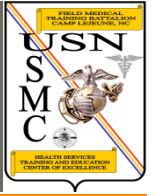




# MANAGE RESPIRATORY TRAUMA





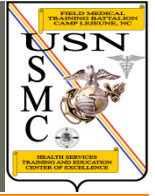
# OVERVIEW



- Terminology
- Anatomy
- Respiratory Trauma
- Needle Thoracentesis



# LEARNING OBJECTIVES

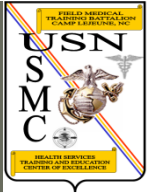


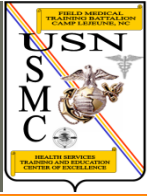
Please Read Your

Terminal Learning Objectives

And

Enabling Learning Objectives





# TERMINOLOGY



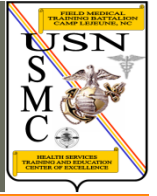
# TERMINOLOGY



- DYSPPNEA - Difficult or labored breathing
- WHEEZE - High pitched whistling sound that is caused by movement of air through a narrowed airway
- STRIDOR - A harsh shrill respiratory sound produced from the obstruction of the laryngeal area
- HYPERVENTILATION - Increase in the rate and depth of respiration causing a increase in O<sub>2</sub> and a decrease in CO<sub>2</sub>
- HYPOVENTILATION - Loss of ventilation drive (TBI). Upper or lower airway obstruction, and decreased expansion of the lungs.



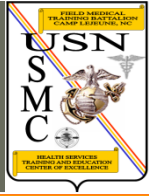
# TERMINOLOGY



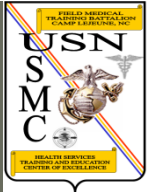
- TACHYPNEA - Abnormally excessive, rapid rate of respirations ( $>20$  BPM)
- BRADYPNEA – Abnormally slow rate of respiration ( $<8$  BPM)
- HYPOXIA - Insufficient concentration of  $O_2$  in the tissue in spite of an adequate blood supply
- HYPOXEMIA – Decreased level of  $O_2$  in the bloodstream
- APNEA - Total cessation of breathing, also known as a respiratory arrest

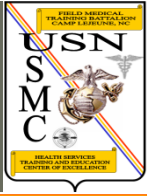


# TERMINOLOGY



- SUBCUTANEOUS EMPHYSEMA - Presence of air or a gas in the subcutaneous tissues around the face, neck, and/or the chest
  - Skin may appear swollen and makes a CRACKLING sound when palpated
  - Sounds and feels like RICE CRISPIES

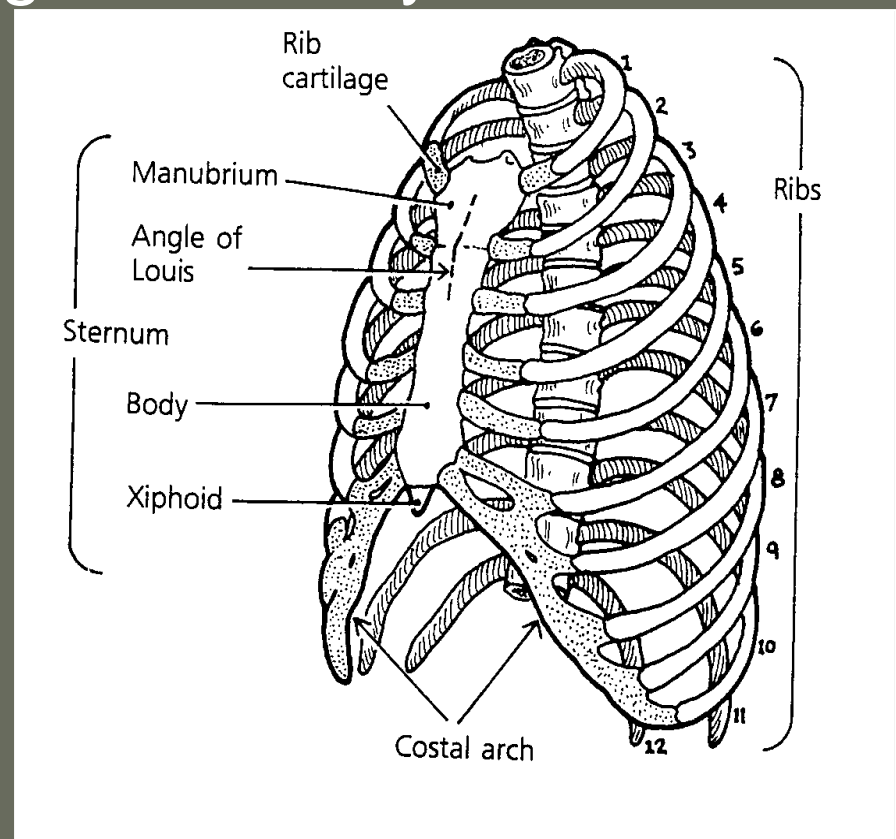




# ANATOMY

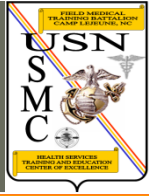
# ANATOMY

- Thorax (Chest Cavity)
  - Protected by a bony cage formed by the:
    - Sternum
    - Costal cartilages
    - Ribs
    - Vertebrae





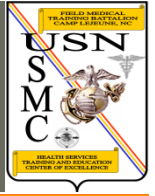
# ANATOMY



- THORAX (Chest Cavity)
  - Diaphragm
    - Primary muscle of respiration
    - Inferior border of the chest cavity

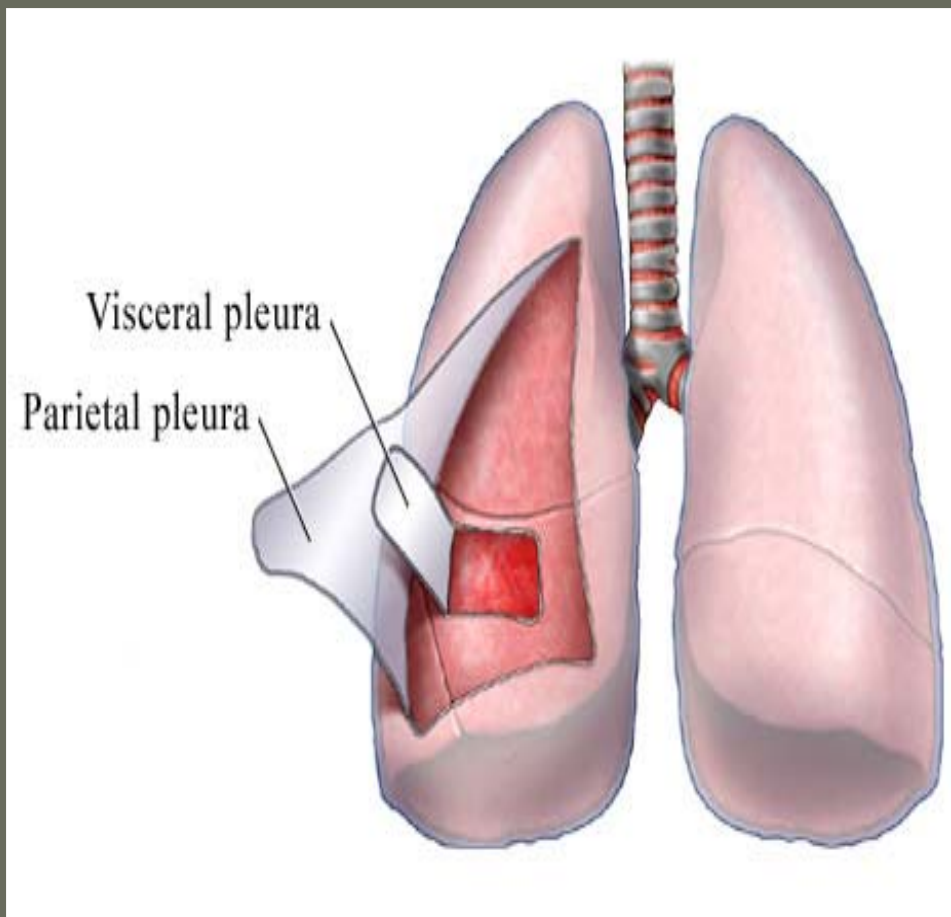


# ANATOMY



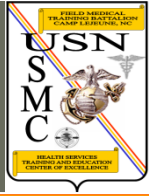
- PLEURA
  - Thin membranes separated by a small amount of fluid
    - Fluid between the two pleural membranes create surface tension and causes the two pleura to stick together
    - Prevents lungs from collapsing

- PLEURA
  - **PARIETAL PLEURA** – Lines inner portion of the thoracic cavity
  - **VISCERAL PLEURA** – Lines the outer surface of the lung





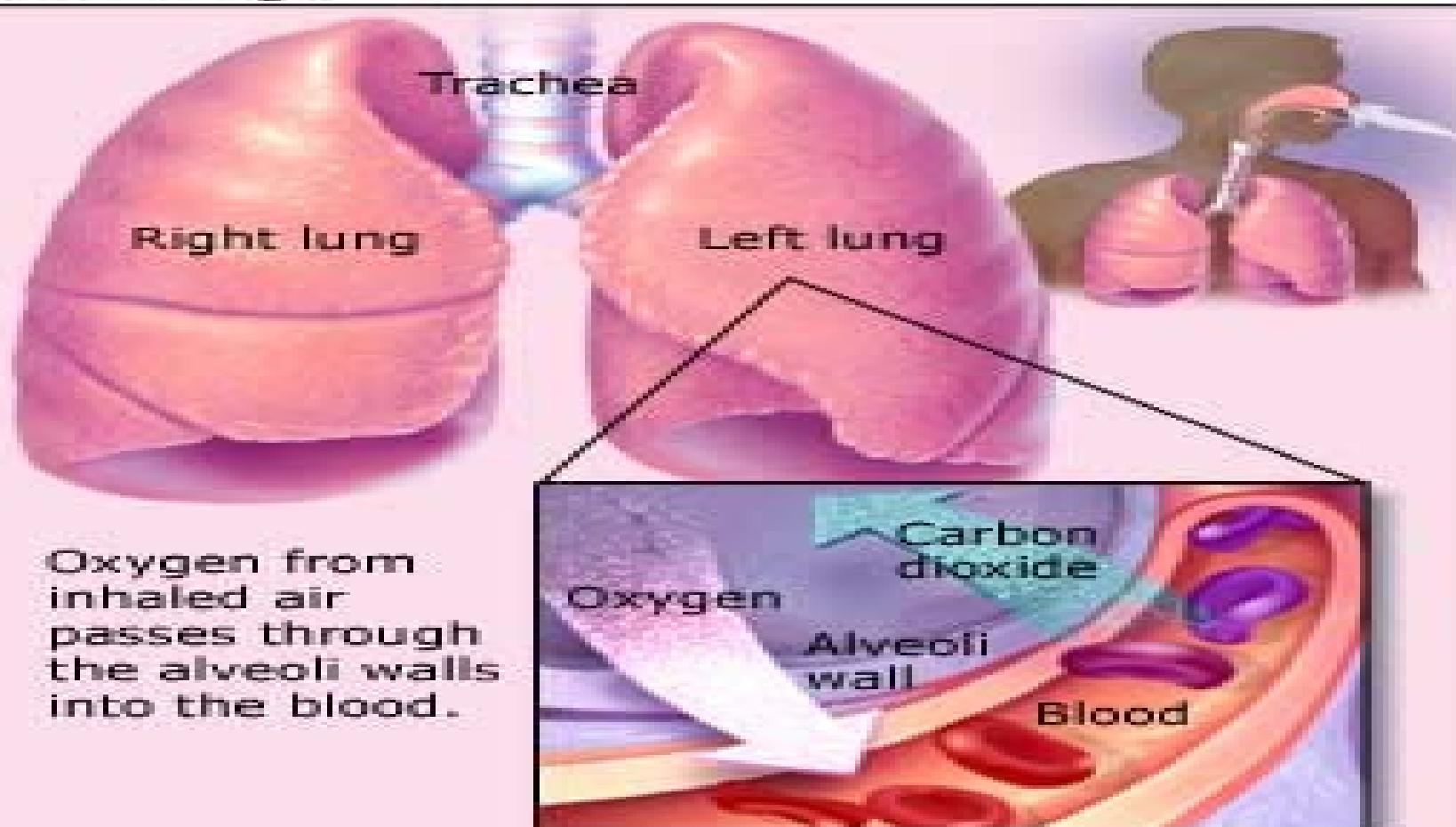
# ANATOMY



- LUNGS – occupy the left and right halves of the thoracic cavity
  - Left lung: 2 lobes
  - Right lung: 3 lobes, larger than the left
  - ALVEOLI: Smallest component of the lungs, saclike structures where CO<sub>2</sub> and O<sub>2</sub> exchange takes place

# ANATOMY

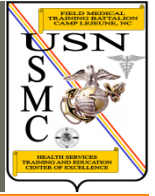
## The Lungs



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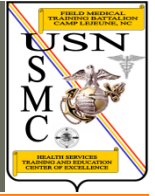


# ANATOMY



- MEDIASTINUM
  - Area in the middle of the thoracic cavity that encases:
    - Heart
    - Great vessels (aorta, superior / inferior vena cava)
    - Trachea (windpipe)
    - Bronchi
    - Esophagus

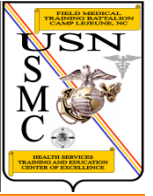




# RESPIRATORY TRAUMA



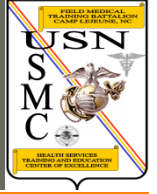
# RESPIRATORY TRAUMA



- Causes
- Signs & Symptoms
- Treatment



# RESPIRATORY TRAUMA



- Chest injuries are the second leading cause of trauma deaths each year
- Many of these injuries can be managed without surgery
- Usually classified into 2 categories
  - Blunt and Penetrating

# RESPIRATORY TRAUMA



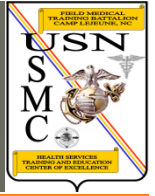
- Penetrating Injuries
  - Gun shot and stab wounds
  - Organs in path of object are injured

# RESPIRATORY TRAUMA





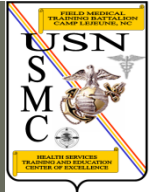
# RESPIRATORY TRAUMA



- Blunt Injuries
  - Caused by severe blow, blast, or rapid deceleration
  - May result in:
    - Pulmonary contusion
    - Flail chest
    - Cardiac tamponade
    - Aortic Rupture

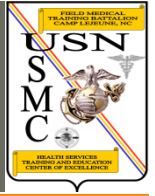


# RESPIRATORY TRAUMA





# RESPIRATORY TRAUMA

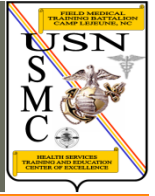


## Assessment of Respiratory Trauma

- Look for the obvious, but also communicate with the casualty if possible.
- Likely to be experiencing chest pain, frequently the pain is worse with respiratory efforts or movement.
- Shortness of breath.
- Apprehensive or lightheaded if shock is developing.



# RESPIRATORY TRAUMA

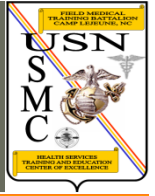


## Conduct a physical examination:

- Observation
- Auscultation
- Palpation



# RESPIRATORY TRAUMA



## Observation:

- Casualty is observed for pallor of the skin and sweating
- The presence of cyanosis
- Observe frequency of respirations (rate, rhythm, and depth)
- Look for gasping, contractions of the accessory muscles of respiration in the neck, or nasal flaring
- Look for signs of trachea deviation and distended jugular veins



# RESPIRATORY TRAUMA

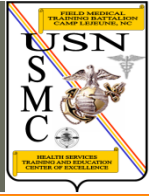


## Observation Cont.

- Chest is examined for contusions, abrasions, and lacerations
- Identify whether chest wall expands symmetrically with breathing.
- Identify whether any portion of the chest wall moves paradoxically with respiration



# RESPIRATORY TRAUMA



## Auscultation:

- The entire chest is evaluated to identify decreased breath sounds on one side compared to the other which may indicate pneumothorax or hemothorax on the examined side.
- Pulmonary contusions may result in abnormal breath sounds (crackles).



# RESPIRATORY TRAUMA

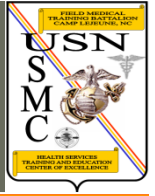


## Palpation:

By gently pressing the chest wall with hands and fingers to assess for the presence of tenderness, crepitus (either bony or subcutaneous emphysems), and bony instability of the chest wall is performed.

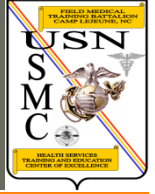


# RESPIRATORY TRAUMA



## MANAGEMENT OF SPECIFIC INJURIES

- Rib Fracture
- Flail Chest



# RIB FRACTURE

- Occurs when force applied is greater than the strength of the rib

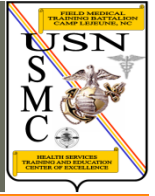
**REMEMBER!!**

***ANY rib fx can cause injuries to nearby structures***

- Fractures of the first and second rib normally indicate head injury



# RIB FRACTURES



- SIGNS AND SYMPTOMS
  - Pain at the site with inhalation/exhalation
  - Shortness of breath (SOB)
  - Deformity
  - Crepitus
  - Bruising



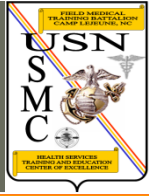
# RIB FRACTURES



- TREATMENT
  - Anticipate potential complications
    - Tension Pneumothorax
  - Simple Rib FX's
    - Usually require no tx other than analgesics
  - Multiple FX's
    - Can be immobilized to the affected side using patient's arm and a sling



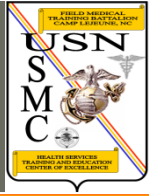
# RIB FRACTURES



- TREATMENT
  - Encourage coughing and deep breathing
  - Avoid bandaging or taping that encircles the chest
  - Monitor and TACEVAC as necessary



# FLAIL CHEST



- A segment of 2 or more adjacent ribs fractured in at least 2 places
- The segment moves IN with inhalation and OUT with exhalation, called *Paradoxical Movement*
- Caused by blunt trauma to the chest wall



# FLAIL CHEST



- SIGNS & SYMPTOMS
  - Localized chest pain, aggravated by breathing and coughing
  - Rapid, shallow respirations
  - Tenderness or crepitus upon palpation
  - Subcutaneous emphysema

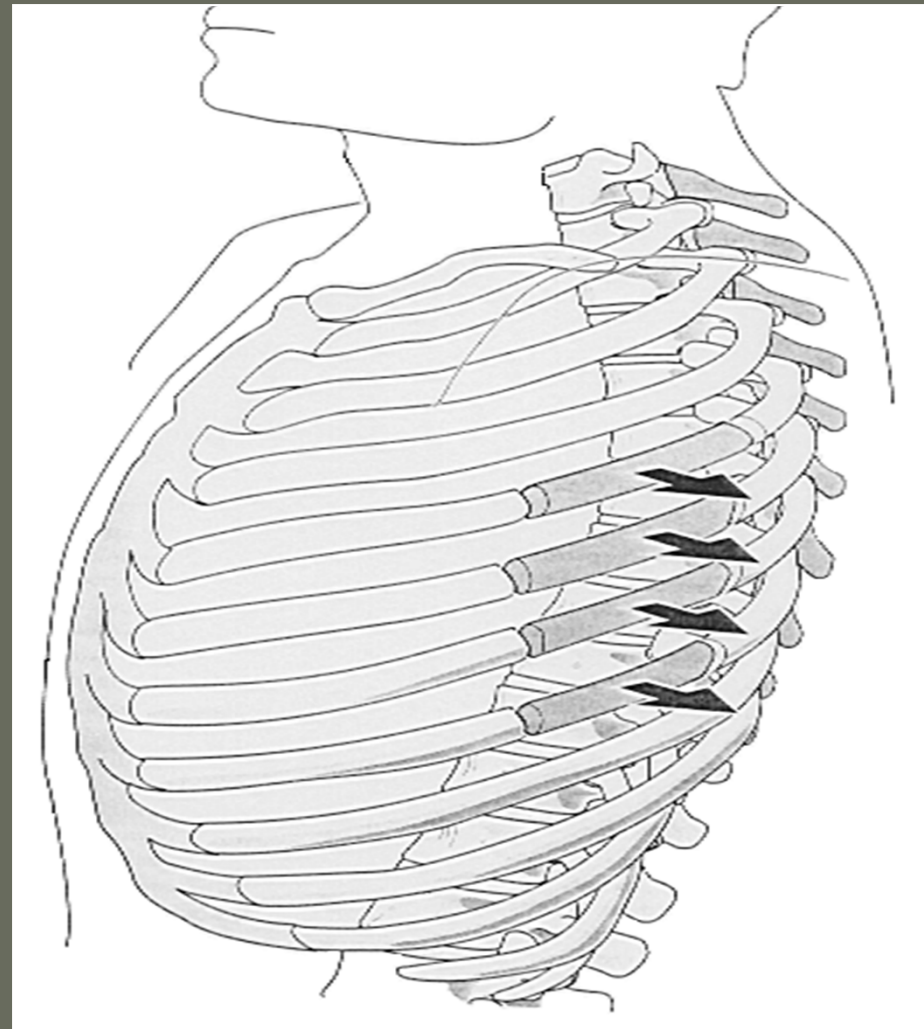


# FLAIL CHEST

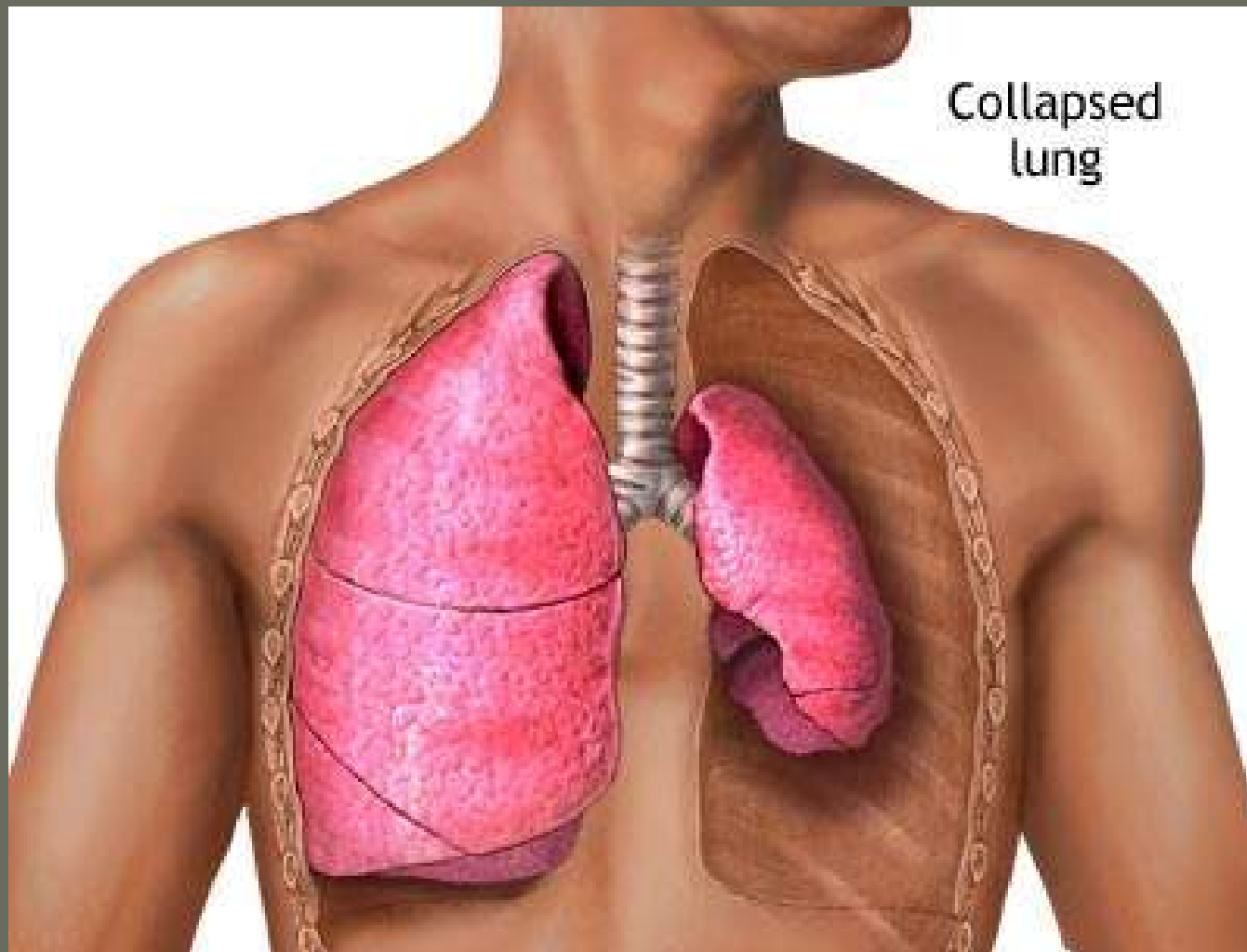


- TREATMENT
  - Immobilize flail segments upon inhalation using strips of tape
  - Positive pressure ventilation if you suspect respiratory failure
  - Analgesics
  - O2 if available
  - Monitor and TACEVAC as necessary

# Flail Chest



# PNEUMOTHORAX





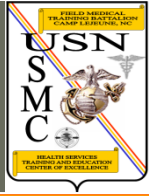
# DEFINITION OF PNEUMOTHORAX



- A simple pneumothorax is caused by the presence of air in the pleural space.
- The air separates the pleura causing the lungs to either partially or totally collapse



# PNEUMOTHORAX



- CAUSES
  - Penetrating trauma of the chest
    - Also possible with abdominal injuries that cross the diaphragm
  - Blunt trauma
  - Spontaneous



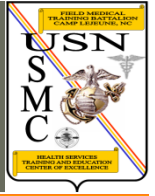
# PNEUMOTHORAX



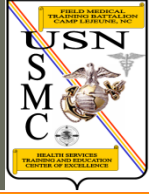
- SIGNS / SYMPTOMS
  - Pleuritic chest pain
  - Tachypnea / Dyspnea
  - Decreased or absent breath sounds on affected side
  - Decreased chest wall motion



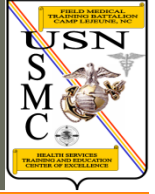
# PNEUMOTHORAX



- TREATMENT
  - Place pt in Fowler's or Semi-Fowler's position
  - Administer O2 if available
  - Use BVM if hypoxia is present
  - If caused by wound, apply occlusive dressing
  - Monitor for s/sx's of tension pneumothorax
  - TACEVAC ASAP



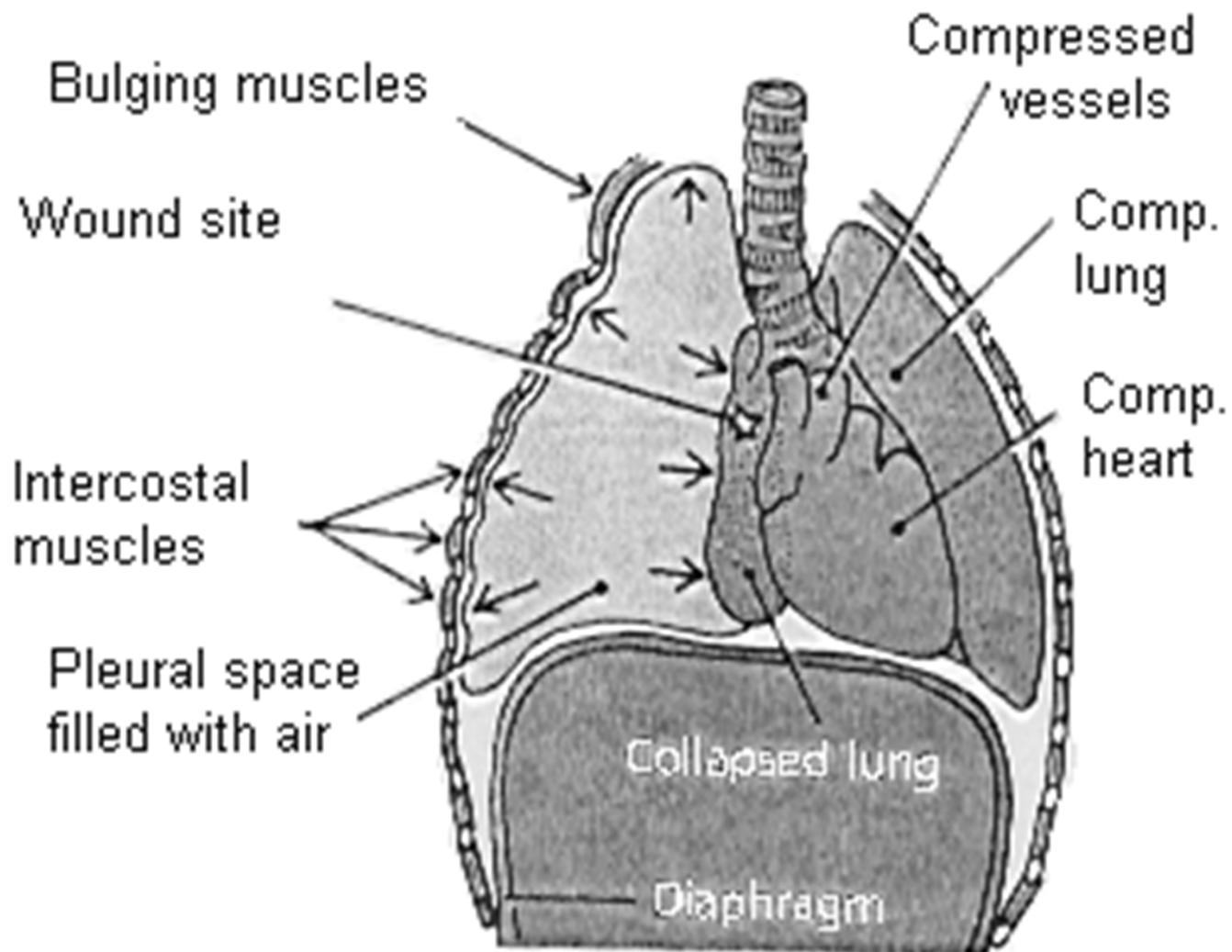
# TENSION PNEUMOTHORAX

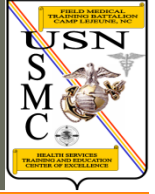


# TENSION PNEUMOTHORAX

- Air enters the pleural space and cannot escape
- Pressure builds in pleural space, the lung collapses and the mediastinum is forced to the opposite side
  - Breathing becomes more difficult
  - Cardiac blood flow is severely decreased

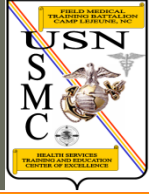
# TENSION PNEUMOTHORAX





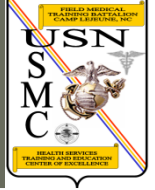
# TENSION PNEUMOTHORAX

- EARLY SIGNS AND SYMPTOMS
  - Unilateral decreased or absent breath sounds
  - Dyspnea
  - Tachypnea



# Tension Pneumothorax

- PROGRESSIVE SIGNS AND SYMPTOMS
  - Increased dyspnea
  - Increased tachypnea
  - Difficulty ventilating



# TENSION PNEUMOTHORAX

- LATE SIGNS AND SYMPTOMS
  - Jugular Vein Distention (JVD)
  - Tracheal Deviation (towards unaffected side)
  - Signs of acute hypoxia
  - Narrowing pulse pressures
  - Signs of uncompensated shock



# TENSION PNEUMOTHORAX

- In some cases the only signs of a developing tension pneumothorax are:
  - Compromised oxygenation
  - Tachycardia
  - Tachypnea
  - Unilateral decreased or absent breath sounds

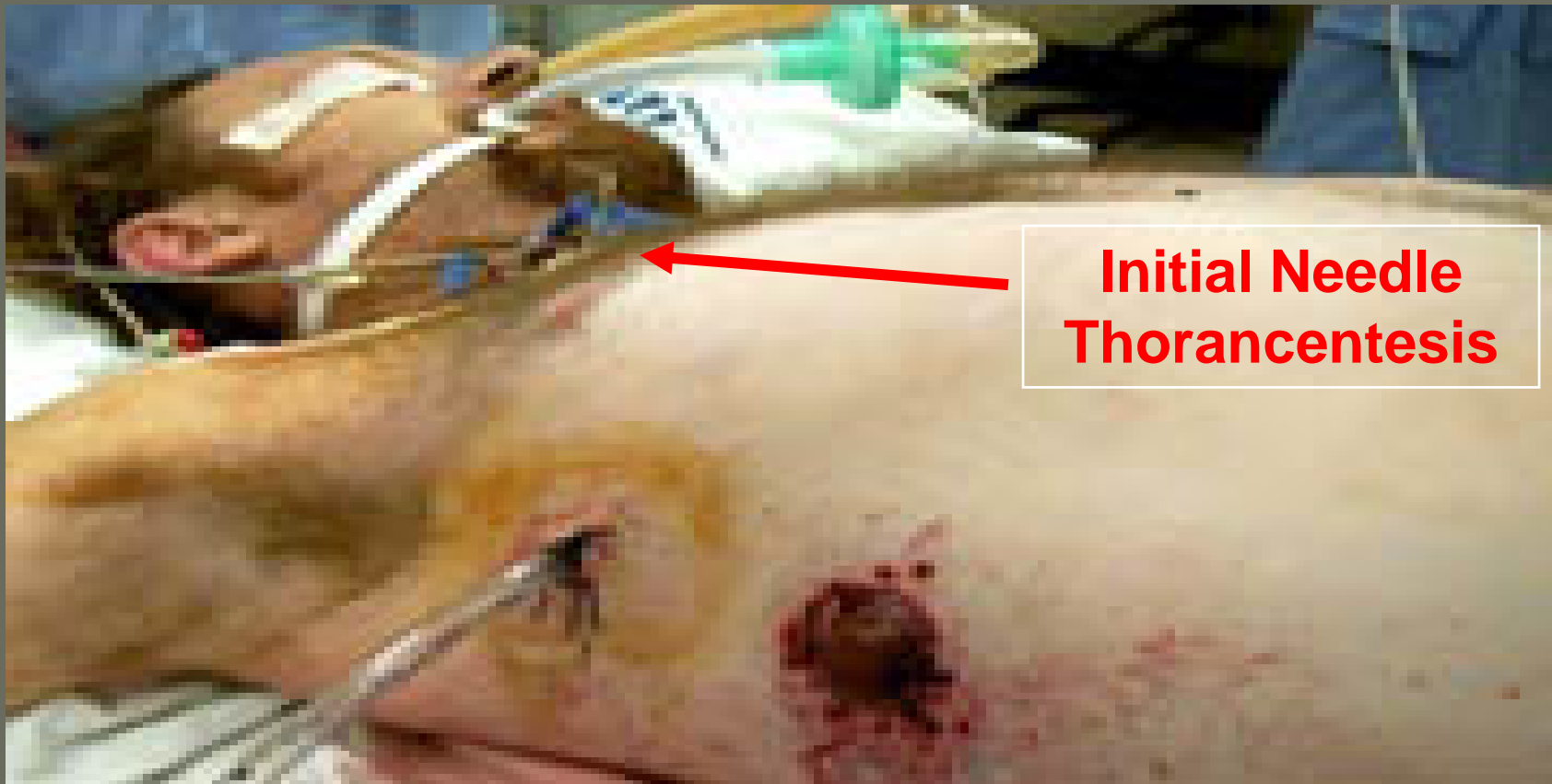


# TENSION PNEUMOTHORAX



- TREATMENT
  - Treat all chest injuries
  - Perform needle thoracentesis
  - Administer oxygen (if available)
  - Pain management
  - Monitor and TACEVAC

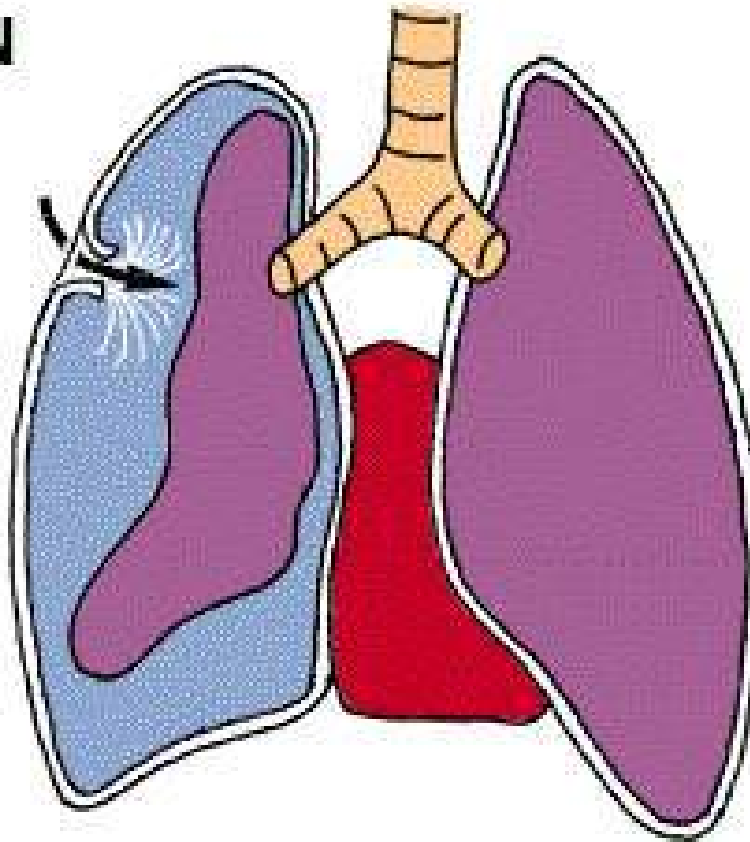
# SHOTGUN BLAST TO LOWER RIGHT CHEST / UPPER RIGHT ABDOMEN



# OPEN PNEUMOTHORAX

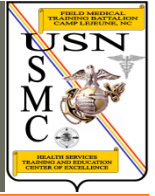
(SUCKING CHEST WOUND)

**OPEN**





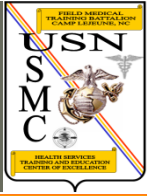
# OPEN PNEUMOTHORAX



- DEFINITION
  - A collection of air or gas in the pleural space that causes the lung to collapse
  - More than the normal amount of air will enter the lung adding stress and tension to affected side
- CAUSES
  - Gunshot, stab wounds, impaled objects, occasional blunt trauma

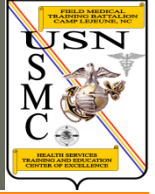


# OPEN PNEUMOTHORAX





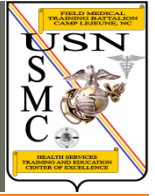
# OPEN PNEUMOTHORAX



- SIGNS AND SYMPTOMS
  - Pain at the injury site
  - Chest wall trauma
  - Shortness of breath
  - Tachypnea
  - Decreased chest wall motion
  - May hear a sucking or bubbling sound as air moves through the wound



# OPEN PNEUMOTHORAX



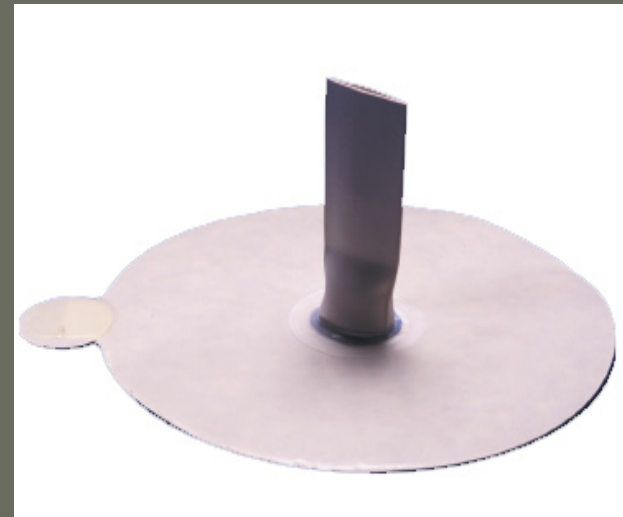
- TREATMENT
  - Occlusive Dressing
    - Apply chest seal
    - Improvised chest seal
      - Tape on all sides
    - Assess anterior and posterior torso for entrance/exit wounds

# CHEST SEALS

## Bolin Chest Seal



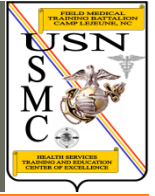
## Asherman Chest Seal



## H&H Wound Seal



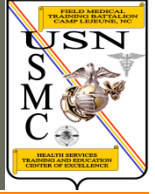
# OPEN PNEUMOTHORAX



- TREATMENT (cont.)
  - Place patient on AFFECTED Side
  - Monitor for signs/symptoms of tension pneumothorax
  - Administer O2, if available
  - Pain management
  - Monitor and TACEVAC ASAP



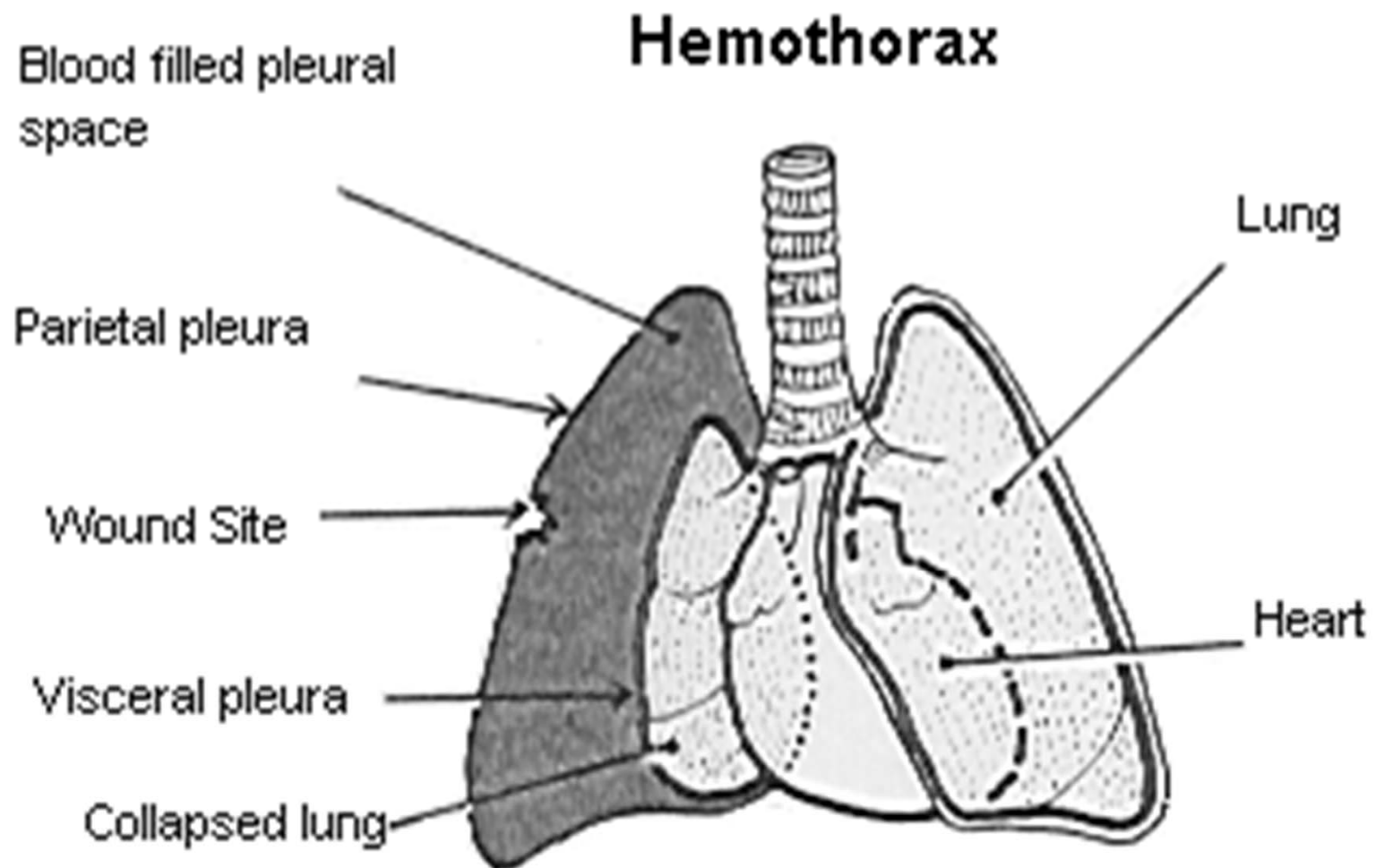
# HEMOTHORAX



# HEMOTHORAX

- Blood accumulated into the chest cavity from lacerated vessels compressing the lung
- Prevents adequate ventilation
- Causes
  - Penetrating or blunt trauma

# HEMOTHORAX





# HEMOTHORAX



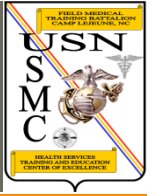
- SIGNS / SYMPTOMS
  - SOB
  - Chest pain
  - Tachypnea
  - S/S of shock: pallor, confusion, hypotension
  - Decreased or absent breath sounds
  - Hemoptysis (coughing up blood)
  - Decreased chest wall motion



# HEMOTHORAX



- TREATMENT
  - Place patient in Fowler's position
  - Treat chest injuries
  - Treat for shock
  - Administer O2, if available
  - Monitor and TACEVAC



# HEMOPNEUMOTHORAX



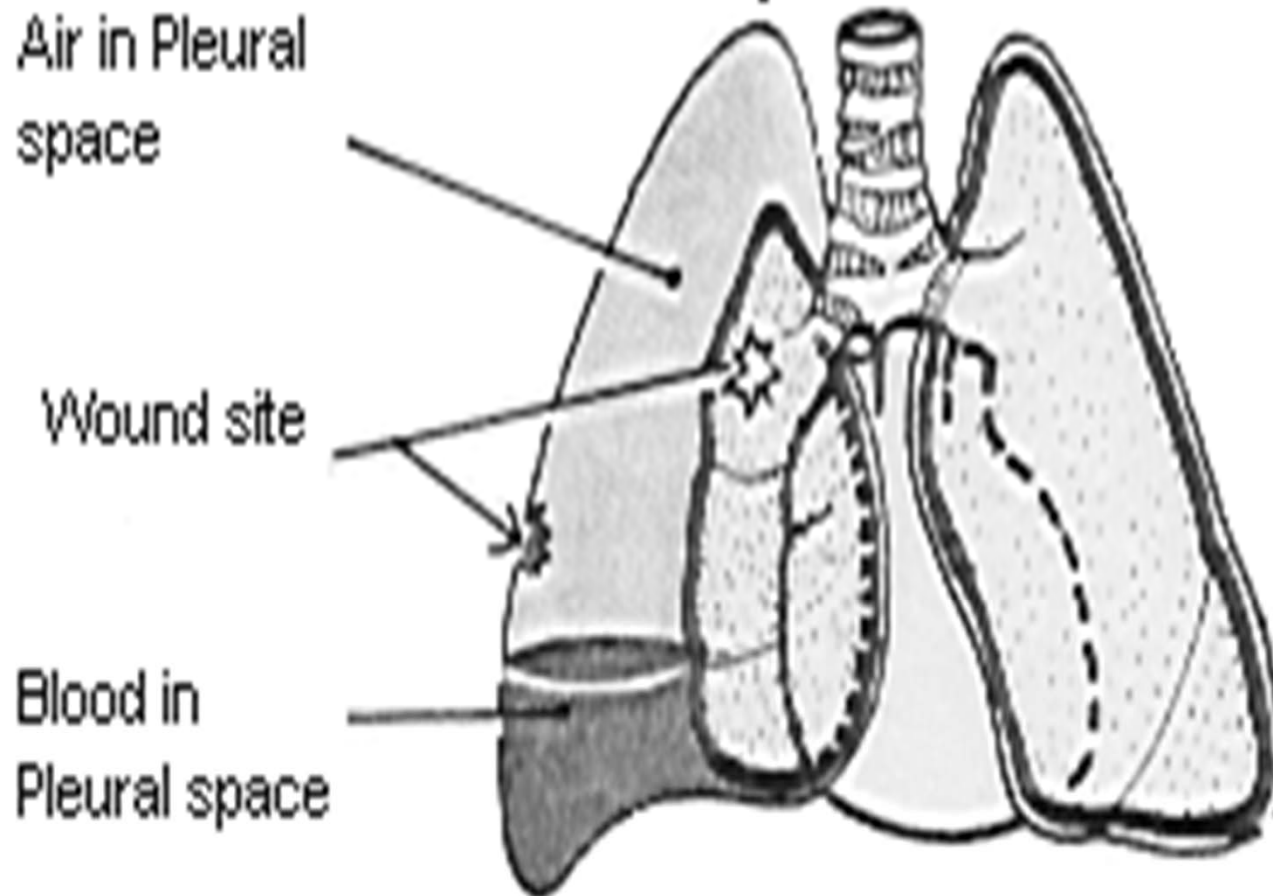
# HEMOPNEUMOTHORAX



- A collection of blood and air in the pleural space
- May result in a collapsed lung and pressure on the heart and uninjured lung
- Caused by penetrating trauma to the chest wall or the lungs

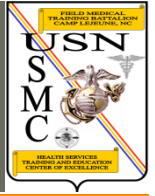
# HEMO-PNEUMOTHORAX

## Hemopneumothorax





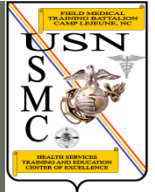
# HEMOPNEUMOTHORAX



- SIGNS / SYMPTOMS
  - Tachypnea
  - Decreased breath sounds
  - Signs of shock



# HEMOPNEUMOTHORAX

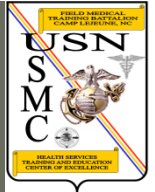


- TREATMENT
  - Place patient In Fowler's Position
  - Perform needle thoracentesis to relieve pressure
    - If blood is withdrawn, immediately remove needle and catheter
  - Administer O2, if available
  - Treat for shock
  - Monitor and TACEVAC





# NEEDLE THORACENTESIS





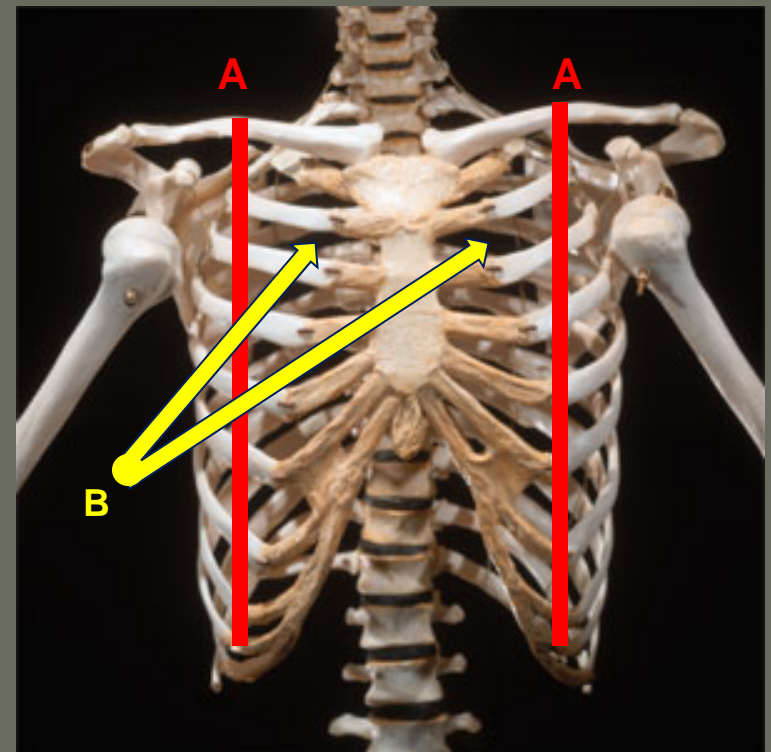
# PURPOSE



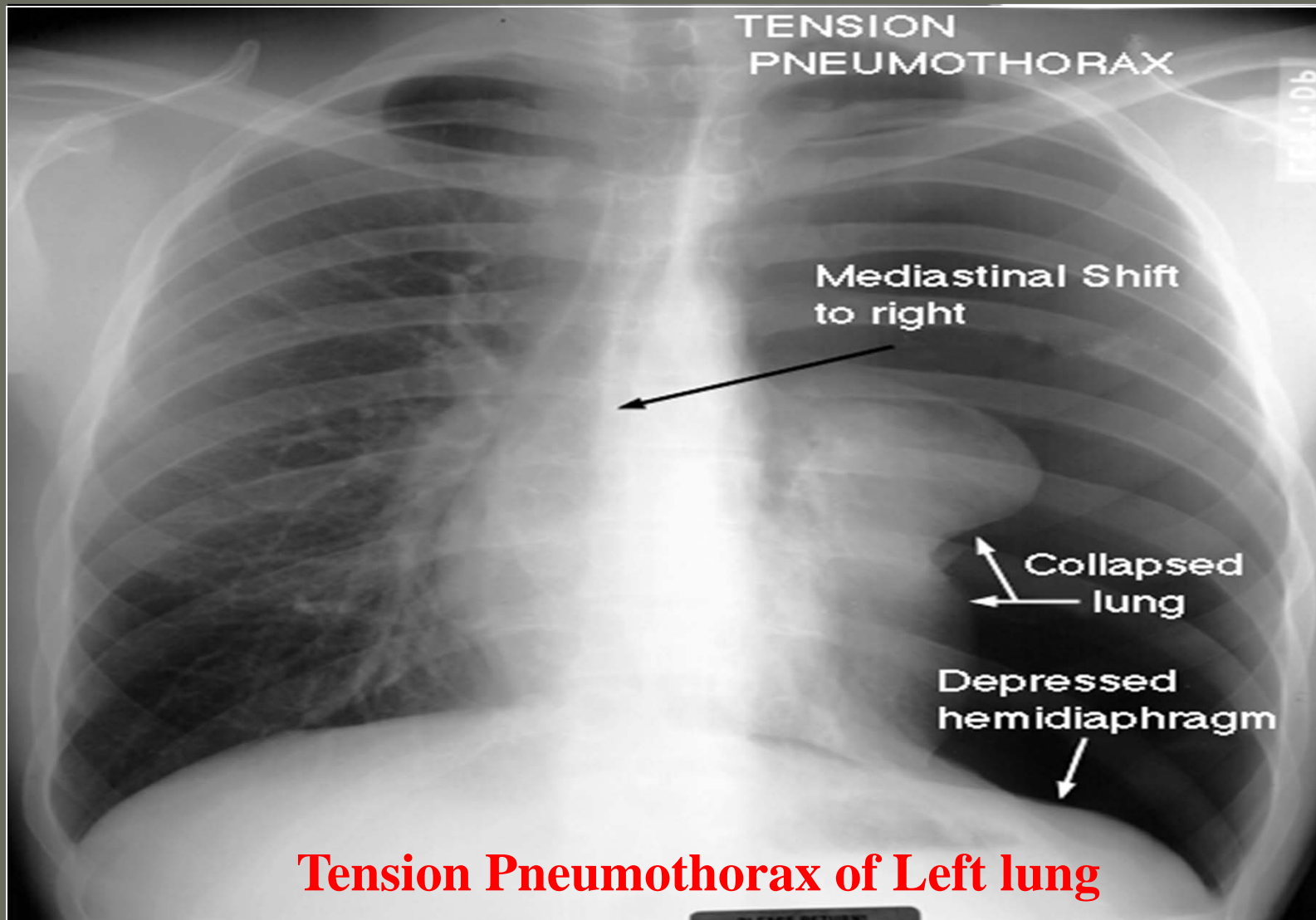
- Definition:
  - Procedure where a needle and catheter is inserted through the chest wall into the pleural space
- Purpose:
  - Relieves accumulated pressure in the pleural space
  - Reduces pressure on the heart, lungs, and chest cavity

# ANATOMICAL LANDMARKS

- Mid-Clavicular Lines (A)
- 2<sup>nd</sup> Intercostal Space (B)



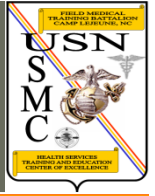
# ANATOMICAL LANDMARKS







# INDICATIONS

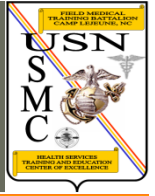


- Any casualty with thoracic injury is at risk of a tension pneumothorax
- Casualties with penetrating wounds to the chest and those with signs of rib fracture are at risk
- There are NO significant contraindications





# PROPER EQUIPMENT



- 14-gauge, 3.25 inch needle catheter
- Antiseptic solution
- Gloves





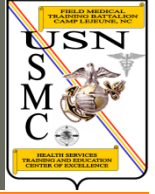
# PROCEDURAL STEPS



- Assess Casualty and Make Decision
  - Based on MOI
  - Noted increase in difficult breathing
- Inspect
- Auscultate
- Palpate



# PROCEDURAL STEPS



- Assemble and Check Equipment
  - 14-gauge, 3.25 inch needle/catheter
  - Antiseptic Solution
  - Gloves



# PROCEDURAL STEPS



- Prepare Patient
  - Upright position
  - Explain procedure
  - Expose chest



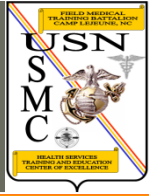
# PROCEDURAL STEPS



- Identify Landmarks
  - Midclavicular Line
  - 2<sup>nd</sup> Intercostal Space



# PROCEDURAL STEPS

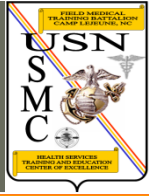


- Perform the Procedure
  - Cleanse area
  - Insert needle/catheter (over the rib, NOT below)
  - Puncture parietal pleura
  - Remove needle
  - Secure catheter

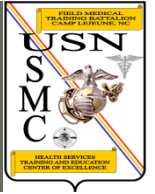


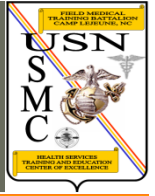


# PROCEDURAL STEPS



- Reassess Patient
  - IAP the chest
  - Visually inspect neck
  - Monitor patient's response
  - Continue monitoring and reassessing



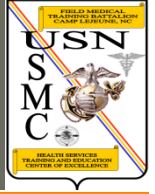


# COMPLICATIONS

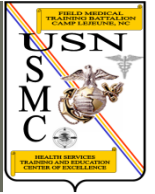
- Hemothorax
  - Blood within the pleural space
  - Caused by needle puncturing any vessel within the chest
- Cardiac Tamponade
  - Pressure on the heart that occurs when blood or fluid builds up in the space between the heart muscle and the pericardium.
  - Ensure needle is at or lateral to the nipple line



# COMPLICATIONS

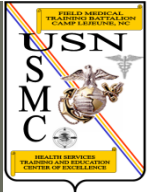


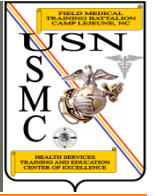
- Subcutaneous Emphysema
  - Released air becomes trapped under skin
  - Feels like “rice crispies”
- Misdiagnosis
  - Performing a needle thoracentesis on a casualty with non-penetrating torso trauma could result in a pneumothorax if not already present.



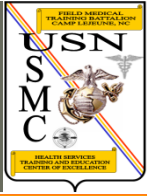


# DEMONSTRATION





# PRACTICAL APPLICATION





# MANAGE RESPIRATORY TRAUMA

