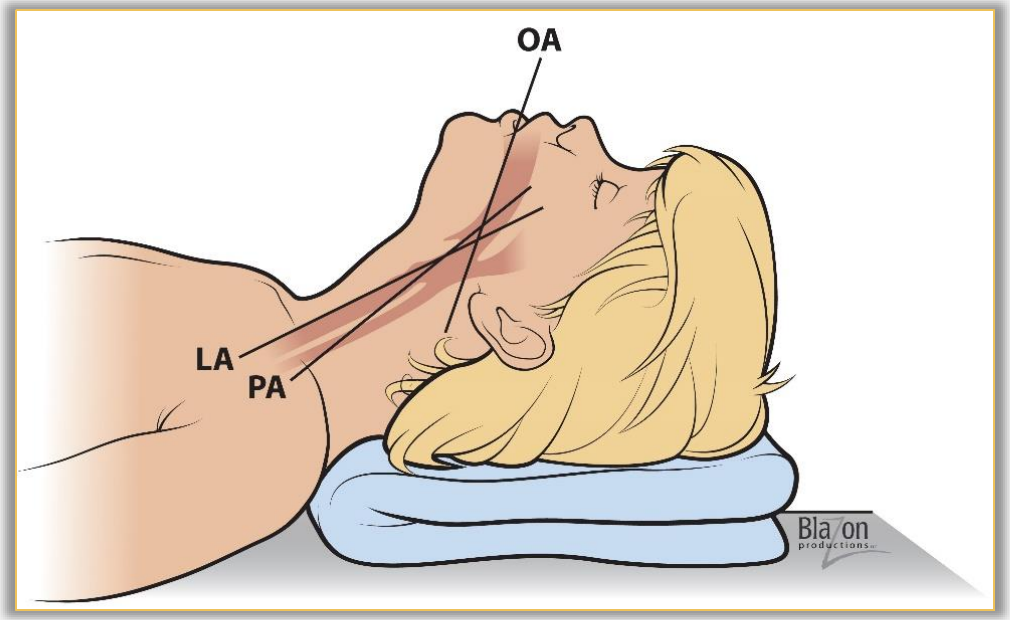


Manual of Emergency Airway Management, 4th Edition

Open Patient Airway

Positioning

Sniffing Position



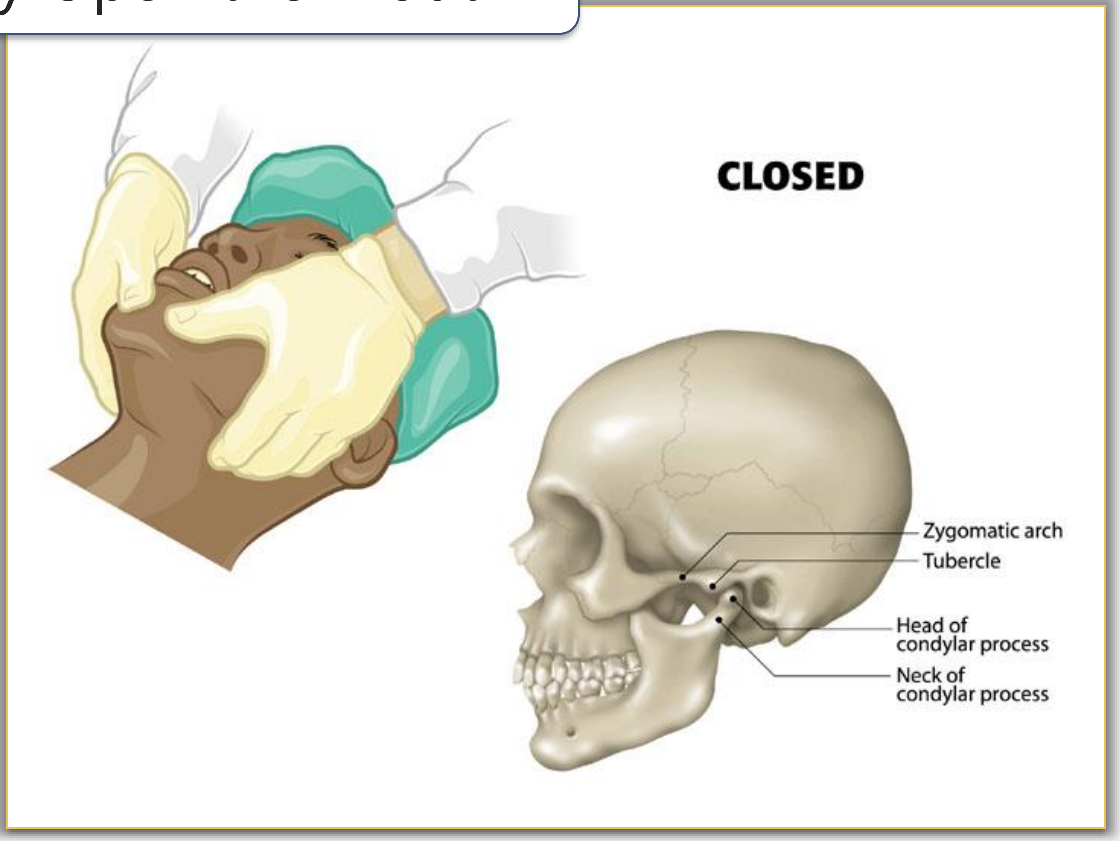
Ramped Position

PRESUMES NO CONCERN FOR CERVICAL INJURY

Open Patient Airway

Move the Jaw

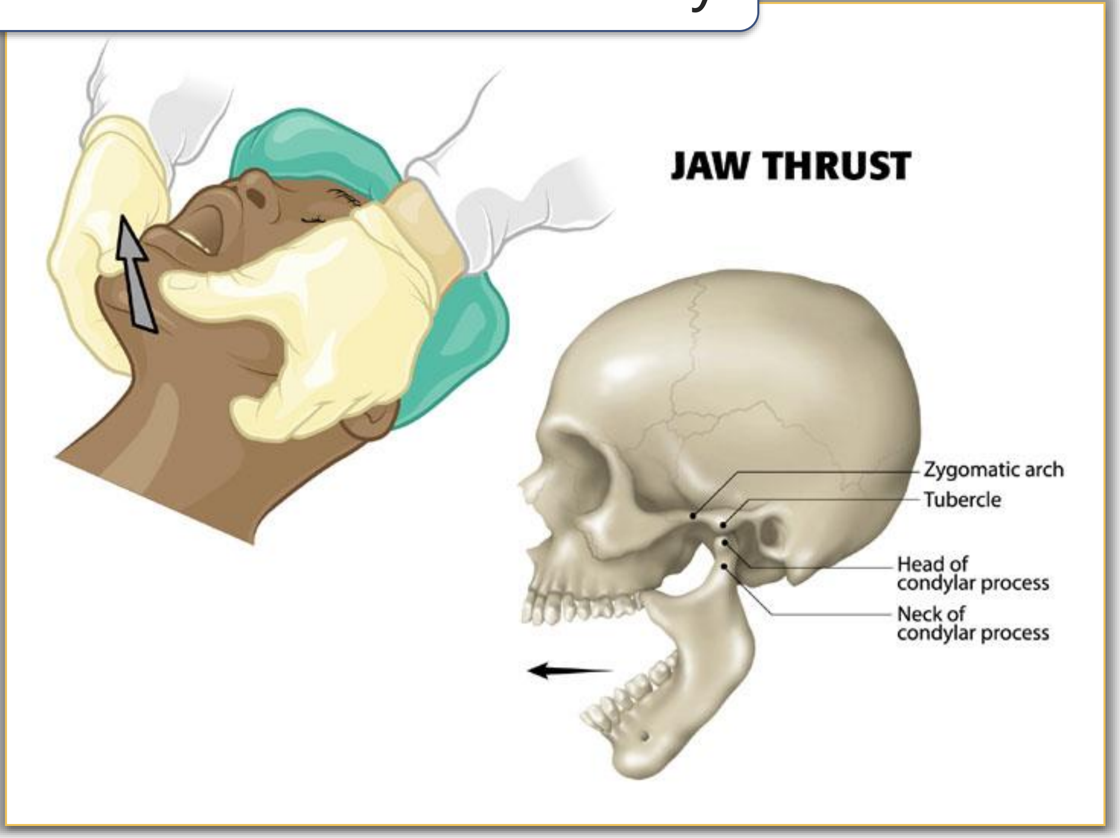
Fully Open the Mouth



Manual of Emergency Airway Management, 4th edition

Move the Jaw

Translate Mandible Anteriorly



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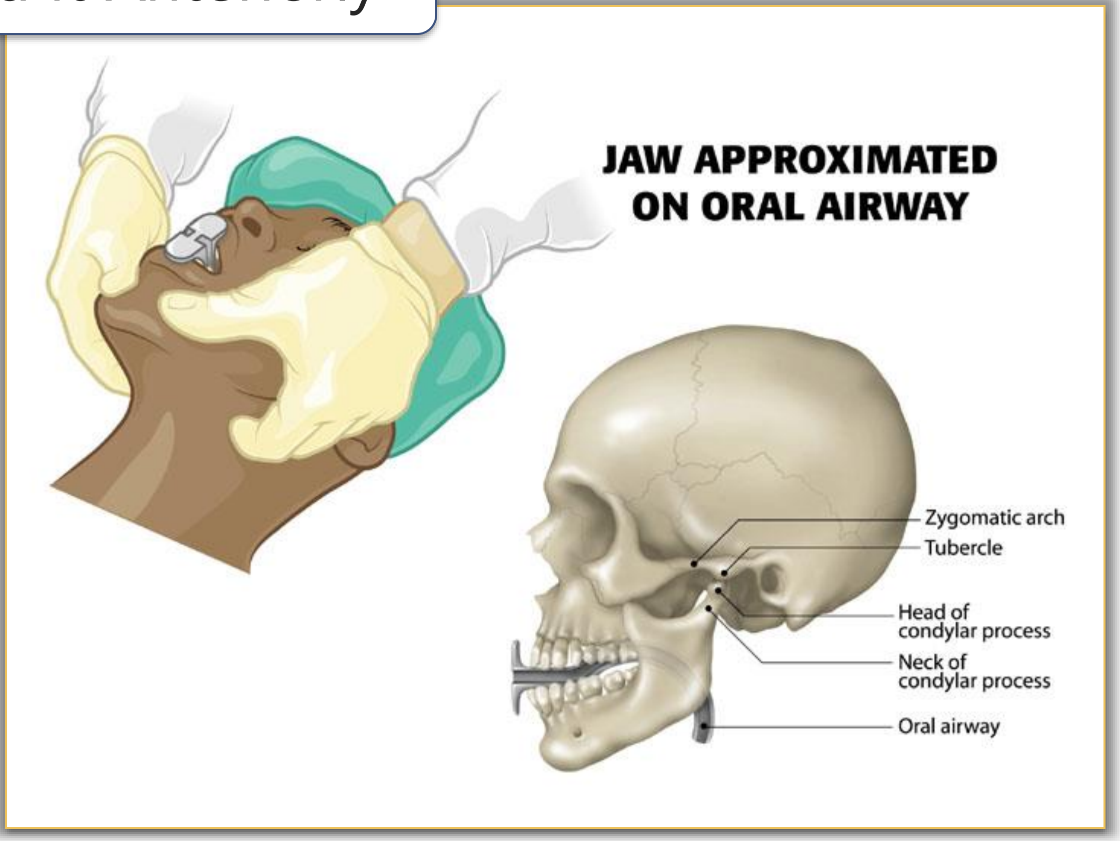
Open Patient Airway

Move the Jaw

Hold it Anteriorly



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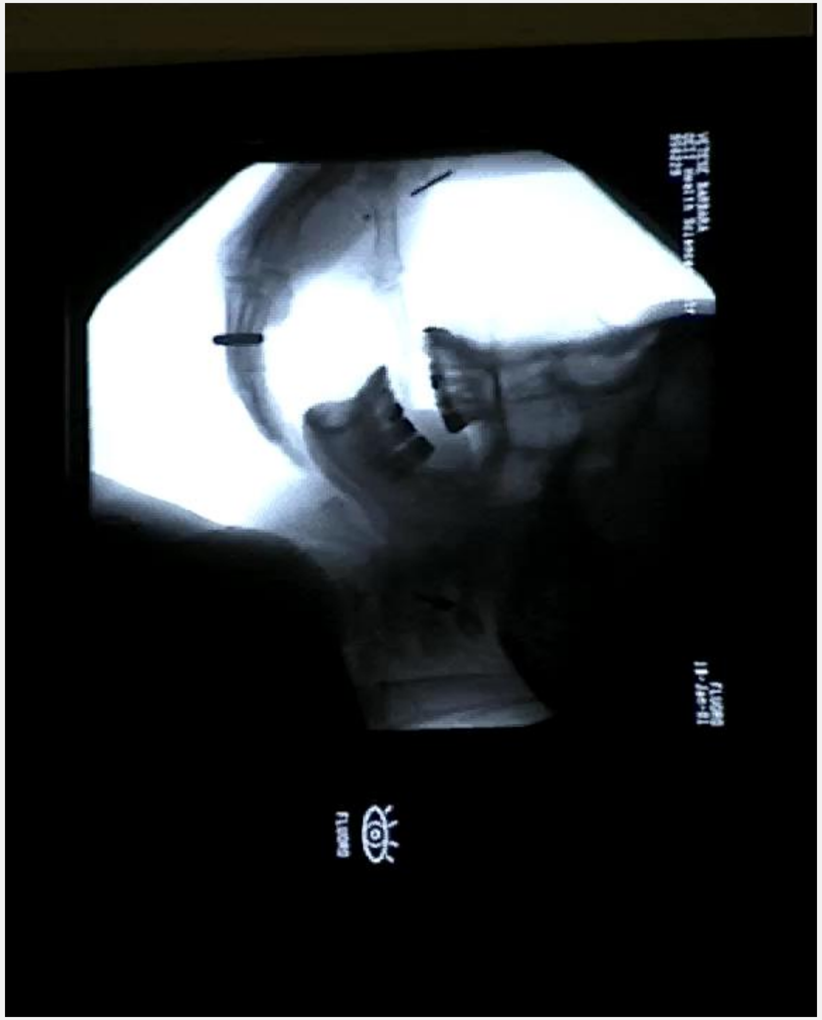
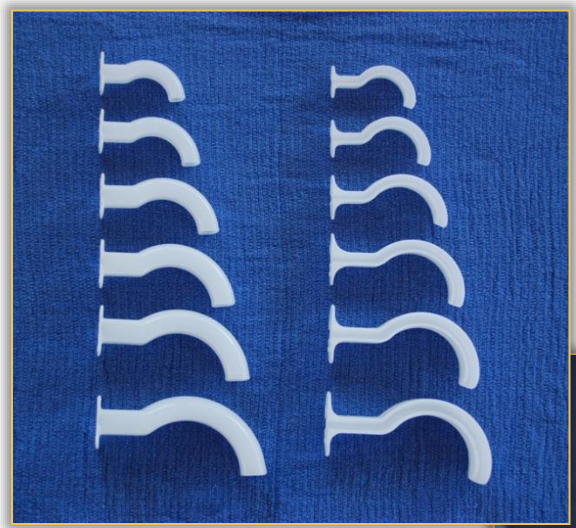
Open Patient Airway

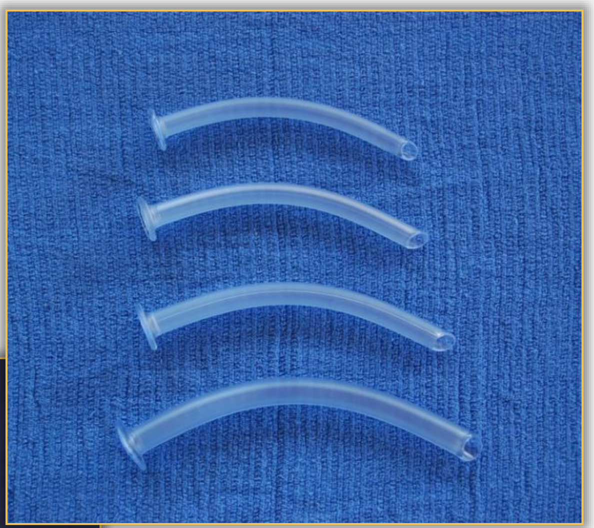
Improving the Airway



Open Patient Airway

Don’t Forget Your Airway Adjuncts!

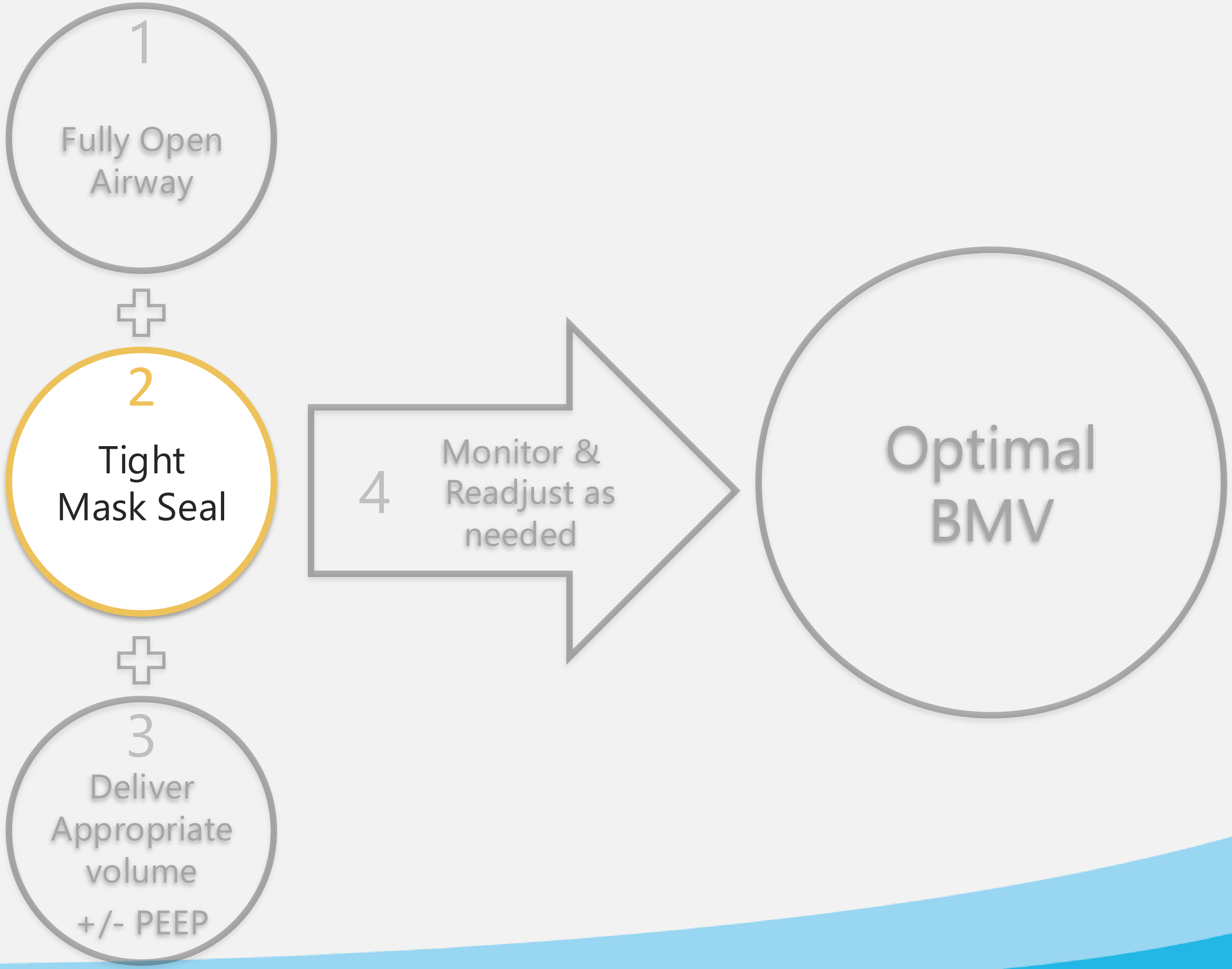




Fill every hole with plastic!

Bag-Mask Ventilation (BMV) Mastery

Creating a Tight Mask Seal



Bag-Mask Ventilation (BMV) Mastery

Creating a Tight Mask Seal

- Right size mask
- Spread mask first!
- Right grip
  - Two people
  - TE vs EC
  - Pull the face to the mask

Creating a Tight Mask Seal

Right Size Mask

Manual of Emergency Airway Management, 4th Edition

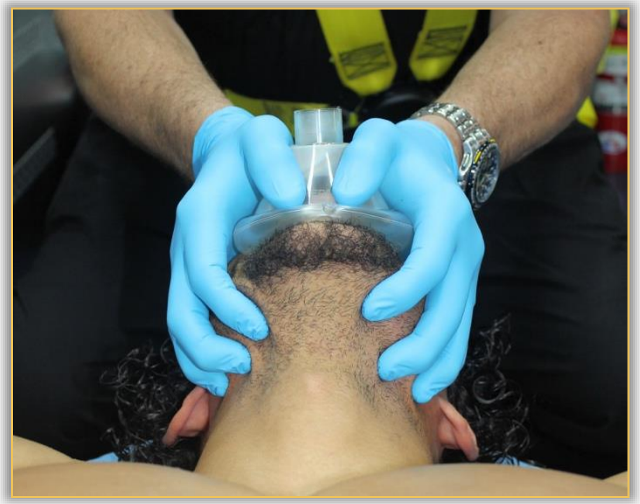
Creating a Tight Mask Seal

How Do I Hold the Mask?

Poor

OK

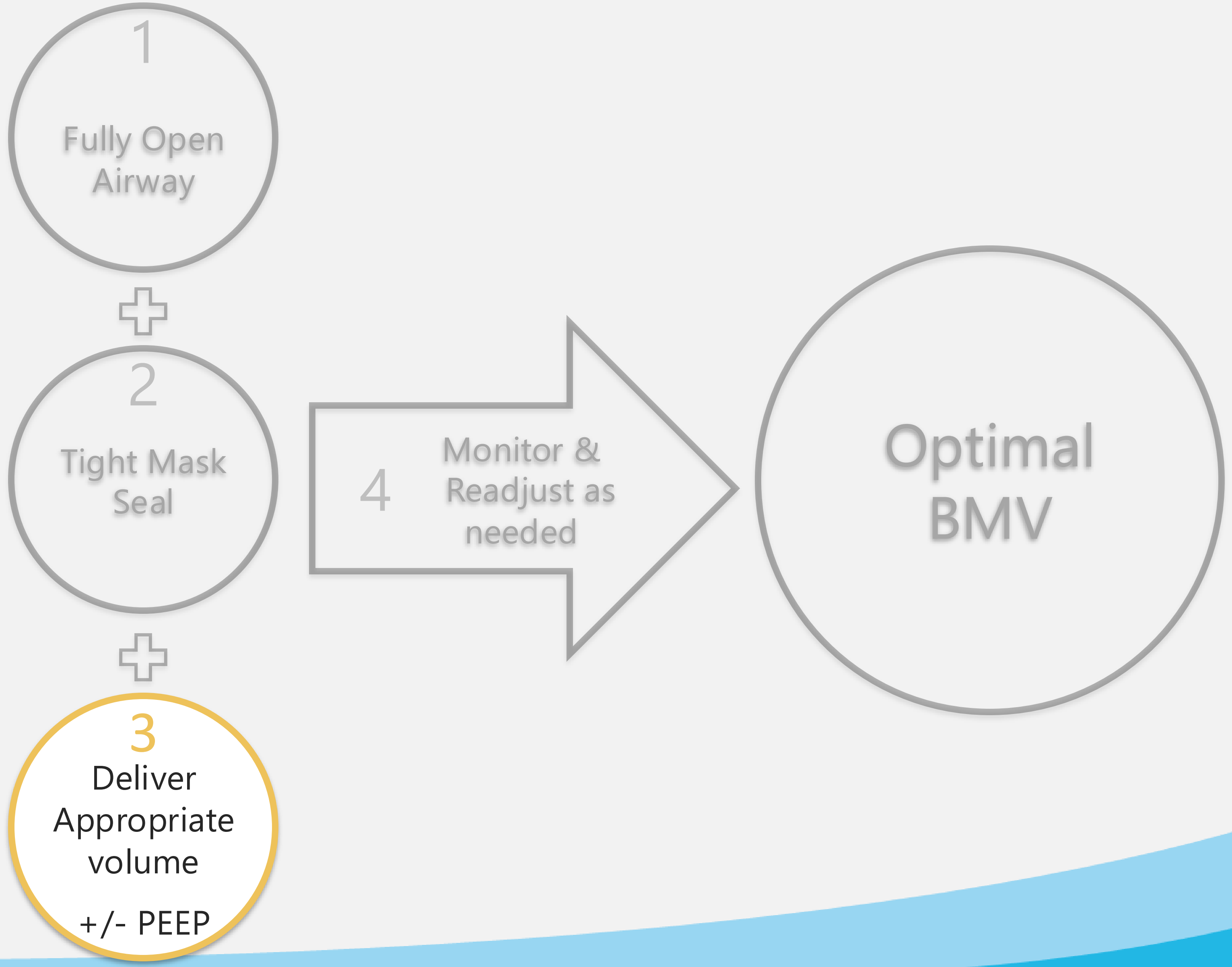
Best



Photos courtesy of Harris County Emergency Corps

Bag-Mask Ventilation (BMV) Mastery

Deliver Appropriate Volume



Over-ventilation kills!

1. Direct barotrauma
2. Reduced cardiac output
3. Effect on cerebral blood vessels

What's our target volume?

~ 6 ml/kg of IDEAL BODY WEIGHT

Enough to just barely see chest rise

Can Altering Grip Technique and Bag Size Optimize Volume Delivered with Bag-Valve-Mask by Emergency Medical Service Providers?

Melissa Kroll, MD, Jyoti Das, BS, Jeffrey Siegler, MD

Prehospital Emergency Care ■/■ 2018 Volume 0 / Number 0

Table 2. Median tidal volume (mL) by BVM size and number of fingers used

BVM Size	# of fingers	Median (mL)	95% CI (mL)
Adult	1	794.0	763–825
Adult	2	834.5	807–862
Adult	3	836.0	807–864
Adult	All scenarios	826.5	800–853
Pediatric	1	547.0	533–561
Pediatric	2	571.5	559–584
Pediatric	3	576.0	565–588
Pediatric	All scenarios	563.5	552–575

WHAT'S OUR TARGET RATE?

Age and disease dependent

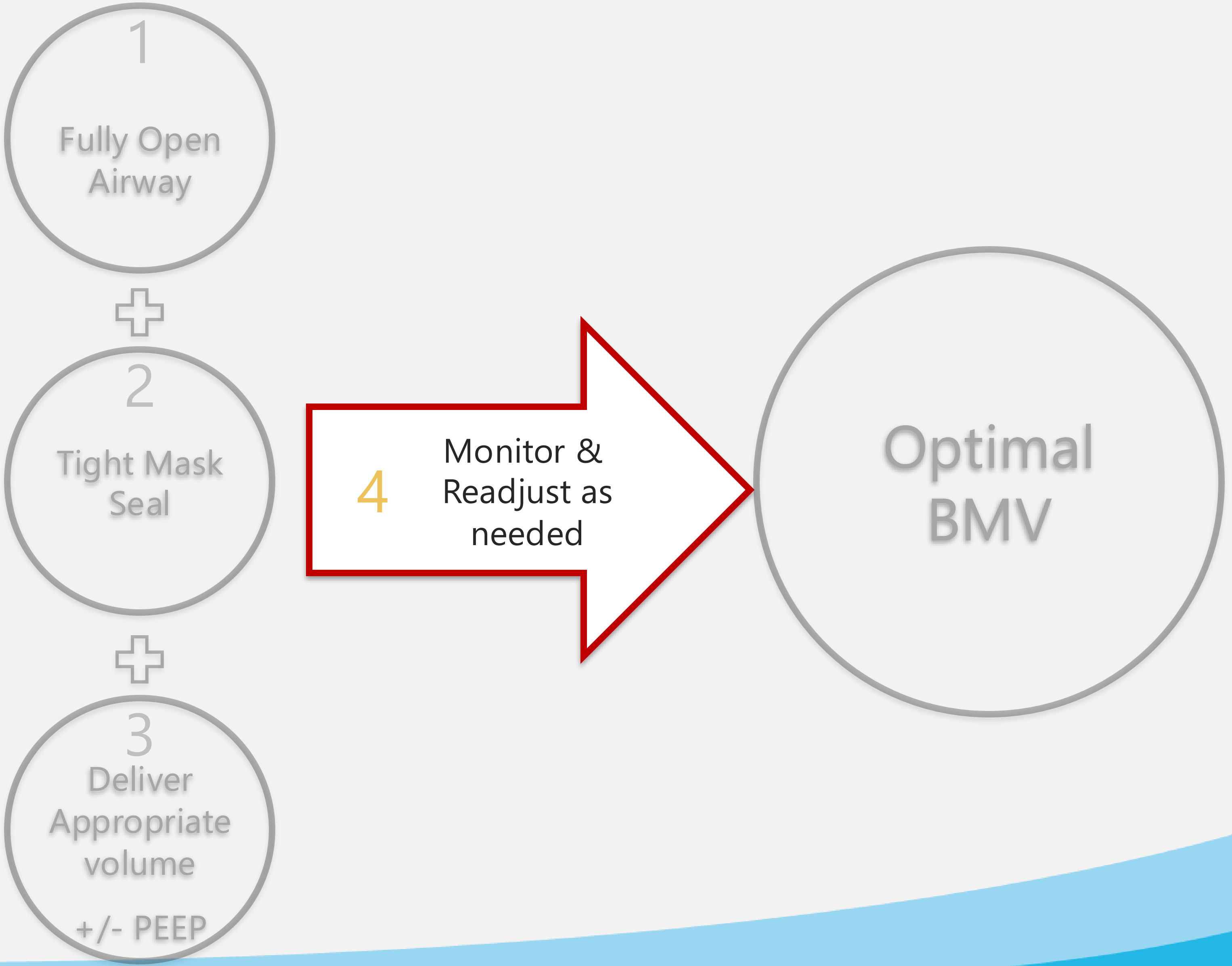
What "Minute Ventilation" do they need

WHAT'S OUR TARGET PRESSURE?

< 30 mm Hg

Bag-Mask Ventilation (BMV) Mastery

Monitor & Readjustment

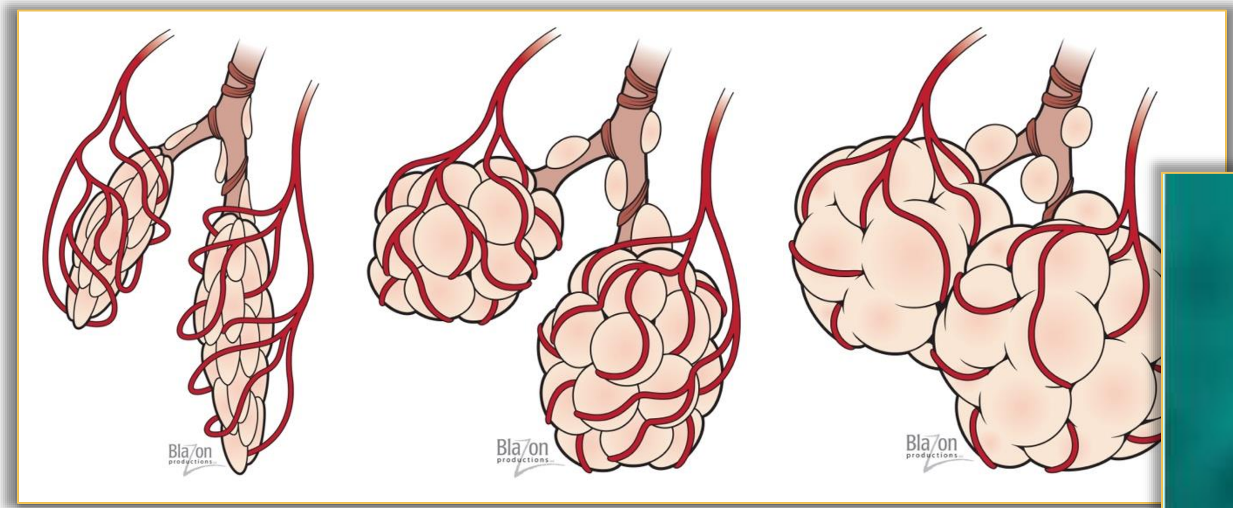


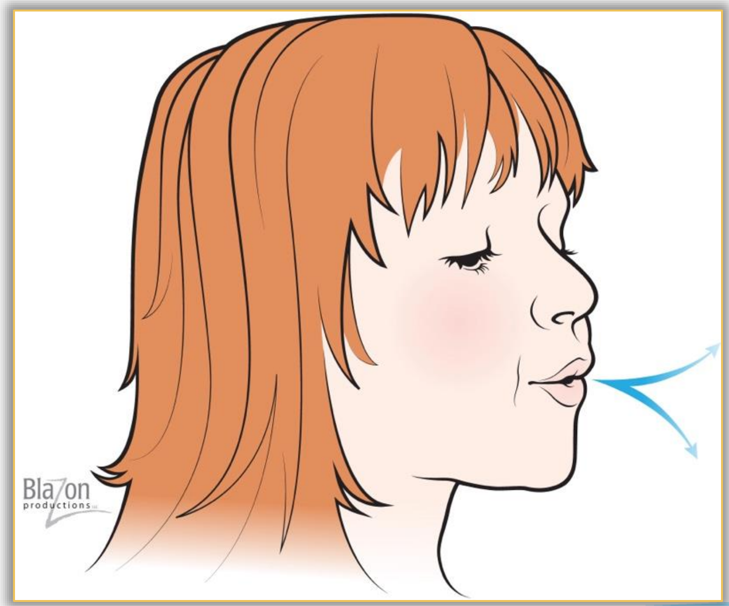
Constant Monitoring and Readjustment

- Audible/palpable air leak
- Subtle chest rise
- Compliance/resistance/pressure
  - Some bags include manometer to measure pressure
- Lung sounds
- Saturation
- Capnography

What if the SAT does not come up?

Add PEEP for Hypoxemia





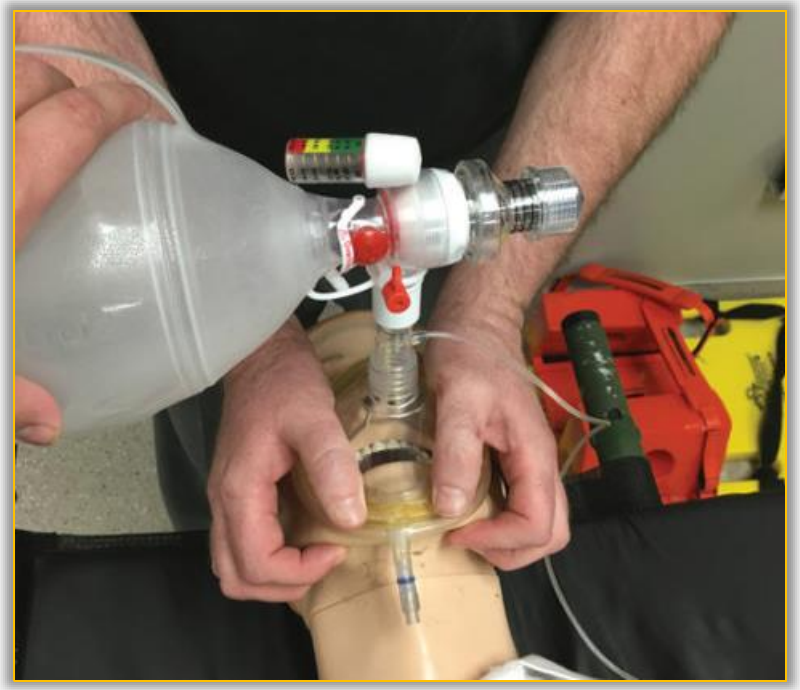
PEEP

- How much PEEP to add?
  - Common
    - Start with 10 if hypoxemic
      - Titrate up with persistent hypoxemia
      - Titrate down if blood pressure low or airway pressure high

BMV with Capnography: A New Standard

Waveform capnography is an essential component of optimal mask ventilation and is utilized regularly in the OR. This configuration provides for the following advantages:

- Control of respiratory rate and volume.
- Confirmation of perfusion status and adequacy of ventilation
- Mask seal confirmation



Used with permission from JEMS

Monitor and Readjustment

Waveform Capnography in Mask-Ventilation

Waveform

- Indicator of quality of seal
  - During exhalation
- Indicator of patency of airway
- Helps assure complete exhalation

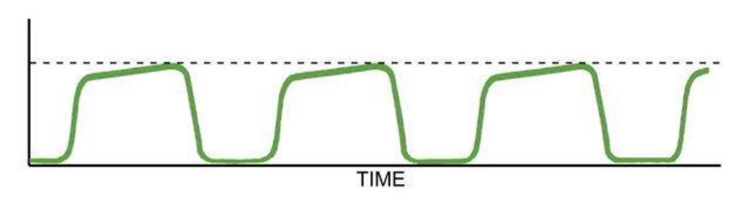
Numerical Value

- General indicator of over or under-ventilation
- In most cases want the ETCO2 30 to 40

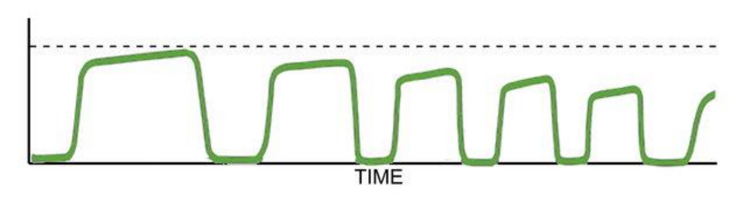
Monitor and Readjustment

BMV with Capnography: Control Ventilation Rate

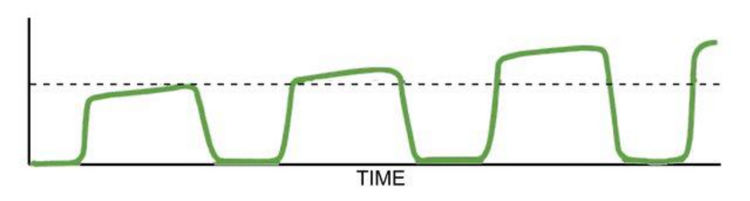
Normal Waveform



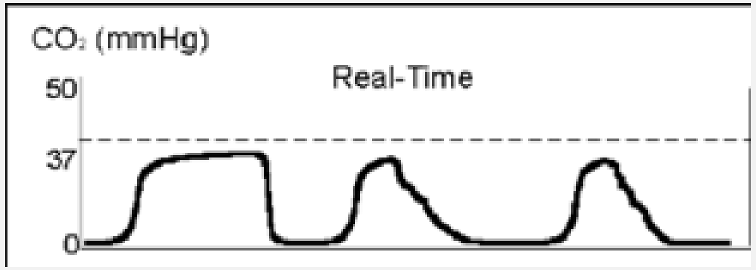
Hyperventilation



Hypoventilation



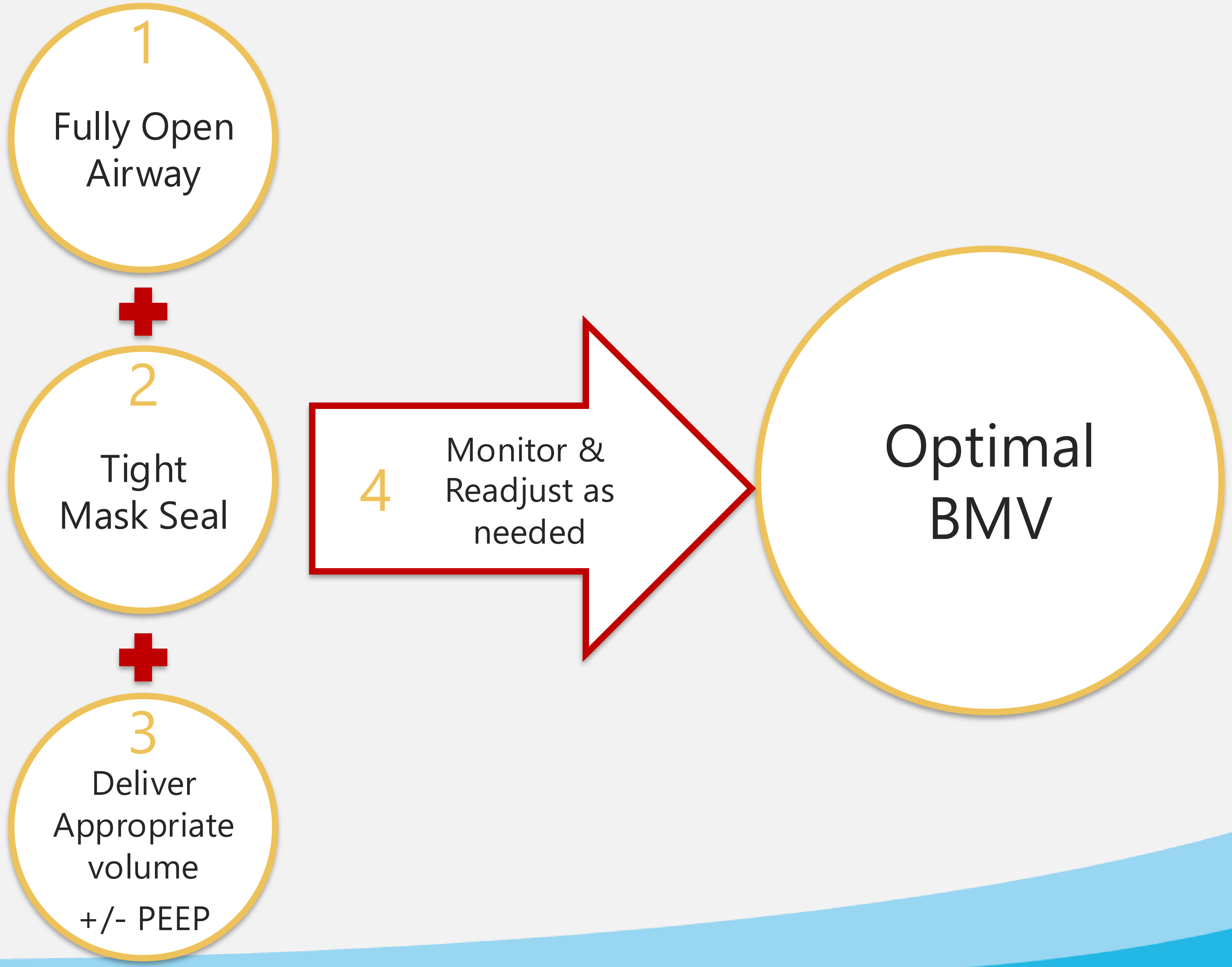
Poor Mask Seal



https://www.capnomask.com/waveform & https://www.openairway.org

Bag-Mask Ventilation (BMV) Mastery

Four Critical Factors to Optimal BMV



Edentulous Patients

- Leave their teeth in or put them back in!
- Adjust mask position to lower lip
- Bypass issue with an EGD

Manual of Emergency Airway Management, 5th Edition

OBESE PATIENTS

- Hard to get good mask seal at the same time you need extra pressure to lift the chest
- Solutions
  - May need two people just on the mask!
  - Ramped position to open airway and take weight of the abdomen off the chest
  - EGD is a consideration but may also be challenging

Pitfalls

Facial Hair

- Challenging to create tight mask seal
  - – Do not recommend KY jelly
    - Too slippery
  - – Do not recommend Tegaderm™
    - Didn't work
  - – Bypass the face
    - Place EGD

The Journal of Emergency Medicine, Vol. 66, No. 2, pp. 163–169, 2024

Use of Transparent Film Dressing to Facilitate Mask Ventilation in Bearded Patients

Neal S. Gerstein, MD, FASE,[*] Darren A. Braude, MD,[*,†] Timothy R. Petersen, PHD,[*,‡] Andrew Goumas, MS,[§] Adam C. Fish, DO,[*] and Pramod V. Panikkath, MD[*]

Conclusions: The use of transparent cling film to cover the lower half of the bearded face did not have an impact on the ability or efficacy to perform mask ventilation in the operating room setting. ClinicalTrials.gov, Number NCT04274686.

Advanced Concepts

Assisted Respirations

- Not well tolerated especially if hypoxic!
  - This is where you earn your money…or not ☺
- Explain procedure
- Be gentle
  - Low pressure
  - Avoid tight grip and pressure at angle of jaw
- Ventilate when they breathe
- CPAP may be better option if in scope

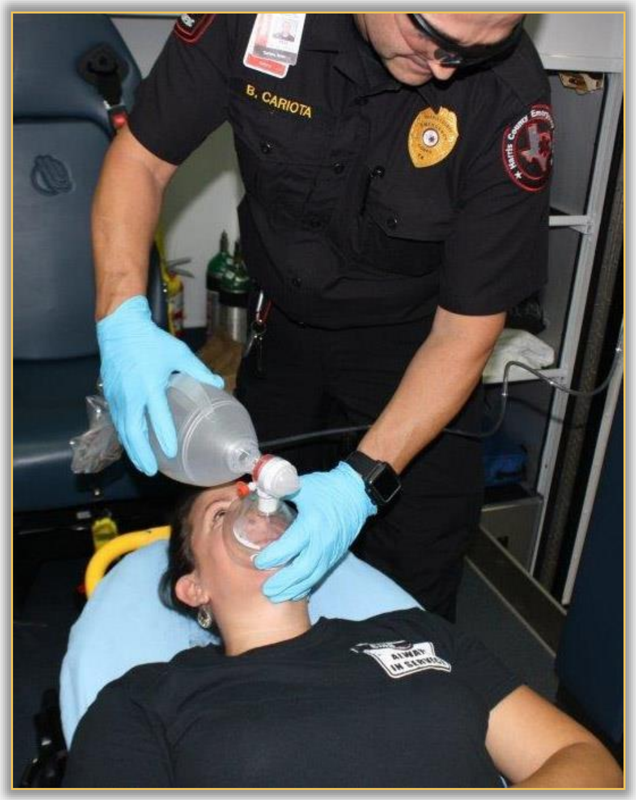


Photo courtesy of Harris County Emergency Corps

Summary

Bag-Mask Ventilation Mastery

- Positioning
- Capnography
- PEEP valve
- Manometer when available
- Two providers for mask seal
- Target minimal chest rise
- Constant monitoring and readjustment

the difficult airway course™ EMS

EXTRAGLOTTIC AIRWAYS

Extraglottic Devices (EGD)

- Representative 2nd Gen Supraglottic-Type Devices

LMA® Supreme™

air-Q® sp3

i-gel® Plus

Ambu® AuraGain™

LMA® Protector™

Extraglottic Devices (EGD)

- Representative Retroglottic-Type Device

King LTS-D™

Extraglottic Devices (EGD)

Pediatric EGDs

Supreme™

AuraGain™

air-Q®

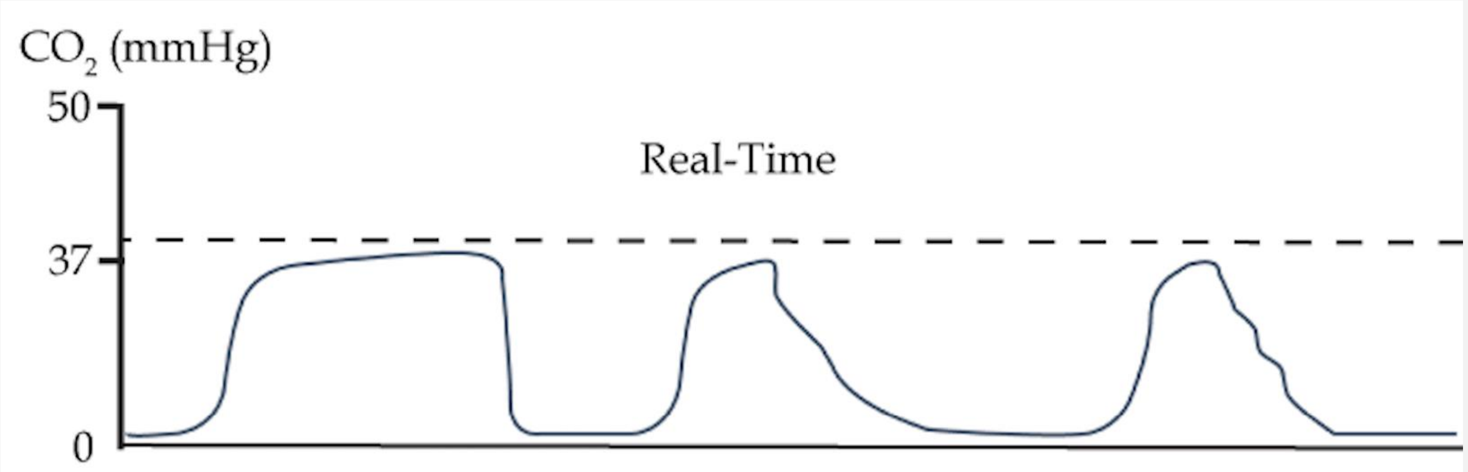
SMALLEST NEONATAL SIZES

King LTS-D™

i-gel®

EGDs to Facilitate Gastric Decompression

- BLS level skill in some jurisdictions when done via channel in an FDA-approved device
- EGDs with g-tube channel
  - Supreme™
  - AuraGain™
  - King LTS
  - i-gel®
  - Protector™



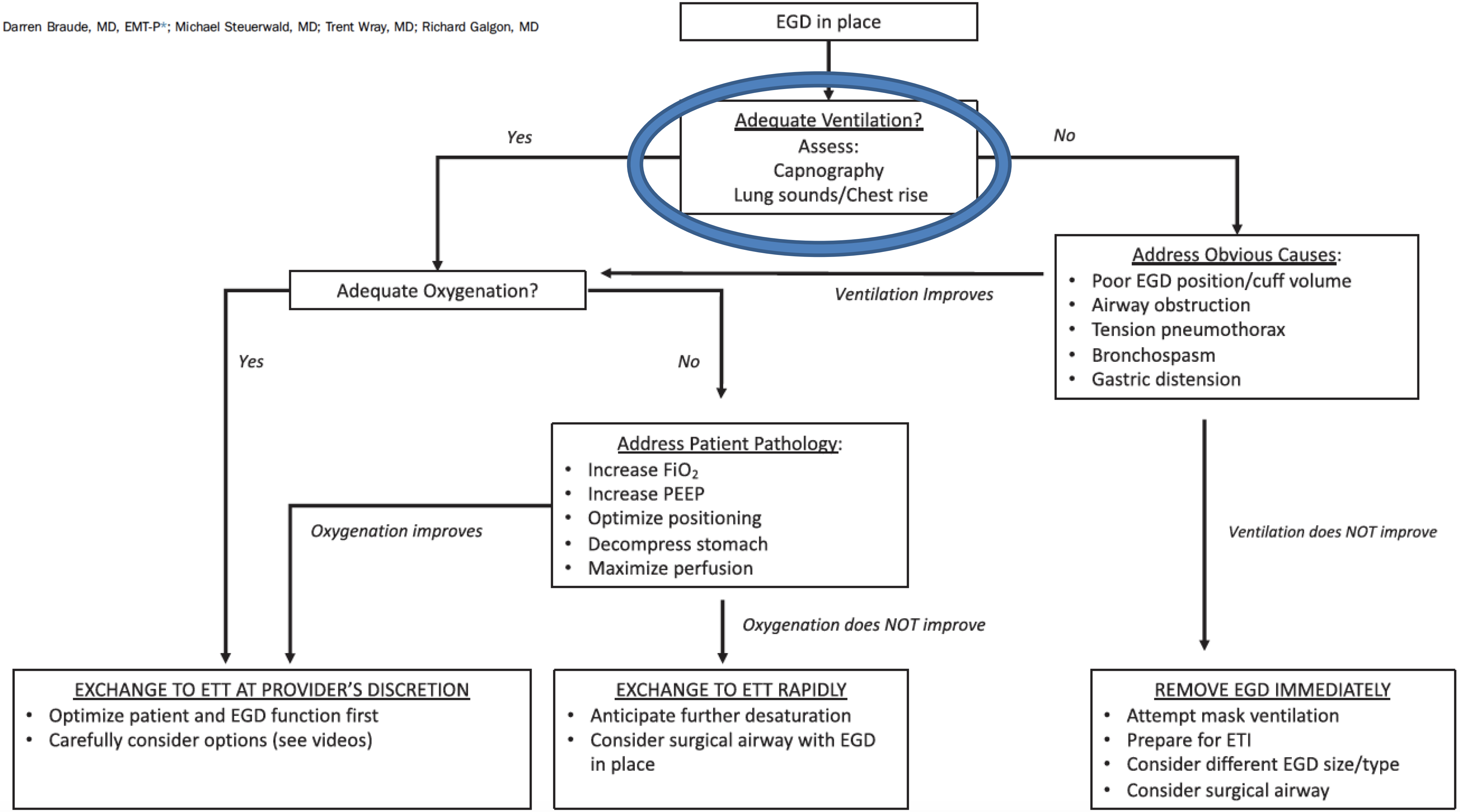
Assessment and Monitoring

Yes, capnography works with EGDS

Capnography can also help assess for air leak

Managing the Out-of-Hospital Extraglottic Airway Device

Darren Braude, MD, EMT-P*; Michael Steuerwald, MD; Trent Wray, MD; Richard Galgon, MD



Management

Virtually the same as an ETT

- ✓ Gastric decompression
- ✓ Waveform Capnography
- ✓ May connect to ventilators
- ✓ May apply PEEP
- ✓ Should be secured

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EMS

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