

Clinician Guide

Safer Airway

Safer Airway Program

Safer Airway is a team-based system for emergent airway management safety. It integrates validated best practices into a coordinated program to help clinical teams increase safety, effectiveness and efficiency with intubation as well as prevention of unplanned extubation (UE).



Why It Is Critical

Emergent ED, ICU and hospital airway intubations are some of the highest-risk procedures in medical care. Failure to promptly secure the airway can lead to devastating injury or death. The incidence of failed airways can be as high as 1 in 50 in the ED and ICU setting and the occurrence of death or brain damage have been reported to be nearly 40-60 times higher (respectively) than in OR settings.

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Common Airway Vulnerabilities

- No formal failed airway protocol/pathway
- Lack of planning for failure
- Lack of necessary equipment
- Suboptimal preparation
- Lapse in critical practices
- Insufficient teamwork
- Lack of hardwired QA

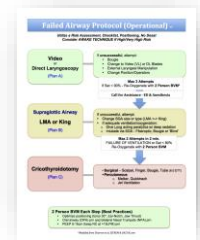
Key Components

Safer Airway

Four key components provide a comprehensive, coordinated and self-reinforcing approach for achieving sustainable high reliability with airway management in EDs, ICUs or other medical units. The Safer Airway tools and resources are customizable and can be tailored to fit local use.

1) Failed Airway Pathway

Provides a clear pathway to guide all team members through essential steps. A simple A->B->C approach helps to avoid critical delays, assure best practices and enable team coordination and collaboration.



2) Unified Airway Cart/Equipment System

Avoids critical delays and ensures that all essential primary and rescue airway equipment is at hand with a unified, comprehensive cart system that support the FAP.



3) Critical Practices - Checklist

Ensures critical best practices are hardwired and sustained. This team-based tool integrates elements for preparation, performance, post intubation management and QA.

The image shows a checklist titled "Airway Safety Checklist". It is a table with columns for "Preparation", "Performance", and "Post-intubation Management". The table contains various items to be checked, such as "Patient history", "Vital signs", "Equipment", and "Team roles".

4) Team Training

Team based training for essential clinical, safety and communication practices.



Failed Airway Pathway

ABC Model

A simple, team-based Failed Airway Pathway may help to coordinate care, avoid delays and expedite critical next steps should a failed airway be encountered. This model is a simplified version of a pathway proposed by the Difficult Airway Society and is not intended to be a comprehensive difficult airway algorithm. Customization for local practice is advised.

Planning for failure is essential in preparing for all airways. Assessing the airway (as possible) and engaging the clinical team (physician, nurse, respiratory therapist, techs) with a strategy (initial and backup plans) can help ensure success.

The standard definition of a failed airway is 3 attempts to pass the ET tube without success or sustained oxygen saturation below 90%.

This model encompasses a comprehensive pathway of validated critical rescue techniques. The specified nomenclature of Plan A, Plan B and Plan C is intended to help guide the team through the critical steps. Best practice 2 or 3 person BVM technique is advised between attempts for each step if needed. The Pathway on the following page provides detailed instructions.

Plan A – Primary intubation technique with VL or DL

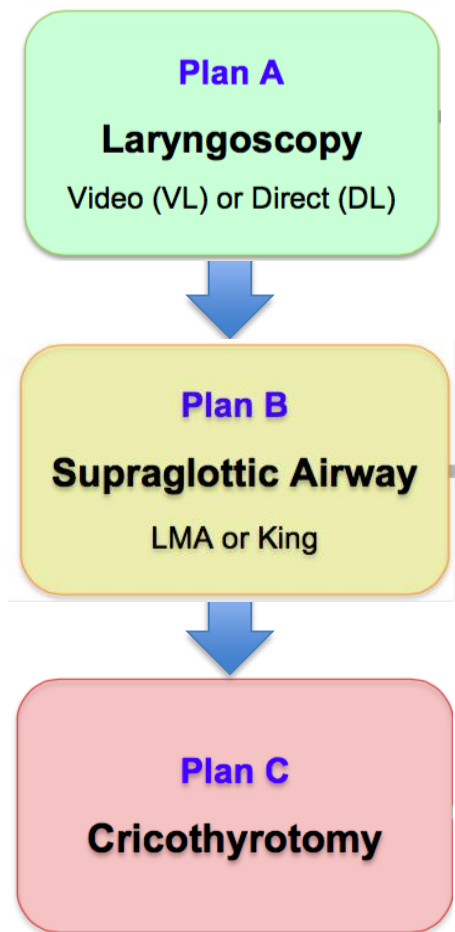
- 3 attempts or sustained desaturation (then MOVE ON)
- Call for back up (ED, ICU, Anesthesia)

Plan B – “B”ack up Airway– Supraglottic device (LMA or King Airway)

- Use early
- Long acting paralytics & deep sedation
- King Airway may be easier to place in codes

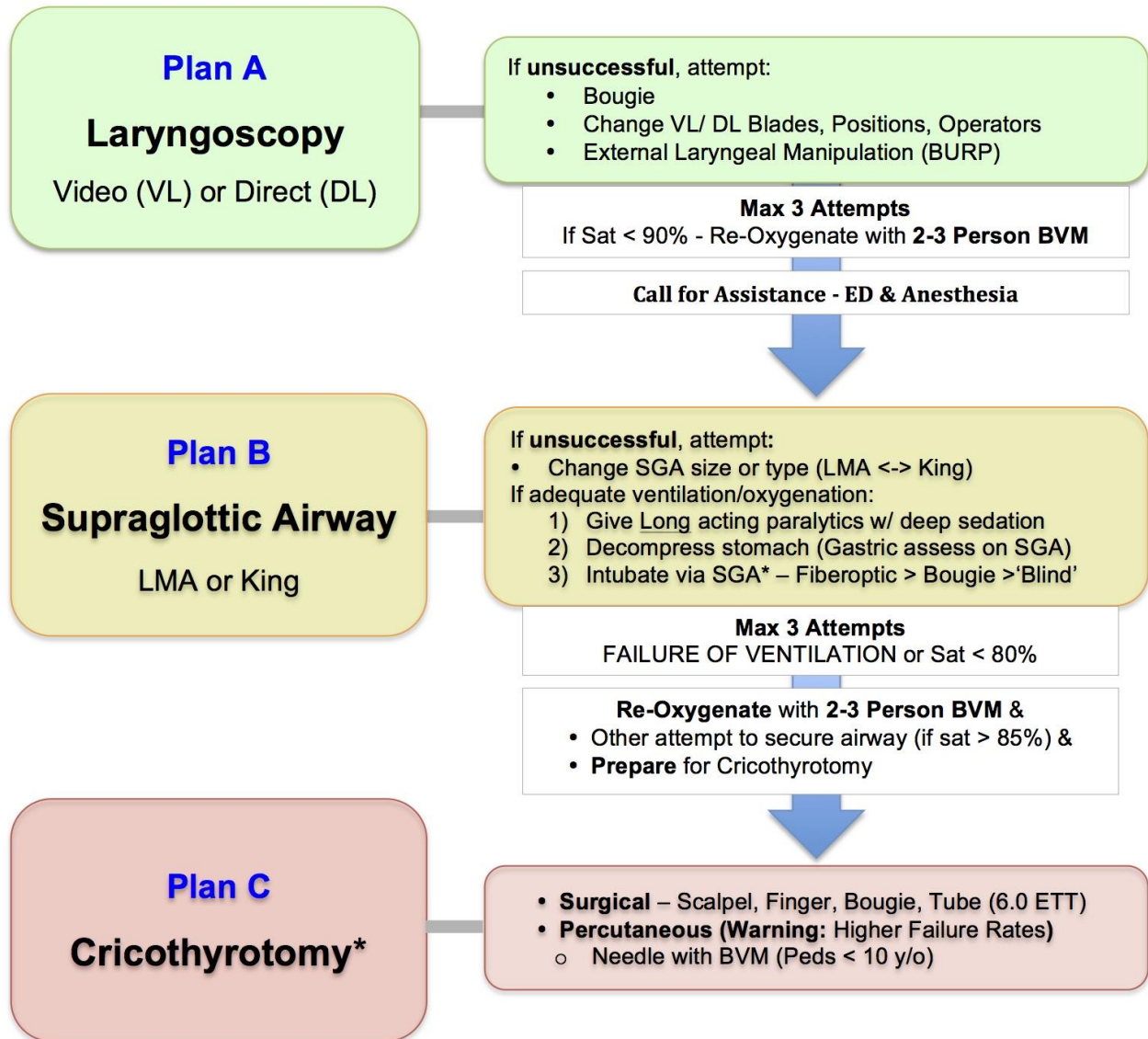
Plan C - “C”ricothyrotomy Plan - Anticipate needs/barriers

- If A & B fail and patient cannot be ventilated with BVM then move quickly to the cricothyrotomy (qualified personal only).
- Open surgical techniques may have higher success



Failed Airway Pathway (ABC) v10

Assess Airway & Confirm Intubation Strategy (Plan ABC) with Team
Consider Non-Paralyzed Technique When Appropriate for High/Very High Risk Airway



2-3 Person BVM - Each Step (Best Practice)

- Optimize positioning (torso >30, Ear-Notch, 2 hand Jaw Thrust)
- Oral airway (OPA) prn **and** bilateral Nasal Trumpets (NPA) prn
- Cricoid Pressure (3rd Person)
- PEEP 5-15cm (keep NC at >15LPM to establish true CPAP) prn

*Modified from Sharren et al. SJTREM & Difficult Airway Society (DAS) algorithm. Customization to meet local practice is encouraged. *Qualified Personnel*

Airway Equipment

Airway Cart (Every Intubation, Any Room)

A comprehensive, unified cart (basic and rescue equipment together) will help avoid critical delays that can occur if all the essential tools are not immediately at hand. Avoid the pitfalls of methods that utilize a separate “toolbox” and a “Difficult Airway Cart” as they may be less reliable if it cannot be guaranteed that both will ALWAYS be in the room and ready. Arranging the drawers by progression of need will help hardwire the failed airway pathway.

- Carts should be resilient, compact and easy to move
- **Drawer Arrangement** – Hardwire the **Failed Airway Pathway** and lay out by **progression of need**
- **Workstation** – carts provide space for medication prep, documentation and reference tools. Some have slide out writing surfaces for additional space



Video Laryngoscopy (VL)

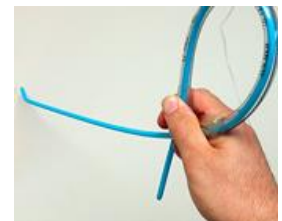
The Video Laryngoscope (VL) (Glidescope, C-mac, etc) should always be setup in the room for **every** intubation. Even if Direct Laryngoscopy (DL) is a physician’s first choice, the VL should be immediately ready if needed.

- VL has Higher 1st Pass Success (compared to than DL)
- Better view of larynx and higher success with difficult airways
- Clinicians should be encouraged to use routinely to develop and maintain skills



Bougie

The Bougie is becoming a first-line intubation tool and should always be available. Some experts advise primary use to guide the ET tube as it allows for more assured visualization of the glottis opening and a guided pathway. Standard Bougie devices can be placed in a holder attached to cart (requires customization) or “Pocket” Bougies can be stocked in the cart.



Credit: R. Levitan

Supraglottic Airways (SGA)

These are essential rescue devices and should always be ready if a failed intubation occurs or for primary placement (e.g. codes)

- 95% success rate
- Stocking **both** the King Airways and intubation capable LMAs will enhance safety options
- Clinicians should practice placing these devices in manikins

1) Intubating LMAs - “Advanced” generation single use LMAs now allow:

- Intubation with regular ETTs through the LMA via flexible videoscope (recommended), Bougie or if needed with an unaided approach
- Gastric tube placement to lower aspiration risk
- Recommended advanced LMAs include:
 - AuraGain (Ambu), iGel (Intersurgical), AirQ (Cookgas)



- ### 2) King Airway
- this SGA offers easy and fast placement and accommodates some deformed anatomy. It is becoming a standard with many EMS services. We recommend the King LTS-D version with gastric access port. Conversion to endotracheal intubation may be more difficult and require flexible videoscope.



Cricothyrotomy Kit

This critical procedure has been shown to be most effective with an open surgical (non-needle or percutaneous) approach. A simple kit that assures a # 10 scalpel, Bougie and # 6.0 ETT (+/- tracheal hook) is ideal. Some physicians may also prefer tracheal hooks.

Inexpensive, simple commercial kits are available for \$40. Larger combo kits can cost as much as \$400.



Note: Percutaneous techniques have been shown to have failure rates as high as 40% and are not recommended as a first-line strategy in a crash or failed airway.

Flexible Fiberoptic Scopes

(Intubating/bronchoscope - ED/ICU)

A flexible fiberoptic scope can be a critical airway tool for an emergency department or ICU. It should be immediately available for staff and teams that are trained and familiar with its use.

These scopes are not intended for “crash” or rapidly decompensating airways. Clinicians should employ the method that they are most comfortable performing during failed airway scenarios.

Flexible fiberoptic scopes may be critically important in select clinical cases including:

- LMA/King Airway conversion to ET tube (ASA recommended)
- Awake Fiberoptic Intubation (AFOI) (Sedated, topically anesthetized, non-paralyzed) in relatively stable but anticipated highly difficult airways
- Inspection of glottis or intubation in severe angioedema
- Posterior nasal bleed inspection & treatment
- Tracheostomy inspection



Video capable scopes may allow for better visualization and team assistance. A single use system avoids the need for weekly cleaning and costly replacement.

Legacy or permanent (non-video) scopes - can work if teams have access, training and competency with their use. They may have several challenges including:

- Costs = \$10,000-\$15,000 + Warranty
- Require **weekly** cleaning (Joint Commission)
- Not available 1 day a week (during cleaning)
- Higher replacement cost
- Fewer opportunities for training
- Team unable to visualize procedure



Critical Practice Checklist

The checklist tool is intended to help hardwire critical practices with preparation, team performance and post intubation protective procedures.

Checklist (Front)

- Store on Airway Cart
- WHO Safer Surgery format
- Capture QA and Debrief
- Beta Version

Airway Safety Checklist

Before Intubation

Preparation

Equipment Ready?

- Bag & Mask attached to O2
- Airway Cart & Video Laryngoscope
- Suction
- Table for equipment near head of bed

Patient Ready?

- Monitor (Pulse ox, Card, BP, EtCO2)
- Positioning ("Ear to Sternal Notch")
 - "RAMP" if Obese
- Dual PreOxygenation (Both)
 - Nasal Cannula @ 15+LPM AND
 - NRB/BVM @ 15+ LPM

Medication Ready?

- Premedication (Prn)
- Sedation/Induction
- Paralysis (Prn)

Intubation

Performance

Difficulty Estimate Shared w/ Team?

(Circle) Low, Moderate, High, Very High

Strategy Shared w/ Team?

- RSI vs. "Awake" approach
- Medications needed
- Plan A - "Primary" - DL/VL, Bougie
- Plan B - "Backup" SGA (LMA/King) Size
- Plan C - "Cricthyrotomy"

Intubation

- Time Out - Assure "All Ready"
- Announce "Starting RSI" (give RSI meds)
- Maintain Nasal Cannula at 15+ LPM
- Confirm Tube Placement
- Auscultation
- EtCO2 (Colorimetric or Waveform)

After Intubation

Protection

Post-Intubation

- Elevated Head 30-45
- Continuous Waveform Capnography
- ABC in 10-15 min
- OG Tube Placement
- CXR
- Restraints Prn
- Sedation Orders
- Debrief

1) What went well? _____ See Back

2) What could be strengthened & how? _____ See Back

Difficulty Rating (Post Intubation)
(Circle) Low, Moderate, "High," "Very High"

Entered into chart alert if "High" & Discussed with family/patient

Patient ID (Sticker)

Patient Name _____

ID # _____

Date _____ Unit/Room _____

Team

Physician: _____

Nurse Lead: _____

Resp. Therapist: _____

Scribe: _____

QA

Laryngoscopy Tech: Video (VL) Direct (DL)

Attempt # (Circle) 1 2 3 4 5 >5

Precipitous/"Crash" Airway: Yes No

Device Used: N/A LMA King Cric Flex Fib. Scope

Comments: _____ See Back

www.SaferAirway.org
This is a QA tool and is NOT Part of the medical record v8

Reference (Back of Checklist)

- Useful references from top industry leaders
- Customizable

Back Page References – Safer Airway Checklist

Predictors of Difficulty Reference

Mask Vent - Obese | Beard | Toothless | >55 | Sl. Apnea Intubation (LEMON)

- **Look** - Face Trauma | Large Tongue/Incisors
- **Exam** - Incisor (<3), I-I-M (<3), Thyroid-Hyoid (<2)
- **Mallampati** - Base of Uvula (3) or Hard Palate (4)
- **Obstruction/Obesity** - Mass | Stridor | Voice
- **Neck Limited Mobility** - C-collar | Physical SGA (King/LMA) - Mouth | Obstruct | Stiff Lung | C-spine
- CRIC** - Obese | Mass | Hematoma | XRT | Deformity

Failed Airway Pathway

Plan A - Laryngoscopy x 3
(Video or Direct)

Plan B - SGA x 3
(LMA/King)

Plan C - Cricthyrotomy
(Finger, Scalpel #10, Bougie, ETT & O)

Positioning = "Ear to Sternal Notch" (Face Parallel to ceiling)

Obese -> "RAMP" **Adult** **<2 months**

Blankets or Bed

Occupup up 2-3 inches

Shoulder

SGA Size		King Airway	Height
LMA	IBW	3	4-5 ft
3	30-50kg	4	5-6 ft
4	50-70kg	5	> 6 ft
5	70-100kg		

Intubation Medications

Drug	Normotensive Dose	70 kg Patient	Hypotensive Dose	Indication
Fentanyl	3 mcg/kg	200 mcg	Omit	Head, AAA
Lidocaine	1.5 mg/kg	100 mg		Head, Asthma
Ketamine	1 mg/kg	70 mg		Severe Anxiolate
Propofol	<i>Rarely Needed in Peds</i>			
Etomidate				
	0.3 mg/kg	20 mg	Half	
Midazolam				
	0.1-0.2 mg/kg	14 mg	Half	
Propofol				
	1.5 mg/kg	100 mg	Half or Less	
Ketamine				
	2 mg/kg (low)	140 mg	Quarter	Low BP, Asthma
Paralysis				
Rocuronium				
	1.2 mg/kg	85 mg	1.6 mg/kg	
Vecuronium				
	0.2 mg/kg	14 mg	0.3 mg/kg	
Succinylcholine				
	1.5-2.0 mg/kg	140 mg	2 mg/kg	Caution K

Post Intubation Sedation Meds RASS to -4 in ED then to -2 when stable in ICU

Drug	Bolus	Drip	Indication
Fentanyl	2 mcg/kg	1 mcg/kg/min	
Midazolam	0.05 mg/kg	0.025 mg/kg	
Propofol	500 mcg/kg	15 mcg/kg/min	Caution BP
Ketamine	1 mg/kg (low)	1 mg/kg/hour	Low BP, Asthma

Post Intubation Hypotension

IVF Bolus	
Epinephrine Diluted	1 ml code dose ep in 9ml NS, give 1 ml doses.
Phenylephrine	100 mcg IV slow Use if HR elev.

References modified from EmCrit, Weigart, Rippey, Strayer (EDIC7)
Further modification to meet local practice and standards is encouraged

www.SaferAirway.org

Initial Ventilator Settings

(Immediately Use Continuous Waveform ET-CO2 & get ABG in 15 min)

Setting	Normal	Asthma COPD	ARDS	Severe Met Acidosis	Head Injury
Tidal Vol ml/kg IBW	6-8	5-6	6	10	6-8
Rate	16	10	14	20	16
PEEP	5	0-Asthma 5-COPD	5-10	5	5
I:E Ratio	1:2	1:4-5	1:2	1:2	1:2
Notes	Caution Stacking	Permissive Hyperpvent to compensate			PCO2 35-40

Modified from James Rippey & EmCrit Initial Checklist

Debrief & Comments (Continued from front)

Critical Team Practices

1) Airway Assessment & Team Plan Sharing

Physicians should attempt to assess the airway prior to intubation (as time permits) and communicate a strategy for the initial and planned failed airway contingency steps.

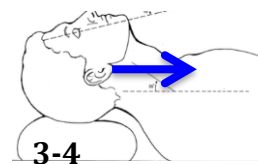
Specifying the intubation strategy (PLANs ABC) is a critical action for team effectiveness and should be shared prior to initiation of RSI or Awake Technique. This should not be a significant departure from traditional practice as physicians typically verbalize the medications they wish to use with RSI. A more complete plan can be provided for the team by communicating anticipated challenges, as well as the SGA device size and cricothyrotomy technique of choice if needed.

Sample Script:

“This may be a moderately difficult airway. Let’s medicate with 20mg of Etomidate, 100mg of Rocuronium, and use an 8.0 ET Tube with a Glidescope #4 blade. We will need to have a King Airway #4 ready and will do a surgical cricothyrotomy if needed.”

2) Patient Positioning (See Attachment for Detailed Views)

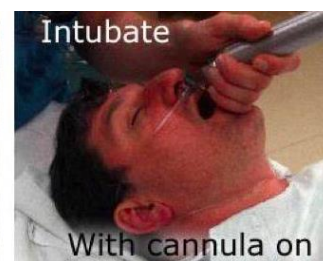
This is an important but often overlooked step. Even if using Video Laryngoscopy (VL), proper positioning can help increase visualization, alignment and facilitate ET tube placement.



“Ear to Sternal Notch” is a mnemonic that provides a more clear description of positioning. Positioning is especially important with obese patients and the RAMP technique is recommended.

3) Dual PreOxygenation (No Desat or “Apneic” Oxygenation)

Place **both** a **Nasal Cannula** (at >15 LPM) AND a **NRB Mask** at > 15 LPM on the patient for at least 3 minutes prior to RSI. This allows for close to 100% FIO₂. Keep the NC running at >15 LPM during intubation attempts. These practices may significantly extend apnea time prior to desaturation.



4) Post Intubation Practices

The following critical practices are important for patient protection to assure optimal ventilation settings, aspiration prevention and Unplanned Extubation (UE) prevention.

A. **Continuous Waveform Capnography** (Immediate placement)

This technology has become a standard of care in Europe, US EMS and is recommended by AARC, ACEP and the AHA. It may allow for a more rapid assessment of ventilator status or loss of airway.

B. **Prompt ABG**

10-15 min is enough time to assess ventilation settings. A short turn around time may allow for rapid corrections as needed and decrease delays.

C. **Elevate Head of Bed 30-45 degrees** (Aspiration Prevention)

D. Post-Intubation Sedation – Deeper RASS scores (-3, -4) initially in the ED/ICU may help prevent unplanned extubation (UE) or airway injury during highly dynamic phase of illness, for transport or for procedures. Lower RASS scores (-2) may be more appropriate once stable in the ICU settings

E. **Preventing post intubation hypotension** (Fluids, press dose pressers, vent settings)

F. **Debrief** (record key issues and insights to capture system vulnerabilities)

- Ask the essential questions “What could be strengthened?” and “How can we do it?”

G. **Record and communicate the discovery of a difficult airway**

- Enter into EMR alert, communicate during handoff, ID patient and inform family
- Use special alert bands

5) Miscellaneous

- **Long acting paralytics** (Rocuronium or Vecuronium) may have advantages for many ED/ICU emergent intubations. If a failed airway develops and an SGA (LMA/King) or Cricothyrotomy is needed then the patient must remain paralyzed (and sedated). The other critical advantage for long acting paralytics in highly dynamic environments is that they may possibly reduce the risk of unplanned extubation (UE) as post intubation sedation is being advanced.
- **Rocuronium Dose:** in RSI is 1.2mg/kg ideal body weight which is a higher than the dose in elective OR settings and has been validated in a 2015 Cochran Analysis. This dose allows for induction times nearly as quickly as succinylcholine.
- **Team Communication:** The physician should share the assessment and plan with the team and be open to team member feedback. Every team member should be empowered to share recommendations or concerns. The focused team debrief should focus on system strengthening and be conducted with every intubation.

LMA (AuraGAIN) Placement

Prepare the LMA (do ahead if anticipated)

- Fully Deflate Cuff with syringe
- Lubricate **back** of the cuff and distal end



Placement

- 1) Head elevated in “Sniffing Position” or neutral position
- 2) Hold at the end of the LMA due to curved shape
- 3) Follow the hard then soft palate
- 4) Press against POSTERIOR pharyngeal wall in a **circular** motion (follow the curve)
- 5) Continue until resistance
(may need to gently rock side to side at end)
- 6) Inflate until seal obtained near 40-60 mls
(pressure monitor < 60 cc/H₂O)



Motion of Placement



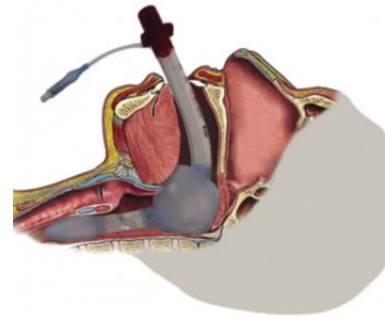
Post Placement

- 1) Secure the LMA (tape or holder)
- 2) Assure **LONG acting paralytics** (e.g. Vecuronium) and **DEEP** Sedation
- 3) Place OG tube to evacuate stomach (Decrease Aspiration Risk)
- 4) Prepare for intubation with ET Tube via a flexible fiberoptic scope (preferred) bougie, or blindly (least recommended)

King Airway Placement

Indications & Use:

- Fast First Airway for Codes (can skip ET Tube)
- Failed intubations
- Size by estimated patient height
 - 4-5 feet = #3
 - 5-6 feet = #4
 - > 6 feet = #5
- Test for leaks, then Deflate & Lubricate tip
- Head elevated in “sniffing” or neutral position



Placement

- 1) Lift entire TONGUE & JAW with thumb or laryngoscope
- 2) Enter at **corner** at **90-45 degrees** and **rotate** to midline once in post pharynx
- 3) Once midline, advance until connector to the teeth
- 4) Inflate to < 60 cc/H2O
- 5) **May need to slowly pull back** while bagging until adequate ventilation achieved



Post Placement

- 1) Assure **long acting paralytics** (e.g. Vecuronium) & **DEEP** sedation prn
- 2) Place OG Tube via King port and deflate the stomach
- 3) Leave in place or convert to ETT with bougie or preferably Flexible Fiberoptic Scope (aScope) (See Quick Reference Resource)

Team Member Roles

Safer Airway

Physician

- 1) Assess airway and estimate Difficulty Level (Low, Mod, High, Very High)
- 2) Communicate Intubation Strategy (Plan A B C) with team
- 3) Encourage open team communication with recommendations, concerns, questions
- 4) Lead/participate in a focused debrief
- 5) Record post intubation difficulty rating & assure EMR warning system updated as needed and communicate if any airway difficulty during handoffs (sign out/admission)

Nurse

- 1) Assure Airway Cart & Video Laryngoscope in room
- 2) Assure pre-oxygenation & respiratory support prior to RT arrival
- 3) Prepare medications for RSI (or Awake Intubation)
- 4) Speak UP & share recommendations, concerns, questions
- 5) Finalize and complete checklist (as possible)
- 6) Lead/participate in a focused debrief
- 7) Enter any "Difficult" airway designation into EMR warning system and place band on patient wrist. Communicate difficult airway in handoff.

Respiratory Therapist

- 1) Assure equipment, pre-oxygenation and patient positioning & record on checklist
- 2) Assist physician with intubation (equipment, laryngeal manipulation, BVM)
- 3) Confirm ETT placement (with physician) & Secure ETT (C-Collar for peds under 8?)
- 4) Assist with ventilator settings
- 5) Place on continuous waveform ETCO₂ monitor immediately and ABG within 15 min
- 6) Speak UP & share recommendations, concerns, questions
- 7) Lead/participate in a focused debrief

Nurse Tech (Multi-Skilled Technician)

- 1) Assure equipment, pre-oxygenation and patient positioning & record on checklist
- 2) Place **Bedside Table** near head of bed for placement of airway equipment
- 3) Speak UP & share recommendations, concerns, questions
- 4) Participate in a focused debrief

Scribe (ED only)

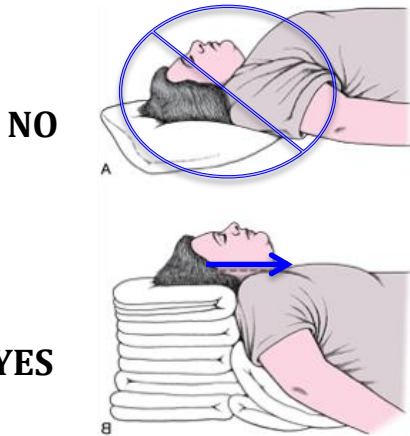
- 1) Record QA on form
- 2) Enter debrief & QA in Safer Airway Learning Portal (Registry)

Patient Positioning

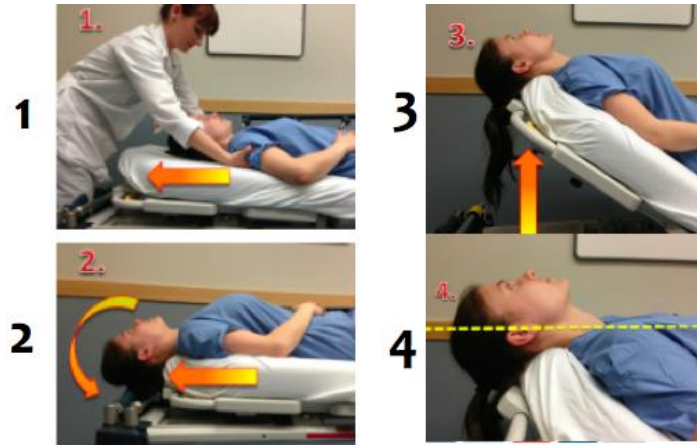
Obese – “RAMP” Position

- Ear to Sternal Notch – Face parallel to ceiling

Blanket Technique



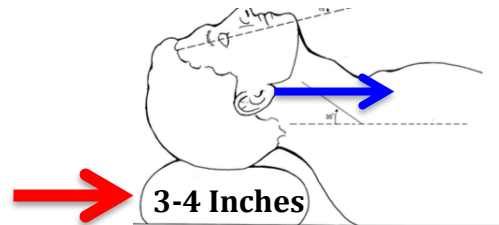
Head Off End of Bed Technique



Credit: Mark Brady PA-C

Adult Positioning (non-obese)

- Towel or sheet under the **Occiput of Head** - Elevation 3-4 Inches
- “Ear to Sternal Notch” w/ face parallel to ceiling



Pediatric (older infants, toddlers, children)

- No elevation usually needed

Infants (Under 2 months)

- Elevate shoulder to accommodate large occiput

