CPP TCCC

COMBAT PARAMEDIC/ PROVIDER

# TACTICAL COMBAT CASUALTY CARE COURSE

## MODULE 7: AIRWAY MANAGEMENT IN TFC


Committee on Tactical Combat Casualty Care (CoTCCC)

| **TCCC** TIER 1 | **TCCC** TIER 2 | **TCCC** TIER 3 | **TCCC** TIER 4 |
|---|---|---|---|
| All Service Members | Combat Lifesaver | Combat Medic/Corpsman | Combat Paramedic/Provider |

## TACTICAL COMBAT CASUALTY CARE (TCCC) ROLE-BASED TRAINING SPECTRUM

### ROLE 1 CARE

**NONMEDICAL PERSONNEL**



**MEDICAL PERSONNEL**



YOU ARE HERE

STANDARDIZED JOINT CURRICULUM

# 1 x TERMINAL LEARNING OBJECTIVES

**07 Given a combat or noncombat scenario, perform airway management during Tactical Field Care in accordance with CoTCCC Guidelines.**

- **7.1** Identify signs of an airway obstruction.
- **7.2** Identify spinal immobilization considerations for casualties with suspected cervical spine injuries.
- **7.3** Describe the progressive strategies for airway management and the indications, contraindications, ~~and limitations~~ of airway management techniques in Tactical Field Care.
- **7.4** Demonstrate the placement of a casualty in the recovery position in Tactical Field Care.
- **7.5** Demonstrate opening the airway with the head-tilt/chin-lift or jaw-thrust maneuver.
- **7.6** Demonstrate the insertion of a nasopharyngeal airway in a casualty in Tactical Field Care.
- **7.7** Demonstrate airway management with Manual Suction device in Tactical Field Care.
- **7.8** Demonstrate airway management with Mechanical Suction device in Tactical Field Care.
- **7.9** Demonstrate the insertion of a CoTCCC-recommended extraglottic airway in a trauma casualty in Tactical Field Care.
- **7.10** Identify the indications, contraindications, and techniques for performing cricothyroidotomy in Tactical Field Care.

# 21 x ENABLING LEARNING OBJECTIVES

**#** = **Terminal Learning Objectives** = Cognitive ELOs = Performance ELOs

# 1 x TERMINAL LEARNING OBJECTIVES

**07 Given a combat or noncombat scenario, perform airway management during Tactical Field Care in accordance with CoTCCC Guidelines.**

- **7.11** Identify the indications, contraindications, and administration methods of lidocaine as a local anesthesia when performing a cricothyroidotomy in Tactical Field Care.
- **7.12** Demonstrate surgical cricothyroidotomy on a trauma casualty in Tactical Field Care.
- **7.13** Identify the considerations, indications, limitations, and principles of endotracheal intubation in Tactical Field Care.
- **7.14** Demonstrate endotracheal intubation on a trauma casualty in Tactical Field Care.
- **7.15** Describe proper Bag Valve Mask (BVM) technique for casualty ventilation in Tactical Field Care.
- **7.16** Identify the indications, considerations, limitations, and principles of automated ventilation in Tactical Field Care.
- **7.17** Demonstrate the application of automated ventilation to a trauma casualty in Tactical Field Care.
- **7.18** Demonstrate the application of multimodal ventilation to a trauma casualty in Tactical Field Care.
- **7.19** Identify the considerations, indications, and limitations for oxygen administration in Tactical Field Care.
- **7.20** Identify the importance, considerations, limitations, and application of pulse oximetry monitoring in Tactical Field Care.
- **7.21** Identify any evidence-based medicine, best practices, casualty data, and Subject Matter Expert consensus on airway management techniques in Tactical Field Care.

# 21 x ENABLING LEARNING OBJECTIVES

**#** = **Terminal Learning Objectives** = Cognitive ELOs = Performance ELOs

# INTRO TO ASSESSING THE EVIDENCE

| Level of Evidence | AHA Recommendation System Terminology Explanation | Why the AHA Classification System? |
|---|---|---|
| **A** | Evidence from multiple randomized clinical trials (RCT) with concordant results or from **HIGH-QUALITY** meta-analyses. | • The level of evidence recommendations allow readers to quickly glean information on the strength, certainty, and quality of evidence supporting each recommendation.<br>• A recommendation with Level of Evidence (LOE) C does not imply that the recommendation is weak.<br>• Although, RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective. |
| **B-R** | Evidence from moderate-quality trials, or a meta-analysis of moderate quality (RCT) followed by an R to denote **RANDOMIZED** studies | |
| **B-NR** | Evidence from moderate-quality trials, or a meta-analysis of moderate quality followed by NR to denote **NON-RANDOMIZED** studies | |
| **C-LD** | There is no convincing evidence and is followed by LD to indicate **LIMITED DATA** | |
| **C-EO** | There is no convincing evidence and is followed by EO if the consensus is based on **EXPERT OPINION**, case studies or standards of care. | |

# MARCH PAWS

## DURING LIFE-THREATENING

- **M** MASSIVE BLEEDING — #1 Priority
- **A** AIRWAY
- **R** RESPIRATION
- **C** CIRCULATION
- **H** HYPOTHERMIA / HEAD INJURIES

## AFTER LIFE-THREATENING

- **P** PAIN
- **A** ANTIBIOTICS
- **W** WOUNDS
- **S** SPLINTING

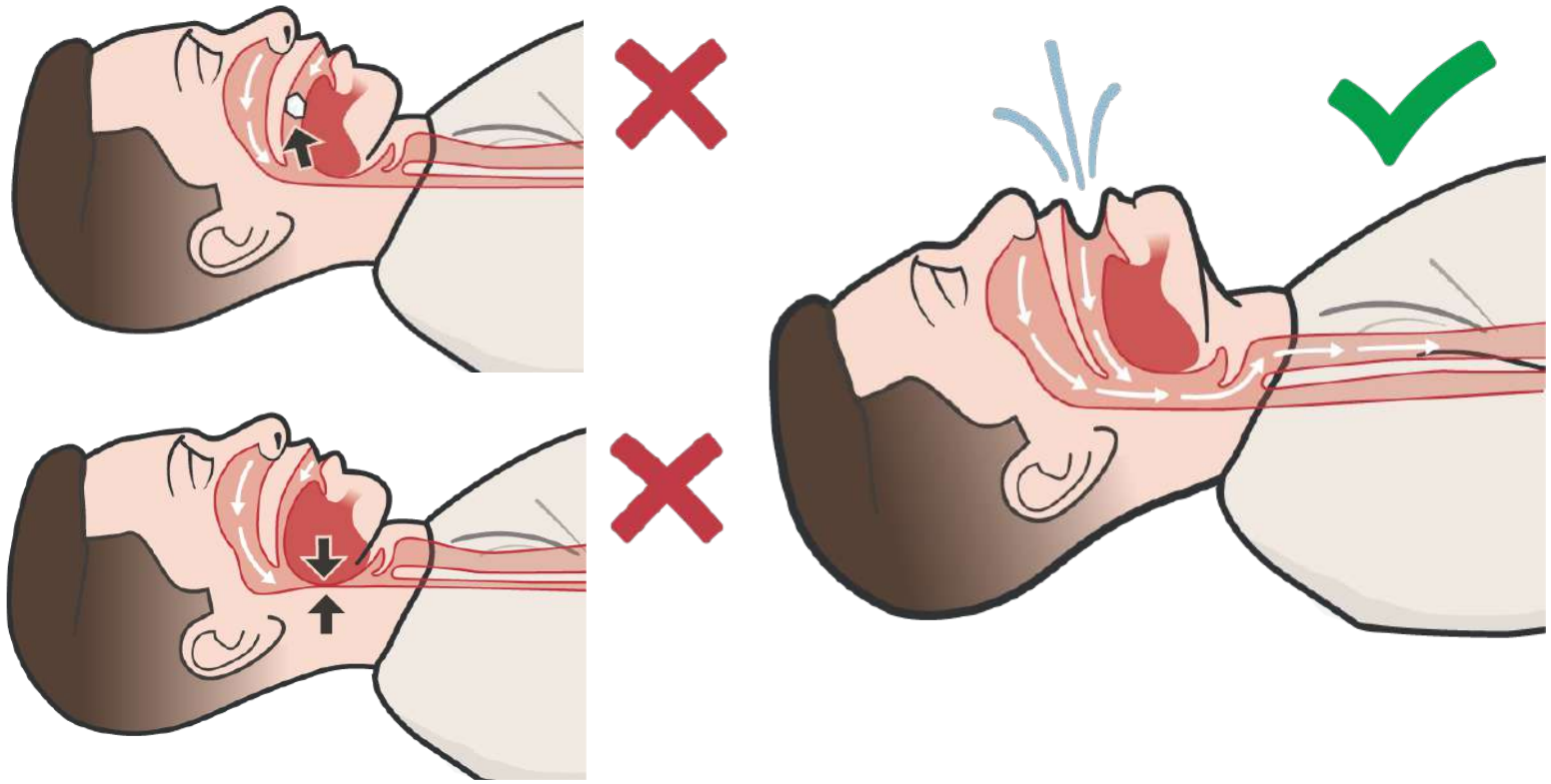
# AIRWAY MANAGEMENT INTRODUCTION

Airway obstruction on the battlefield is often due to **maxillofacial trauma**

- **Unconscious** casualties can also lose their airway when the muscles of their tongue relax, causing the tongue to block the airway by sliding to the back of the pharynx and covering the tracheal opening
- Airway obstruction on the battlefield is often easily corrected with simple maneuvers

M A R C H

# IDENTIFYING AN OBSTRUCTED AIRWAY



**IMPORTANT!** Remove any visible objects, but **DO NOT** perform a blind finger sweep

M A R C H

## SIGNS AND SYMPTOMS

**AIRWAY MAY BE BLOCKED:**

- Casualty is in distress and indicates they can't breathe properly
- Casualty is making snoring or gurgling sounds
- Visible blood or foreign objects are present in the airway
- Maxillofacial trauma (severe trauma to the face) is observed

# SPINAL IMMOBILIZATION CONSIDERATIONS IN TFC

Consider the mechanism of injury when determining risk of spinal injury

The **Jaw-thrust** method is the preferred airway opening maneuver in case of suspected spinal injuries

If immobilization is indicated a second responder may be needed to maintain an open airway

C-Spine stabilization is **NOT** necessary for casualties who have sustained penetrating trauma to the **FACE** or **NECK ONLY**

**Level of Evidence: C-EO**

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# PROGRESSIVE STRATEGIES FOR AIRWAY MANAGEMENT

**Assess Airway**

- Conscious, no obstruction → 
- Unconscious, no obstruction → Recovery Position, Airway Maneuvers or NPA or Extraglottic Airway
- Airway obstruction or impending airway obstruction → Position of comfort, Airway Maneuvers, Suction, NPA or Extraglottic Airway, Recovery Position, if unconscious

Successful?

- YES → **Assess Respiration and Breathing**
- NO → Cricothyroidotomy/ Endotracheal Intubation

**M A R C H**

# CASUALTY POSITION: MAINTAINING THE AIRWAY

If a casualty **can breathe on their own**, let them assume the position that best protects the airway, including sitting up and/or leaning forward

**DO NOT** force a casualty into a position or perform airway procedures that causes them difficulties in breathing

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# RECOVERY POSITION

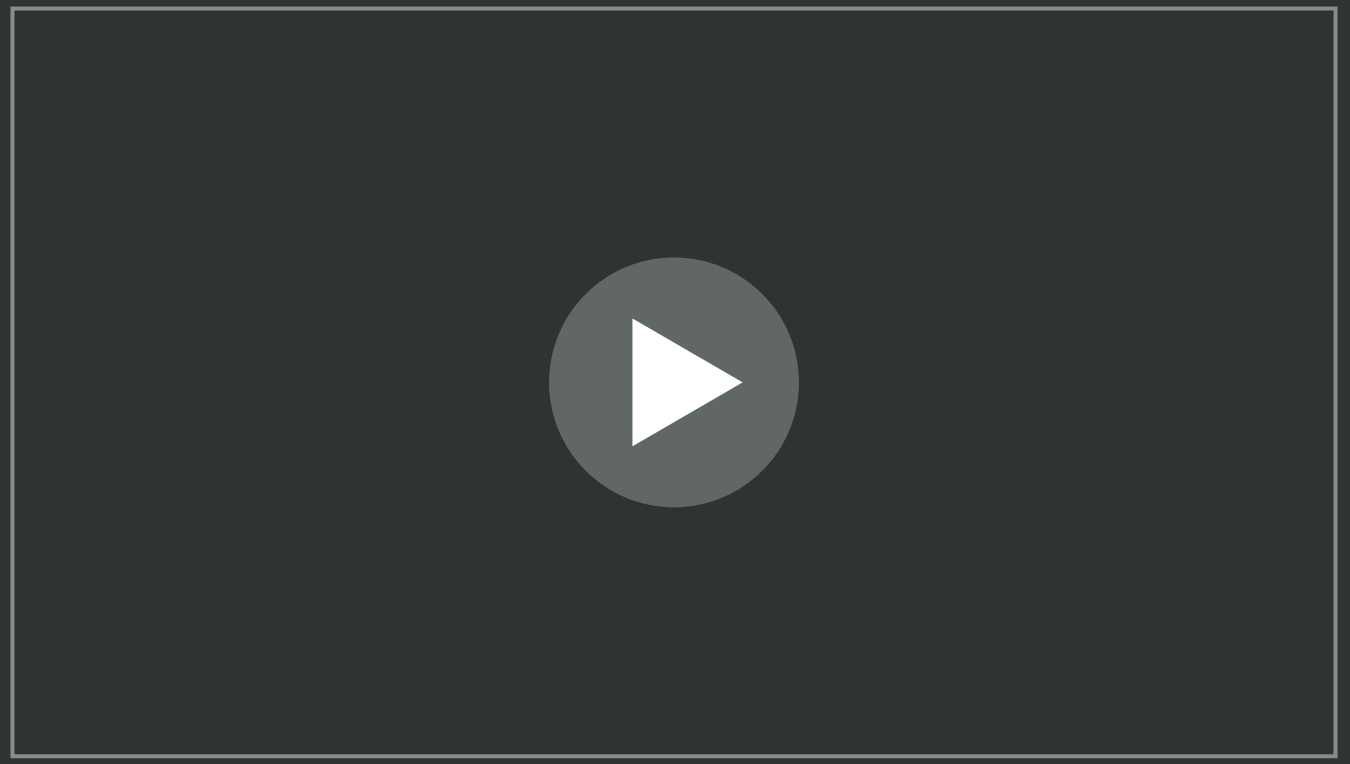
For an **unconscious** casualty **not in shock**, or **conscious** casualty that **can tolerate any position**, place them into the **RECOVERY POSITION**

Clinical indications occasionally dictate which side is lower in the **RECOVERY POSITION**

During transport patient may need to be returned to a supine position

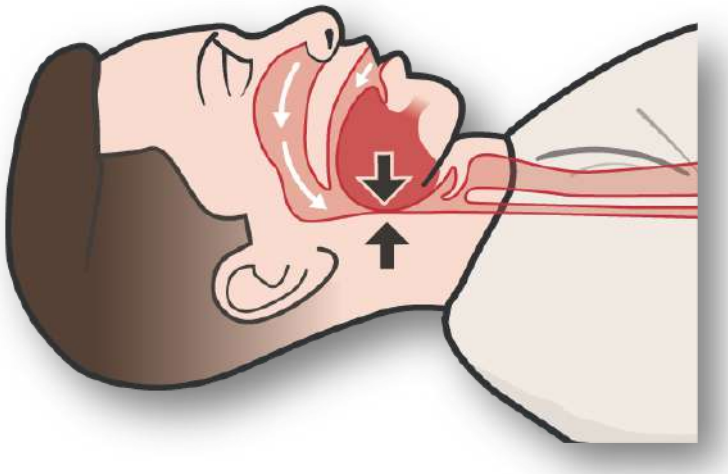
M A R C H

# RECOVERY POSITION TECHNIQUE VIDEO



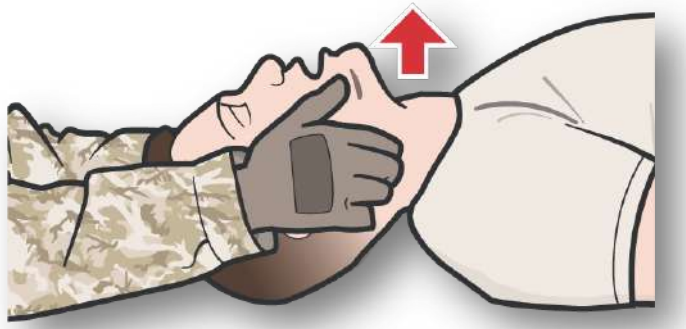
*Video can be found on deployedmedicine.com*

# AIRWAY MANEUVERS



**UNCONSCIOUS** casualty's tongue may have **relaxed**, causing the tongue to **BLOCK** the airway by sliding to the back of the mouth, **occluding the airway**

**HEAD-TILT/CHIN-LIFT**



**JAW-THRUST**

## POTENTIAL LIMITATIONS

- Lack of scene safety
- Inadequate space to operate
- Need for continued support to maintain the airway position

If you suspect that the casualty has suffered a neck or spinal injury, use the jaw-thrust method if tactically feasible

Level of Evidence:

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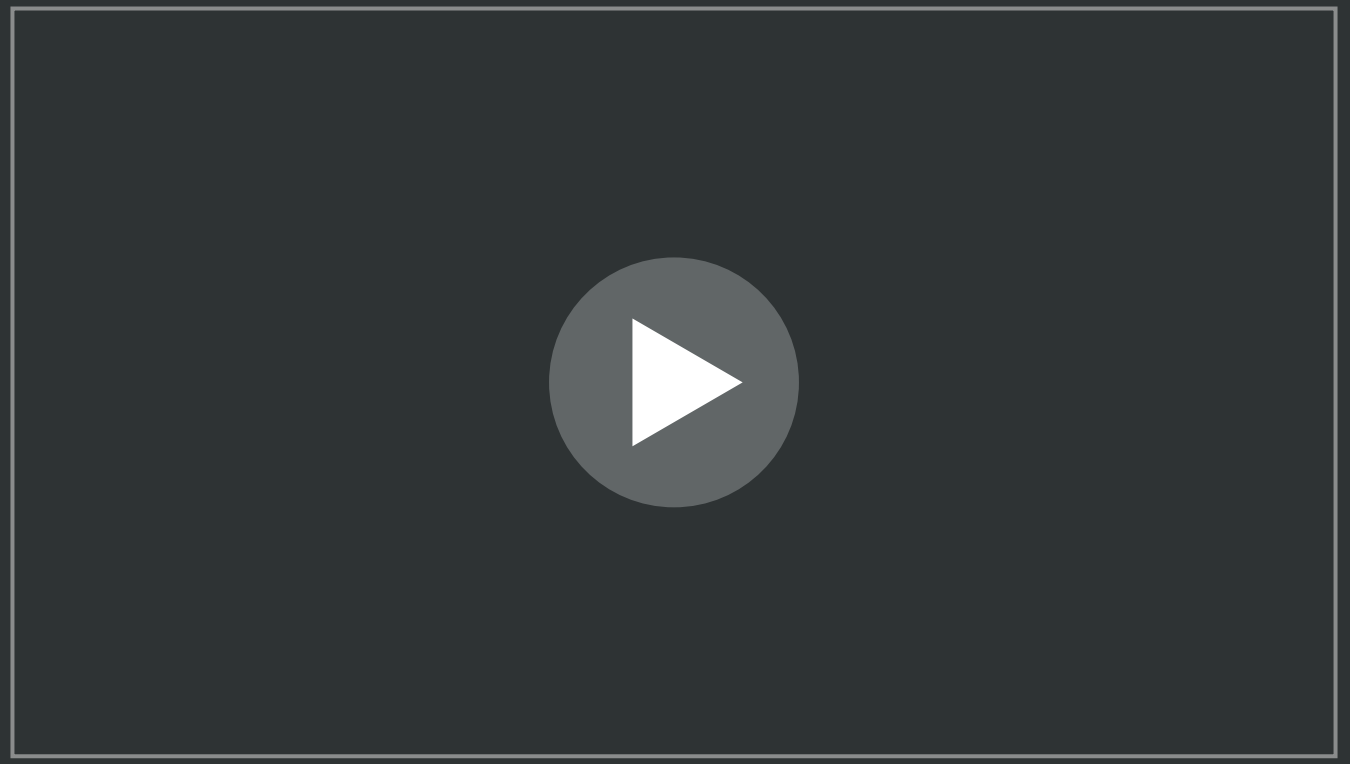
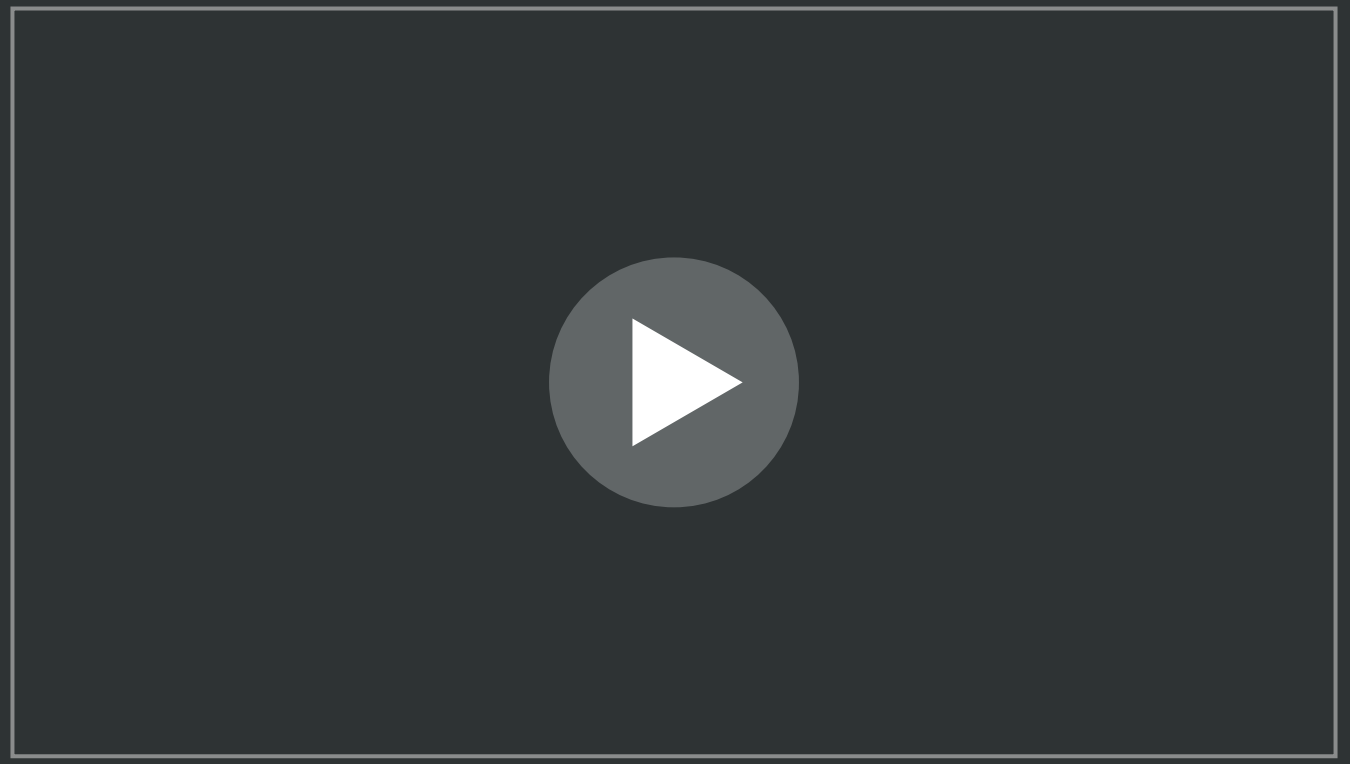
# HEAD-TILT/CHIN-LIFT MANEUVER VIDEO



*Video can be found on deployedmedicine.com*

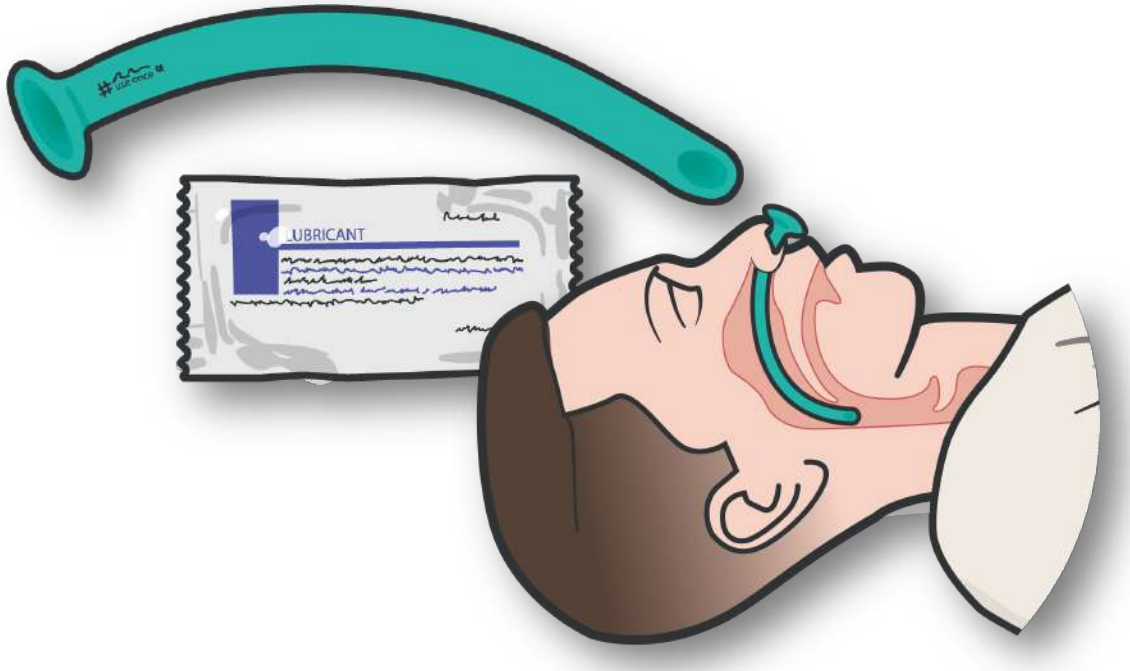
# JAW-THRUST MANEUVER VIDEO



*Video can be found on deployedmedicine.com*

# NASOPHARYNGEAL AIRWAYS

- Can be used on both **unconscious** or **semiconscious** casualties with **NO** airway obstruction to help **open and maintain an open airway**
- Better tolerated than an oropharyngeal airway (less likely to stimulate gag reflex)
- **Lubricate** before inserting
- **Insert at 90-degree** angle to the face, NOT along the axis of the external nose
- **Tape it** in place after insertion

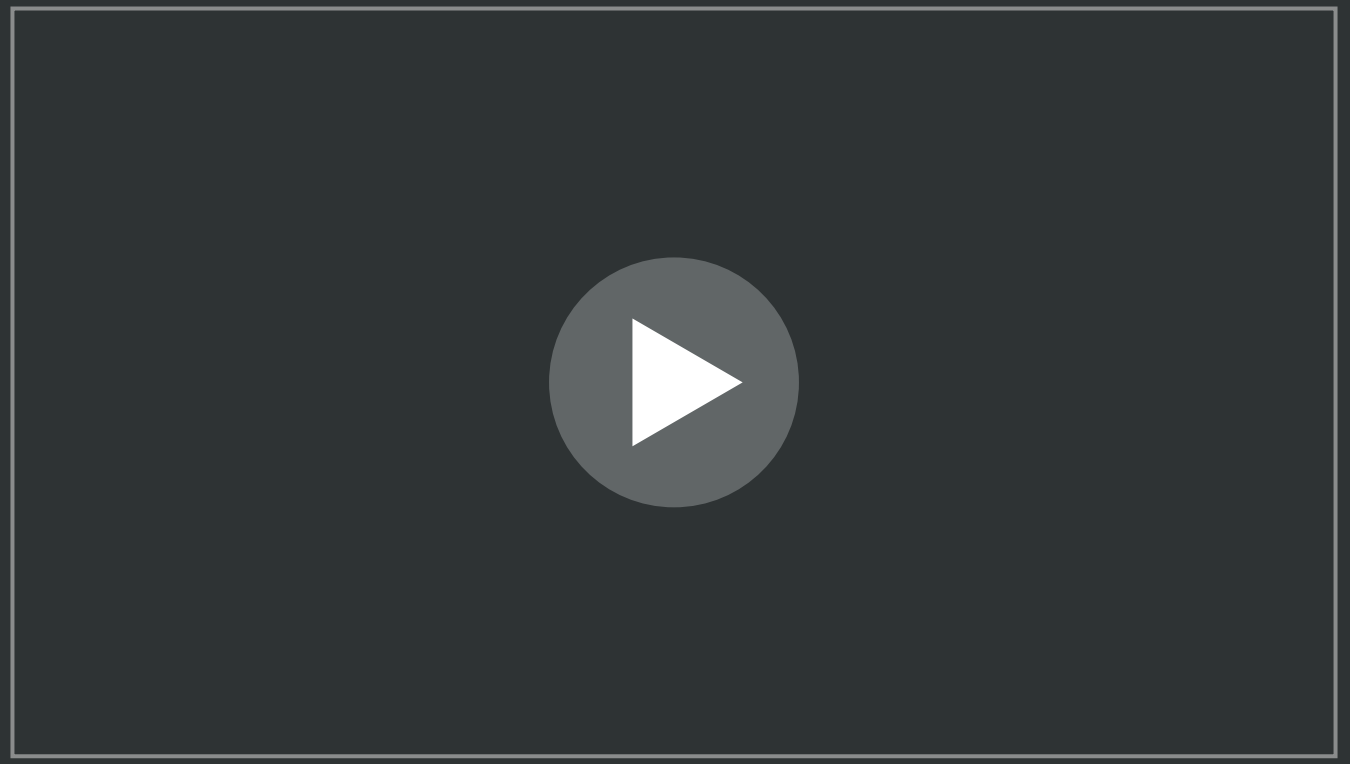



**DO NOT** attempt to insert an NPA if there is clear fluid coming from nose or ears, signs of inhalation burns, or moderate to severe trauma to the nose

Level of Evidence:

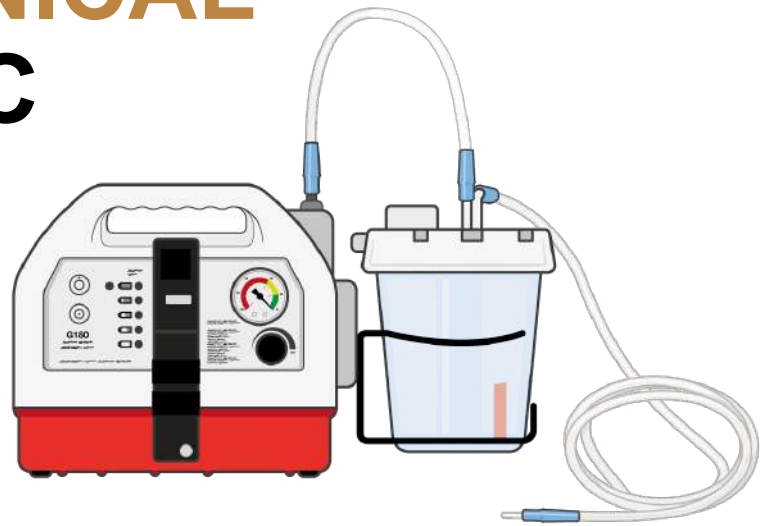
MARCH

# NPA INSERTION VIDEO



*Video can be found on deployedmedicine.com*

# MANUAL AND MECHANICAL SUCTIONING IN TFC



**GOOD:**
Improvised suction device

**BETTER:**
Manual suction device

**BEST:**
Mechanical suction device

- Only insert as far as you can see to avoid eliciting a gag reflex
- Limit the suction time to **NO more than** 10 seconds
- Suction should only be applied when withdrawing the catheter

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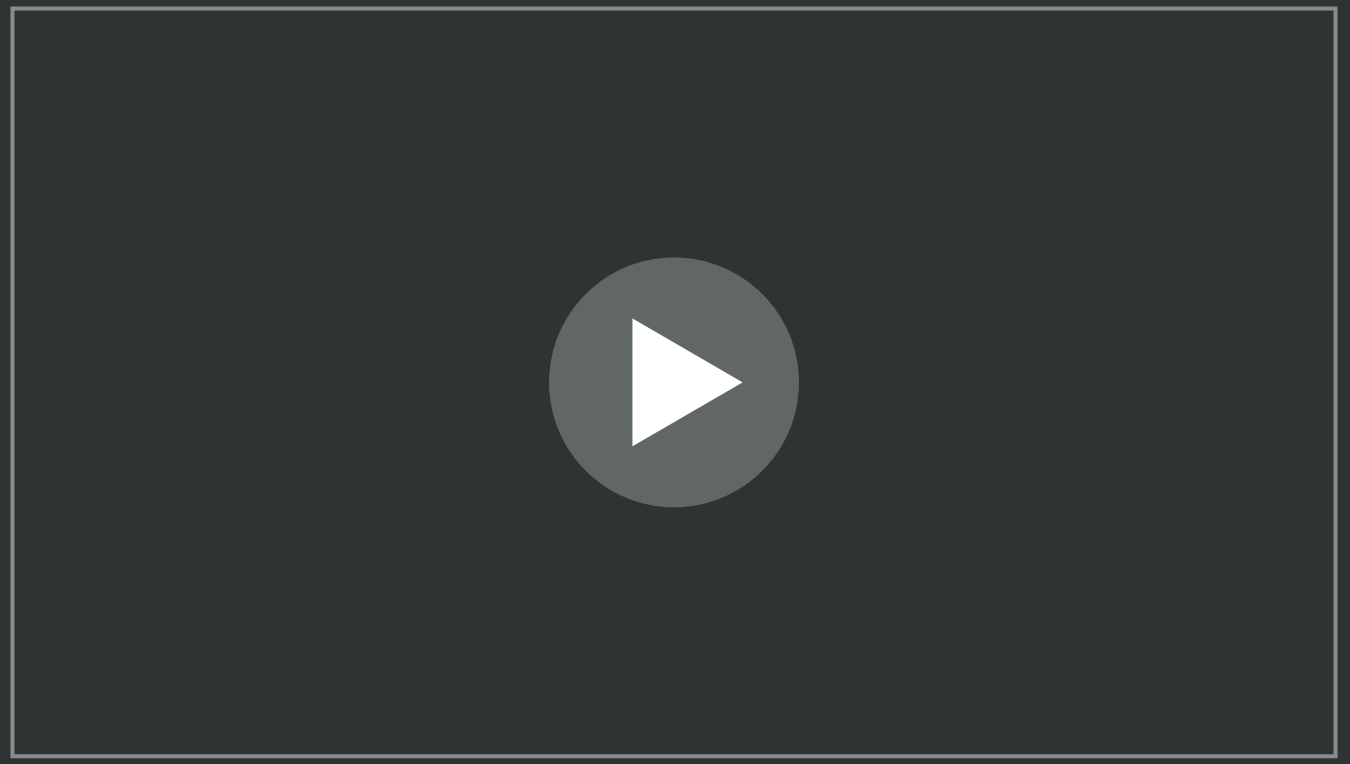
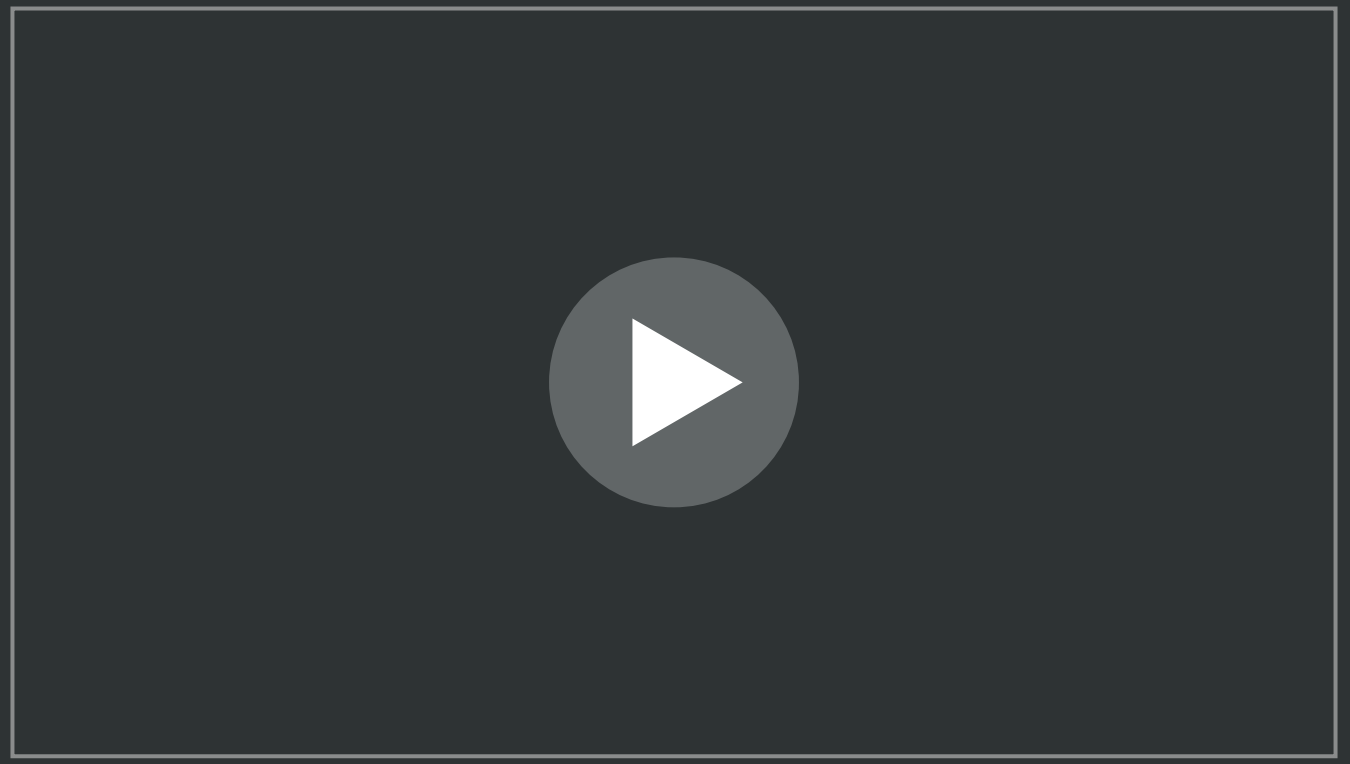
# MANUAL SUCTION VIDEO



*Video can be found on deployedmedicine.com*

# MECHANICAL SUCTION VIDEO



*Video can be found on deployedmedicine.com*

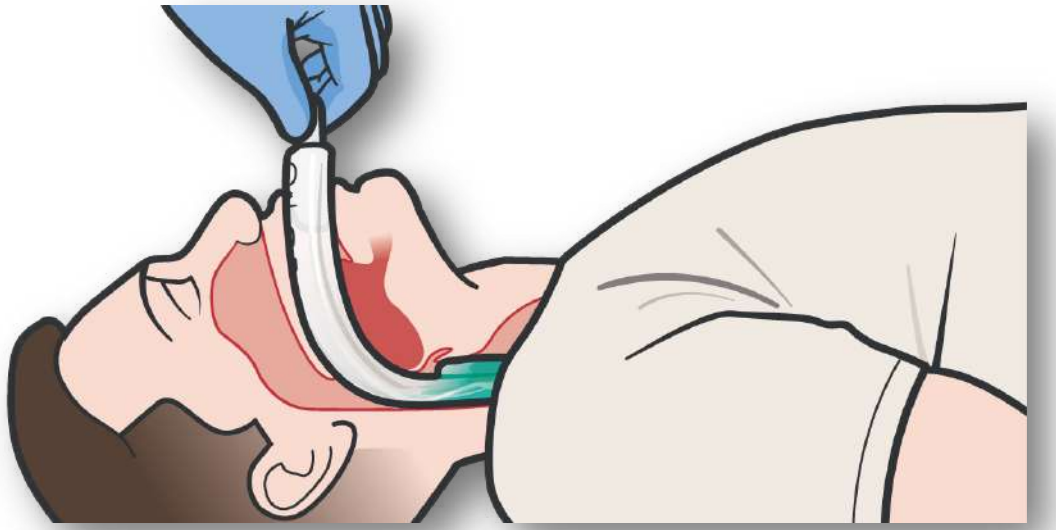
# SKILL STATION

## Airway Maneuvers and Suctioning

- Recovery Position
- Head-Tilt/Chin-Lift
- Jaw-Thrust Maneuver
- Manual Suctioning
- Mechanical Suctioning

# EXTRAGLOTTIC AIRWAYS

**EXTRAGLOTTIC AIRWAYS** form a seal over the hypopharynx, opening the airway for ventilations



**i-gel® benefits**:

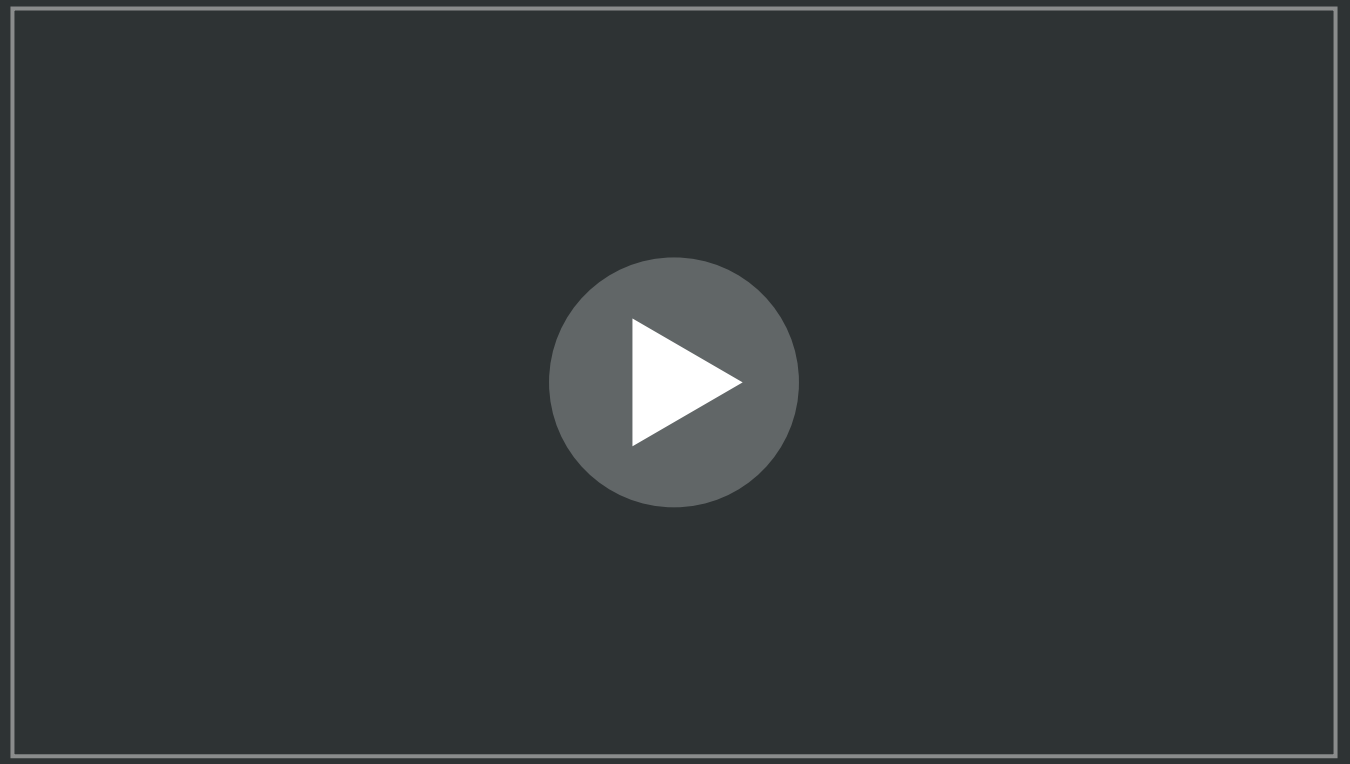
- No need to inflate cuff
- No need to monitor cuff pressure during evacuation since there is no air in the cuff

**EXTRAGLOTTIC AIRWAYS** will not be tolerated by a casualty who is not deeply unconscious

Level of Evidence:

MARCH

# EXTRAGLOTTIC AIRWAY INSERTION VIDEO



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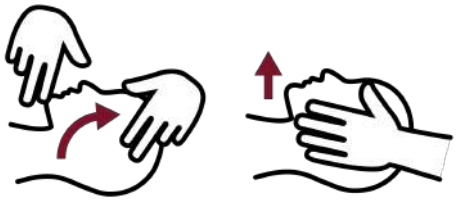
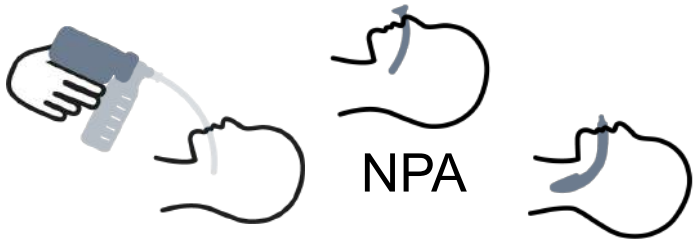
# CRICOTHYROIDOTOMY
## INDICATIONS

**PRIMARY INDICATION**
**UNSUCCESSFUL** airway management with:

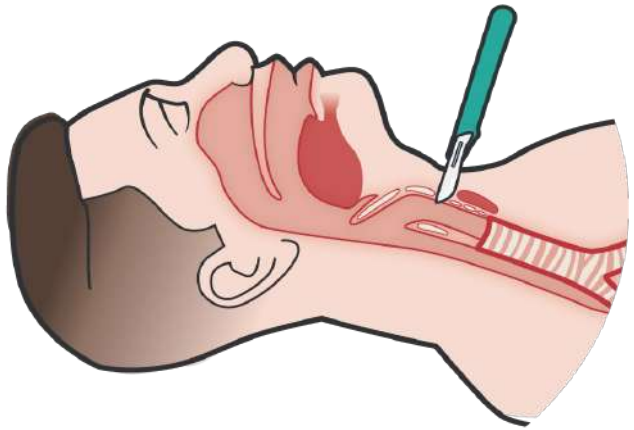


Airway maneuvers




Suction
(if appropriate)

Extraglottic airway



**CRICOTHYROIDOTOMY** is indicated for maxillofacial injuries, to include partial or complete airway obstruction

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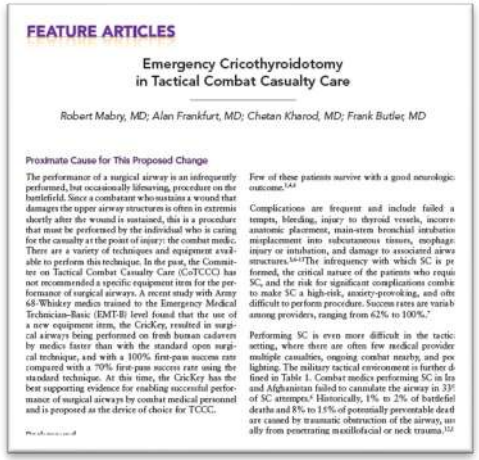
Thermal and toxic gas injuries are additional indications for cricothyroidotomy

**Contraindications:**

- Ability to secure less invasive airway
- Tracheal transection
- Massive swelling
- Age Younger than 10-12 years old
- Massive Swelling
- Massive Airway Trauma

# CRICOTHYROIDOTOMY TECHNIQUES



FEATURE ARTICLES

Emergency Cricothyroidotomy in Tactical Combat Casualty Care

Robert Mabry, MD; Alan Frankfurt, MD; Chetan Kharod, MD; Frank Butler, MD

Proximate Cause for This Proposed Change

The performance of a surgical airway is an infrequently performed, but occasionally lifesaving, procedure on the battlefield. Since a combatant who sustains a wound that damages the upper airway structures is often in extremis shortly after the wound is sustained, this is a procedure that must be performed by the individual who is caring for the casualty at the point of injury: the combat medic. There are a variety of techniques and equipment available to perform this technique. In the past, the Committee on Tactical Combat Casualty Care (CoTCCC) has not recommended a specific equipment item for the performance of surgical airways. A recent study with Army 68-Whiskey medics trained to the Emergency Medical Technician–Basic (EMT-B) level found that the use of a new equipment item, the CricKey, resulted in surgical airways being performed on fresh human cadavers by medics faster than with the standard open surgical technique, and with a 100% first-pass success rate compared with a 70% first-pass success rate using the standard technique. At this time, the CricKey has the best supporting evidence for enabling successful performance of surgical airways by combat medical personnel and is proposed as the device of choice for TCCC.

Few of these patients survive with a good neurologic outcome.[3,4]

Complications are frequent and include failed attempts, bleeding, injury to thyroid vessels, incorrect anatomic placement, main-stem bronchial intubation misplacement into subcutaneous tissues, esophageal injury or intubation, and damage to associated airway structures.[3,4,7]The infrequency with which SC is performed, the critical nature of the patients who require SC, and the risk for significant complications combine to make SC a high-risk, anxiety-provoking, and often difficult to perform procedure. Success rates are variable among providers, ranging from 62% to 100%.[7]

Performing SC is even more difficult in the tactical setting, where there are often few medical providers, multiple casualties, ongoing combat nearby, and poor lighting. The military tactical environment is further defined in Table 1. Combat medics performing SC in Iraq and Afghanistan failed to cannulate the airway in 33% of SC attempts.[4] Historically, 1% to 2% of battlefield deaths and 8% to 15% of potentially preventable deaths are caused by traumatic obstruction of the airway, usually from penetrating maxillofacial or neck trauma.[1,2]

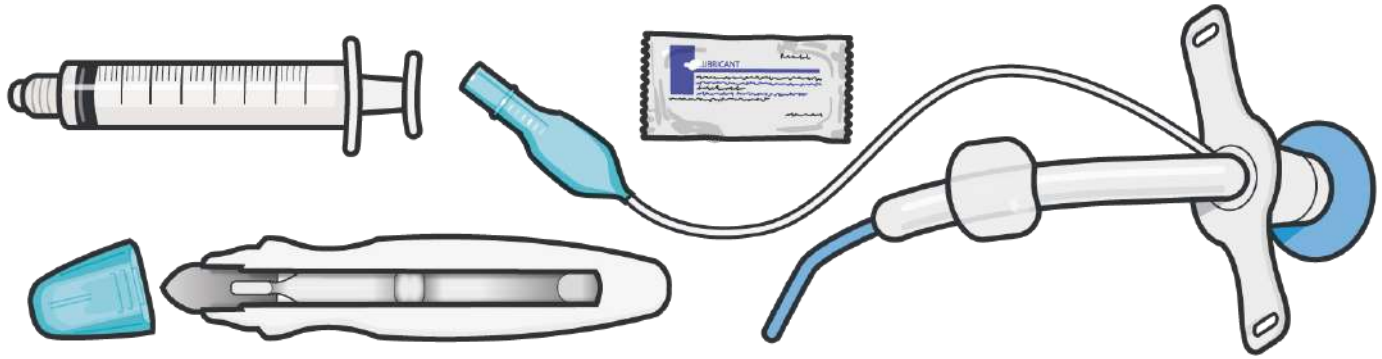
**CoTCCC** research results:
Preferred method: Cric-Key™

## ALTERNATE METHODS:

- Standard open surgical method
- Bougie-aided open surgical method

**Cricothyroidotomy considerations:**

- **DO NOT** make incision too short
- Practice locating anatomical landmarks frequently
- **Avoid** a “stabbing” technique
- Palpate cricothyroid membrane with the index finger, identifying the landmark to make a horizontal incision

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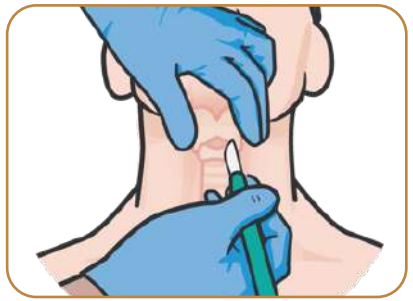
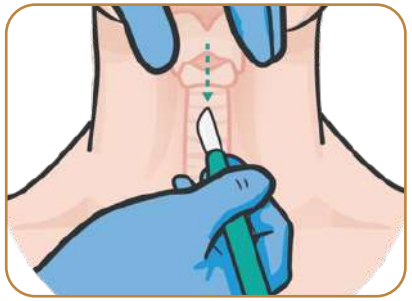
# CRICOTHYROIDOTOMY TECHNIQUES (cont.)

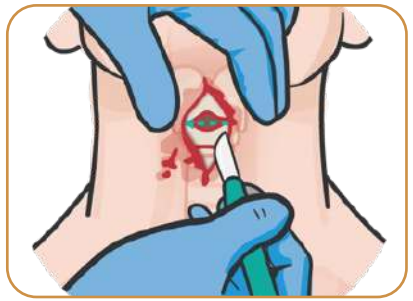
Identify cricothyroid membrane



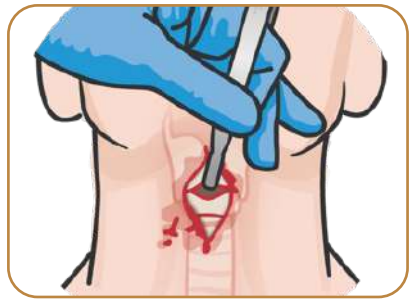
Stabilize larynx



Make 1” vertical incision



Make horizontal incision through membrane



Hook cartilage and lift to stabilize and maintain the opening

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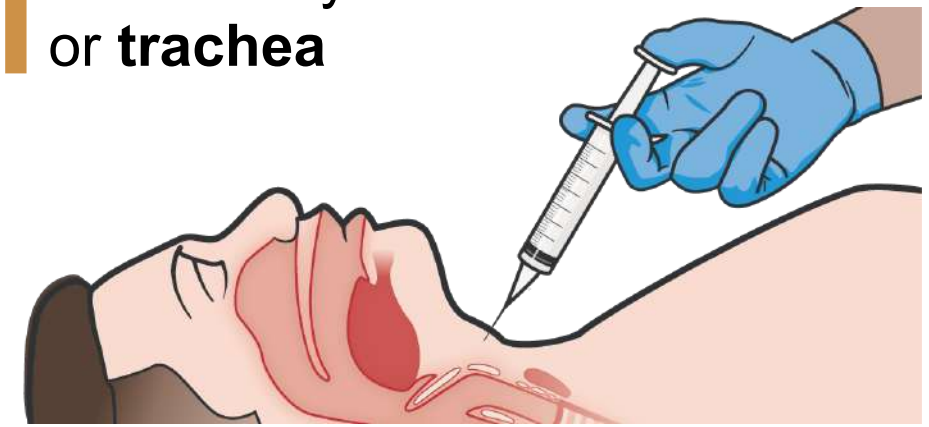
# LIDOCAINE USAGE IN FIELD CRICOTHYROIDOTOMIES

Consider **LIDOCAINE** for **conscious** or **semi-conscious** casualties, or casualties with a **response to painful stimuli**

- Use lidocaine **after** identifying anatomical **landmarks**
- Anesthetize subcutaneous structures **without penetrating** the cricothyroid **membrane** or **trachea**



⚠ The clinical or tactical situation may be a contraindication to lidocaine usage prior to placing the airway

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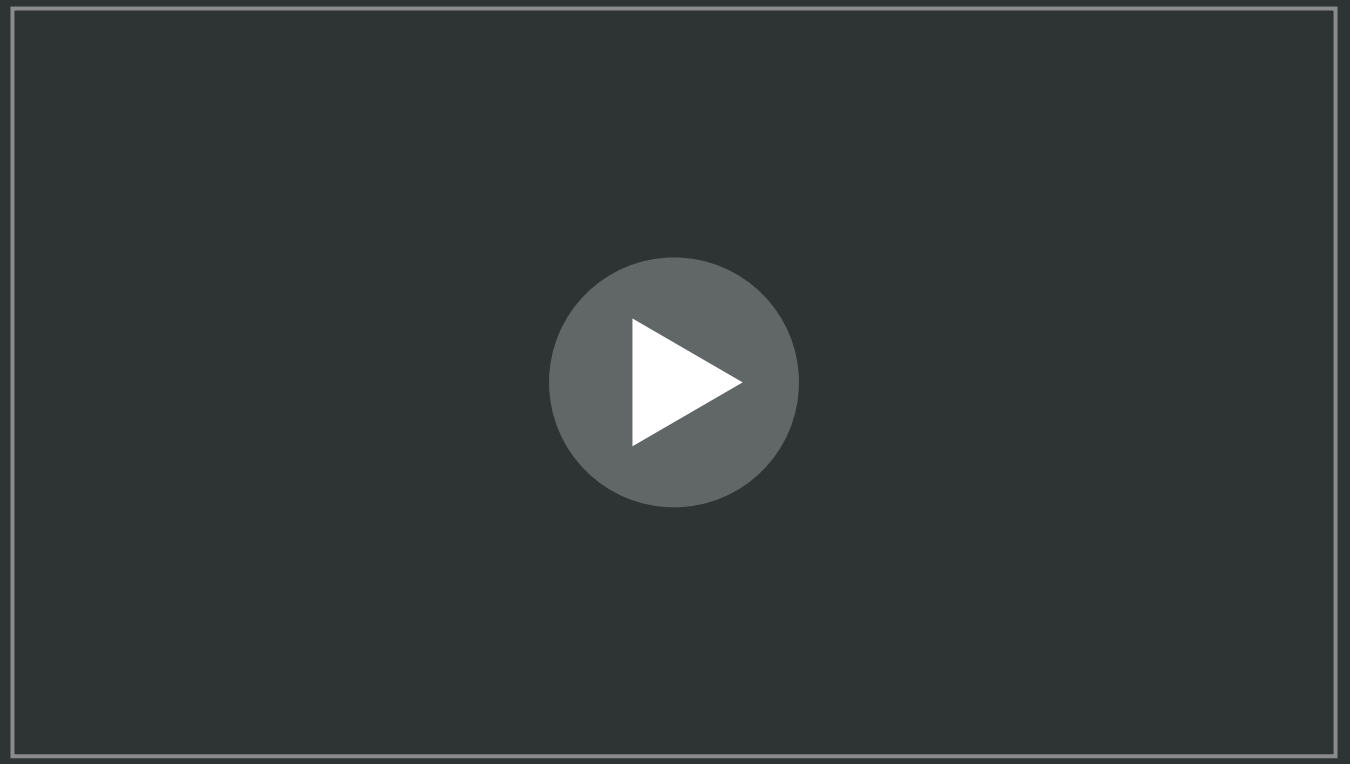
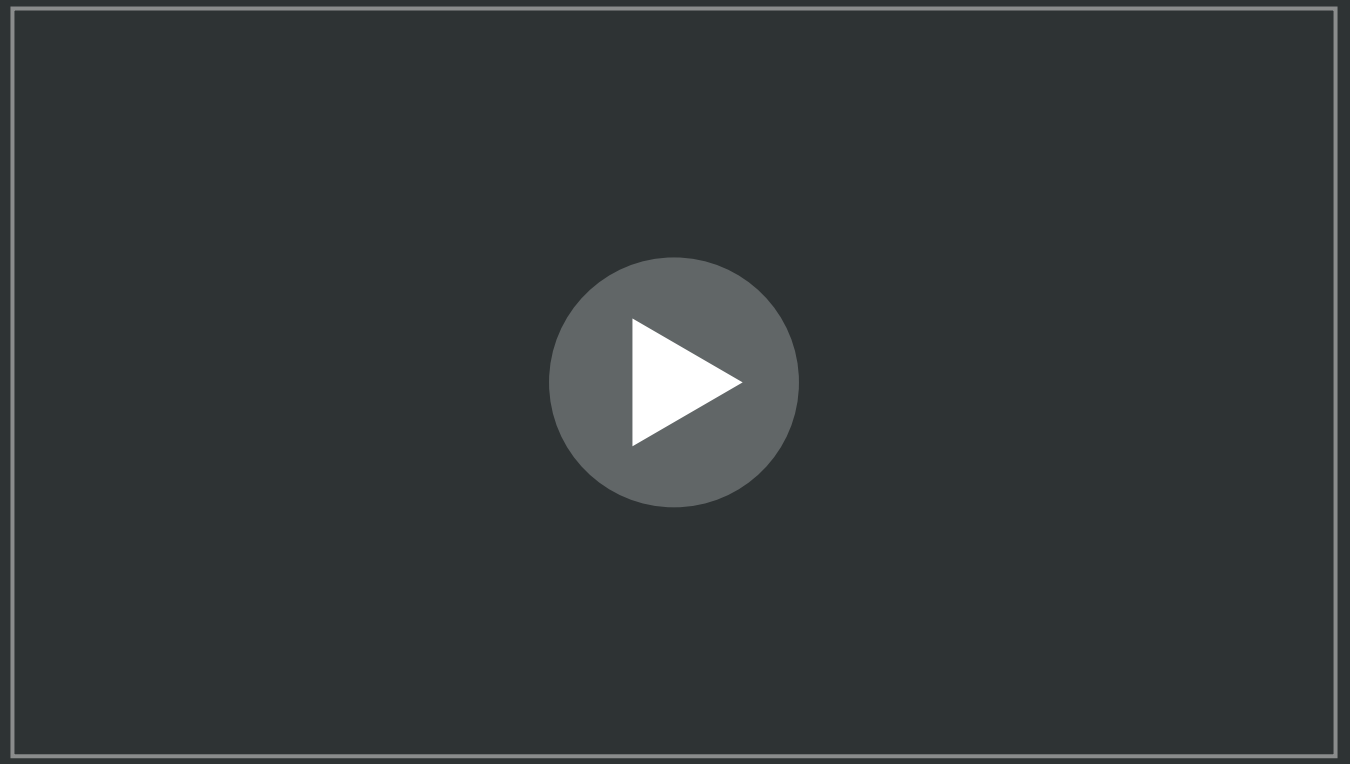
# CRIC-KEY CRICOTHYROIDOTOMY VIDEO



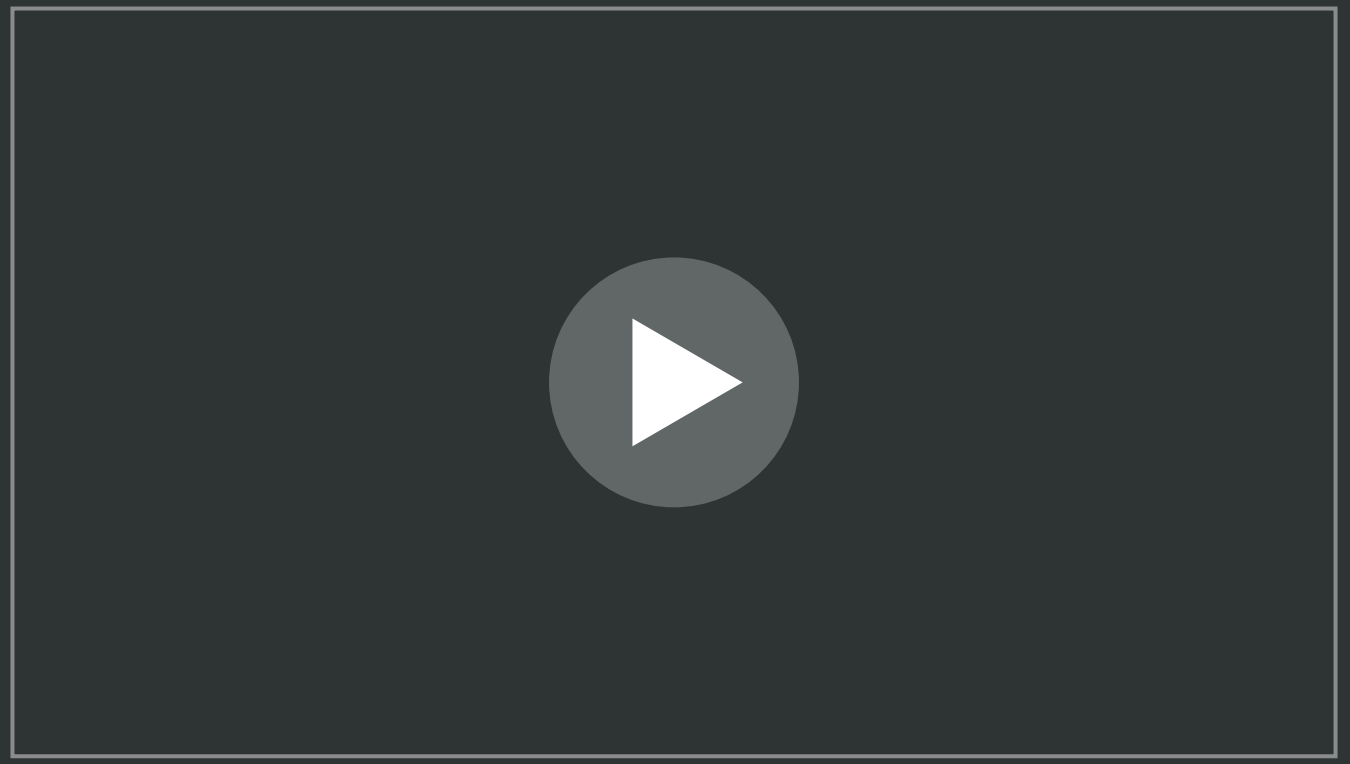
*Video can be found on deployedmedicine.com*

# BOUGIE-AIDED CRICOTHYROIDOTOMY VIDEO



*Video can be found on deployedmedicine.com*

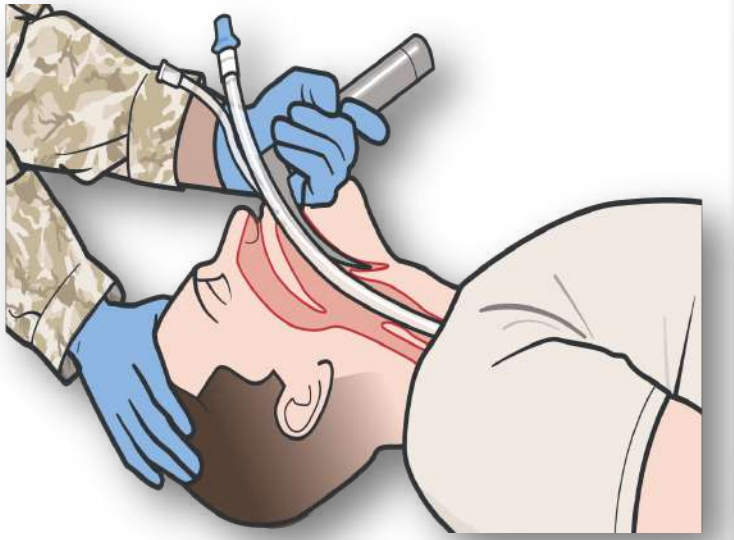
# OPEN CRICOTHYROIDOTOMY VIDEO



*Video can be found on deployedmedicine.com*

# INDICATIONS AND LIMITATIONS OF ENDOTRACHEAL INTUBATION (ETI)

| ETI limitations: |
| --- |
| Low ETI experience even in seasoned medics |
| White light requirements |
| Maxillofacial injuries |
| Difficulty recognizing esophageal intubations |

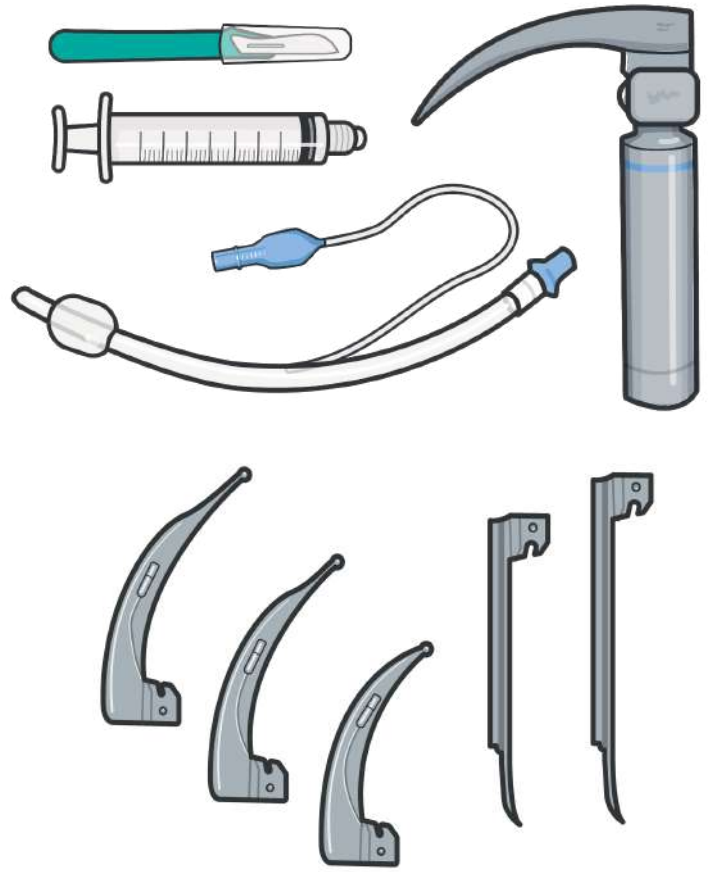


| ETI indications: |
| --- |
| Unsuccessful airway management with: |
| ▪ Airway maneuvers<br>▪ Nasopharyngeal airway<br>▪ Extraglottic airway(s) |
| Thermal and toxic gas injuries |

Level of Evidence: MARCH

# PRINCIPLES OF ETI IN TACTICAL FIELD CARE AND EVACUATION SETTINGS

| ETI CONSIDERATIONS | TACTICAL LIMITATIONS |
|---|---|
| Equipment/Casualty preparation | Equipment Shortages |
| Pre-ventilation/Preoxygenation | Scene safety, space limitations |
| Rapid Sequence induction with lidocaine for conscious/semi-conscious | Conscious sedation with RSI requires significant experience and training |
| Laryngoscope insertion | Poor lighting, lack of suction |
| Endotracheal tube (ETT) advancement | Lack of O2 or airway adjuncts |
| ETT cuff inflation | Aeromedical concerns over cuff pressures at altitude |
| ETT position check | High noise level making auscultation difficult |
| Secure ETT | Lack of capnography |



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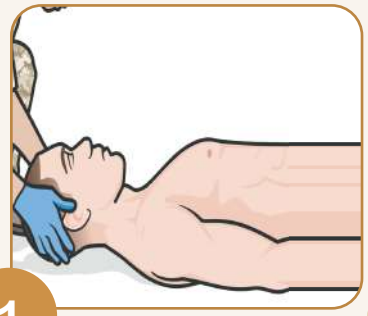
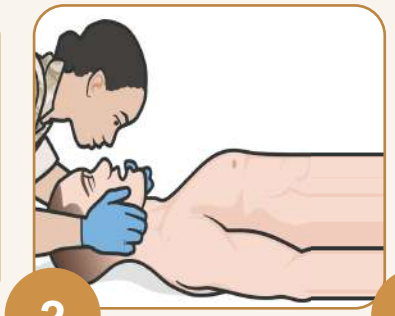
# ENDOTRACHEAL TUBE INTUBATION

## TECHNIQUES



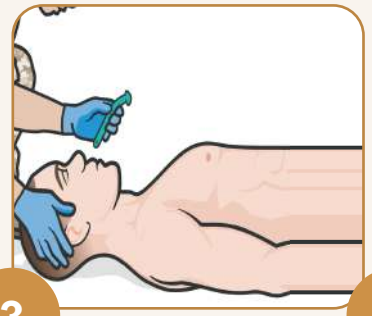
1

**ROLL** the casualty onto their back and place them onto a hard surface



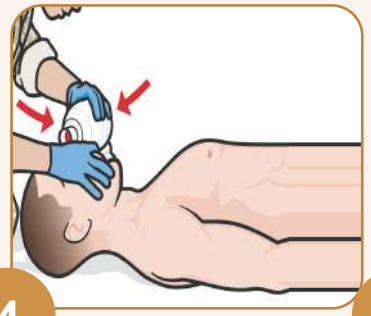
2

**OPEN** the mouth and look for visible obstructions (e.g., lacerations obstructions, broken teeth, burns, or swelling or other debris, such as vomit)



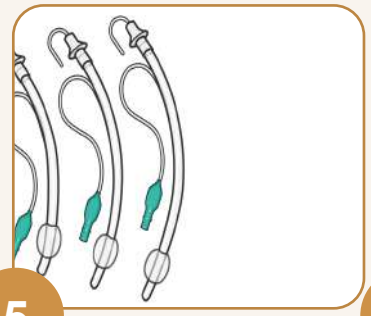
3

If available and tolerated, **INSERT** airway adjunct. Nasopharyngeal (NPA) or oropharyngeal airway (OPA)



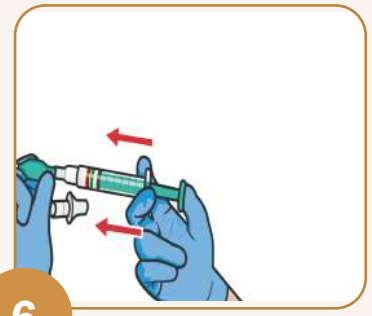
4

**VENTILATE** casualty with a bag-valve-mask device



5

**SELECT** the appropriate size of ETT for the casualty and open the proximal end keeping the ETT in the packaging

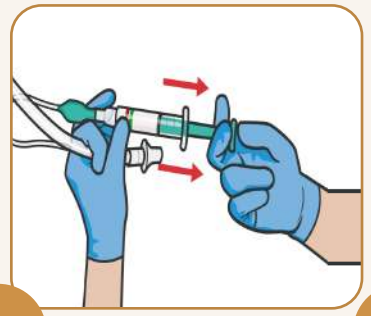


6

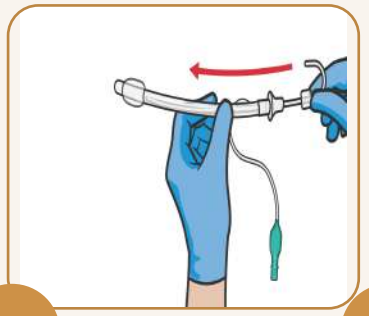
**FILL** the 10mL syringe with air and attach the syringe to the ETT cuff valve (pilot balloon), inflate the cuff, and inspect for leaks

**Direct Laryngoscopy (Stylet)**

# ENDOTRACHEAL TUBE INTUBATION TECHNIQUES



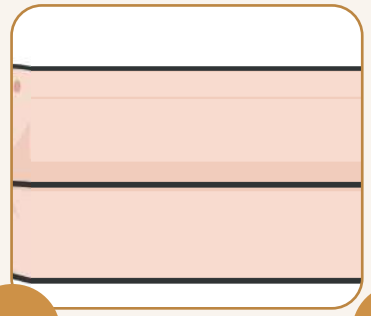
**7** **DEFLATE** cuff by pulling back on the plunger until all the air is removed



**8** **INSERT** stylet into ETT

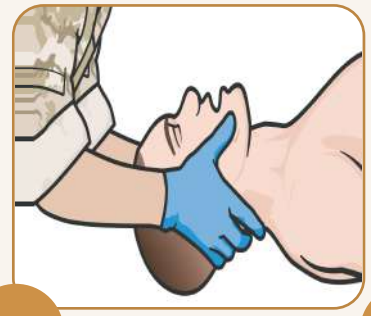
**(a)** The stylet should be inserted in the ETT so the tip of the stylet is recessed ½ inch from the tip of the ETT

**9** **SELECT** appropriate laryngoscope blade, attach to the handle and verify the light is functioning

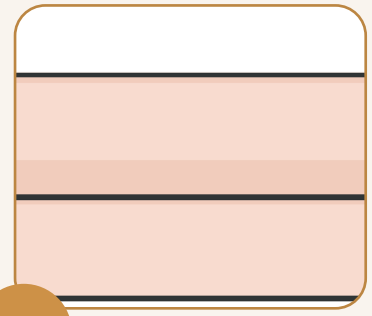


**10** **POSITION** the casualty's head by hyperextending the neck

**NOTE:** Hyperextension of the neck will allow for visualization of the vocal cords



**11** **OPEN** the casualty's mouth and hold the it open by pushing down on the jaw

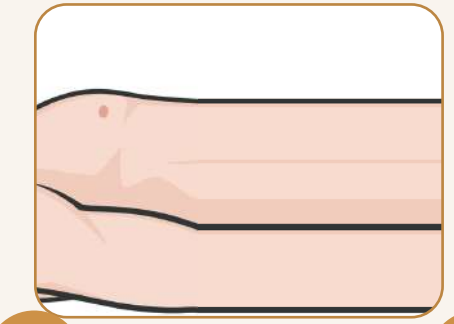


**12** **REMOVE** OPA, if in place

**Direct Laryngoscopy (Stylet)**

# ENDOTRACHEAL TUBE INTUBATION

## TECHNIQUES



13

**POSITION** yourself at the top of the casualty's head.

**(a) HOLD** the laryngoscope with your left hand.

**(b) OPEN** and **LOCK** the selected blade at a 90- degree angle

13

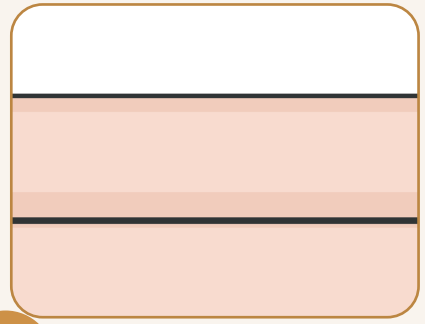
**(c) PLACE** the blade into the right side of the casualty's mouth

**(d) MOVE** the laryngoscope to the center of the mouth by sliding the laryngoscope to the left side of the mouth, moving the tongue out the way

13

**(e) INSERT** the laryngoscope blade into the posterior pharynx and visualize the vocal cords

**(i)** Using a **Macintosh blade**, apply anterior pressure to the vallecula with the tip of the laryngoscope blade.



13

**(ii)** Using a **Miller blade**, hook the blade tip under the epiglottis and pull up to fold back the epiglottis to expose the vocal cords

13

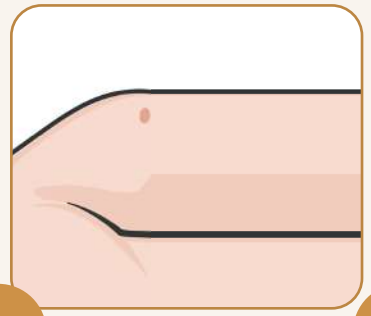
**(f)** Advance the blade a short distance to observe the epiglottis

**(g)** Retract the epiglottis and observe the vocal cords

**CAUTION:** DO NOT use the casualty's teeth as a fulcrum

**Direct Laryngoscopy (Stylet)**

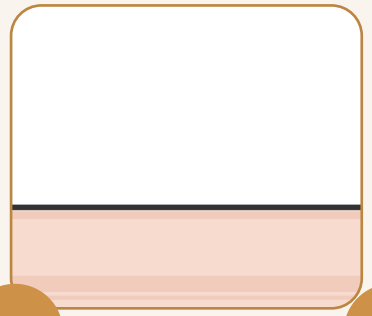
# ENDOTRACHEAL TUBE INTUBATION TECHNIQUES



**14**

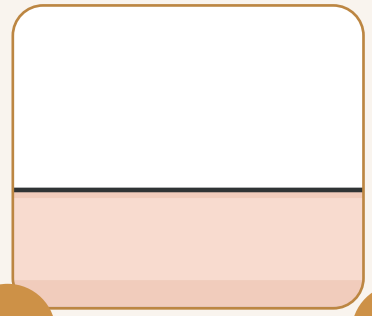
**(a)** Grasp the ETT with your right hand

**(b)** Carefully, guide the tip of the tube between the vocal cords until the cuff is just below the level of the vocal cords



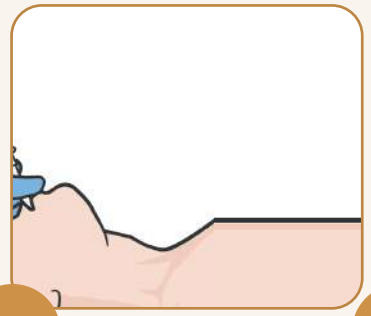
**15**

**REMOVE** the laryngoscope from the airway



**16**

**MAINTAIN** positive control of the ETT with your right hand and remove the stylet with your left hand



**17**

**INFLATE** the cuff of the ETT by injecting the required amount of air (5-10mL) to create a seal by pressing the plunger of the syringe

**18**

**ATTACH** EtCO2 device between the ETT and BVM, if available. If not available, connect the BVM to the ETT

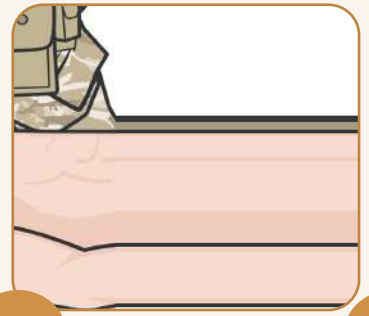
**19**

**CHECK** placement of the ETT by connecting BVM

**Direct Laryngoscopy (Stylet)**

# ENDOTRACHEAL TUBE INTUBATION

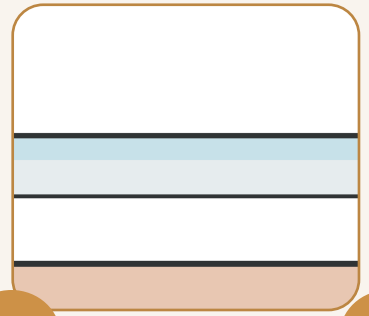
## TECHNIQUES



19

**(a)** Auscultate the epigastric area first, then lungs fields while manually ventilate

**(b)** If a rushing sound is heard over the epigastric area and no breath sounds, repeat the procedure



19

**(c)** If casualty has strong bilateral breath sounds proceed to Step XX

**(d)** If sound is heard over one lung field only, consider a right main stem intubation, deflate, withdraw slightly and listen again

20

**SECURE** positive control of the ETT with your right hand and remove the stylet with your left hand

**CAUTION:** Maintain manual control of the ETT until the ETT is properly secured

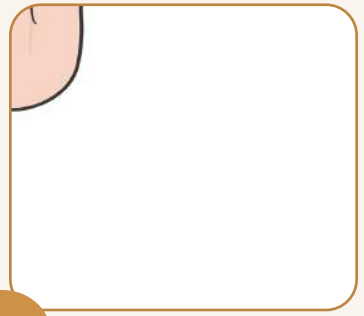
21

**MANUALLY VENTILATE** casualty every 5-6 seconds

**CONSIDER:** If available, attach oxygen reservoir to BVM device and/or connect to high-flow regulator (12-15 lpm)

22

**ATTACH** EtCO2 device between the ETT and BVM, if available. If not available, connect the BVM to the ETT

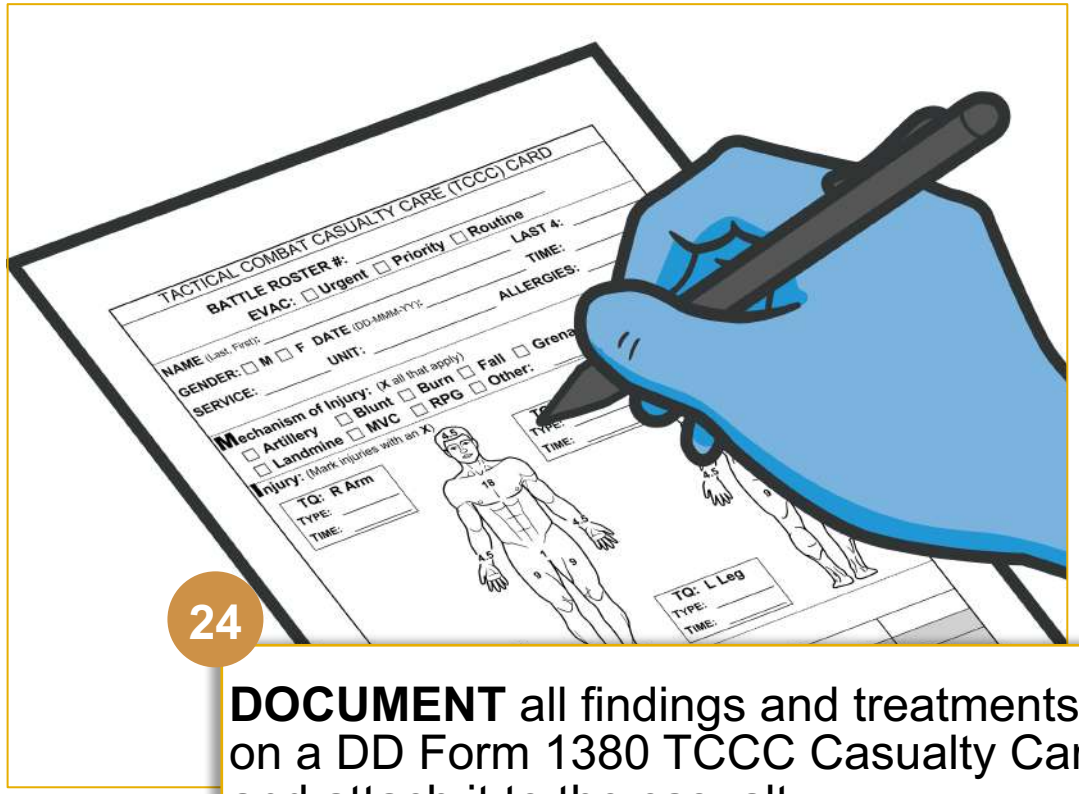


23

**CONTINUE MONITORING** the casualty to ensure correct tube placement is maintained by auscultating the lungs and epigastric area

**Direct Laryngoscopy (Stylet)**

# ENDOTRACHEAL TUBE INTUBATION TECHNIQUES




24

**DOCUMENT** all findings and treatments on a DD Form 1380 TCCC Casualty Card and attach it to the casualty

**NOTE:** If colorimetric was previously utilized during bag-valve-mask ventilation, replace with new colorimetric or transition to capnography, if available.

**NOTE:** Colorimetric can be used in both the TFC and PCC environments but if the equipment is available Capnography is the gold standard and will be utilized.

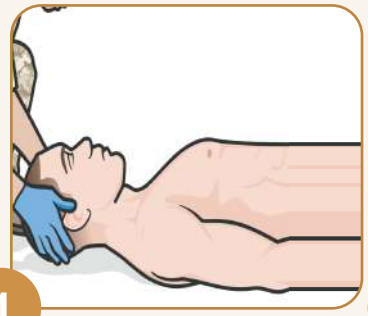
# ENDOTRACHEAL TUBE INTUBATION SKILL

## INSTRUCTOR-LED Demonstration

*(Trainer-led demonstration review of the ETT Intubation (Stylet) Skill sequence & key steps)*

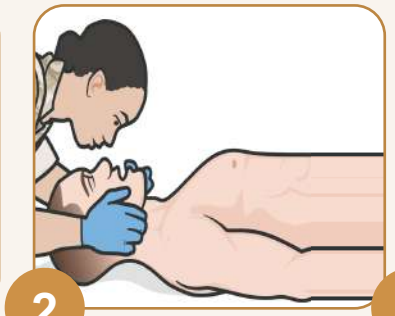
# ENDOTRACHEAL TUBE INTUBATION

## TECHNIQUES



1

**ROLL** the casualty onto their back and place them onto a hard surface



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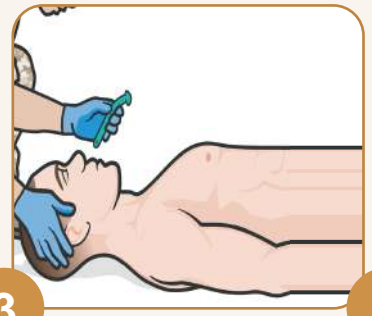
**OPEN** the mouth and look for visible obstructions (e.g., lacerations obstructions, broken teeth, burns, or swelling or other debris, such as vomit)



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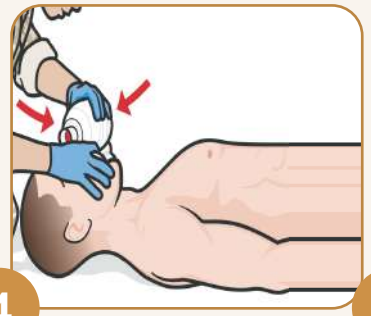
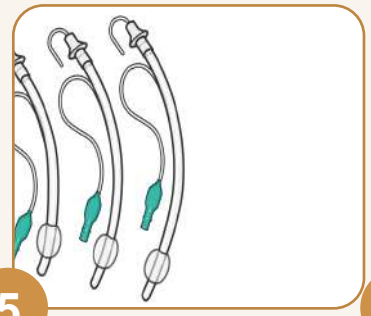
If available and tolerated, **INSERT** airway adjunct. Nasopharyngeal (NPA) or oropharyngeal airway (OPA)



4

**VENTILATE** casualty with a bag-valve-mask device

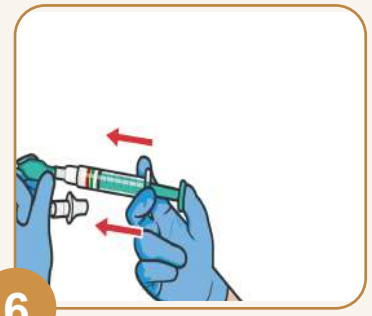
**NOTE:** Monitor O2 Sat with a pulse oximetry device and attempt to maintain O2 Sat at 94%



5

**SELECT** the appropriate size of ETT for the casualty and open the proximal end keeping the ETT in the packaging

**NOTE:** Average adult male (7.5-9.0cm) Average adult female (7.0-8.0cm)



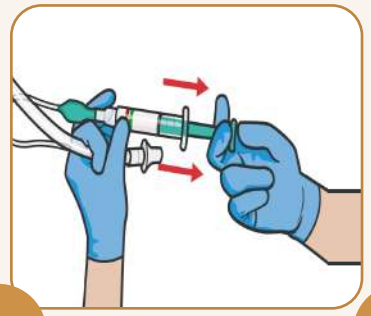
6

**FILL** the 10mL syringe with air and attach the syringe to the ETT cuff valve (pilot balloon), inflate the cuff, and inspect for leaks

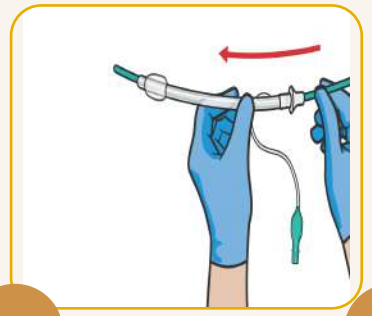
**NOTE:** If you detect a leak, discard ETT and get a new one

**Direct Laryngoscopy (Bougie-Aided)**

# ENDOTRACHEAL TUBE INTUBATION TECHNIQUES

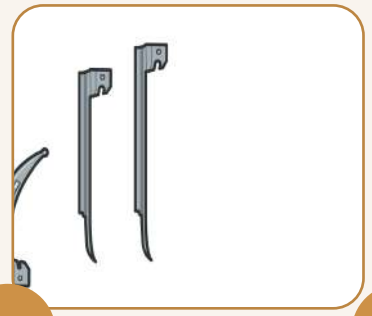


**7** **DEFLATE** cuff by pulling back on the plunger until all the air is removed

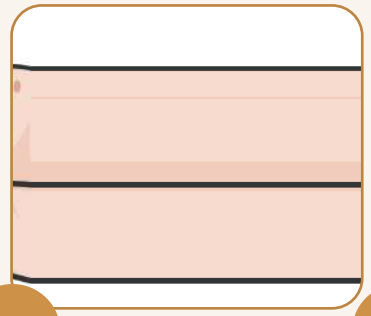


**8** **OPEN** bougie/tube introducer

**CONSIDERATION:** Placement of the ETT on the proximal end of bougie for insertion is an option, if training and/or resources permit

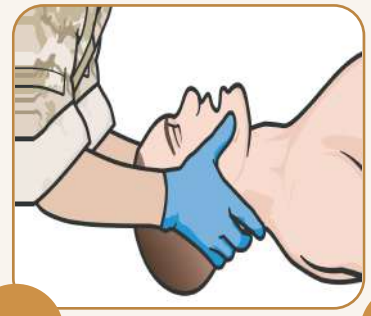


**9** **SELECT** appropriate laryngoscope blade, attach to the handle and verify the light is functioning

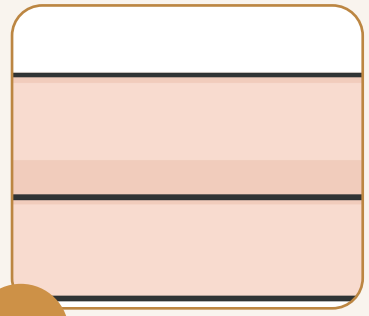


**10** **POSITION** the casualty's head by hyperextending the neck

**NOTE:** Hyperextension of the neck will allow for visualization of the vocal cords



**11** **OPEN** the casualty's mouth and hold the it open by pushing down on the jaw

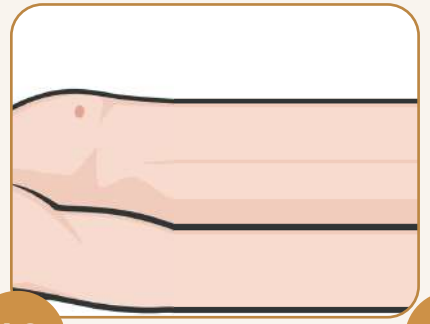


**12** **REMOVE** OPA, if in place

**Direct Laryngoscopy (Bougie-Aided)**

# ENDOTRACHEAL TUBE INTUBATION

## TECHNIQUES



13

**POSITION** yourself at the top of the casualty's head.

**(a) HOLD** the laryngoscope with your left hand.

**(b) OPEN** and **LOCK** the selected blade at a 90- degree angle

13

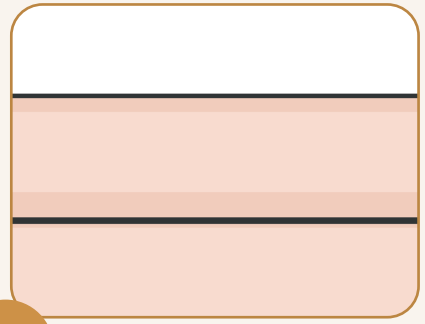
**(c) PLACE** the blade into the right side of the casualty's mouth

**(d) MOVE** the laryngoscope to the center of the mouth by sliding the laryngoscope to the left side of the mouth, moving the tongue out the way

13

**(e) INSERT** the laryngoscope blade into the posterior pharynx and visualize the vocal cords

**(i)** Using a **Macintosh blade**, apply anterior pressure to the vallecula with the tip of the laryngoscope blade.



13

**(ii)** Using a **Miller blade**, hook the blade tip under the epiglottis and pull up to fold back the epiglottis to expose the vocal cords

13

**(f)** Advance the blade a short distance to observe the epiglottis

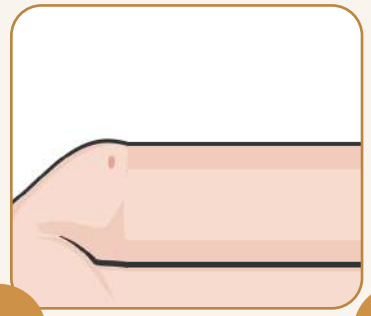
**(g)** Retract the epiglottis and observe the vocal cords

**CAUTION:** DO NOT use the casualty's teeth as a fulcrum

**Direct Laryngoscopy (Bougie-Aided)**

# ENDOTRACHEAL TUBE INTUBATION

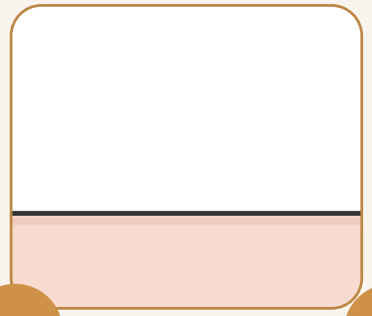
## TECHNIQUES



**14**

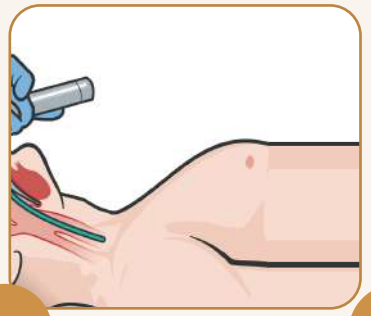
When the vocal cords are visualized, **INSERT** the bougie into the trachea with the coude tip facing anteriorly.

**(a)** You should feel the bougie "vibrate" as the tip moves against the cricoid rings.



**14**

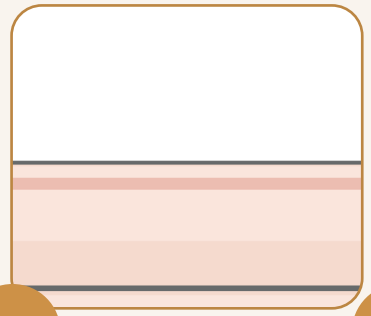
**(b)** While stabilizing the laryngoscope with your left hand, grasp the bougie from your right hand with the fingers from your left hand and hold against the laryngoscope handle.



**14**

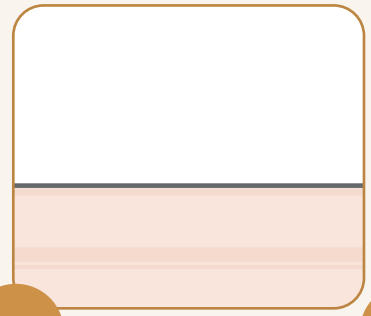
**(c)** Grasp the ETT with your right hand and place over the proximal end of the bougie.

**NOTE**: If not previously placed on the proximal end of the bougie, this can be done independently or with assistance.



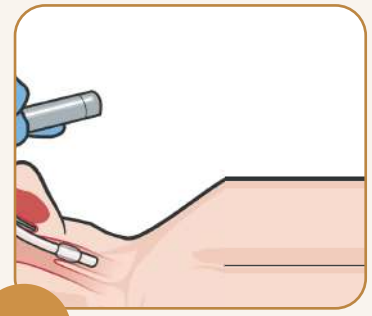
**14**

**(d)** Carefully guide the tip of the tube between the vocal cords until the cuff is just below the level of the vocal cords.



**15**

**REMOVE** the laryngoscope from the airway.



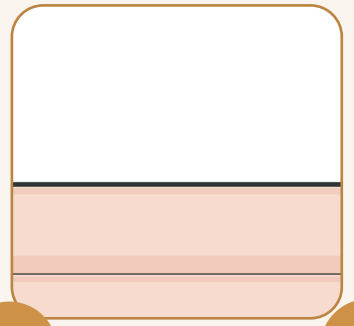
**16**

**REMOVE** the bougie from the ET tube.

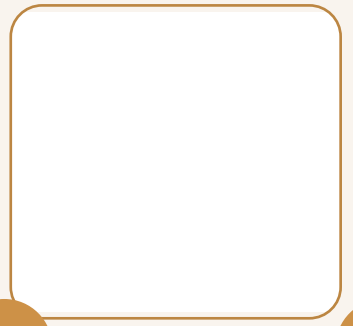
**Direct Laryngoscopy (Bougie-Aided)**

# ENDOTRACHEAL TUBE INTUBATION TECHNIQUES

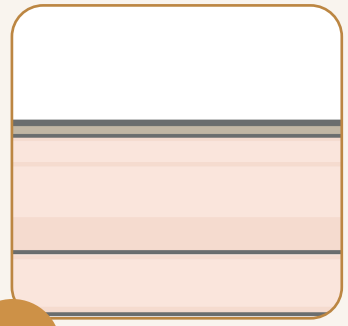
**15** **REMOVE** the laryngoscope from the airway.



**16** **REMOVE** the bougie from the ET tube.



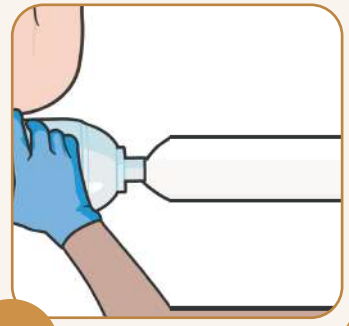
**17** **INFLATE** the cuff of the ETT by injecting the required amount of air (5-10mL) to create a seal by pressing the plunger of the syringe.



**18** **CHECK** placement of the ETT

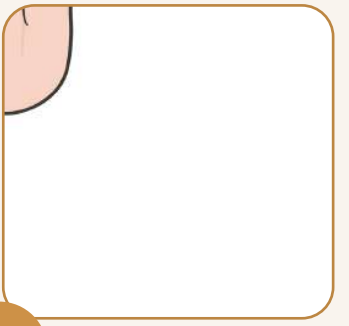
**(a)** Auscultate the epigastric area first, then lung fields while manually ventilate.

**(b)** If a rushing sound is heard over the epigastric area and no breath sounds, repeat the procedure.



**18** **(c)** If casualty has strong bilateral breath sounds, proceed to **Step XX.**

**(d)** If sound is heard over one lung field only, consider a right mainstem intubation, deflate, withdraw slightly, and listen again.



**19** **SECURE** the ETT with ½-inch adhesive tape, ETT tie or commercial ETT securing device.

**CAUTION**: Maintain manual control of the ETT the ETT is properly secured

**Direct Laryngoscopy (Bougie-Aided)**

# ENDOTRACHEAL TUBE INTUBATION TECHNIQUES

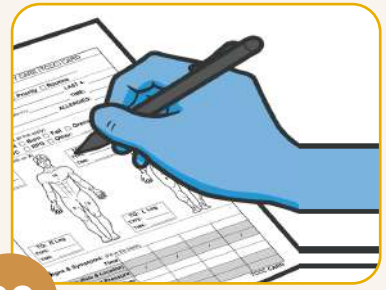
**20** **MANUALLY VENTILATE** casualty every 5-6 seconds.

**CONSIDER**: If available attach oxygen reservoir to BVM device and/or connect to high flow regulator (12-15 lpm)

**21** **ATTACH** $EtCO^2$ device between the ETT and BVM, if available. If not connect the BVM to the ETT.

**22** **CONTINUE MONITORING** the casualty to ensure correct tube placement is maintained by auscultating the lungs and epigastric area.

**23** **DOCUMENT** all findings and treatments on a DD Form 1380 TCCC Casualty Card and attach it to the casualty.



**NOTE:** If colorimetric was previously utilized during bag-valve-mask ventilation, replace with new colorimetric or transition to capnography, if available.

**NOTE:** Colorimetric can be used in both the TFC and PCC environments but if the equipment is available Capnography is the gold standard and will be utilized.

**Direct Laryngoscopy (Bougie-Aided)**

# ENDOTRACHEAL TUBE INTUBATION SKILL

**INSTRUCTOR-LED Demonstration**

*(Trainer-led demonstration review of the ETT Intubation (Bougie-Aided) Skill sequence & key steps)*

# SKILL STATION

## ADVANCED AIRWAY SKILL STATION

- Extraglottic Airway
- Cric-Key Cricothyroidotomy
- Bougie-Aided Cricothyroidotomy
- Open Surgical Cricothyroidotomy
- Endotracheal Intubation

# INDICATIONS AND LIMITATIONS OF AUTOMATED VENTILATION

## INDICATIONS:

- Same as BVM:
  - NOT breathing on their own
  - Hypoxic or hypercapnic distress
  - Mental status changes unable to maintain airway
- Plus:
  - Limited resources to maintain manual ventilations
  - Prolonged field care
  - Transport considerations

## LIMITATIONS:

- Ventilator availability
- Oxygen availability
- Battery life
- Mask seals
- Trained medical personnel
- Alarms

Level of Evidence:

MARCH

# PRINCIPLES OF AUTOMATED VENTILATION IN TFC AND EVACUATION SETTINGS

## ADJUSTABLE VENTILATORS:

- Adjustments for various parameters
  - Delivery modes
  - Tidal volumes
  - Pressure settings
  - Oxygen concentrations
  - Positive end-expiratory pressures
  - Ventilation rates

- Requires greater understanding of mechanical ventilation

## LIMITED-ADJUSTMENT VENTILATORS:

- Several ventilator parameters are fixed
- Limited adjustment options
- Allows medics with less training manage ventilator
- Limits the flexibility for adapting to a particular casualty

MARCH

# AUTOMATED VENTILATION

1

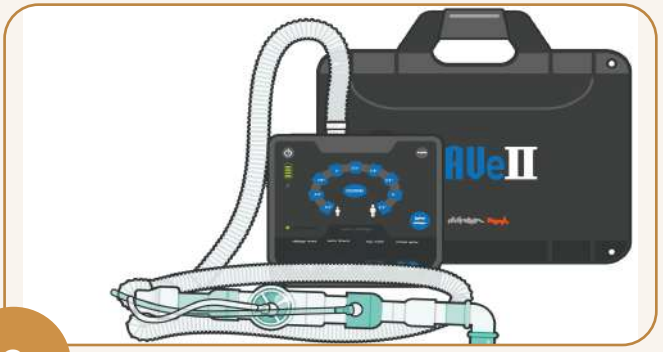
**VENTILATE** casualty's airway (ETT, Cricothyroidotomy or EGA) with a BVM device. If capnometry device is available, place between mask and BVM

**CAUTION:** Do Not deprive the casualty of Oxygen for longer than 20 seconds at any time during the procedure. Suction, as needed, not to exceed 10 seconds.

2

**ATTACH** oxygen reservoir to BVM device and connect to high flow regulator (12-15 lpm), if available.

**NOTE:** Attempt to maintain $O^2$Sat above 94% (this can be monitored through a pulse oximeter)




3

**PREPARE** SAVe II for use:

**(a)** Remove SAVe II from container

**(b)** Verify required items are in kit

**(c)** Inspect ventilator circuit (ensure tubing is connected and circuit is intact)

**(d)** Verify debris filter is in place

**(e)** Verify ventilator is adequately charged

# AUTOMATED VENTILATION

4

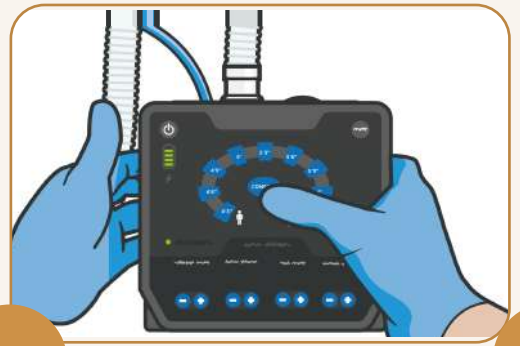
**SET-UP** SAVe II for use:

**(a)** Confirm airway is in place and secure

**(b)** If available, connect heat and moisture exchange filter onto ventilator circuit

**(c)** Connect circuit to ventilator

**NOTE**: Select 5ft, 8in (RR-XX, Vt-XXXmL)



4

**(d)** Turn on ventilator, select casualty height and press "Confirm"

**(e)** Verify "Disconnect Alarm"

**(f)** Verify "PIP Reached" alarm

4

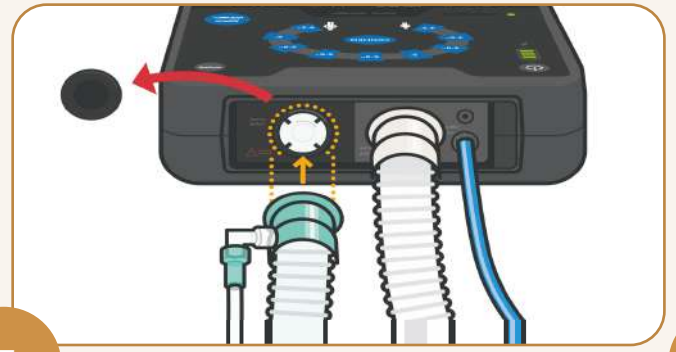
**(g)** Connect distal end of circuit to casualty's airway

**(h)** Set "PEEP" to desire value and press "Confirm"

**NOTE:** Leave circuit disconnected from airway; "Disconnect" visual alarm begins blinking within two (2) breaths, audible alarm should be clearly heard, and pump continues to operate normal.

**NOTE:** Completely block distal circuit with hand; "PIP reached" visual alarm should begin within one (1) breath. Pump turns off for several seconds, turns on again until PIP limit is reached.

# AUTOMATED VENTILATION



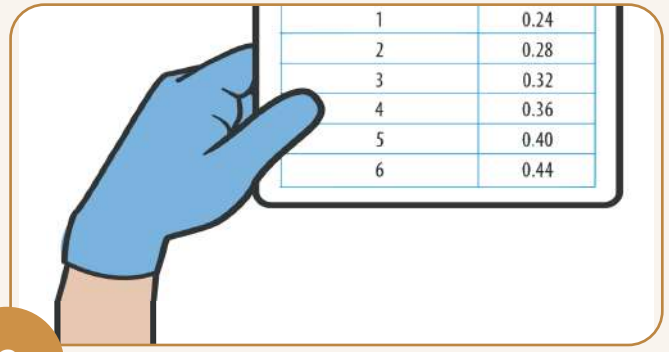
5

**ATTACH** Noise Attenuator

**(a)** Remove and store the air intake black cap and leave the debris filter in place.

**(b)** Connect the Noise Attenuator to the "Air/$O^2$ Intake" port and bend so the nipple is facing the SAVeII.

**NOTE:** Ensure nipple is not occluded or the tidal volume will be significantly reduced.



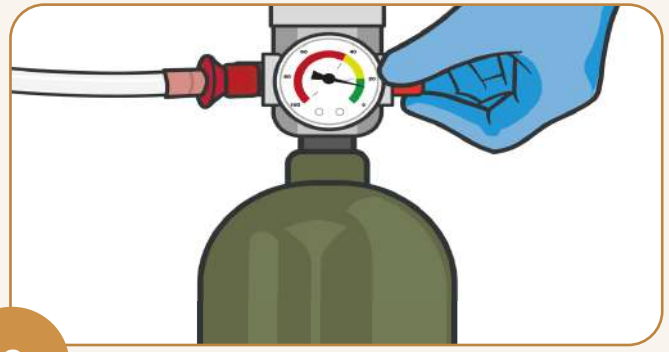

6

**INCREASE** $FiO^2$ with supplemental oxygen.

**(a)** Remove and store the air intake black cap and leave the debris filter in place, if not done already.

**(b)** Connect the expandable $O^2$ reservoir tube to the "Air/$O^2$ Intake" port.

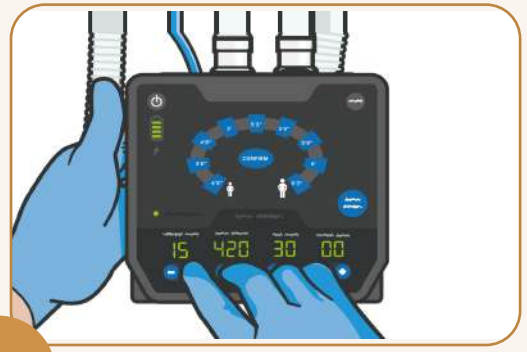
**(c)** Utilize the "$O^2$ Flow Rate" chart to calculate the LPM of oxygen to deliver the desired $FiO^2$



6

**(d)** Connect the O2 tubing from the O2 reservoir tubing to the low-pressure O2 source (tank, wall or concentrator) and turn the flowmeter to the desired LPM.

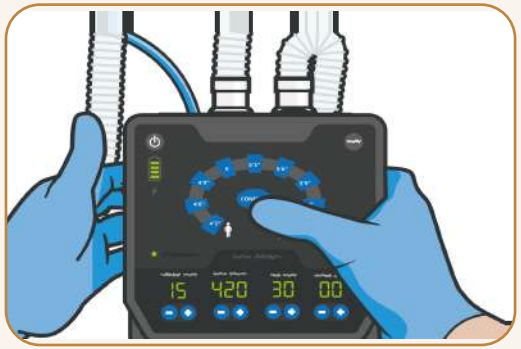
# AUTOMATED VENTILATION




7

**REFINE** ventilator parameters.

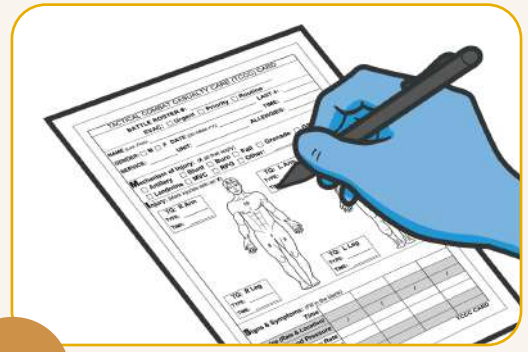
**NOTE:** Increase the respiratory rate by two breaths per minute.




**(a)** Increase respiratory rate. Press the "up" arrow on the "Respiratory Rate" by two (2) breaths and press "Confirm"

**NOTE:** Increase Tidal volume to attain a desired minute volume using the "Minute Ventilation Chart"


**(b)** Increase tidal volume. Using "Minute Ventilation Chart" with current respiratory rate (XX), increase tidal volume using the "up" arrow till the number reaches XXX and press "Confirm"



8

**DOCUMENT** all vent settings along with all findings and treatments on the **DD Form 1380** TCCC Combat Casualty Card and attach it to the casualty

# ADJUSTABLE AUTOMATED VENTILATION SKILL

**INSTRUCTOR-LED Demonstration**

*(Trainer-led demonstration review of the* Adjustable Automated Ventilators *Skill sequence & key steps)*

# SKILL STATION
## VENTILATION SKILL STATION

- Bag Valve Masks (1- and 2-person)
- Adjustable Automated Ventilators

# OXYGEN ADMINISTRATION IN TFC CONSIDERATIONS


- Availability of oxygen is very limited in TFC
- Oxygen may be present at aid stations, casualty collection points or on convoys
- Current TCCC Guidelines only recommend oxygen for traumatic brain injury (TBI)

***Maintain $O^2$ saturation >90%***

***Flow rate often 3 liters/min***
*usually limited by $O^2$ generation*

MARCH

**Tactical Evacuation Phase** indications:

- **Low oxygen** saturation
- Injuries with **impaired oxygenation**
- **Shock**
- **Smoke** inhalation
- Trauma at **altitude**

*If available, consider initiating oxygen during TFC, just prior to evacuation*

# PULSE OXIMETRY MONITORING

## Hypoxemia in TFC is difficult to assess

- **Low-light** conditions mask signs
- Physical findings impaired by the **tactical environment**


Use pulse oximetry in casualties with:

- Injuries that impair oxygenation
  *Blasts, chest injuries, etc.*
- Traumatic brain injury
  *Ensure $O^2$ sats >90%*

***NOTE:*** *Shock is **not** always preceded by a fall in $O^2$ saturation levels*

## Factors Affecting Pulse Ox Readings

Low readings may be seen with:

- **Shock**
- **Cold temperatures**

High readiness may be seen with:

- **Carboxyhemoglobinemia**

Impaired readings may be seen with:

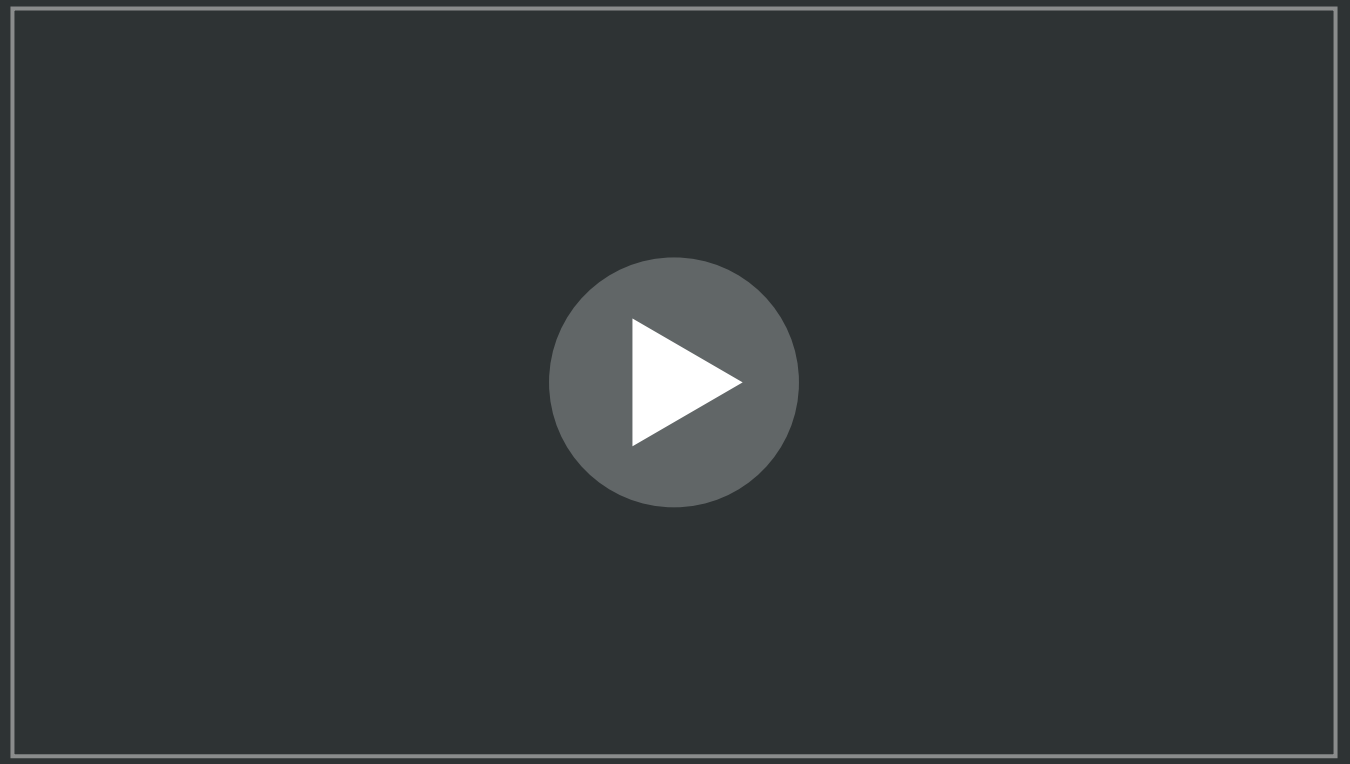
- Nail polish
- Very bright environments
- Skin pigmentations
- Motion artifact

**TCCC Guideline Recommendation:**
Monitor the hemoglobin oxygen saturation in casualties to help assess airway patency

M A R C H

Level of Evidence:

# AIRWAY MANAGEMENT OVERVIEW (VIDEO)



*Video can be found on deployedmedicine.com*

# EVIDENCE SUPPORTING AIRWAY MANAGEMENT STRATEGIES

| Subject Category | Study Types | Level of Evidence |
|---|---|---|
| Spinal Immobilization | Observational and Subject Expert Consensus | |
| Airway Maneuvers | Clinical Practice Guideline Reviews | |
| Nasopharyngeal Airways | Observational and Subject Expert Consensus | |
| Extraglottic Airways | Retrospective and Prospective Comparisons | |

# EVIDENCE SUPPORTING AIRWAY MANAGEMENT STRATEGIES (cont.)

| Subject Category | Study Types | Level of Evidence |
|---|---|---|
| Cricothyroidotomies | Retrospective/Prospective Comparisons & Subject Expert Consensus | |
| Endotracheal Intubation | Retrospective/Prospective Comparisons & Subject Expert Consensus | |
| Automated Ventilation in the TFC Setting | Observational and Subject Expert Consensus | |
| Pulse Oximetry | Prospective Studies, Clinical Practice Guideline Reviews | |

# ASSESSING THE EVIDENCE FOR GUIDELINES

| Level of Evidence | AHA Recommendation System Terminology Explanation | Why the AHA Classification System? |
|---|---|---|
| **A** | Evidence from multiple randomized clinical trials (RCT) with concordant results or from **HIGH-QUALITY** meta-analyses. | • The level of evidence recommendations allow readers to quickly glean information on the strength, certainty, and quality of evidence supporting each recommendation.<br>• A recommendation with Level of Evidence (LOE) C does not imply that the recommendation is weak.<br>• Although, RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective. |
| **B-R** | Evidence from moderate-quality trials, or a meta-analysis of moderate quality (RCT) followed by an R to denote **RANDOMIZED** studies | |
| **B-NR** | Evidence from moderate-quality trials, or a meta-analysis of moderate quality followed by NR to denote **NON-RANDOMIZED** studies | |
| **C-LD** | There is no convincing evidence and is followed by LD to indicate **LIMITED DATA** | |
| **C-EO** | There is no convincing evidence and is followed by EO if the consensus is based on **EXPERT OPINION**, case studies or standards of care. | |

# SUMMARY

## Knowledge Topics

- **Signs** of airway obstruction
- **Considerations** for spinal immobilization
- Progressive **strategies** for airway management
- **Indications** for an advanced airway, including endotracheal intubation
- Considerations for automated ventilation
- **Indications** for using oxygen
- Importance of pulse oximetry

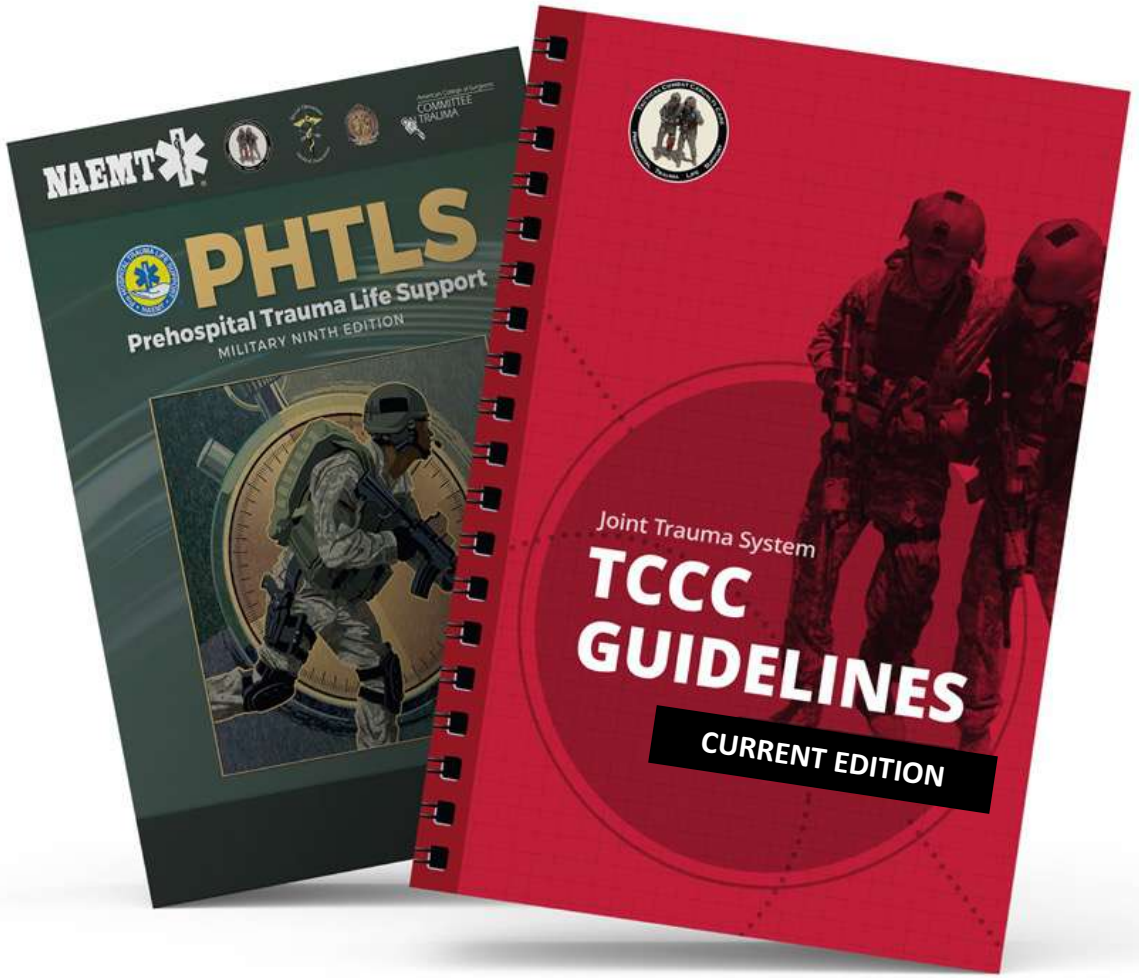
## Skills and Abilities

- Airway maneuvers *(head-tilt/chin-lift or jaw-thrust method)*
- Recovery position
- Nasopharyngeal airway insertion
- Manual and mechanical suctioning
- Extraglottic airway insertion
- Cricothyroidotomy
- Endotracheal intubation
- Bag valve mask ventilation
- Automated ventilation

# CHECK ON LEARNING

- What are the signs of an airway obstruction?
- What is the best position for a conscious casualty that is breathing on their own?
- When would you use an extraglottic airway?
- What are common errors when performing a cricothyroidotomy?
- What condition warrants oxygenation in TFC according to the TCCC Guidelines?

# ANY QUESTIONS?




# REFERENCES

## TCCC: Guidelines

by JTS/CoTCCC

These guidelines, updated regularly, are the result of decisions made by CoTCCC in exploring evidence-based research on best practices.

## PHTLS: Military Edition, Chapter 25

by NAEMT

Prehospital Trauma Life Support (PHTLS), Military Edition, teaches and reinforces the principles of rapidly assessing a trauma patient using an orderly approach.