

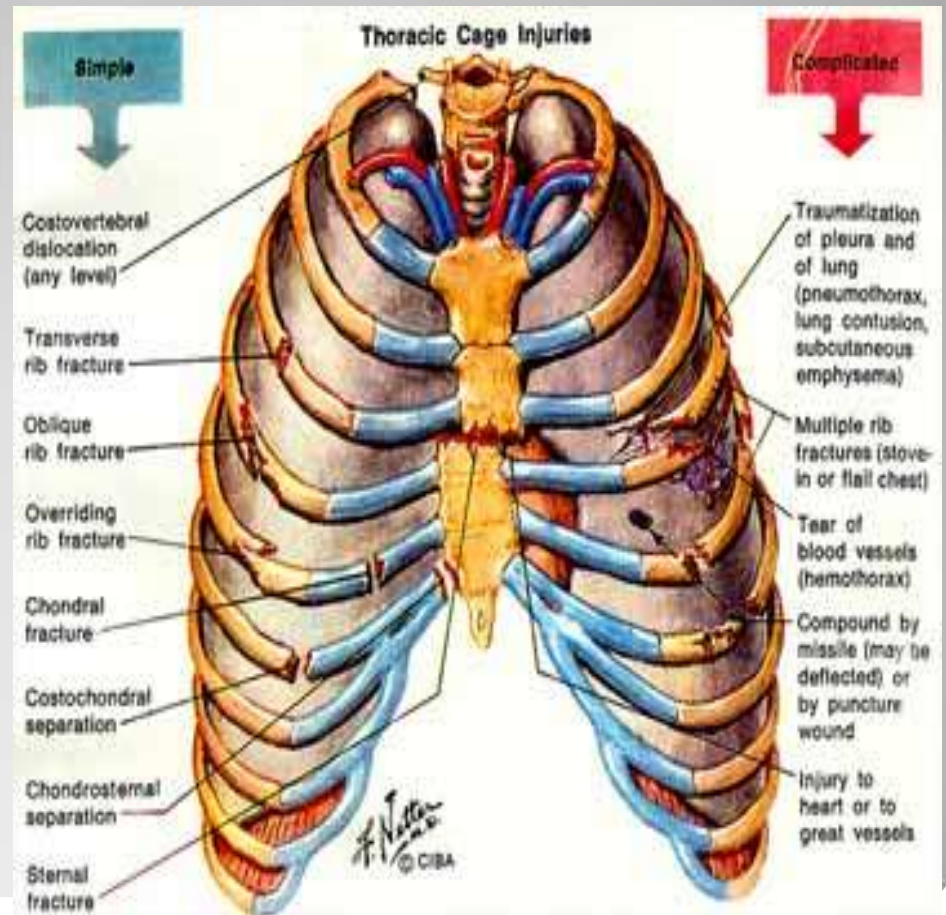
# **Chest & Abdomen Trauma:**

## **Understanding & Responding Appropriately**

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2013

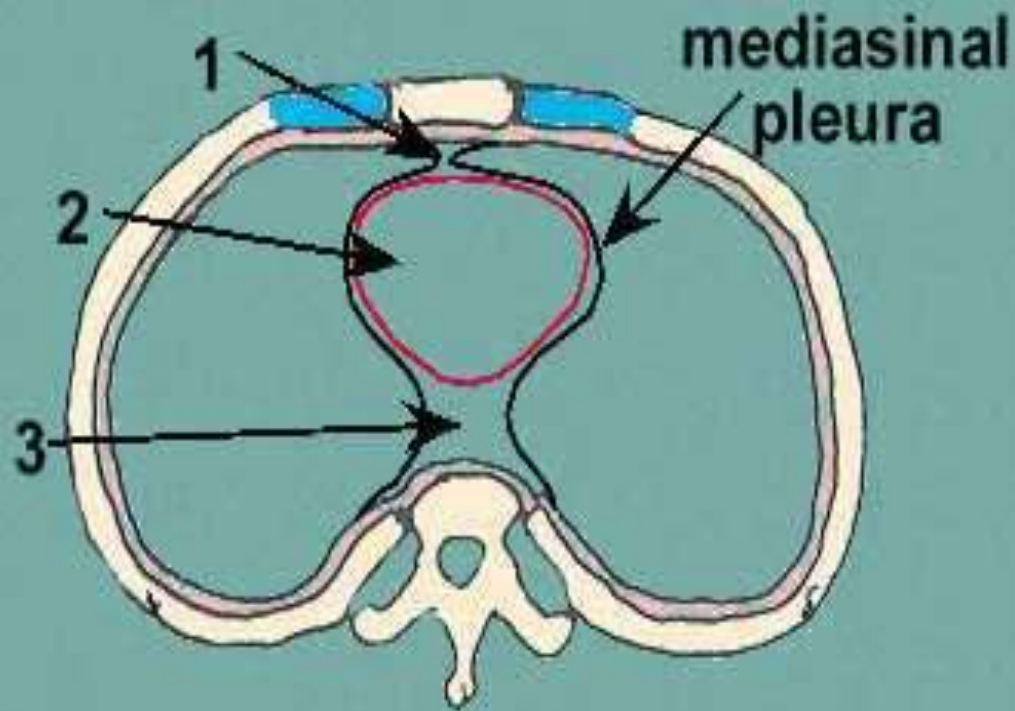
# Potentially Life Threatening Chest Injuries

- Tracheo-bronchial rupture/laceration
- open pneumothorax
- tension pneumothorax
- hemothorax
- flail chest
- cardiac tamponade
- aortic rupture

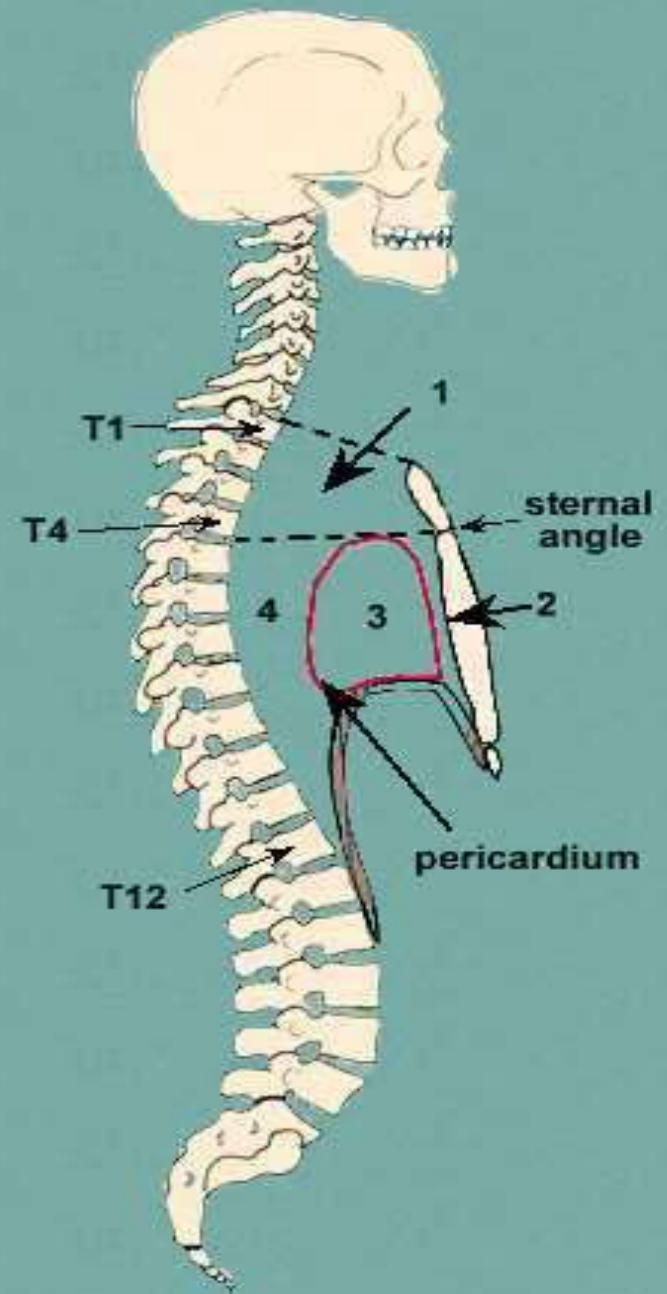


- Actual airway damage
  - 80% involve mainstem bronchus
  - 15% trachea,
  - 5% distal bronchus
  - Usually within 2.5 cm of carina
  - Air escapes into the thoracic cavity
  - mortality up to 30% usu. Within 1<sup>st</sup> hour
- Caused by penetrating or blunt  
mechanism

## Tracheobronchial Injury



- #1= Anterior (#2)
- #2= Middle (#3)
- #3= Posterior (#4)
- Side view: #1= Superior



- Must be considered in all patients
  - with penetrating injuries  
of the lower neck or upper chest
  - AND any patient with evidence of  
violent blunt injury to the chest

## Tracheobronchial Injury

- 2 groups:

- Free communication of injury  
with pleural space

OR

- Injury confined to  
peribronchial connective tissue sheath  
(more subtle symptoms:  
minimal pneumo or emphysema)

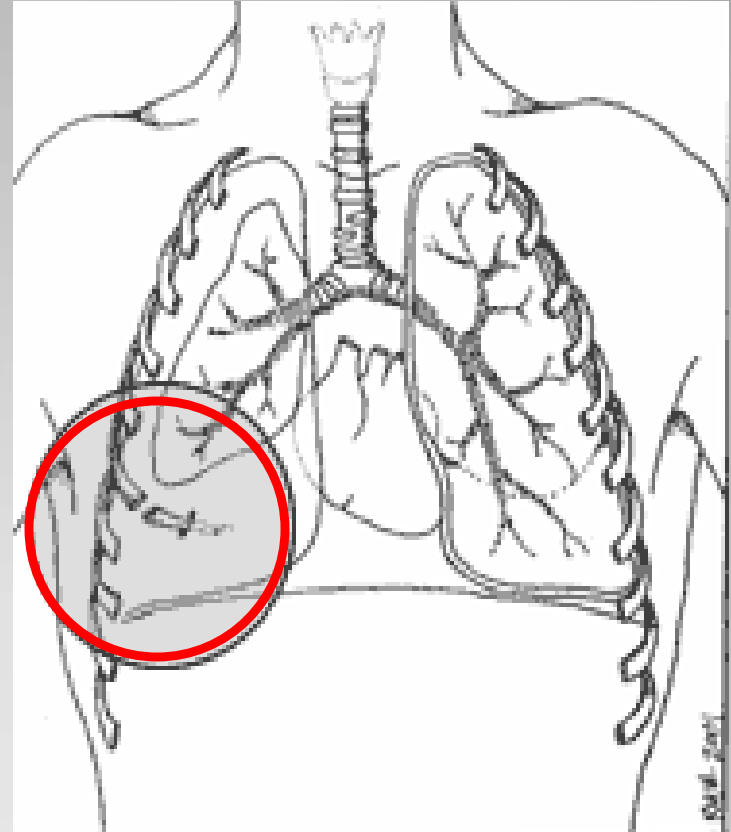
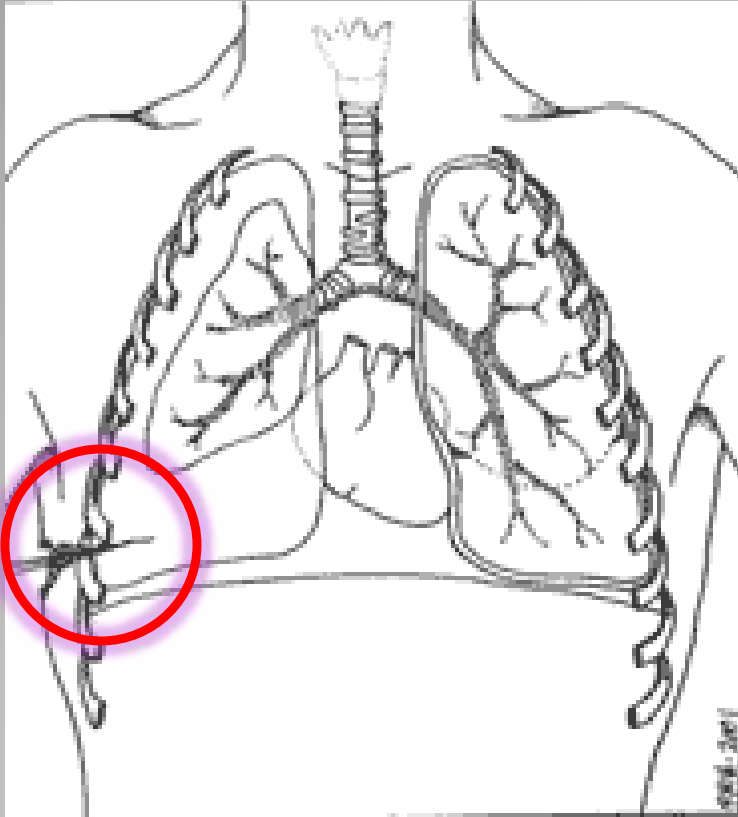
# Tracheobronchial Injury

- Hoarse voice
- Severe respiratory distress
- Stridor
- Cyanosis
- Subcutaneous emphysema  
(cervical or mediastinal)
- Decreased/unequal/absent breath sounds
- Hemoptysis
- Shock

## Signs/Symptoms

- Airway control
  - Maintain spinal immobilization
- IVs en route
- Controlled airway
  - closest trauma center
- Uncontrolled airway
  - closest facility/EDAP
  - needle cricothyrotomy ...?

## Field Treatment



# Pneumothorax: Open & Closed

- Caused by penetrating or blunt mechanism
- *Hole in chest wall*
- *allows air to move freely in and out of the pleural space*
- Negative pressure is lost in Pleural Space
  - causes lungs to passively collapse
- Lung tissue usually remains intact

## Open Pneumothorax “Sucking Chest Wound”

- Sucking sound or “bubbling” at wound site on inspiration
  - possible bubbling on expiration
- Dyspnea/tachypnea
- Decreased breath sounds on affected side
- Unequal chest rise and fall
- Possible subcutaneous air
- Skins and vital signs
  - reflect poor perfusion

## Signs and Symptoms

- O2, monitor,
  - IVs en route
  - Spinal immobilization as indicated
  - Three-sided occlusive dressing
  - Rapid transport
- 
- In ED: Chest tube will be placed.

## Field Treatment

- Observe for signs and symptoms of tension pneumothorax  
(open pneumo can deteriorate)
- If tension pneumothorax develops:  
remove occlusive dressing &...  
prepare for emergent needle  
thoracostomy

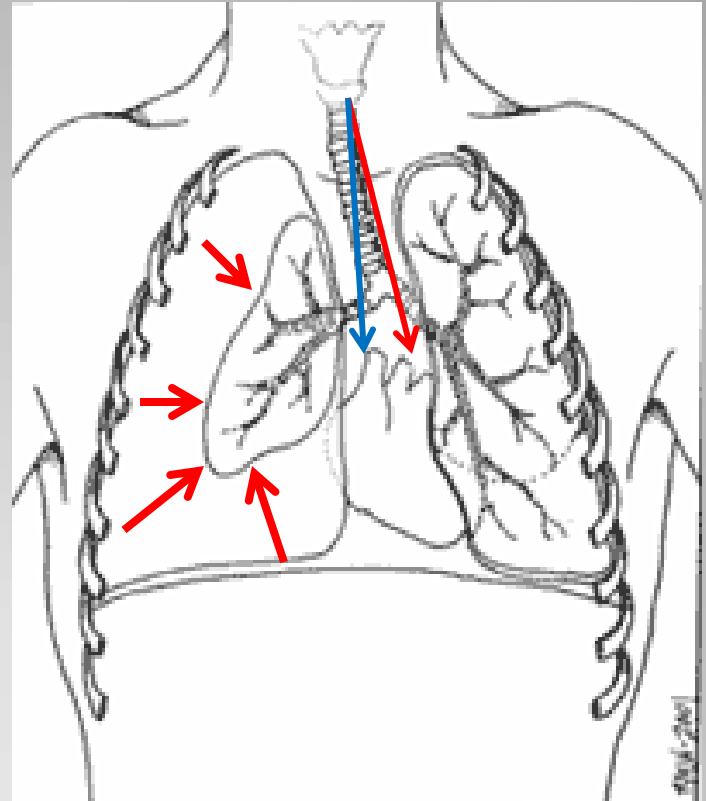
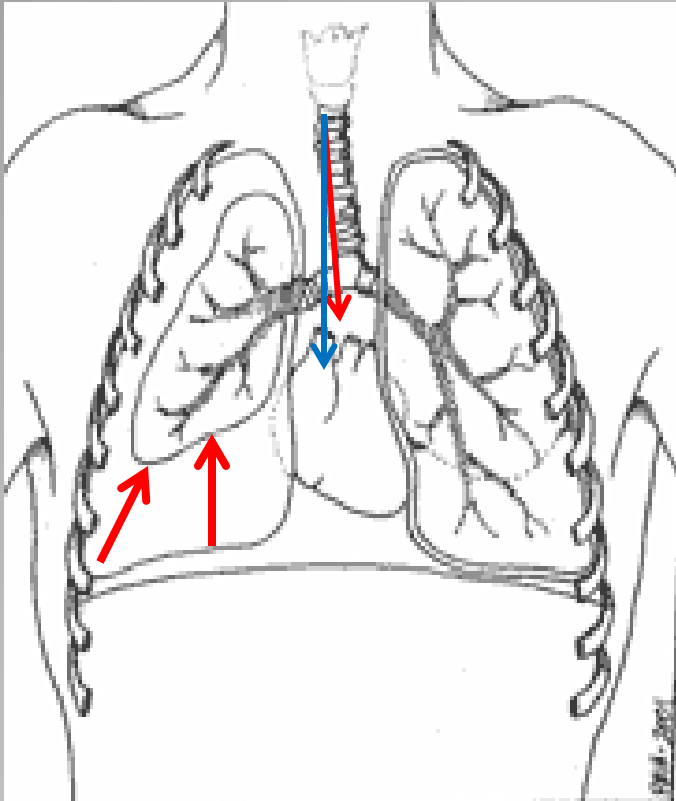
## Monitoring Open Pneumothorax

- Blunt or penetrating mechanism
- Injury perforates chest wall  
and/or pleural space
- Air becomes trapped in the pleural space  
as it enters with each breath
  - air cannot escape
  - space enlarges
  - lung collapses
  - pressure builds

## **Tension Pneumothorax**

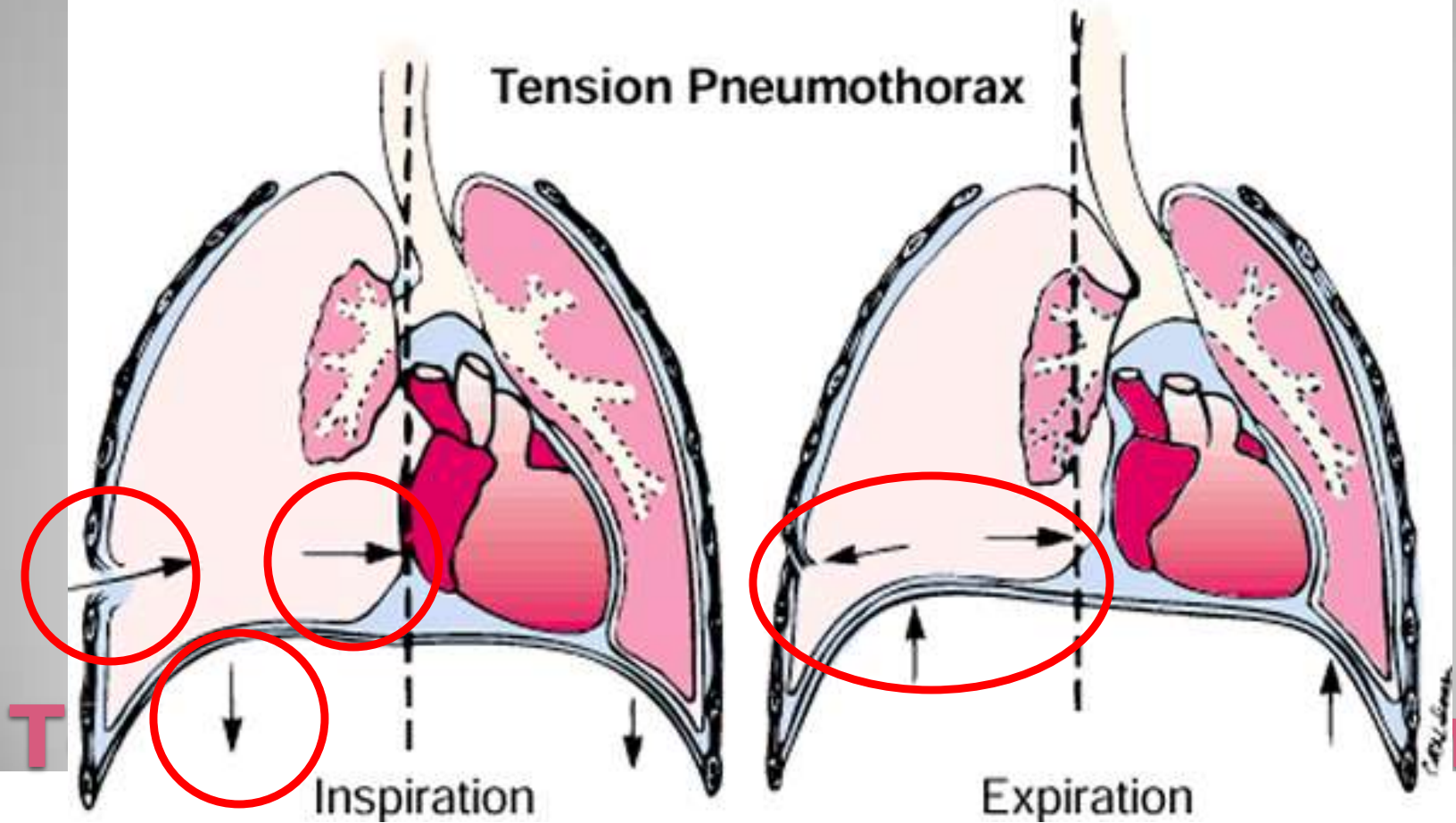
- Pressure builds pushing mediastinum to the opposite side
- Pressure is put on heart & unaffected lung and.. will eventually kink the vena cava and deviate the trachea
- Results in decreased right heart return, and thus decreased cardiac output, decreased BP

## Tension Pneumothorax



## Tension Pneumo Deterioration

## Tension Pneumothorax



- Unequal lung sounds
  - decreased or absent on affected side
- **Progressive** respiratory distress
- Accessory muscle use
- Dyspnea
- May note subcutaneous air  
in upper chest wall
- **Signs of poor perfusion**
- Possibly decreased compliance with BVM

## Signs and Symptoms

- JVD
- Tracheal deviation

**Late Signs and Symptoms**

- High flow oxygen/intubate prn
- Immediate Needle Thoracostomy  
on affected side
- Remove occlusive dressings
- Spinal immobilization
- Two large IVs en route/fluid resuscitate
- Rapid transport
- Shock position as tolerable

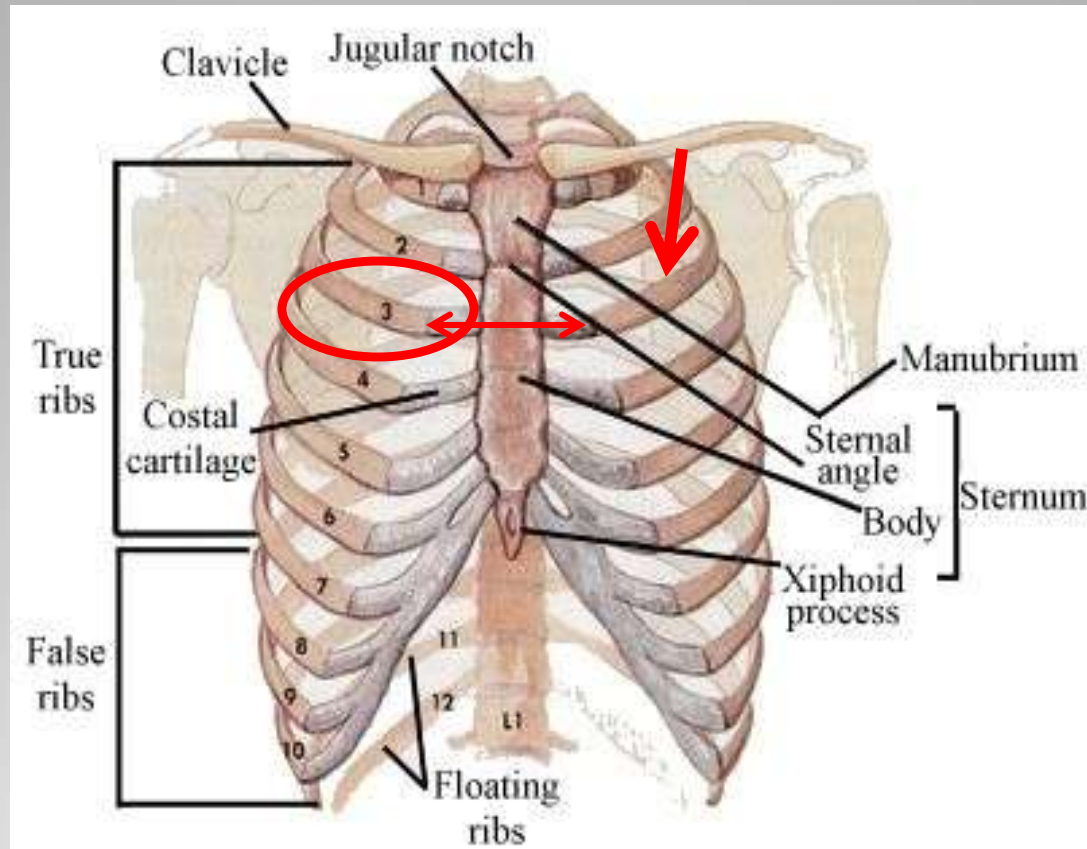
## Field Treatment

- Needle decompresses pleural space
- Converts **tension** pneumothorax to **open** pneumothorax
- Complications
  - hemo/pneumothorax
  - laceration of intercostal nerves/blood vessels
  - infection

## Needle Thoracostomy

- 2nd intercostal space
- Mid clavicular line (2nd ICS, MCL)
- **On the affected side**
- Large bore catheter: 14 ga. or larger
  - with one-way flutter valve
- Inserted perpendicular to chest wall
- **"Walk" the needle over the top 3rd rib**

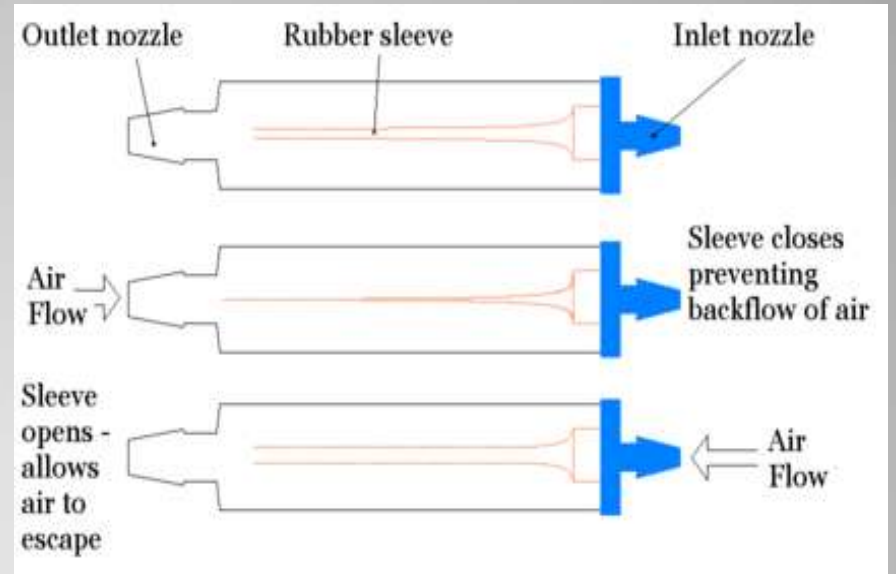
## Needle Thoracostomy Landmarks



**Note N. thoracostomy placement**

- Listen for pop/rush of air
- May get some bubbles of blood
- Remove needle from catheter and take off syringe attach **flutter valve**
- Secure cannula with 4x4s and tape
- Immediate remove & apply pressure if punctured a spurting blood vessel

## Needle Thoracostomy Stabilization



# Heimlich valve & it's function



Needle Thoracostomy Kit example

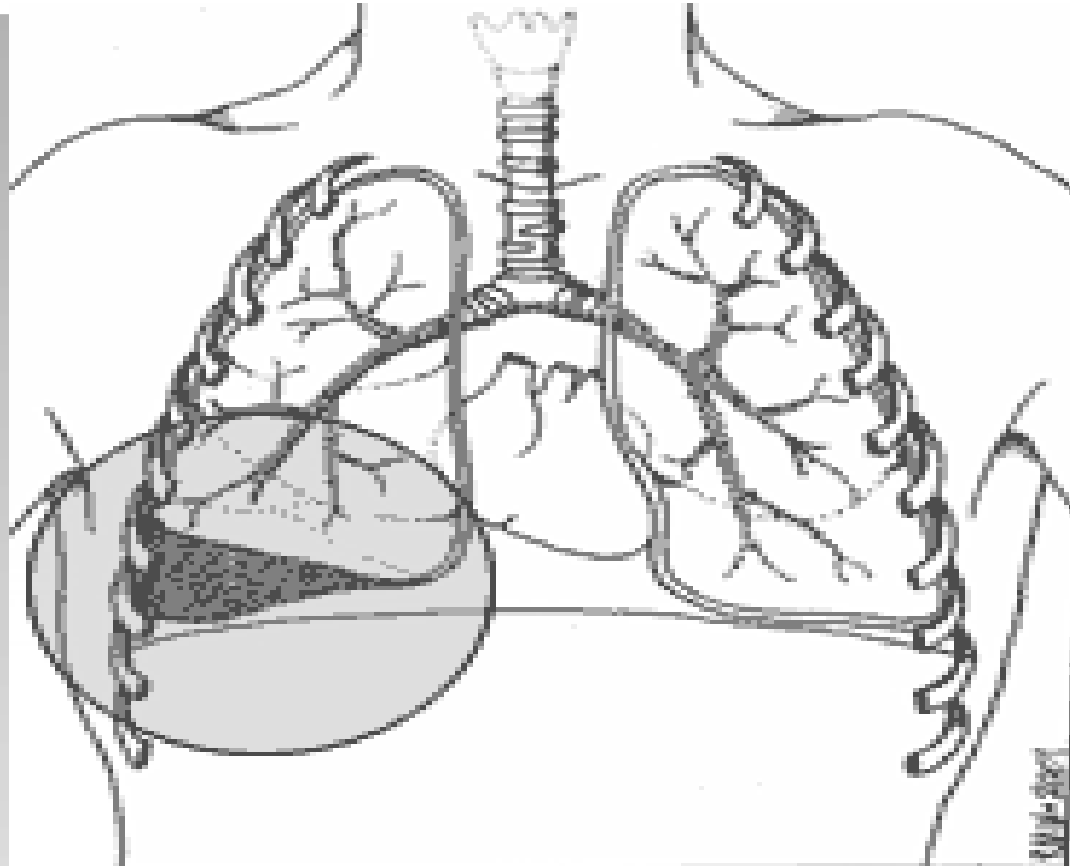


Questions...?

- Blood accumulates in pleural cavity
- Caused from injury to heart, great vessels, or intercostal arteries
- Will get Thoracotomy (cracked chest) in ED if blood loss through chest tube is greater than 2 to 4 ml / kg / hour

# Hemothorax

from blunt or penetrating trauma



# Hemothorax

- May be difficult to distinguish  
if significant hemothorax
- Both present with...
- signs of poor perfusion and unequal  
breath sounds
- More common to see  
hypotension before respiratory  
distress
- Usually pleural space fills with  
air and blood

Tension Pneumothorax vs.  
Hemothorax

- Accumulation of blood  
**into pericardial sac**  
that surrounds heart
- Blood in sac **reduces chamber filling**
- Pressure backs up and results in  
decreased right heart return and thus  
decreased stroke volume and  
decreased cardiac output

## Cardiac Tamponade

*Caused by blunt or penetrating mechanism*

- Hypotension (narrowed pulse pressure)
- JVD
- Muffled, distant heart sounds
- *Patient will also display...*
- Tachycardia
- Dyspnea
- Poor skin vitals

# Becks Triad

Characteristic of Cardiac Tamponade

- Trauma field treatment
- Pericardiocentesis
- to be performed in ED



## Field Treatment

- Both present with
- signs of poor perfusion
- Both have chest trauma
- Difference is breath sounds
  - tension pnemo=unequal BS
  - C. tamponade=equal BS



## Tension Pneumothorax vs. Cardiac Tamponade



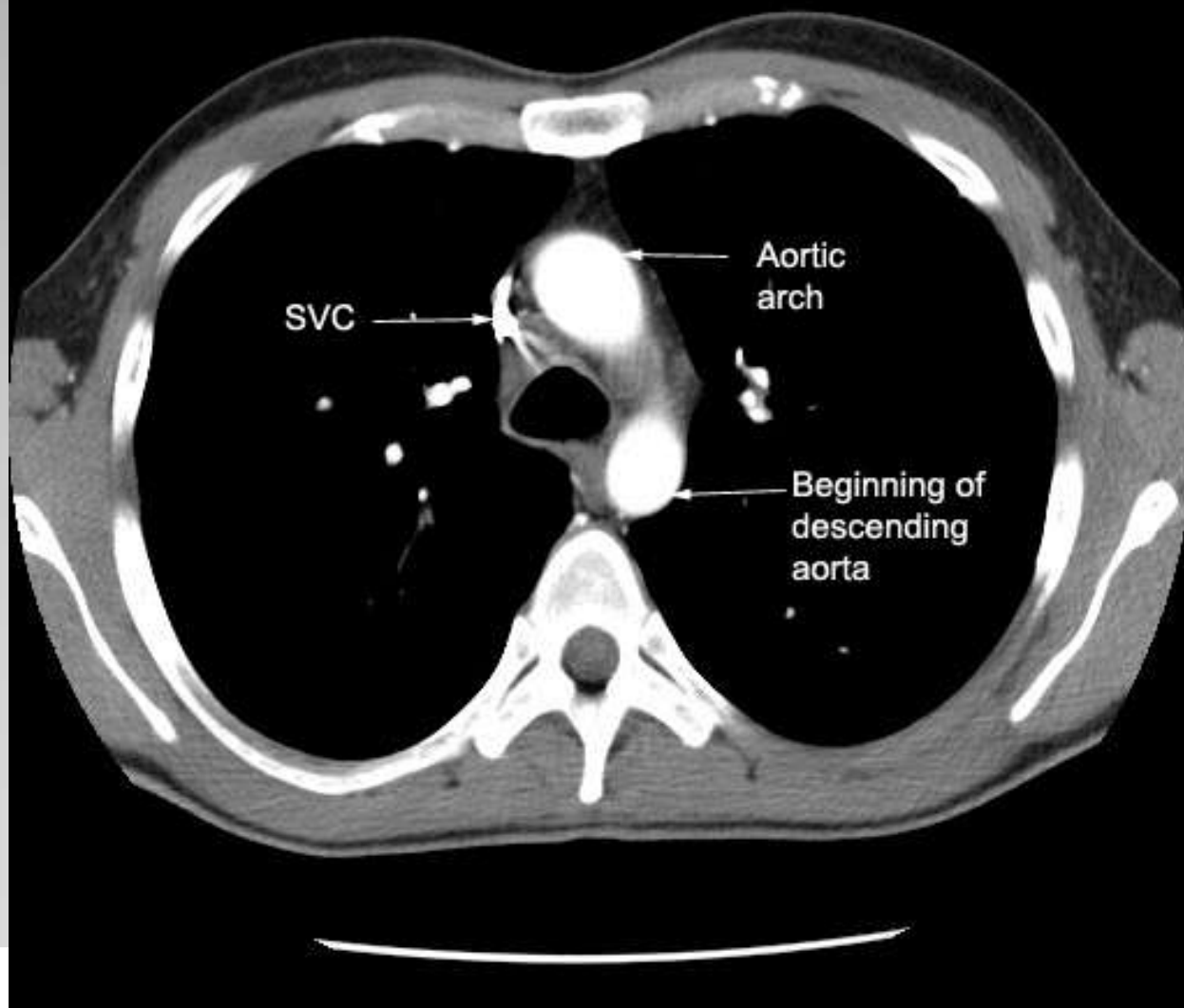
Questions...?

- Usually from
  - a rapid deceleration mechanism
  - Motor Vehicle Accidents
  - falls
  - crush injury
- Usual site:
  - the distal aortic arch
  - just beyond left subclavian artery takeoff
  - where it is firmly tethered

## Aortic Rupture

- Massive hemorrhage within few minutes
  - severe injury; Rapid Deceleration Shearing
  - 80-90% fatality rate within 1st hour
- Most common cause of Sudden Death post MVC
- Estimated that 1:6 who die in MVA's sustain an aortic rupture

## Aortic Rupture



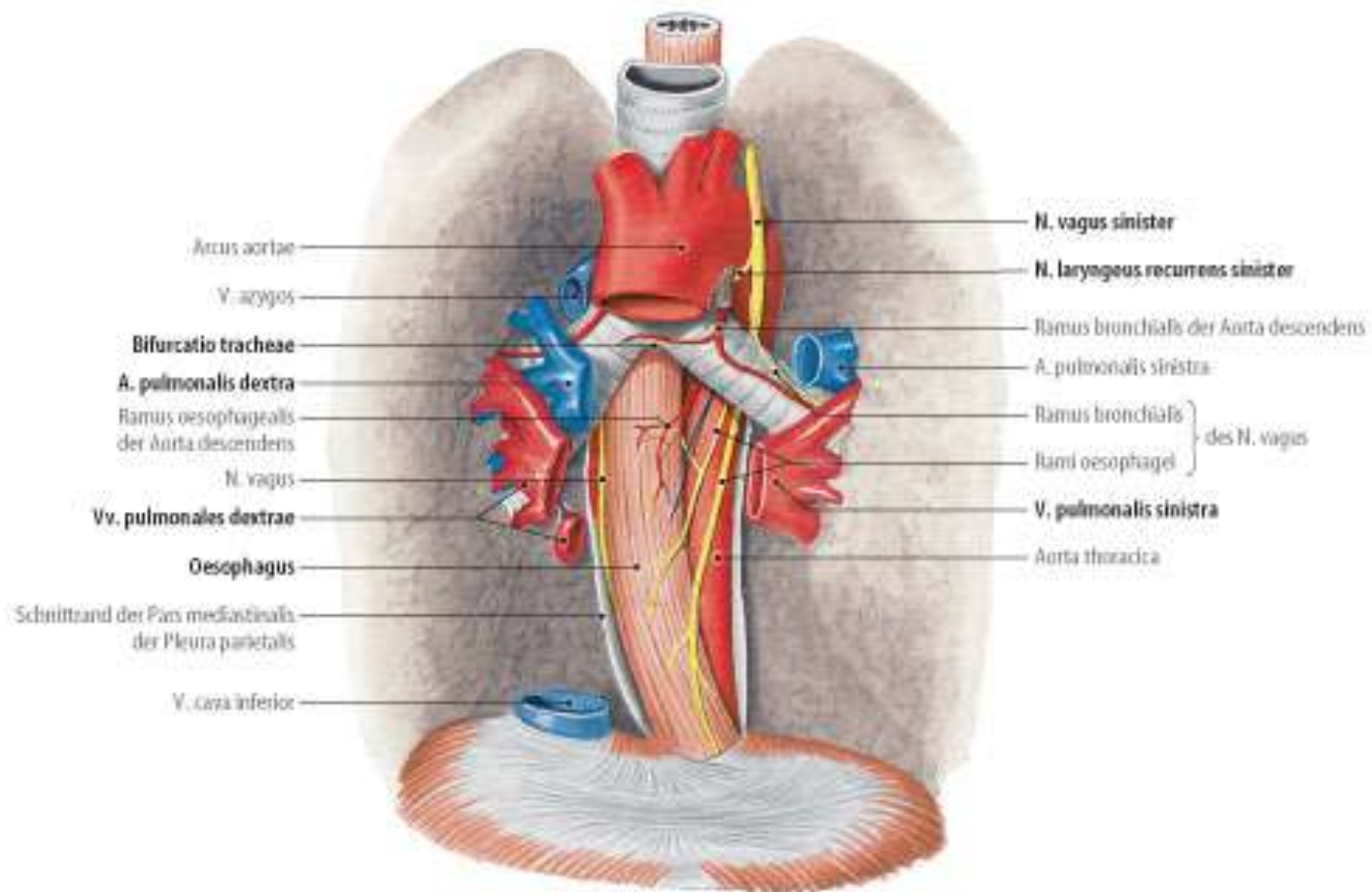


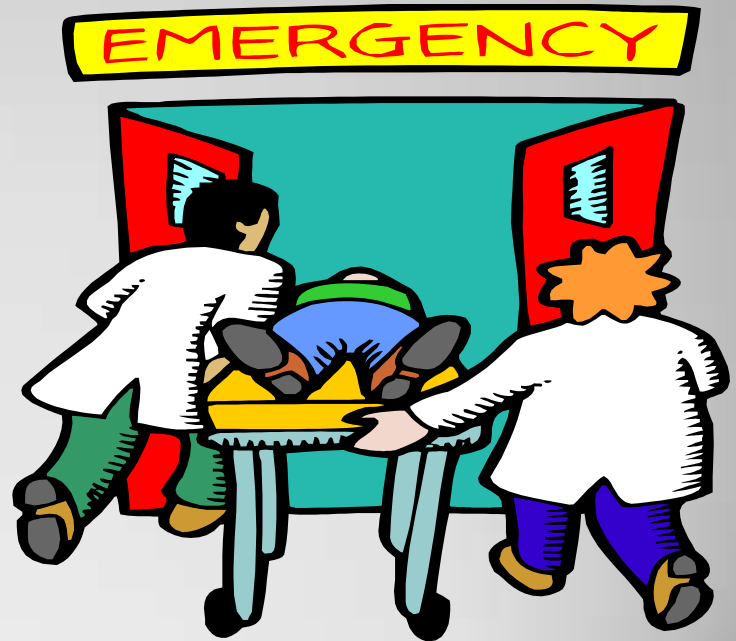
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Aus: B. N. Tillmann, Atlas der Anatomie des Menschen  
 Kapitel 5: Situs – Brustsitus

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- Chest pain
- Dyspnea
- May have...
- no obvious signs of chest trauma  
**(up to 50%!)**

Signs/Symptoms



- Hi-flow O2
- Support airway as needed
- cardiac monitoring
- spinal precautions
- shock position
- IVs (x2) en route
- fluid resuscitate (500 cc) with s/o shock
- Keep Warm (maintain body temperature)

## Trauma Field Treatment

AE538061

H

SOMATOM PLUS  
VC100  
H-S

29-JAN-2003  
00:06:11.90

R

10  
C  
m



*2 or more rib fractures in at least 2 places*

- Paradoxical motion of flail segment
- Segment moves:
  - in on inspiration
  - (Normal is out on Insp.)
- out on expiration
- (Normal is in on Exp.)

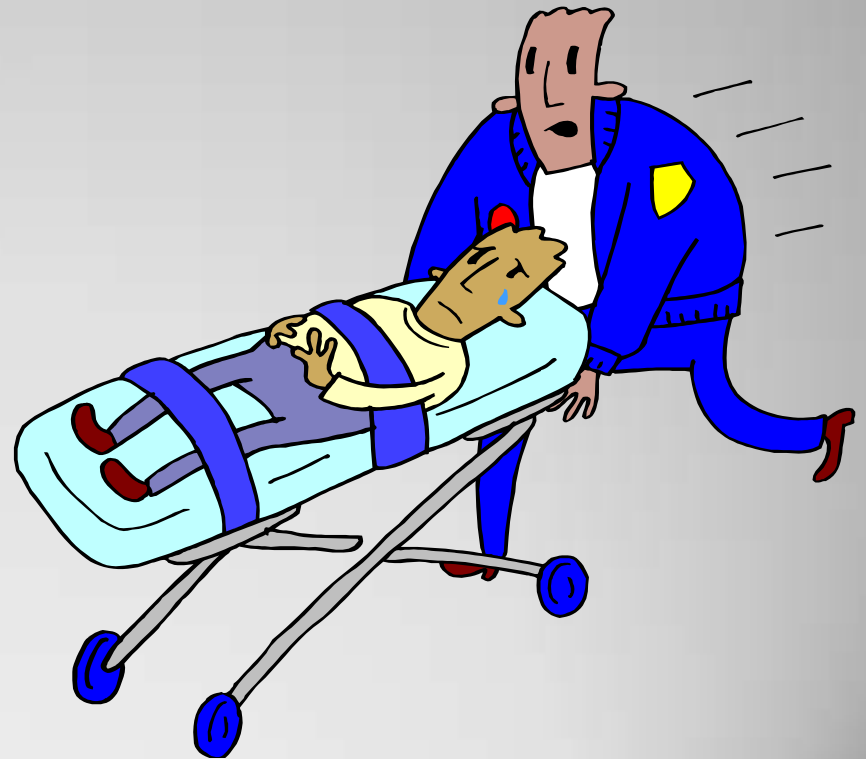
## Flail Chest

- Risk for pneumothorax from fractured rib
- Signs and Symptoms:
  - dyspnea/tachypnea
  - localized chest pain
  - may have palpable crepitus
  - s/o poor perfusion from poor oxygen exchange
- Massive force needed to cause injury
  - think about other injuries
- (4-10) (8-12) (1-2)

## Flail chest

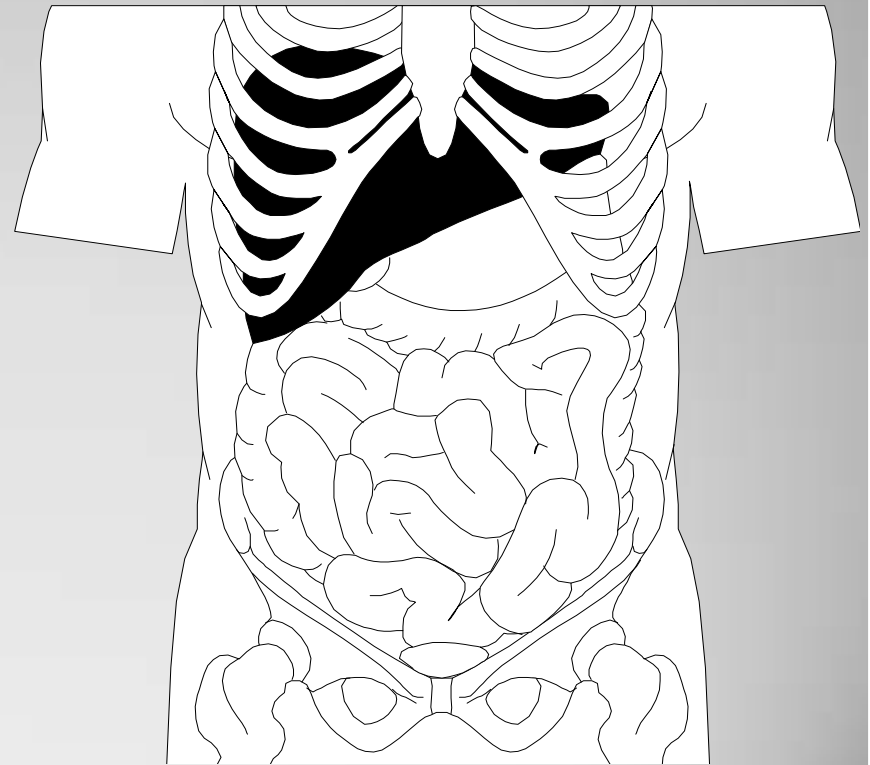
# Treatment for flail chest

- High flow oxygen/IVs en route/monitor
- Stabilize flail segment with bulky taped dressing
- IVs en route



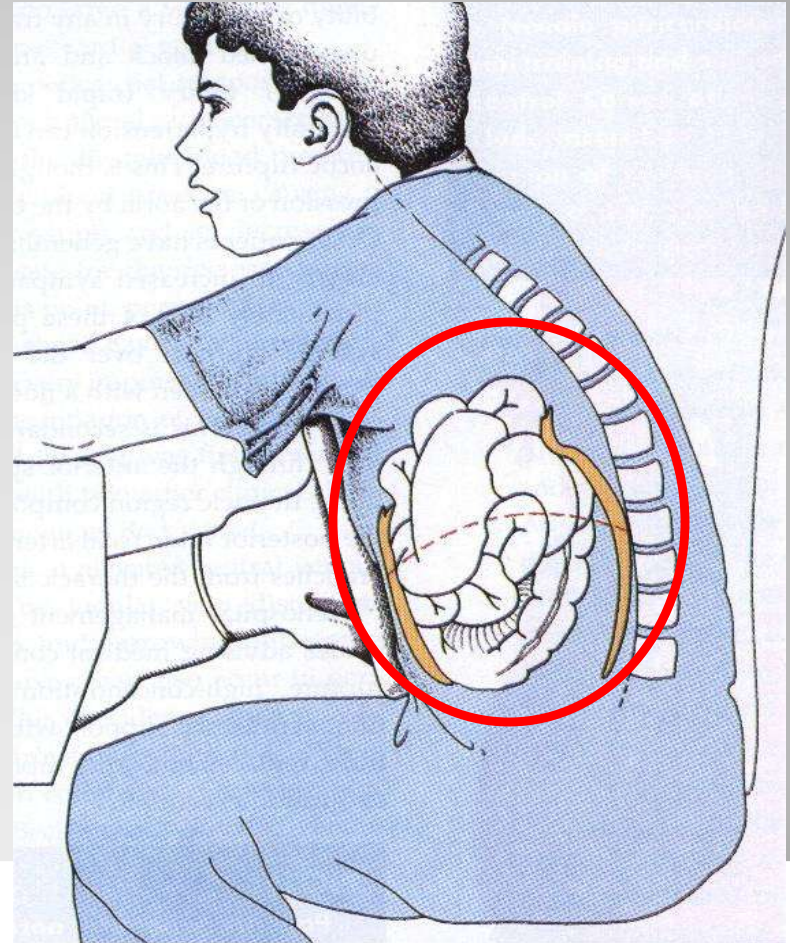
# Diaphragmatic Rupture

- Diaphragm separates abdominal and thoracic cavity
- Abdominal contents rupture through thin diaphragm wall and enter chest cavity
  - from sharp increase in intra-abdominal pressure
- L>R side from liver protection



# Signs and Symptoms of Diaphragmatic Rupture

- Restricted lung ventilation
- decreased venous return
- Dyspnea & hypotension ensues
- May c/o abdominal pain
- Bowel sounds heard in chest
- Multiple injuries usually involved
- Historically < 5% of blunt trauma



- 80 – 90% occur from MVC's
- Lateral Impact 3x more likely to cause rupture. "T-Boned"
- **Postero-lateral aspect** of Diaphragm is its embryologic weak point.
- (L) > (R) rupture likely from (R) liver protection  
**(80-90% occur on (L) side)**
- Preoperatively Dx'd in only 40-50% for (L)

## Diaphragmatic Rupture

- Results from severe crushing injury  
to chest and abdomen
- Rapid increased intra-thoracic pressure
- Blood forced into veins  
of upper thorax, neck and face
- Results in  
reddish-purple discoloration of face and neck,  
JVD, conjunctival hemorrhage

## Traumatic Asphyxia

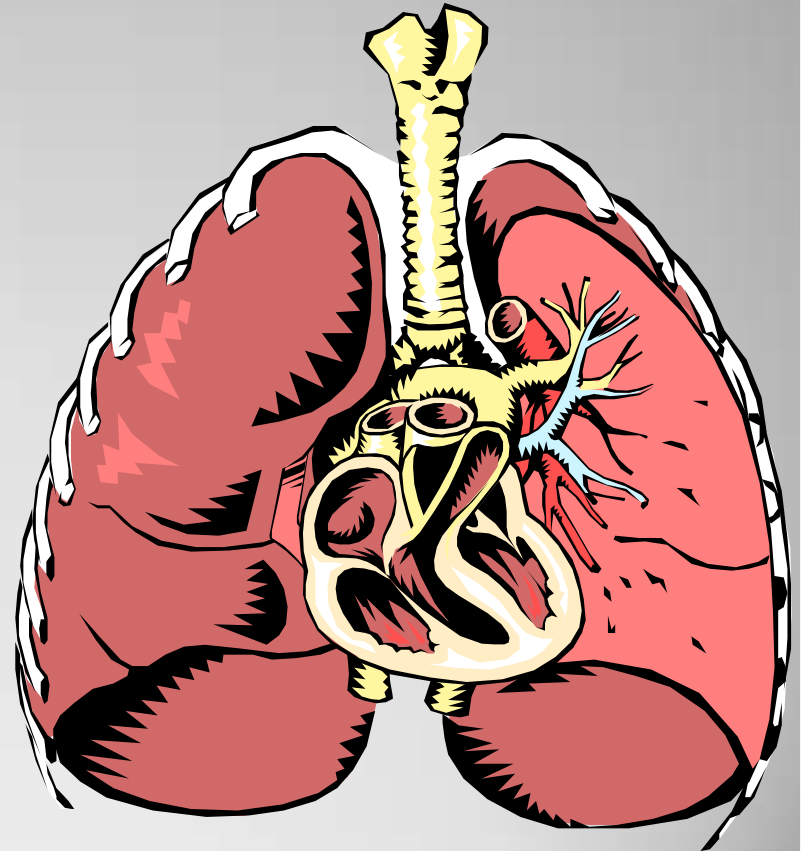


*Fig. 175.—Traumatic asphyxia.*

# Traumatic Asphyxia

# Pulmonary Contusion

- Rapid deceleration forces most common
- Hemoptysis from hemorrhaging alveoli
- Pulmonary edema ensues
- Injury to actual Lung Parenchyma.



- Among the **most common** result of Blunt Force Trauma along with rib fractures & pneumothorax (Think: Airbags!)
- Occurs in 17% of multiple trauma patients
- **A form of hematoma to lung tissue.**
- Mortality 6 – 25% due to superimposed pneumonia, ARDS, embolic blood clots

## Pulmonary Contusion

# Myocardial Contusion

- Common steering wheel injury (now Airbags)
- Heart compresses b/w sternum and vertebra
- Edema can result from ruptured capillaries and damaged heart muscle



- Can range from minor to MI
- May be asymptomatic up to 8 hrs
- Can present in cardiogenic shock
- May occur with cardiac tamponade
- Need to assume contusion  
with significant blunt chest trauma
- Adequate paramedic report of mechanism  
essential

## Myocardial Contusion Presentations

- Can present similar to angina/MI
- Dyspnea: Ronchi, Wheezes, Hemoptysis
- Palpitations
- Possible dysrhythmias
- Obvious chest trauma, or NOT!
- Treatment may include Amiodarone for Ventricular Tachydysrhythmias

**S/S Myocardial Contusion**



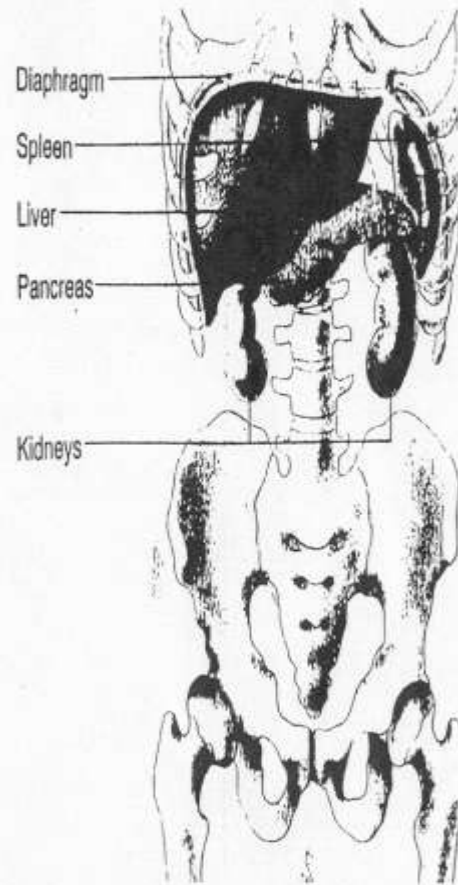
# Abdominal Trauma

Understanding Injury of Solid versus Hollow organs

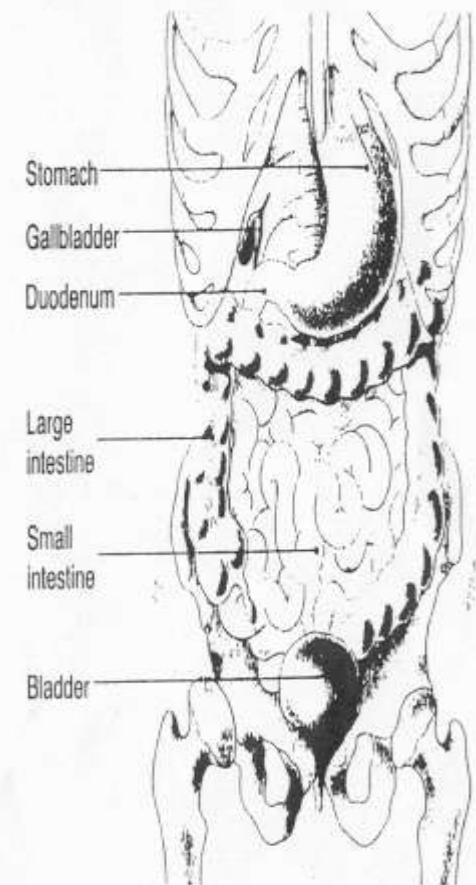
# Solid Organs

- Very vascular
- Bleed out rapidly
- Can be punctured, lacerated, ruptured

## SOLID ORGANS

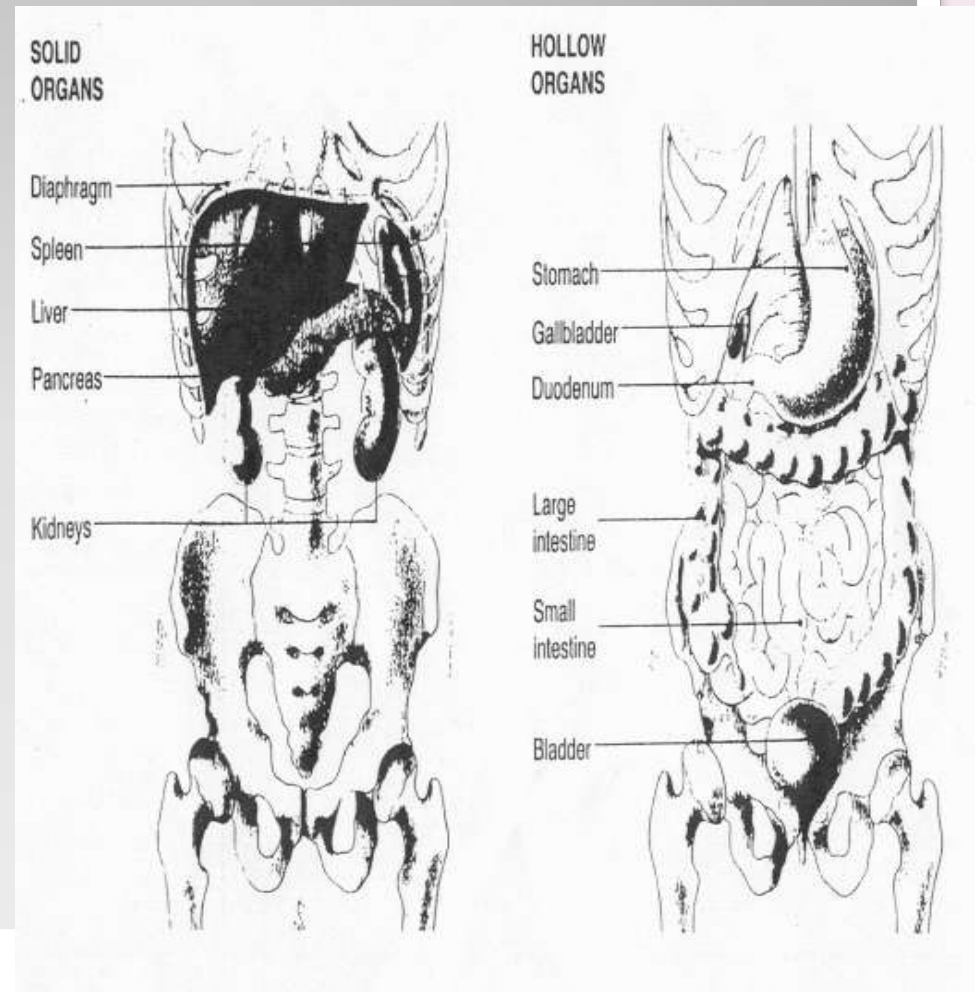


## HOLLOW ORGANS



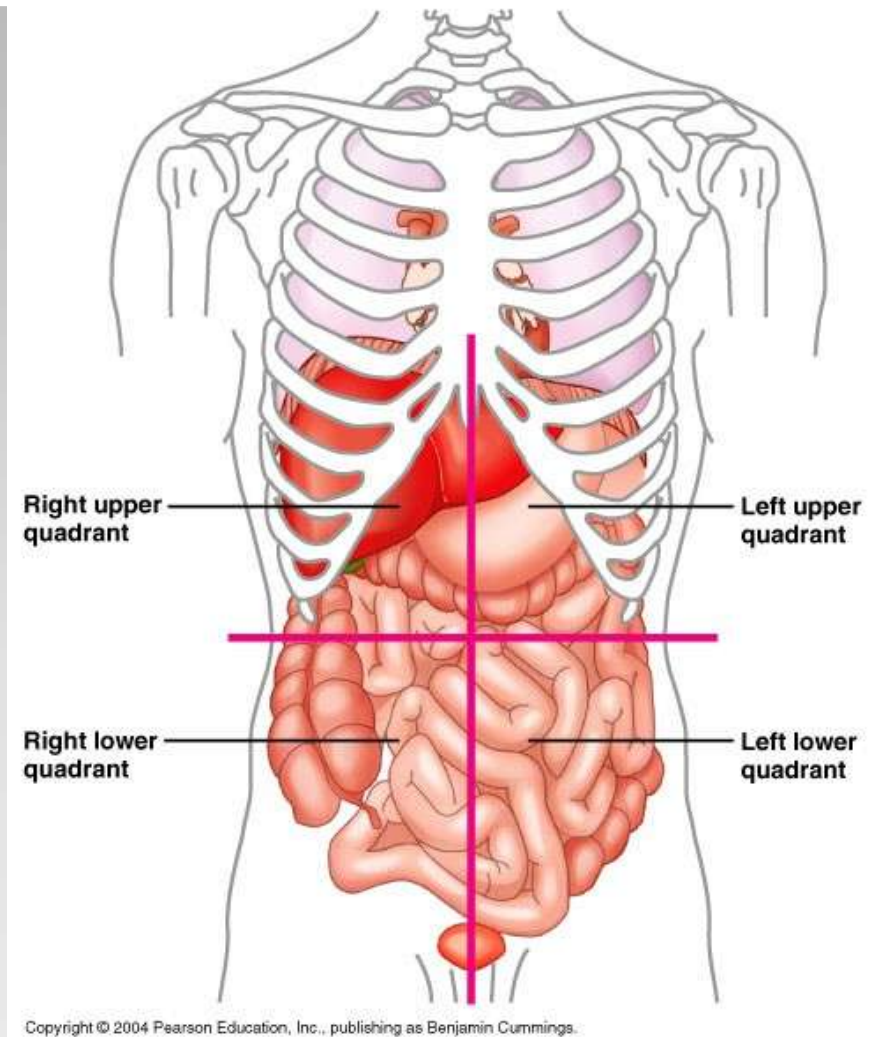
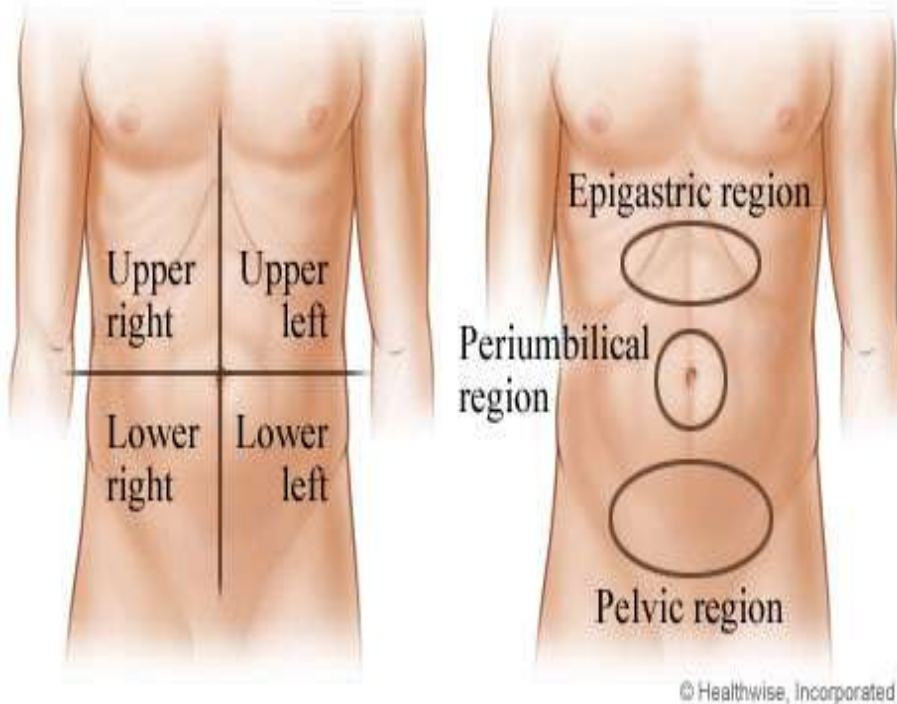
# Hollow Organs

- Usually contain fluids
- Fluids can spill into abdominal cavity after injury
- Causes peritonitis and sepsis
- Can rupture if full
  - water balloon effect



- Rigid abdomen
- Distended abdomen
- Abdominal guarding
- Kerr's sign
  - pain referred to left shoulder from splenic injury
- Or, soft, round, with minimal tenderness!!

## Signs/Symptoms of BAT



# Abdomen regions: What's Involved

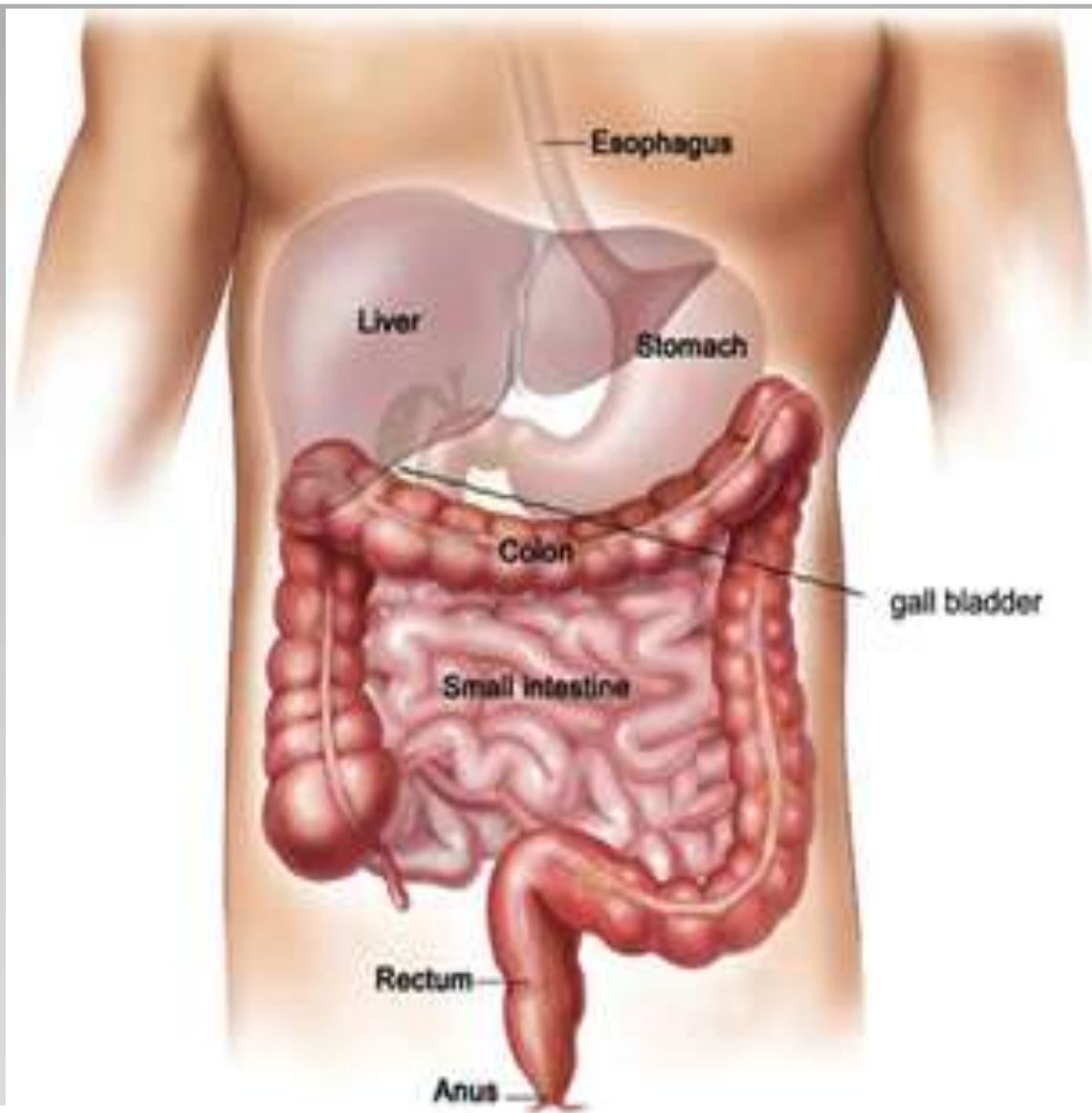
## **Intrathoracic Abdomen:**

- upper abdomen that lies  
beneath the rib cage  
(the ribcage makes complete abdomen exam  
difficult)
  - Diaphragm
  - Liver
  - Spleen
  - Stomach

## **The "4" Abdomens**

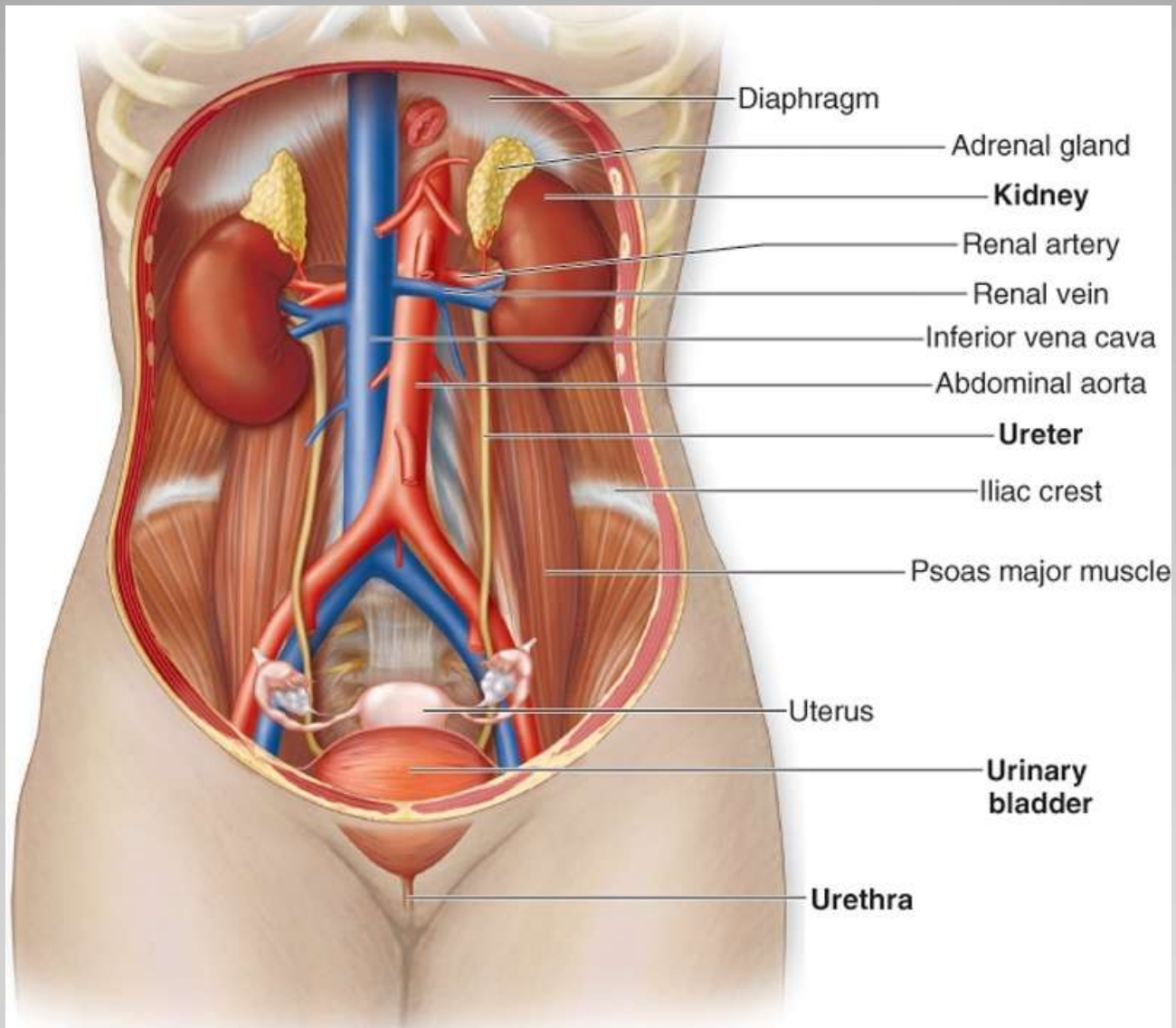
- Contains the intestines, Small & Large
- (with highly omentum!)
- The Uterus when gravid
- The bladder when distended, full
- Perforation in this area  
is associated with significant  
physical findings, pain & tenderness  
from peritonitis

**The “True” Abdomen**



- This area is “behind the guts”
- Problems here are difficult to diagnose by physical exam alone
  - Kidneys
  - Adrenal glands
  - Ureters
  - Pancreas
  - Aorta
  - Vena Cava

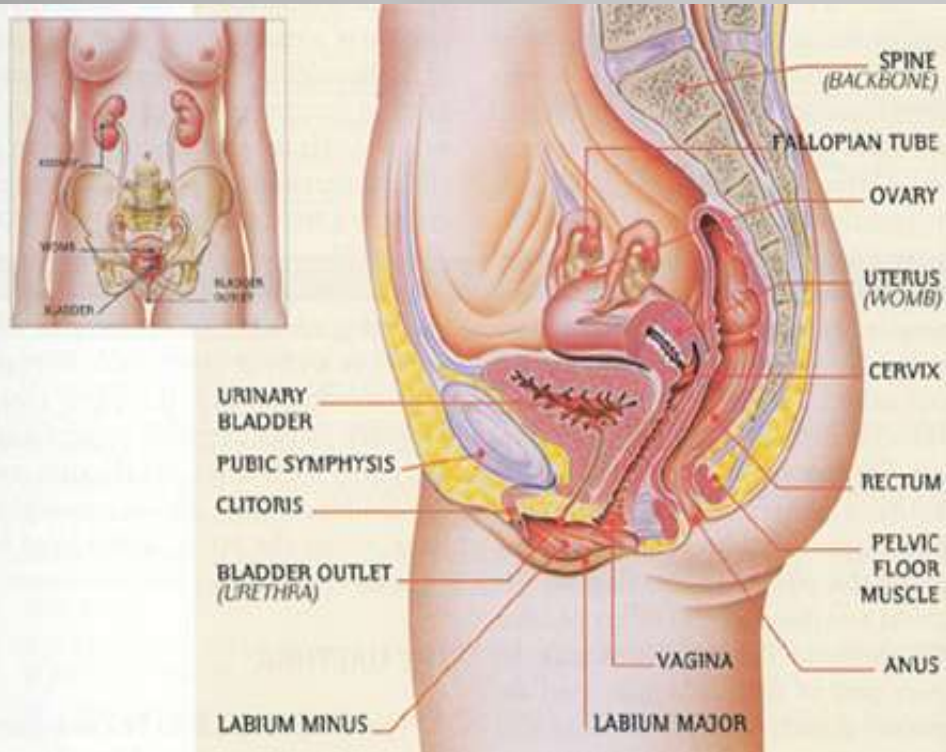
## The “Retroperitoneal” Abdomen



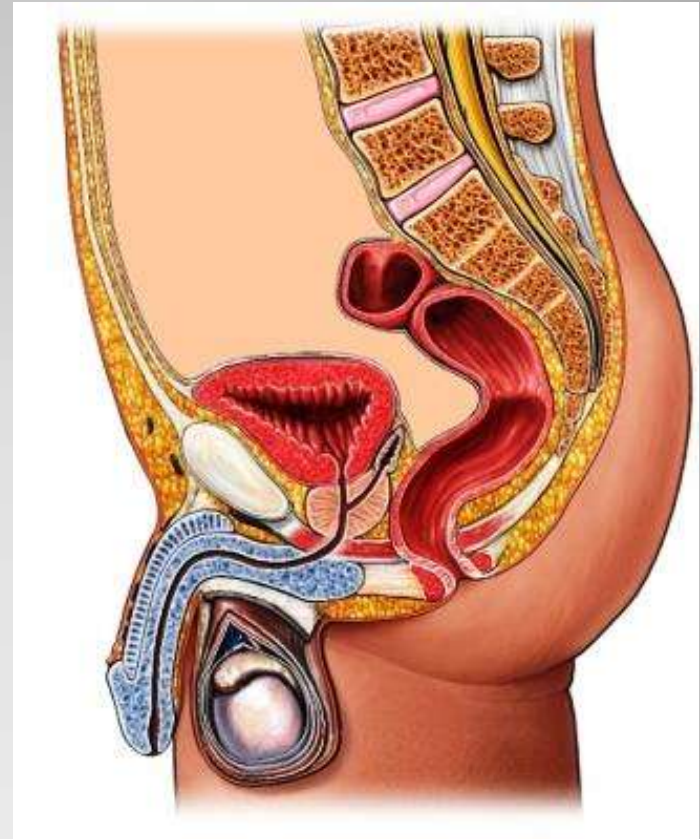
- The bony pelvis
  - Urinary bladder
  - Urethra
  - Rectum
  - Some small intestine
  - Ovaries, Fallopian tubes
  - Uterus
- You can lose 50% of blood volume here!

**The “Pelvic” Abdomen**

## Female Pelvis



## Male Pelvis



"Pelvic" Abdomen

- Cover with moist , sterile dressing
- Place patient supine with knees slightly flexed
- Placing contents back inside Abdominal Cavity is contra-indicated.

## Evisceration

- Collisions by the injured person & the external environment results in sudden, massive increased intra-abdominal pressure.  
(external compression)
- Next, acceleration & deceleration forces directly affect the organs ...  
and the bony body  
(create shear forces at fixed points of organ attachment)

**Be guided  
by mechanisms & associated forces**

- Also, a crushing effect on intra-abdominal organs lying between the vertebral column & abdominal wall (solid viscera particularly vulnerable)

**And Thirdly....**

- Don't let the findings fool you
- Although exam appears normal
  - Soft, nontender, nondistended
- **Bleeding still may occur within the abdomen despite a normal exam**
- Also distracting injuries, abdominal Wall spasms, AMS, Intoxication all confuse the exam.

Physical exam can be...  
notoriously unreliable!

- Remember: Trauma patients with complaints of diffuse abdominal trauma go to a trauma center
- Diffuse abdominal trauma is defined as pain in two or more of the four abdominal quadrants
- The four quadrants of the abdomen are:
  - RUQ, LUQ, RLQ, LLQ

**Trauma Center Criteria in LA Co.**

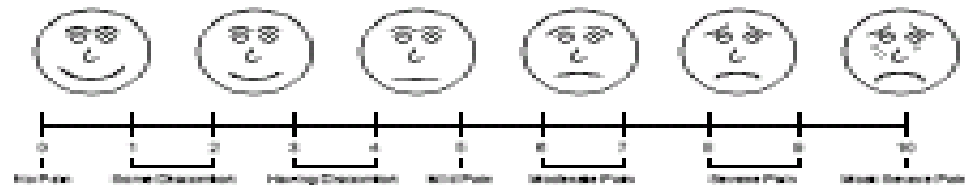
## ASSESSMENT

### PRINCIPLE:

1. All patients with any complaint of pain shall have an appropriate assessment and pain management.
2. An accurate and thorough assessment of pain requires that an initial assessment and ongoing assessment be performed and documented.
3. Measurement of a patient's pain is subjective; therefore, the patient is the best determinant of the presence and severity of their pain.
4. Recording a level of pain using a pain scale is the community standard of care and provides health care providers with a baseline against which to compare subsequent evaluations of the patient's pain.
5. The pain scales utilized in Los Angeles County are the numeric pain intensity scale and the "facial expression" pain scale.

### GUIDELINE:

1. The initial assessment of pain shall include the following:
  - Onset
  - Provoked
  - Quality
  - Region/Location
  - Scale/Intensity
  - Time/Duration
2. Assess and document the numeric pain intensity scale of 0-10.  
(0 = no pain    10 = most severe pain)
3. If unable to use the "numeric pain intensity" scale, use the "facial expression" pain scale.



4. Reassessment of the patient's pain shall be performed frequently and following any treatment and/or pain management. Document the pain scale/intensity in the "medication" section "result" box.

ALS/BLS

PAIN ASSESSMENT

# Consider Pain Management

- Patients who have an isolated traumatic extremity injury, burn, fractured hip, or chief complaint of pain.
- Caution with:
  - Head injuries
  - Multi-system trauma
  - Labor
  - Abdominal pain
  - Elderly

**Who Should Receive  
Pain Medication**

Adults:

- IV Dosage : 2-10 mg slow IVP titrated to pain relief. May repeat to a max dose of 20mg.
- IM Dosage : 10mg IM one time dose.

IV is the recommended route.

**If unable to start an IV or patient does not require IV, IM is an option.**

# Morphine Pain Management



*Any Questions?*

Thanks for  
Listening

