CPP TCCC

COMBAT PARAMEDIC/ PROVIDER

TACTICAL COMBAT CASUALTY CARE COURSE

MODULE 8: RESPIRATION ASSESSMENT AND MANAGEMENT IN TACTICAL FIELD CARE

Committee on Tactical Combat Casualty Care (CoTCCC)

TCCC TIER 1
All Service Members

TCCC TIER 2
Combat Lifesaver

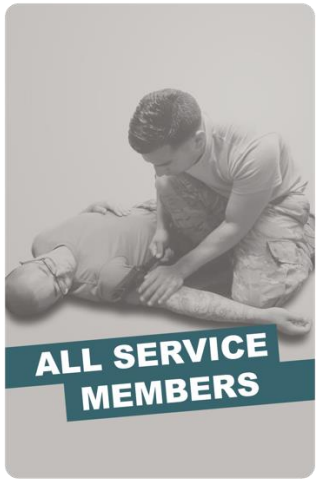
TCCC TIER 3
Combat Medic/Corpsman

TCCC TIER 4
Combat Paramedic/Provider

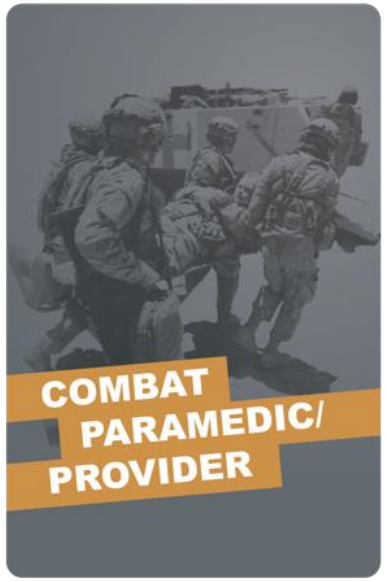
TACTICAL COMBAT CASUALTY CARE (TCCC) ROLE-BASED TRAINING SPECTRUM

ROLE 1 CARE

NONMEDICAL PERSONNEL



MEDICAL PERSONNEL



YOU ARE HERE

STANDARDIZED JOINT CURRICULUM

1 x TERMINAL LEARNING OBJECTIVES

08 Given a combat or non-combat scenario, perform assessment and management of respiration and chest trauma during Tactical Field Care in accordance with CoTCCC Guidelines.

- ● **8.1** Identify the signs and symptoms of respiratory distress.
- ● **8.2** Identify the signs and symptoms of a life-threatening chest injury.
- ● **8.3** Identify the signs and symptoms of open pneumothorax (sucking chest wound) in Tactical Field Care.
- ● **8.4** Identify the importance and implications of vented and non-vented chest seals.
- ○ **8.5** Demonstrate the application of a chest seal to an open chest wound.
- ● **8.6** Identify the signs, symptoms, and initial treatment of tension pneumothorax in Tactical Field Care.
- ○ **8.7** Demonstrate a needle decompression of the chest at the second intercostal space in the midclavicular line.
- ○ **8.8** Demonstrate a needle decompression of the chest at the fifth intercostal space in the anterior axillary line.

13 x ENABLING LEARNING OBJECTIVES

\# = **Terminal Learning Objectives** ● = Cognitive ELOs ○ = Performance ELOs

1 x TERMINAL LEARNING OBJECTIVES

08 **Given a combat or non-combat scenario, perform assessment and management of respiration and chest trauma during Tactical Field Care in accordance with CoTCCC Guidelines.**

- ● **8.9** Identify the signs of recurring or unsuccessful treatment of tension pneumothorax.
- ● **8.10** Identify the indications, considerations, limitations, and principles of finger thoracostomy and tube thoracostomy in Tactical Field Care.
- ○ **8.11** Demonstrate finger thoracostomy in Tactical Field Care.
- ○ **8.12** Demonstrate tube thoracostomy in Tactical Field Care.
- ● **8.13** Identify any evidence-based medicine, best practices, casualty data, and Subject Matter Expert consensus on thoracic trauma management techniques in Tactical Field Care.

13 x ENABLING LEARNING OBJECTIVES

\# = **Terminal Learning Objectives** ● = Cognitive ELOs ○ = Performance ELOs

Three PHASES of TCCC

1. **CARE UNDER FIRE (CUF) / THREAT**
   - RETURN FIRE AND TAKE COVER
2. **TACTICAL FIELD CARE (TFC)**
   - WORK UNDER COVER AND CONCEALMENT
3. **TACTICAL EVACUATION CARE (TACEVAC)**
   - MORE DELIBERATE ASSESSMENT AND PRE-EVACUATION PROCEDURES

YOU ARE HERE

MARCH PAWS

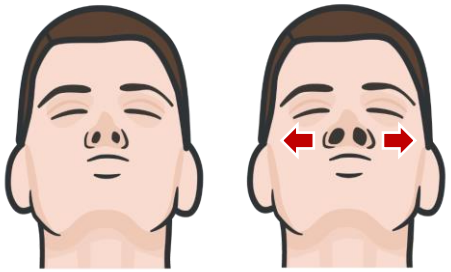
LIFE-THREATENING

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

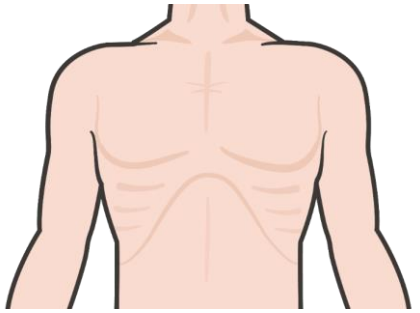
AFTER LIFE-THREATENING

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

SIGNS OF RESPIRATORY DISTRESS



NASAL FLARING ▲
The nostrils widen when the patient breaths



RETRACTIONS ▲
Suprasternal notch or intercostal retractions, when the skin sinks into the chest wall when the casualty inhales

TACHYPNEA

DYSPNEA

CYANOSIS
around mouth and lips

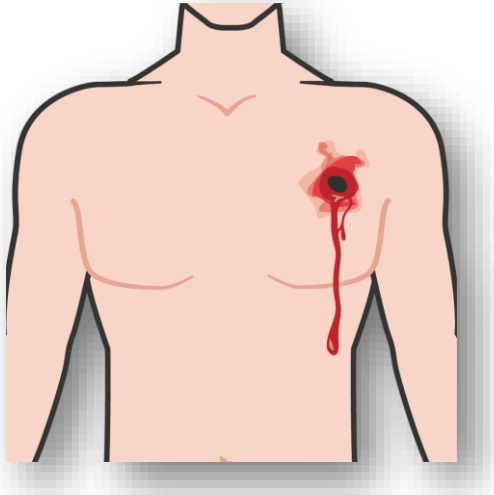
◀ **TRIPOD POSITIONING**
The casualty will sit or stand leaning forward while supporting the upper body with hands on the knees

CONFUSION/ LIGHTHEADED and/or **AGITATION** due to lack of oxygen

◀ **PULSE OXIMETRY**
A pulse ox level that is **less than 90%** can indicate a casualty is in respiratory distress

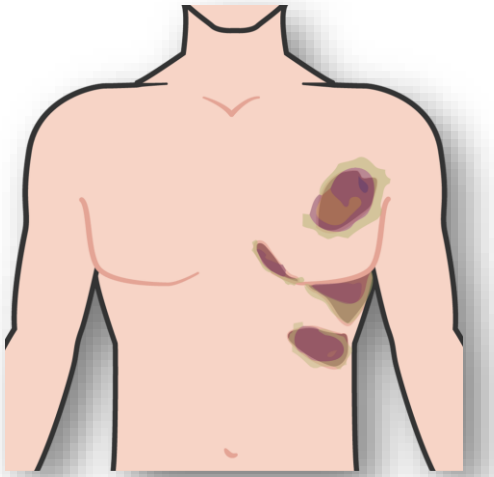
M A R C H

LIFE-THREATENING CHEST INJURY



PENETRATING TRAUMA

Gunshot or **Shrapnel** wound to the chest



BLUNT FORCE TRAUMA

Force from an improvised explosive device explosion (IED), high-impact vehicle accident (chest hitting steering wheel), etc.

Deformities, bruising, swelling, **contusions** (around the chest, back or rib cage), **crepitus** which is felt or heard (crackling, popping, grating)

ANY deformities of the chest

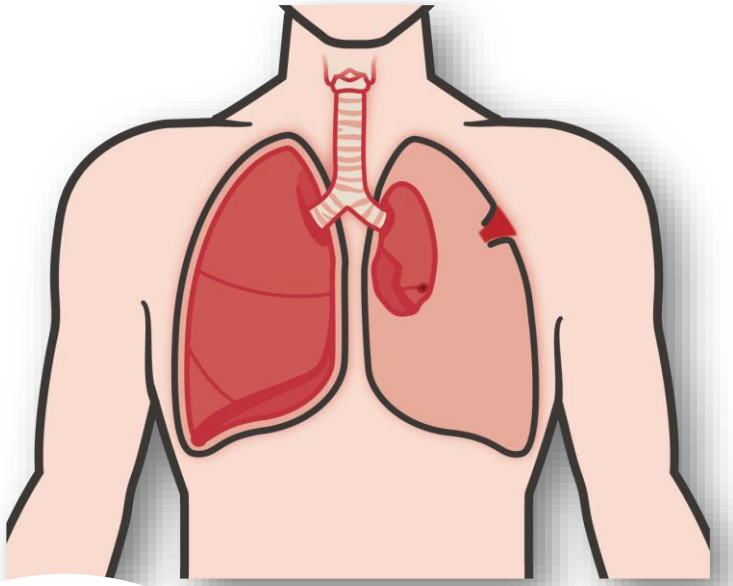
Life-threatening Chest Injuries:

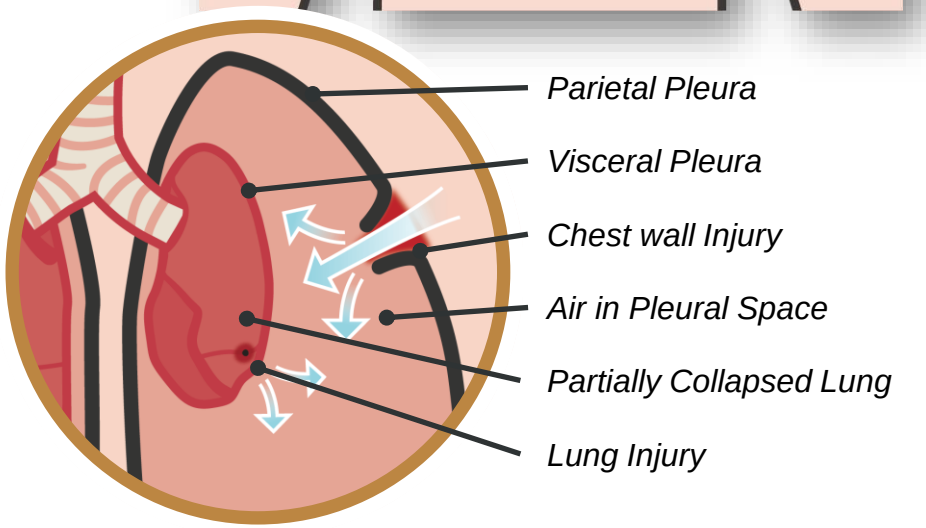
- Tension Pneumothorax
- Open Pneumothorax
- Massive Hemothorax
- Flail Chest
- Airway Obstruction
- Cardiac Tamponade

REMEMBER: These injuries can lead to a tension pneumothorax. This is the **one of the most common causes** of preventable deaths on the battlefield

MARCH

OPEN PNEUMOTHORAX





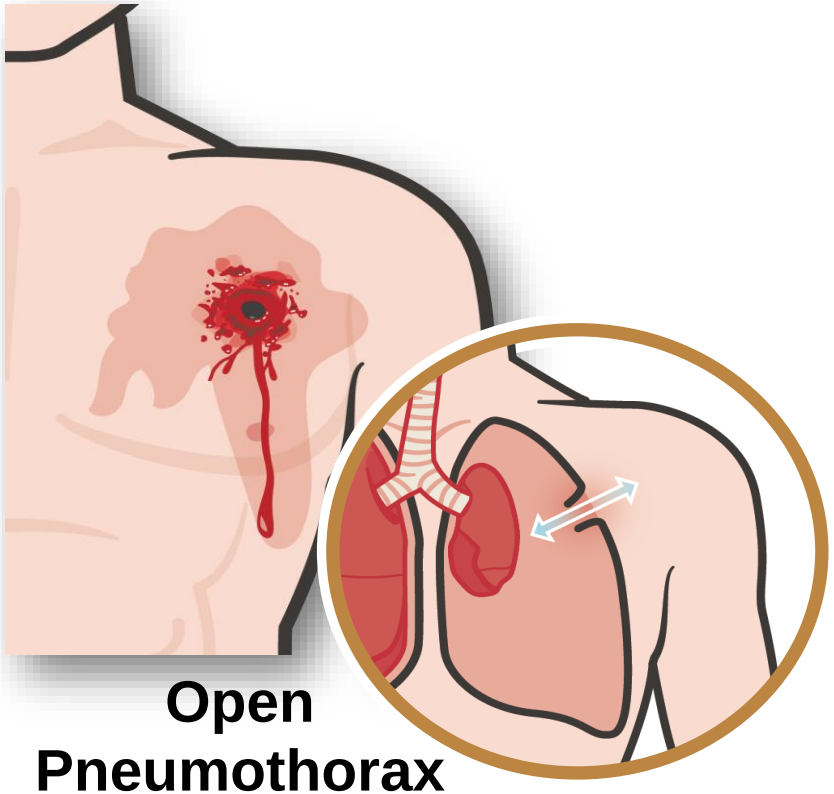
The pleural space between lungs and chest wall naturally has negative pressure which helps the lungs stay expanded, and not collapse during exhalation

PENETRATING INJURIES TO THE CHEST WALL can be difficult to find through the casualty's clothes, protective gear and low-light situations

- On inspiration, air enters the chest through the wound and not the normal anatomy
- The affected lung cannot be fully re-inflated by inhalation
- The wound can be as small 2.0-2.5 cm in diameter and can cause an open pneumothorax

MARCH

IDENTIFYING AN OPEN PNEUMOTHORAX



Open Pneumothorax

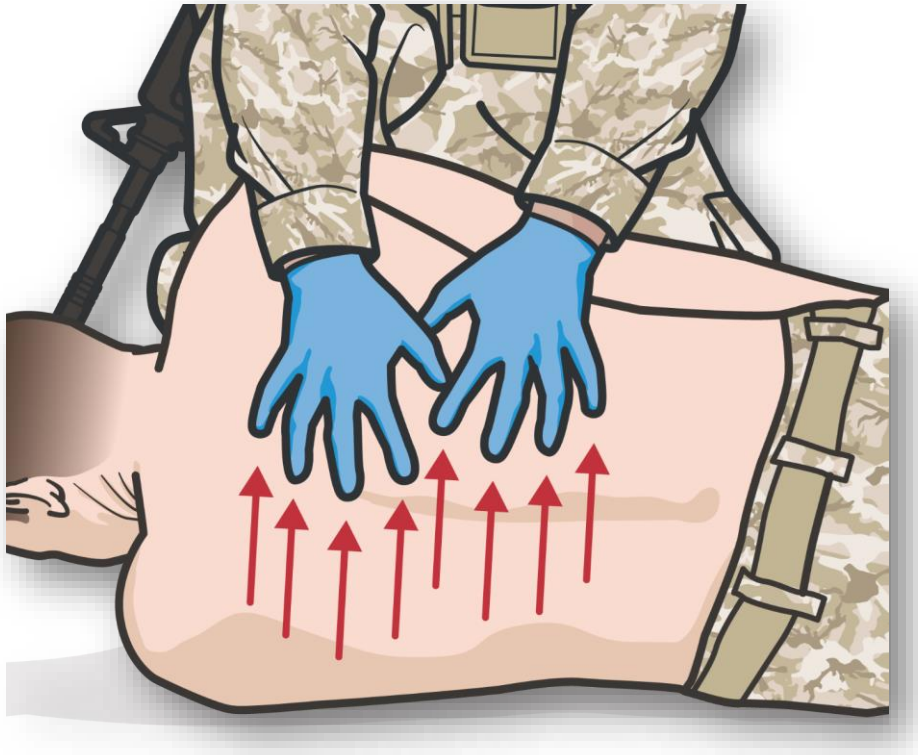
Signs and Symptoms of an **Open Pneumothorax** in Tactical Field Care		
• Respiratory Distress	• A **puncture wound** of the chest	• **Froth** or **bubbles** around the injury
• A "**sucking**" or "**hissing**" sound when the casualty **inhales**	• Coughing up blood	• Blood-tinged sputum
CAUTION: A casualty with an open chest wound will exhibit **ONE OR MORE** of the following signs and symptoms listed above		

REMEMBER: Decreased breath sounds & hyperresonance to percussion are difficult to determine in the tactical environment

Level of Evidence: C-EO

MARCH

IDENTIFYING ADDITIONAL CHEST WOUNDS



Raking motion

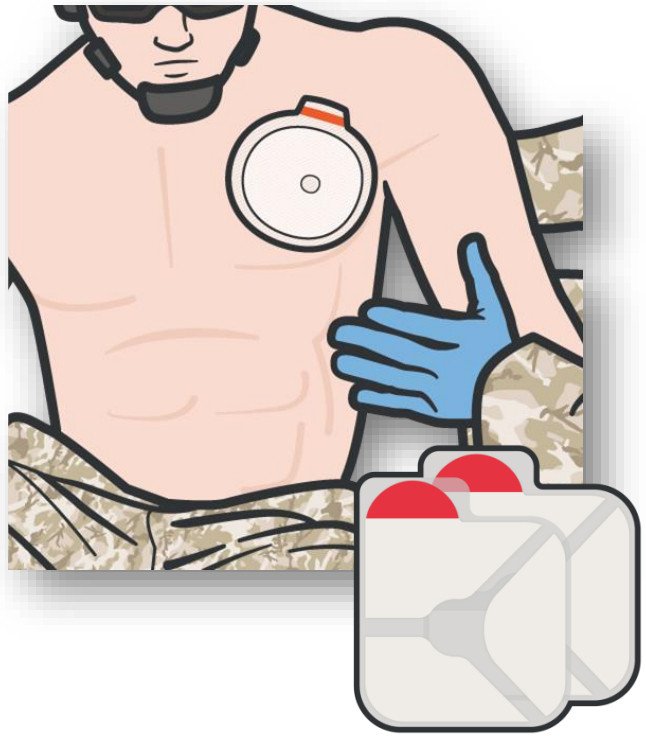
EXPOSE, UNCOVER, and **CHECK/FEEL** for additional open chest wounds by using a *raking motion* (anterior, posterior, and axillary)

> If present, treat multiple wounds with chest seals in the order in which they were found

MARCH

THE IMPORTANCE AND IMPLICATIONS OF VENTED AND NON-VENTED CHEST SEALS

For an **open** or **sucking chest wound**, prompt application of a ***vented chest seal*** is recommended



- When the casualty inhales, the plastic should be sucked against the wound, **preventing the entry of air**
- When the casualty exhales, trapped air should be able to escape from the wound and out the valve
- The injured lung will remain partially collapsed, **but the mechanics of respiration will be better**

⚠ If a vented chest seal is **not** available, USE a non-vented chest seal.

Level of Evidence: C-LD

MARCH

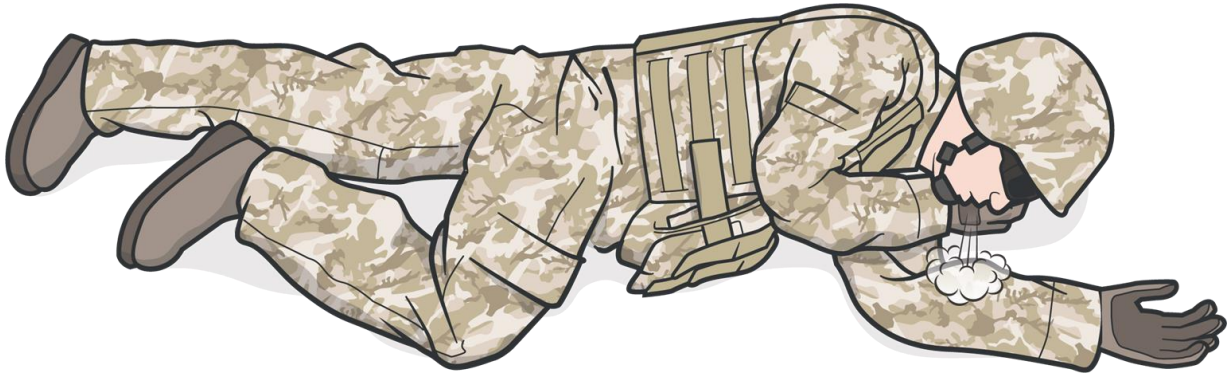
APPLYING & MANAGING CHEST SEALS

Chest seals are for **treating penetrating wounds** to the chest

Application of Chest Seals	Management of Chest Seals
• Place gloved hand or back of hand over the casualty's wound	• Edges of the chest seal must extend **2 INCHES BEYOND** the edges of the wound
• Use the casualty's chest seal from their JFAK • Wipe access blood, sweat, or dirt away from wound	• **MONITOR** the casualty closely and if their condition worsens, you should suspect a **tension pneumothorax**
• When casualty exhales, place adhesive side directly over open/sucking chest wound, pressing firmly to create a seal	• Treat this by **BURPING** or temporarily removing the dressing for a few seconds

MARCH

CASUALTY POSITIONING AFTER CHEST SEAL APPLICATION

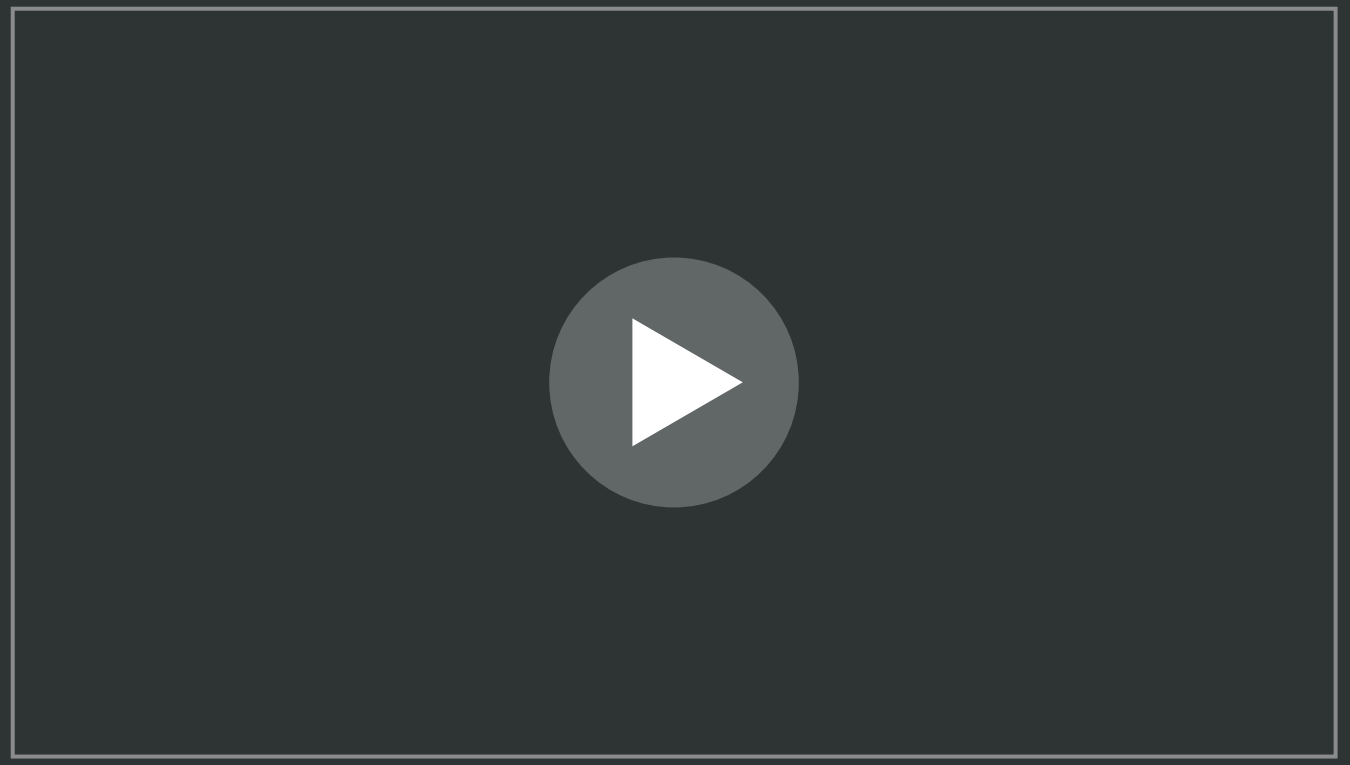


If the casualty is **UNCONSCIOUS**, place the casualty in the **RECOVERY POSITION** with the **injured side down**

If the casualty is **CONSCIOUS**, allow the casualty to adopt the **SITTING POSITION** or **POSITION** of **COMFORT** that helps the casualty to breath

MARCH

CHEST SEAL VIDEO



Video can be found on deployedmedicine.com

SKILL STATION

Respiration Skills

Chest Seal Application

TENSION PNEUMOTHORAX

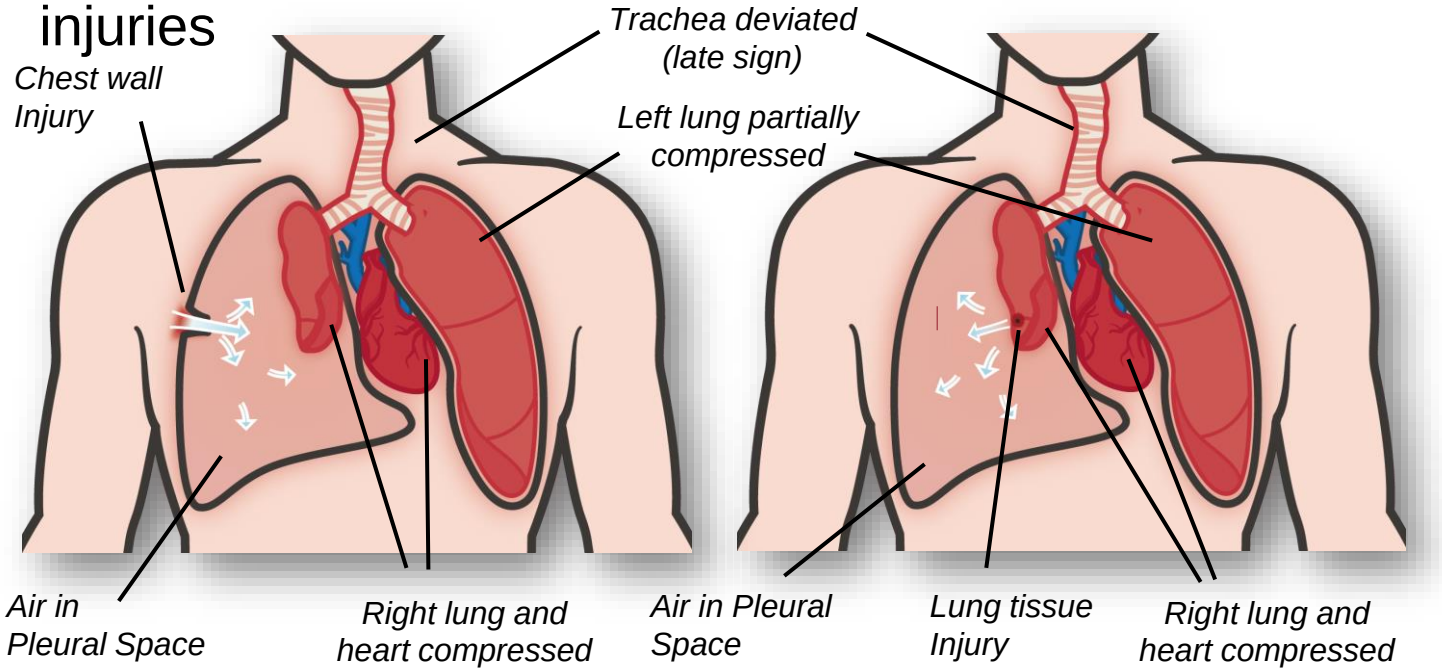
As a tension pneumothorax develops, **air enters** the chest cavity **through the wound WITH EVERY BREATH**

Injured lung tissue acts as a **one-way valve**, **TRAPPING** more and more air between the lung and the chest wall

PRESSURE BUILDS UP AND COMPRESSES BOTH LUNGS AND THE HEART

Level of Evidence: C-EO

TENSION PNEUMOTHORAX can result from significant torso trauma, blunt trauma or blast injuries

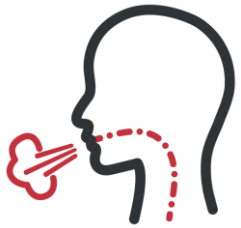


Penetrating Trauma **Blunt Injury**

MARCH

IDENTIFYING TENSION PNEUMOTHORAX

EARLY signs of a Tension Pneumothorax



Severe or progressive **RESPIRATORY DISTRESS**

Severe or progressive **TACHYPNEA**

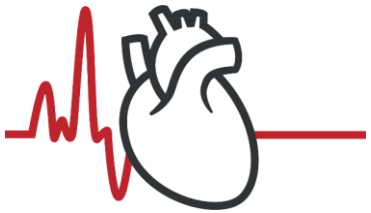
ABSENT or markedly **DECREASED** breath sounds one side of chest

Hemoglobin oxygen saturation **<90%** on **PULSE OX**

LATE signs of a Tension Pneumothorax

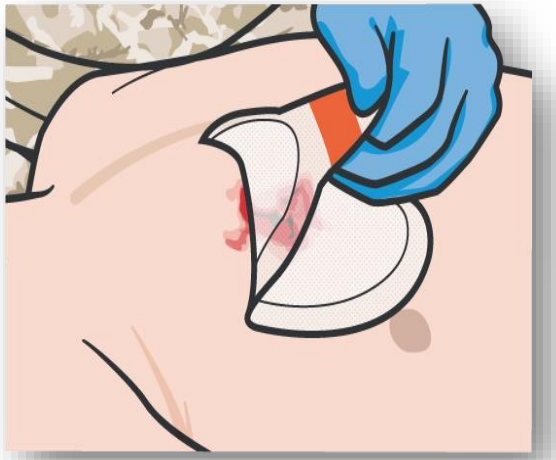
- **TRACHEAL DEVIATION**
- **HYPER-RESONANT HEMOTHORAX**
- **JUGULAR VEIN DISTENTION**
- **MEDIASTINAL SHIFT**

SHOCK



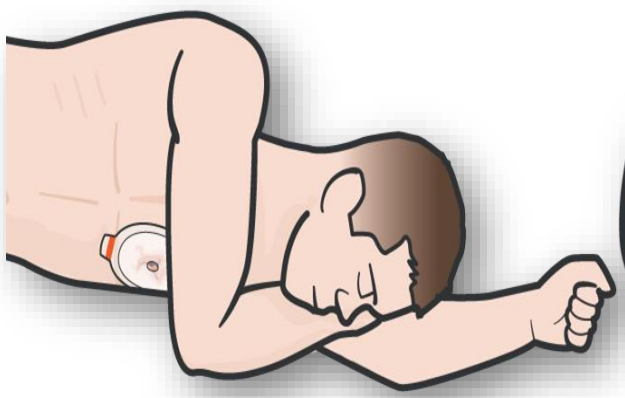
Traumatic **CARDIAC ARREST WITHOUT** obviously fatal wounds

INITIAL TREATMENT OF TENSION PNEUMOTHORAX IN TACTICAL FIELD CARE

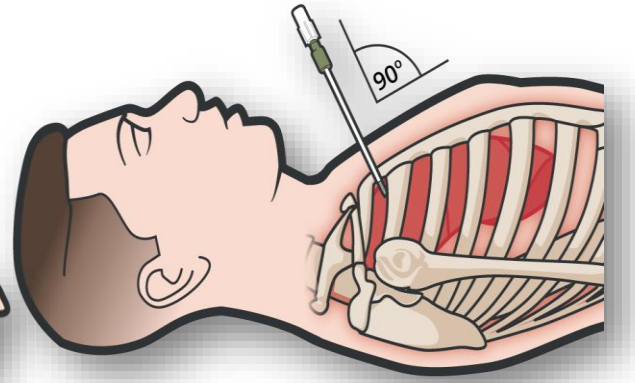


If chest seal in place, **Burp** or **Remove The Chest Seal**

Establish **Pulse Oximetry Monitoring**



Place casualty in **Supine** or **Recovery Position**



Needle Decompression of the Chest, 14- or 10-gauge, 3.25-inch needle/catheter unit

Level of Evidence: C-EO

MARCH

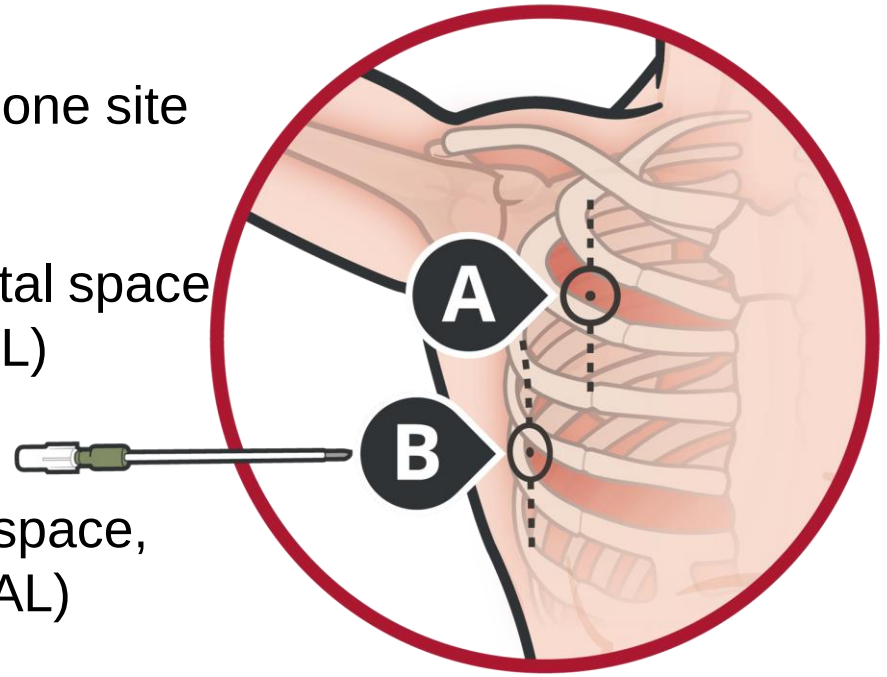
NDC SITE SELECTION

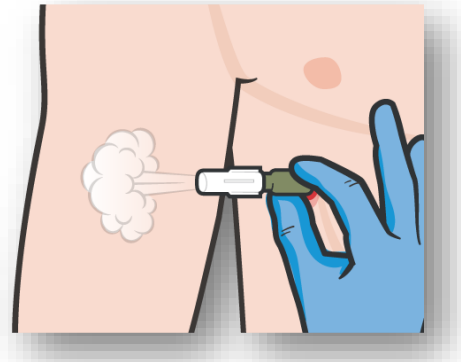
There is no evidence proving one site is preferred over the other:

A The **SECOND** intercostal space mid-clavicular line (MCL)

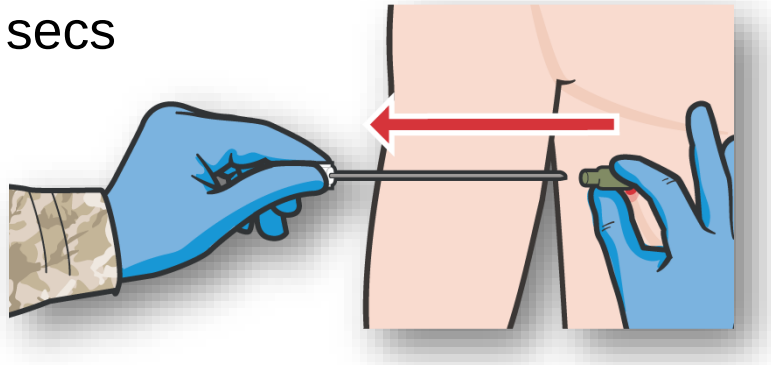
or

B The **FIFTH** intercostal space, anterior axillary line (AAL)





Insert needle/catheter to the hub and hold in place for 5-10 secs



Remove needle and leave catheter in place

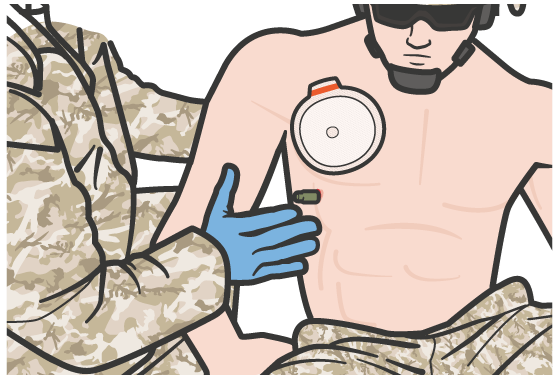
⚠ **NEVER** insert the needle medial to the nipple line for a MCL insertion

Level of Evidence: B-NR

MARCH

POSITION AFTER NDC TREATMENT
SIGNS OF SUCCESSFUL NDC

If the casualty is **UNCONSCIOUS**, place the casualty in the **SUPINE** or **RECOVERY POSITION** with the **injured side down**



If the casualty is **CONSCIOUS**, allow the casualty to adopt the **SITTING POSITION** to help keep the airway clear as a result of maxillofacial trauma

Signs of a successful NDC:

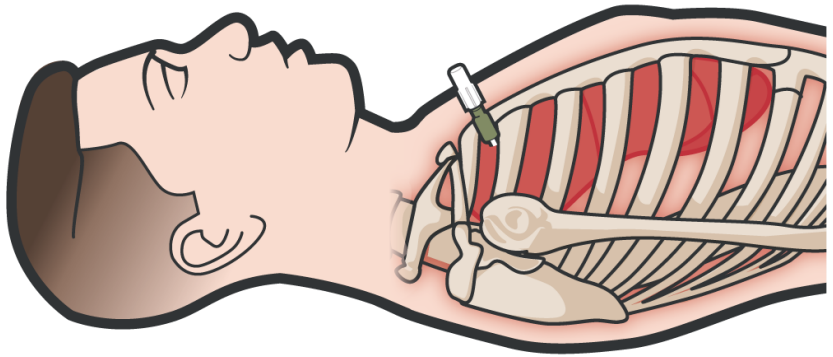
- Respiratory distress improves
- An obvious hissing sound
- Pulse oximetry increases to >90%
- Return of consciousness and/or radial pulse

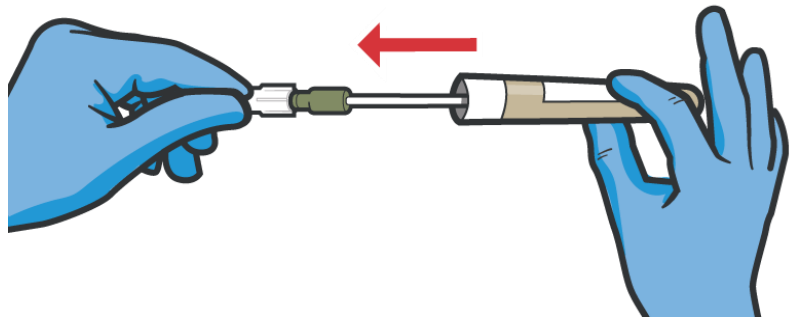
⚠ **EXERCISE CAUTION** while moving your casualty, **EXCESSIVE MOVEMENT** may dislodge or obstruct NDC

MARCH

RECURRENT OR UNSUCCESSFUL TREATMENT OF TENSION PNEUMOTHORAX

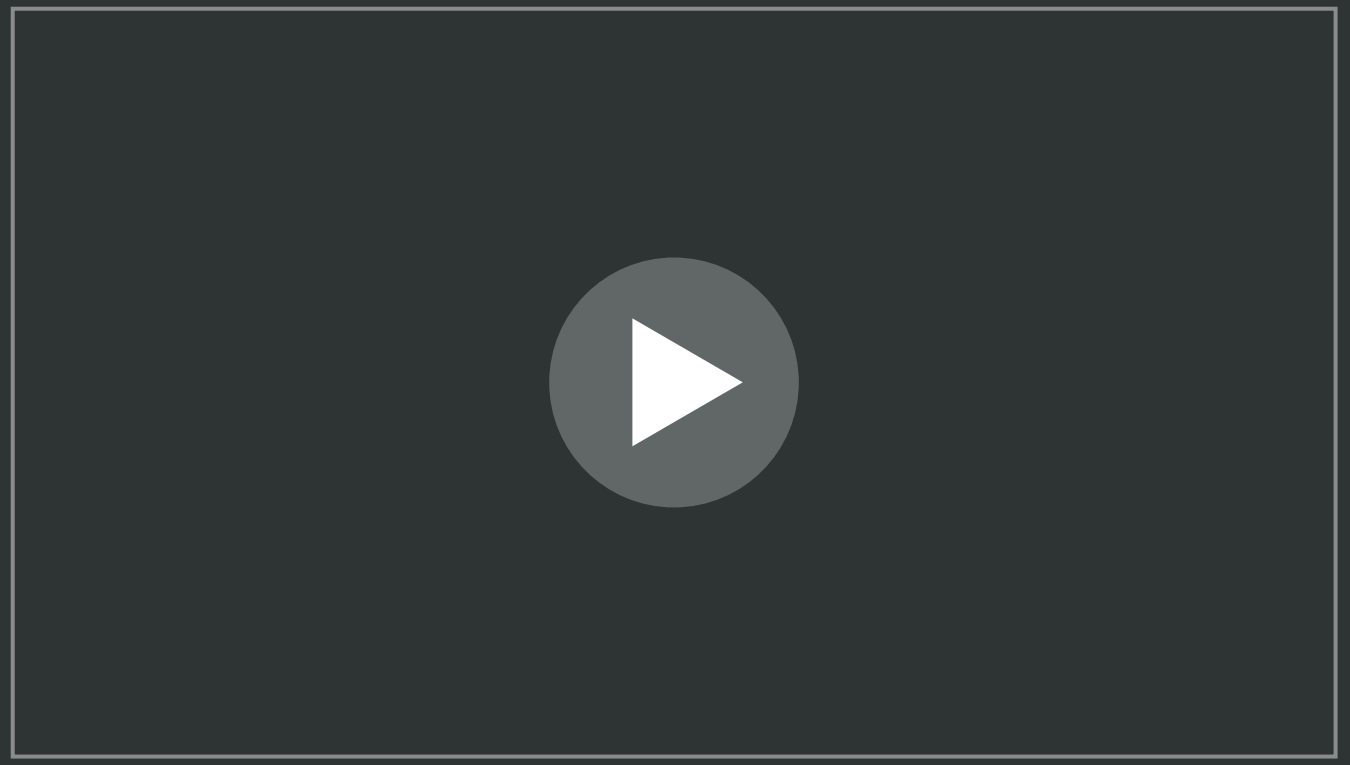
- **BURP CHEST SEAL** if in place
- If tension pneumothorax initially responds to NDC, **but** symptoms later **recur**, then **perform second NDC at the same site lateral to the original NDC**
- If **initial** NDC **DOES NOT** result in improvement, **perform second NDC** at the alternate NDC site on the same side of the chest
- If **no improvement** is noted with these measures, **proceed with** circulation assessment and treatment following the **MARCH protocol**





MARCH

NEEDLE DECOMPRESSION OF THE CHEST



Video can be found on deployedmedicine.com

INDICATIONS, CONSIDERATIONS, AND LIMITATIONS OF THORACOSTOMY

INDICATIONS:

- Appropriate fluid resuscitation (rule out refractory shock)
- Untreated tension pneumothorax:
  - Thoracic trauma
  - Respiratory distress
  - Absent breath sounds
  - SpO2 >90

⚠ **Placement** of an **NDC may require placement** of a **chest tube**

CONSIDERATIONS:

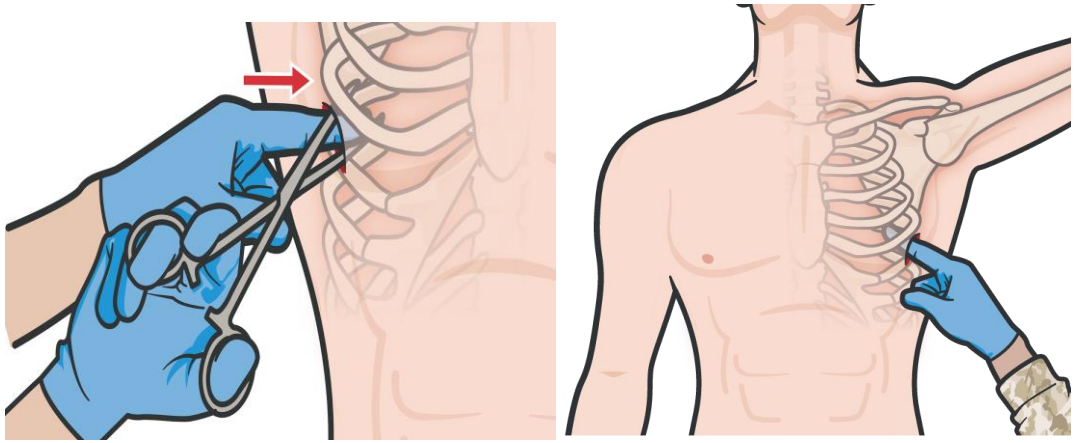
- Untreated tension pneumothorax may progress to cardiac arrest
- Repeat finger thoracostomy, as needed
- Consider decompressing the opposite side of the chest if indicated based on the MOI and physical findings

LIMITATIONS:

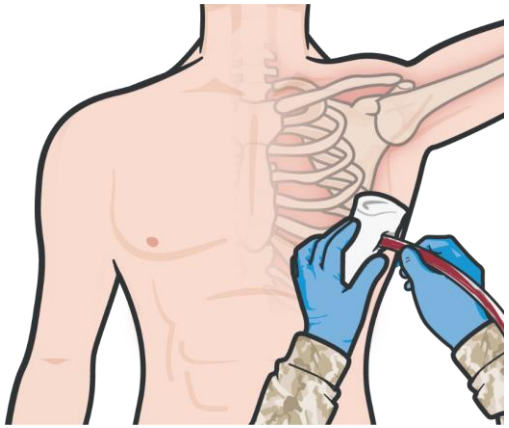
- Skills, experience, equipment and authorizations of the CPP medical provider
- Water seal or low-pressure suction may not be available

MARCH

PRINCIPLES FOR FINGER OR TUBE THORACOSTOMY



Consider **finger or tube thoracostomy** for casualties failing 2 NDC attempts and proper fluid resuscitation



FINGER THORACOSTOMY:

- Use 5th intercostal space at anterior axillary line
- Make incision above the 6th rib
- Blunt dissect into the pleural space
- Insert gloved finger to explore space and decompress tension

TUBE THORACOSTOMY:

- Use same basic steps as finger thoracostomy
- Insert and secure tube after clearing hole with finger
- Requires a Heimlich valve or other one-way valve
- Consider contralateral injury, as well

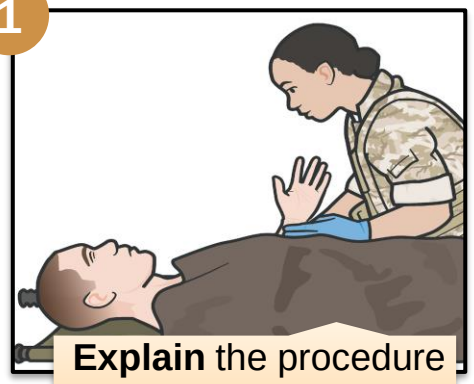
Level of Evidence: B-NR

MARCH

Finger or tube thoracostomy **prior to NDC not associated with increased survival**

FINGER THORACOSTOMY

1



Explain the procedure to the casualty, (if conscious).

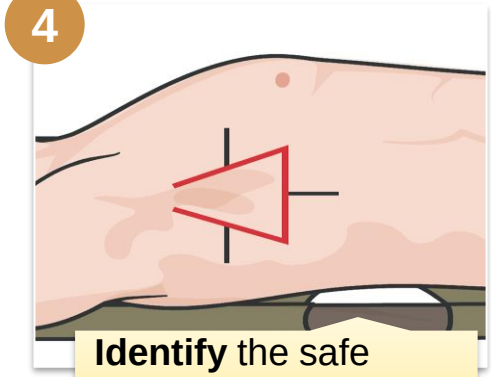
2

Record baseline vital signs and respiratory assessment.

3

Prepare and **position** the casualty appropriately.

4



Identify the safe triangle and insertion site.

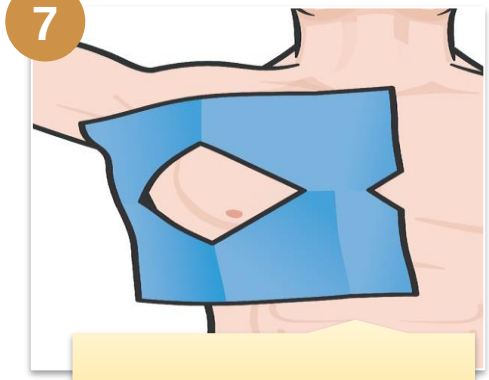
5

Cleanse the site with an antiseptic solution.

6

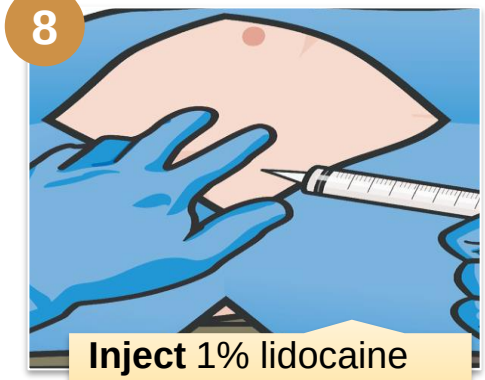
Put on sterile gloves.

7



Drape the area.

8



Inject 1% lidocaine subcutaneously and in the underlying space.

SITE SELECTION:

The point of insertion **most commonly** occurs on the side (lateral thorax)

LIDOCAINE :

Withdraw with 18g needle using **aseptic technique** and inject with 23g, 1.5-inch needle

Limit total amount used to <0.5mL/kg of 1% Lidocaine

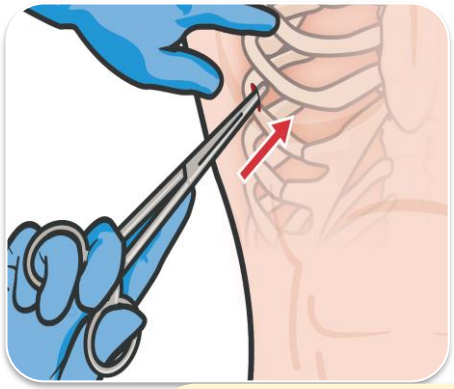
MARCH

FINGER THORACOSTOMY (cont.)

9

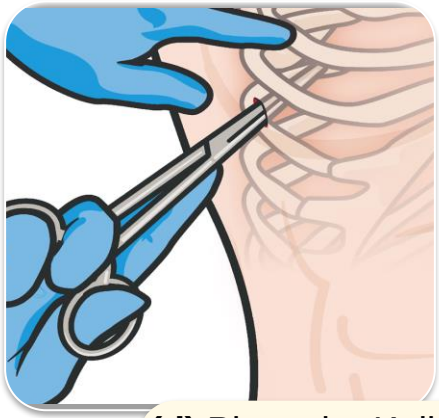
MAKE AN INCISION into the skin that is parallel to the rib.

(a) Incision should be a 2 to 3 centimeters (cm) parallel to the rib over the selected site or directly over the rib (providing a backstop for the blade) and extend down to the intercostal muscles.

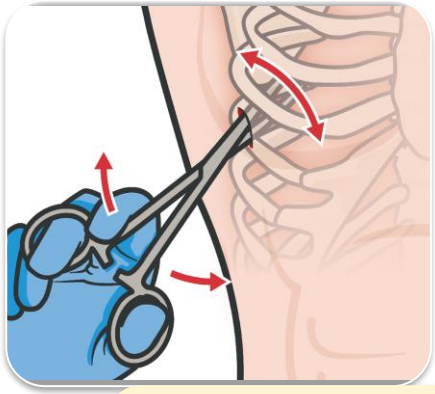


(b) With Kelly clamp, perform a blunt dissect through the soft tissue passing over the superior aspect of the rib and into the chosen intercostal space and puncture the parietal pleura.

(c) Listen for and feel a “pop” as the points go into the cavity.



(d) Place the Kelly clamp, jaws closed on the rib and pointed toward the ICS above the rib.

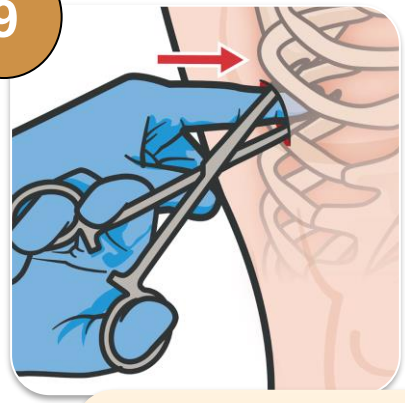


(e) Spread the Kelly clamp, forcing the tissue apart

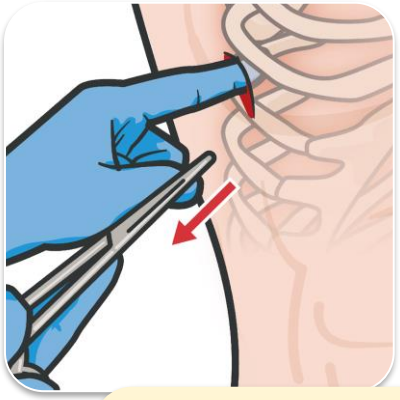
MARCH

FINGER THORACOSTOMY (cont.)

9

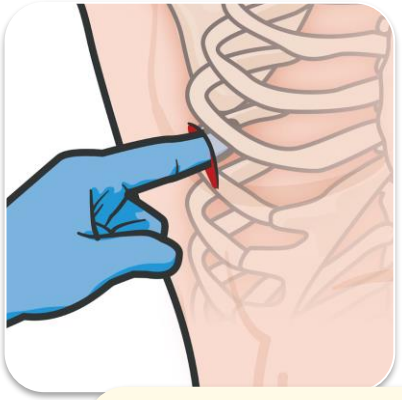


(f) With the jaws of the clamp holding the hole open, carefully insert a gloved finger through the incision and into the pleural space to verify position.



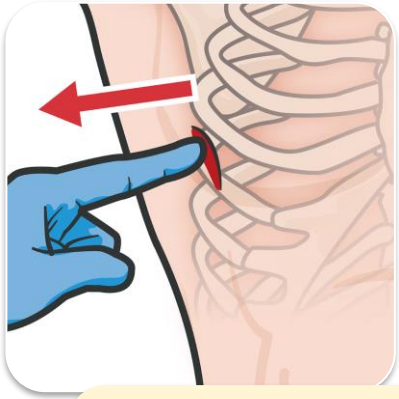
(g) Once the finger is in place, remove the clamp.

(h) Widen the pleural opening and ensure there are no adhesions.



(i) Feel for lung tissue.

(j) Be sure there is air, and the pink spongy lung is immediately inside the chest. If not, you may be in the abdominal cavity.



(k) Allow 10-15 seconds to allows decompression of air in the chest cavity .

(l) Remove finger from chest.

MARCH

FINGER THORACOSTOMY (cont.)

10

Apply 4x4's with tape as a protective dressing but with no occlusive properties

11

Reassess the casualty

12

Document all finding and treatments on a DD Form 1380

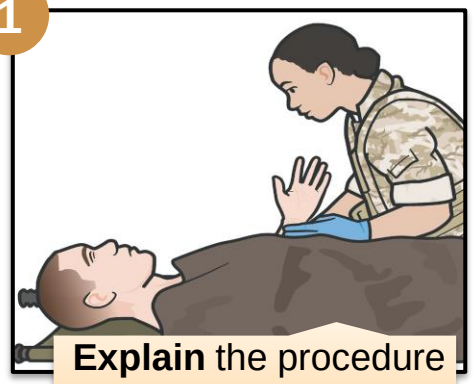
CASUALTY REASSESSMENT:

- Check for bilateral breath sounds or improvement on the affected side
- Clinical improvement e.g., respiratory distress improves and/or O2 Sat increases <90%
- Monitor and record vital signs every 15 minutes
- Administer analgesia for pain management

MARCH

TUBE THORACOSTOMY

1



Explain the procedure to the casualty, (if conscious).

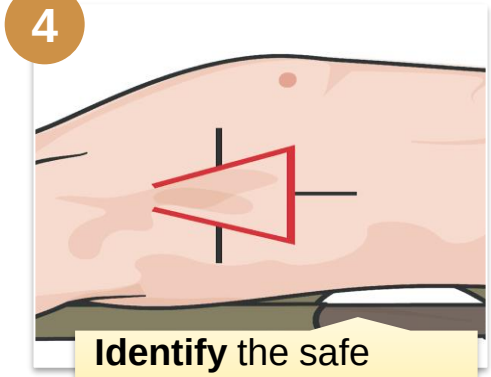
2

Record baseline vital signs and respiratory assessment.

3

Prepare and **position** the casualty appropriately.

4



Identify the safe triangle and insertion site.

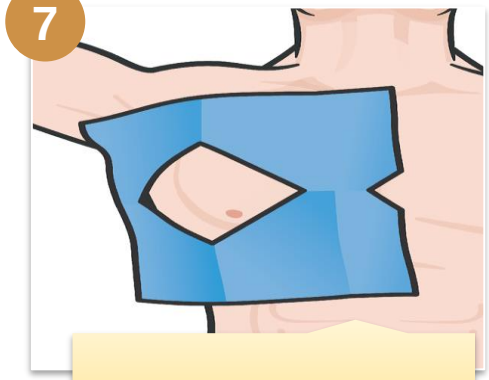
5

Cleanse the site with an antiseptic solution.

6

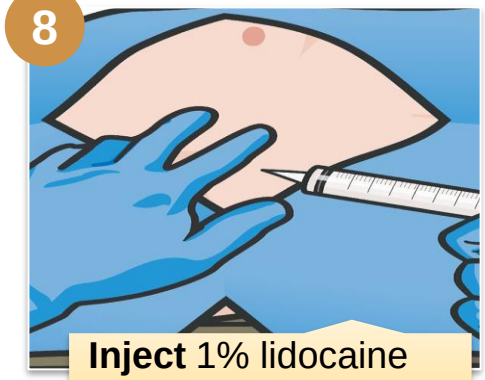
Put on sterile gloves.

7



Drape the area.

8



Inject 1% lidocaine subcutaneously and in the underlying space.

SITE SELECTION:

The point of insertion **most commonly** occurs on the side (lateral thorax)

LIDOCAINE :

Withdraw with 18g needle using **aseptic technique** and inject with 23g, 1.5-inch needle

Limit total amount used to <0.5mL/kg of 1% Lidocaine

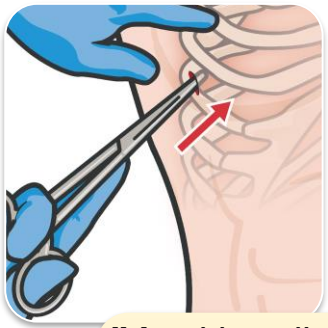
MARCH

TUBE THORACOSTOMY (cont.)

9

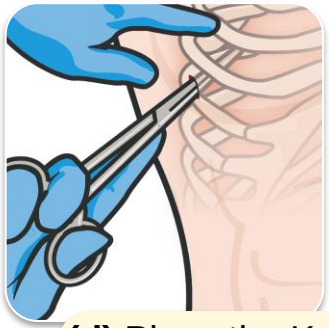
MAKE AN INCISION into the skin that is parallel to the rib.

(a) Incision should be a 2 to 3 centimeters (cm) parallel to the rib over the selected site or directly over the rib (providing a backstop for the blade) and extend down to the intercostal muscles.



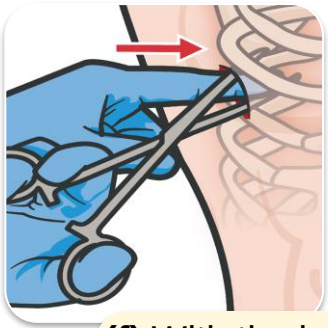
(b) With Kelly clamp, perform a blunt dissect through the soft tissue passing over the superior aspect of the rib and into the chosen intercostal space and puncture the parietal pleura.

(c) Listen for and feel a “pop” as the points go into the cavity.

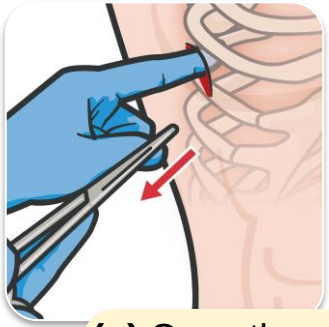


(d) Place the Kelly clamp, jaws closed on the rib and pointed toward the ICS above the rib.

(e) Spread the Kelly clamp, forcing the tissue apart.



(f) With the jaws of the clamp holding the hole open, carefully insert a gloved finger through the incision and into the pleural space to verify position.



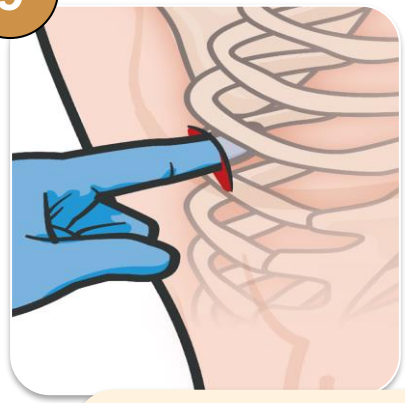
(g) Once the finger is in place, remove the clamp.

(h) Widen the pleural opening and ensure there are no adhesions

MARCH

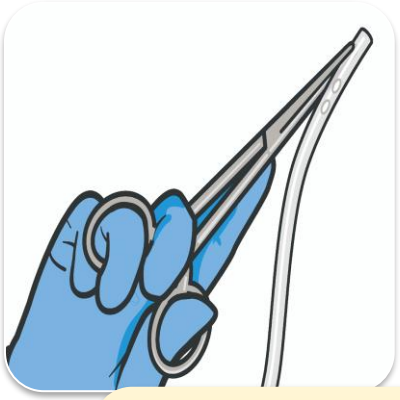
TUBE THORACOSTOMY (cont.)

9



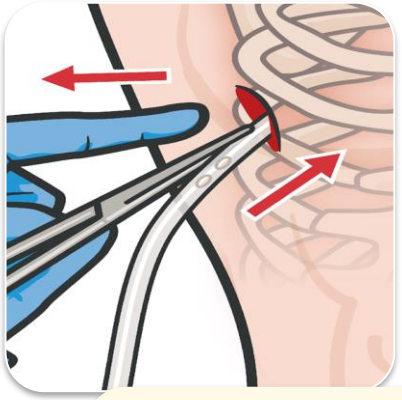
(i) Feel for lung tissue.

(j) Be sure there is air and the pink, spongy lung is immediately inside the chest. If not, you may be in the abdominal cavity.

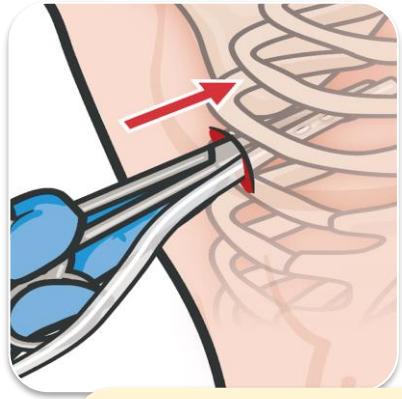


(k) Clamp the proximal end of the chest tube with a Kelly clamp.

(l) Grasp the tip of the chest tube with the other Kelly clamp.



(m) Insert the tip of the tube into the incision as you withdraw your finger in a posterior and cephalad motion (back and towards the head)

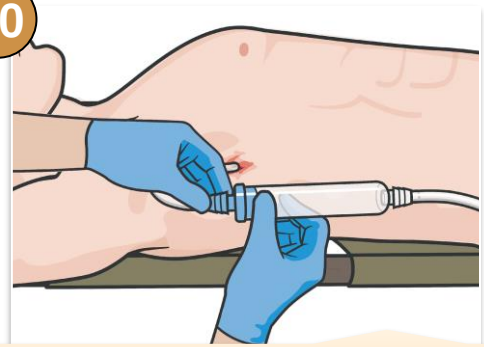


(n) Advance the tube until the last fenestration is 2.5 to 5 cm inside the chest wall.

MARCH

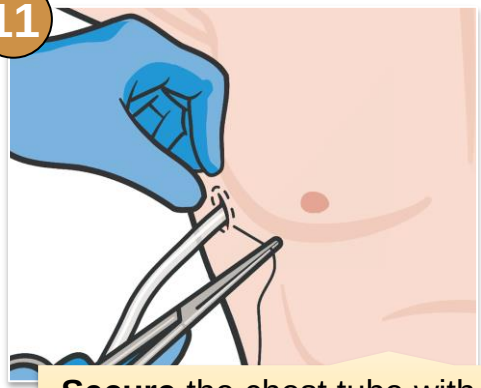
TUBE THORACOSTOMY (cont.)

10



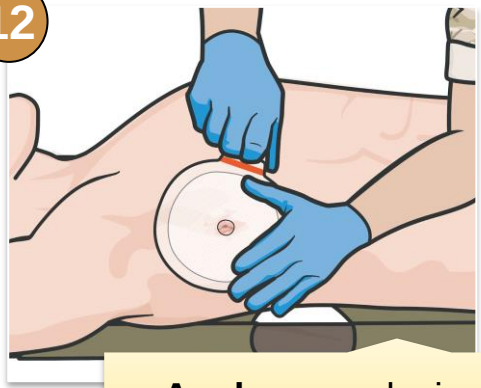
Connect the Proximal end of the tube to a one-way drainage valve and remove the proximal Kelly clamp

11



Secure the chest tube with the 0-silk suture material using purse string method

12

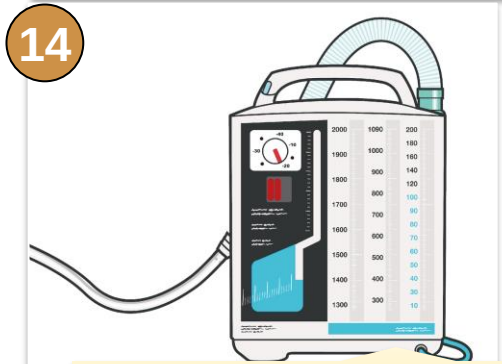


Apply an occlusive dressing

13

Reassess the casualty

14



Check the status of the drainage by visualizing the amount collected

15

Document all finding and treatments on a DD Form 1380

CASUALTY REASSESSMENT:

- Check for bilateral breath sounds
- Misting in the chest tube indicating proper placement and no fenestration obstructions
- Clinical improvements e.g., respiratory distress improves and/or O2 Sat increases to <90%
- Monitor and record vital signs every 15 minutes

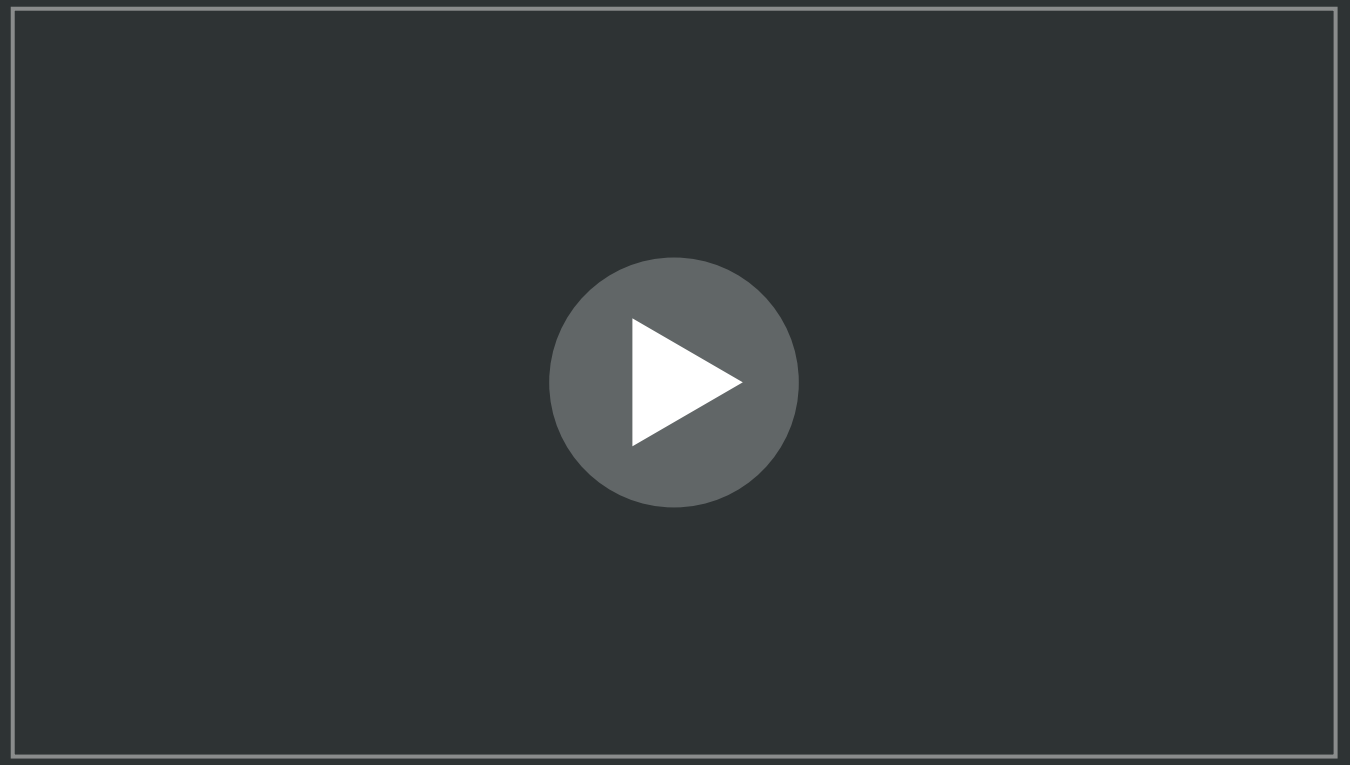
MARCH

SKILL STATION

Respiration Skills

- Needle Decompression of Chest (NDC)
- Finger Thoracostomy
- Tube Thoracostomy

RESPIRATION MANAGEMENT HIGHLIGHTS



Video can be found on deployedmedicine.com

EVIDENCE SUPPORTING THORACIC TRAUMA MANAGEMENT STRATEGIES

Subject Category	Study Types	Level of Evidence
Open Pneumothorax Management	Clinical Consensus, Expert Opinion & Discussion	**C-EO**
Vented versus Non-vented Chest Seal Usage	Comparative nonrandomized study; Retrospective observational study with limitations	**C-LD**
Tension Pneumothorax Management	Clinical Consensus, Expert Opinion & Discussion	**C-EO**
Needle Decompression of the Chest Site Selection	Retrospective Descriptive and Qualitative Studies	**B-NR**
Finger and Tube Thoracostomy in TFC	Retrospective Observational Study	**B-NR**

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. • A recommendation with Level of Evidence (LOE) C does not imply that the recommendation is weak. • 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

- Respiratory distress and life-threatening chest injuries
- Open pneumothorax recognition and management
- Tension pneumothorax recognition and management
- Treatment of unsuccessful decompression or recurrent tension pneumothoraces
- Indications and considerations for finger or tube thoracostomies

Skills and Abilities

- Vented chest seal application
- Non-Vented chest seal application
- Needle decompression of the chest (midclavicular line)
- Needle decompression of the chest (anterior axillary line)
- Tube thoracostomy
- Finger thoracostomy

CHECK ON LEARNING

What is a tension pneumothorax?

How should you treat an open chest wound?

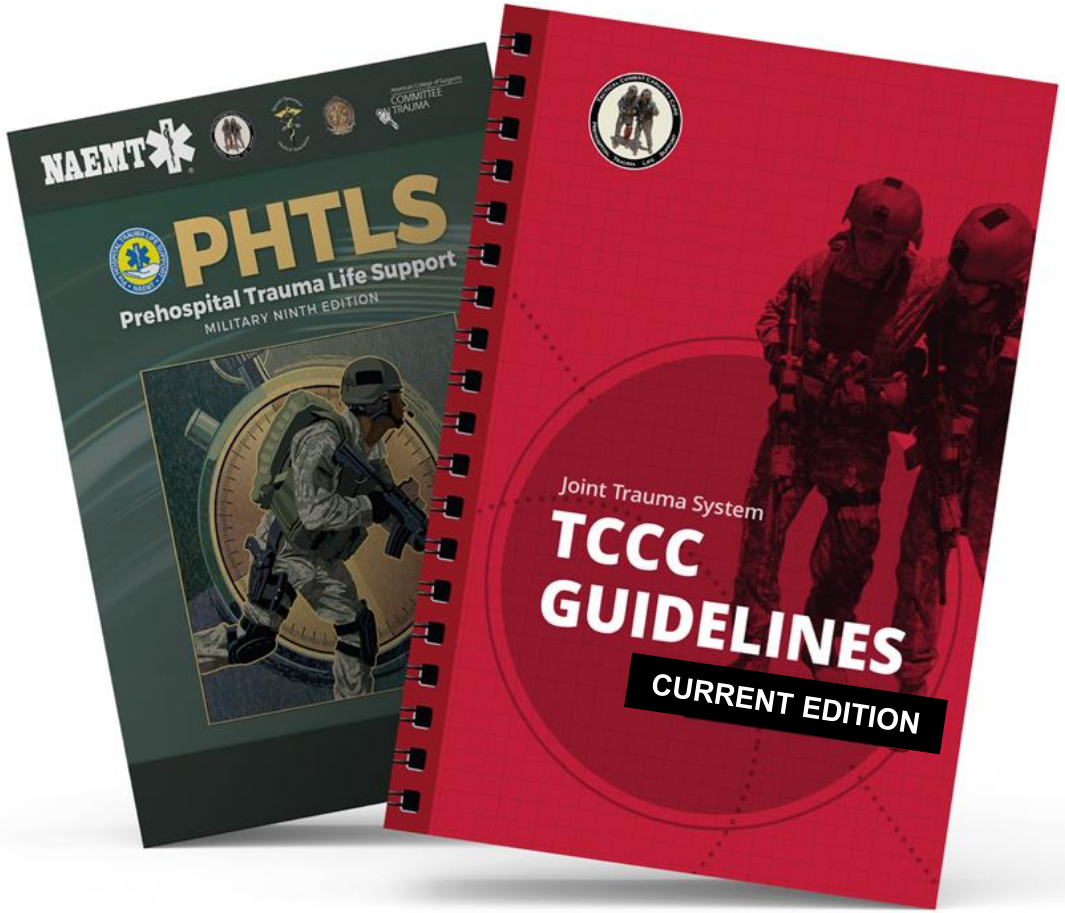
Where is the proper incision and placement for a finger thoracostomy?

What should you do if you suspect a casualty has a tension pneumothorax?

What are the three types of injuries that can cause a tension pneumothorax?

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.