



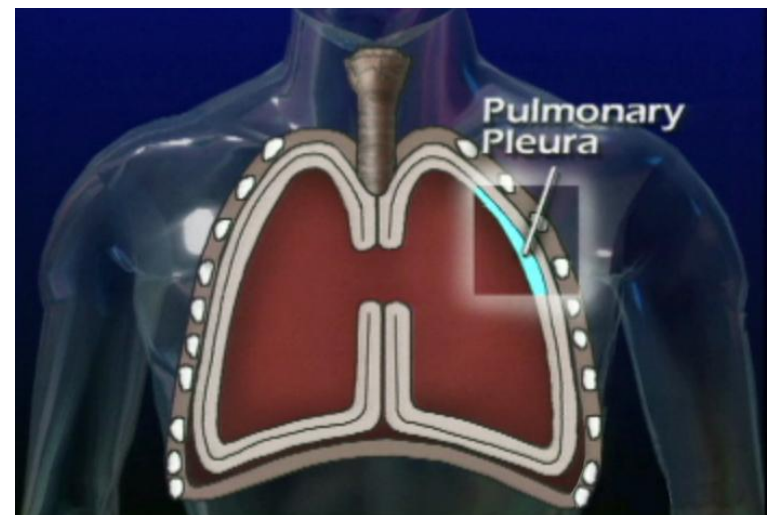
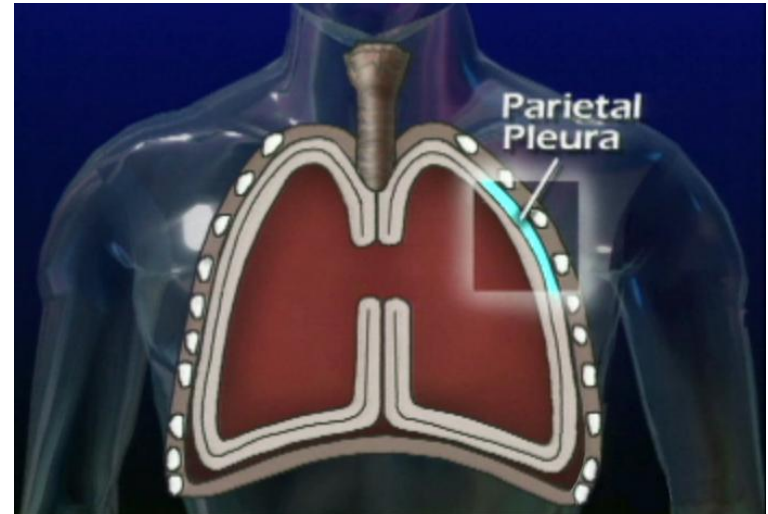
# Chest Drainage Systems

# Pleural Anatomy

- Lungs are surrounded by thin tissue called the pleura, a continuous membrane that folds over itself:

- Parietal pleura lines the chest wall

- Visceral pleura covers the lung

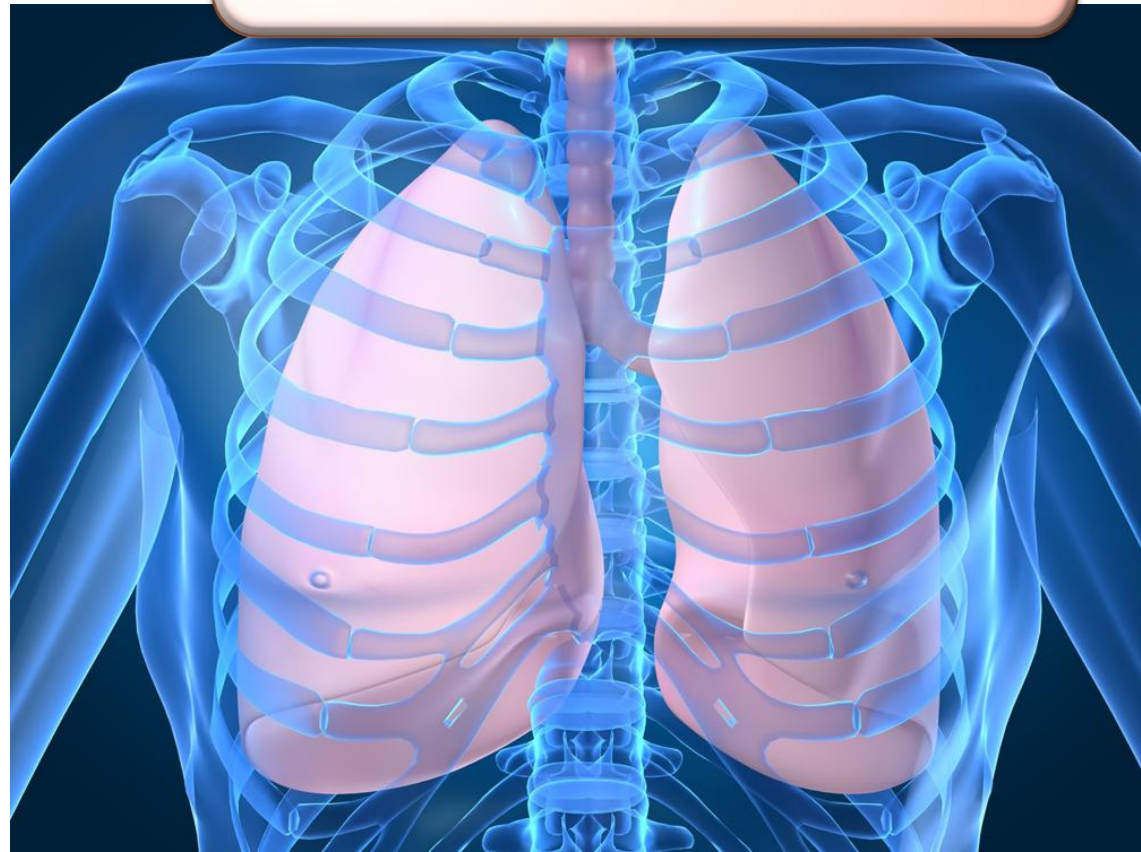


# Pleural Anatomy

- Normally, the two membranes are separated only by the lubricating pleural fluid

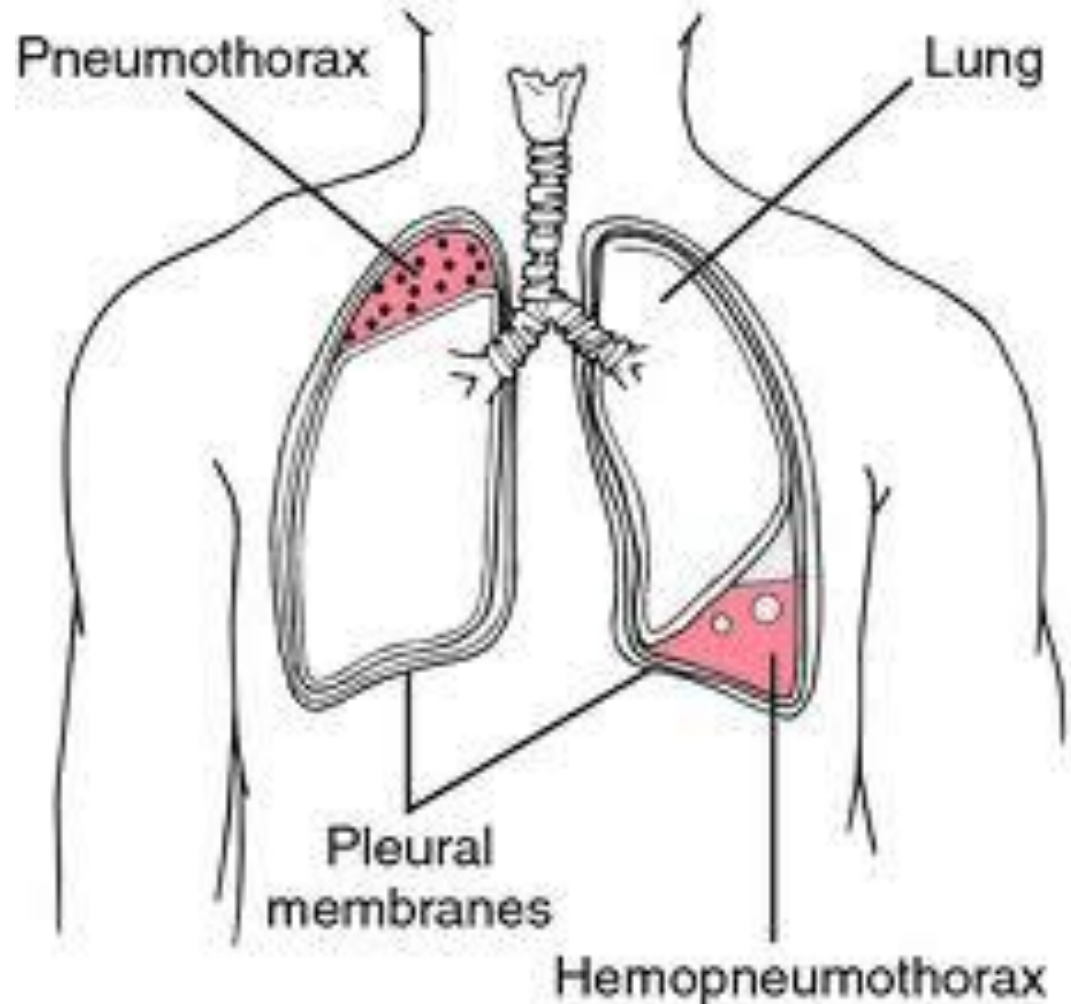
- Fluid reduces friction, allowing the pleura to slide easily during breathing

Normal Pleural fluid quantity:  
Approx. 25 mL per lung



# When pressures are disrupted

•If air or fluid enters the pleural space between the parietal and visceral pleura, the pressure gradient that normally keeps the lung against the chest wall disappears and the lung collapses



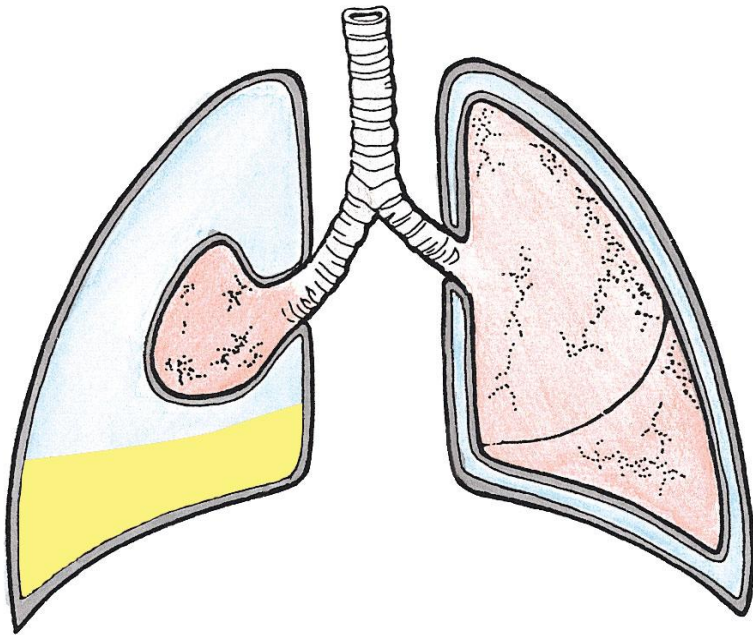
# Indications for Chest tubes

- **Pleural Effusions**
- **Empyema**
- **Pneumothorax**



# Conditions requiring chest drainage

## Pleural Effusion

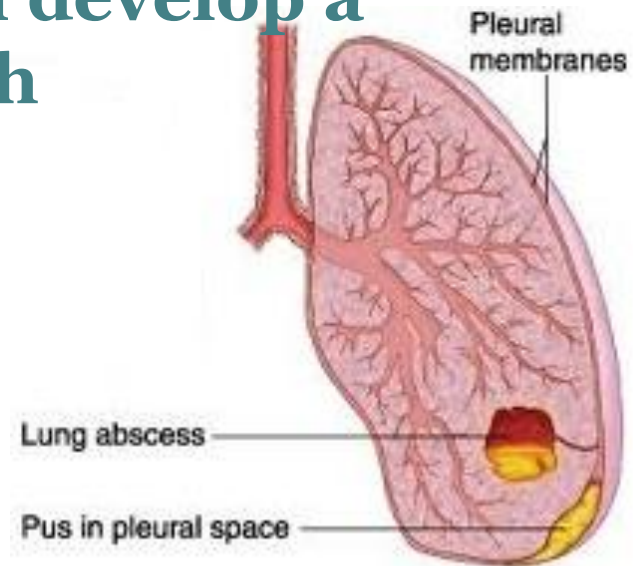


Transudate or exudate in the pleural space is a **pleural effusion**

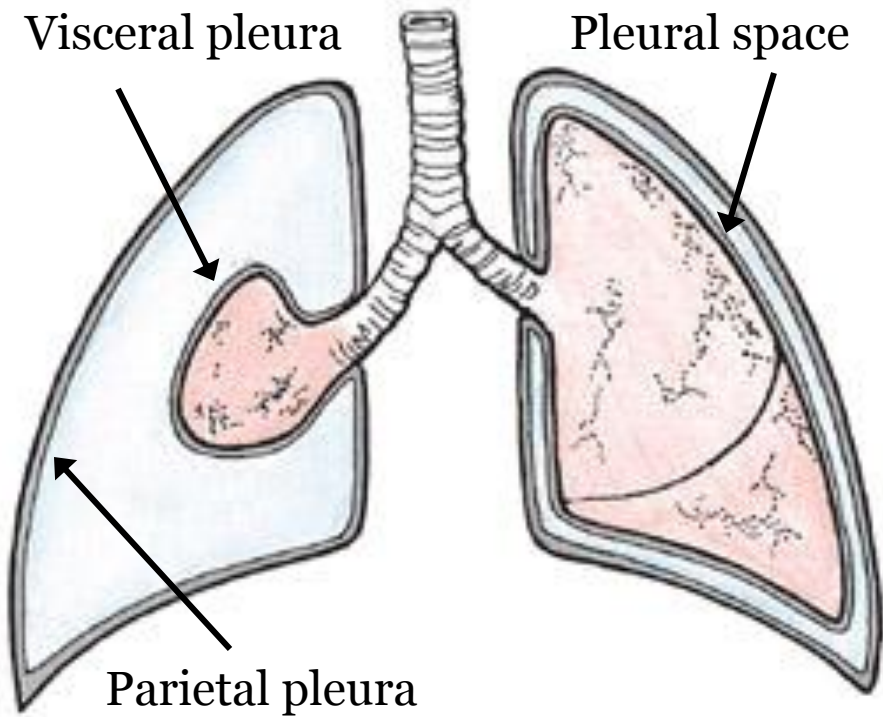
# Empyema

**Definition:** Infected pleural effusion: Pus in the pleural space: Often secondary to bacterial Pneumonia.

- **Fluid can build to a pint or more.**
- **In severe cases the pus ball can develop a fibrotic covering that can attach itself to the wall of the pleural lining.**



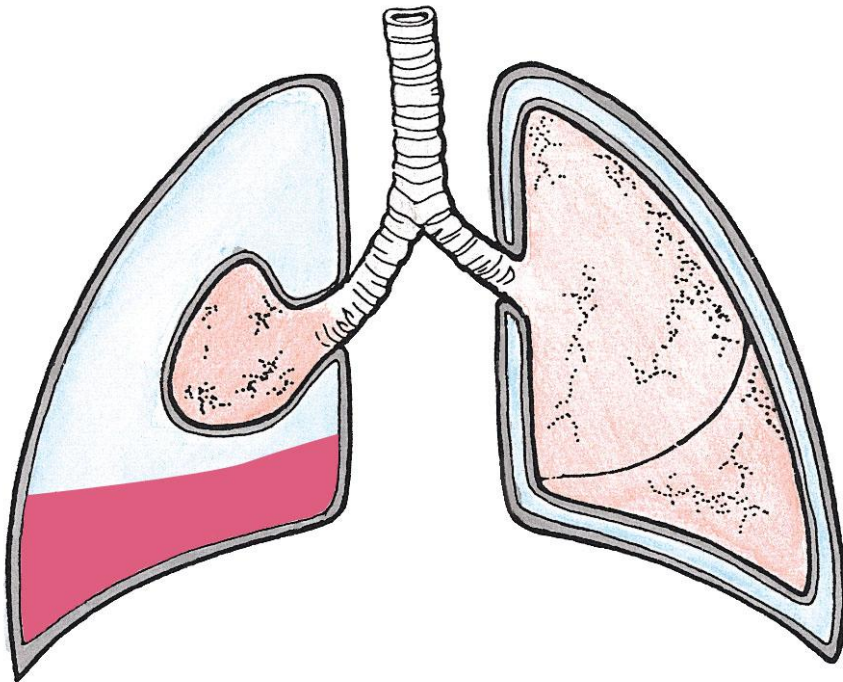
# Pneumothorax



**Air between the  
pleurae is a  
pneumothorax**



# Hemothorax



Blood in the pleural space is a  
**hemothorax**

# Treatment for pleural conditions

1. **Remove** fluid & air as promptly as possible
2. **Prevent** drained air & fluid from **returning** to the pleural space
3. **Restore** negative pressure in the pleural space to re-expand the lung

# **Remove** fluid & air through chest tube

**Also called “thoracic catheters”**

- **Different sizes**
  - From infants to adults
  - Small for air, larger for fluid
- **Different configurations**
  - Curved or straight
- **Types of plastic**
  - PVC
  - Silicone



**Prevent** air & fluid from  
returning to the pleural space

Chest tube is attached to a **drainage device**

Allows air and fluid to leave the chest

Contains a one-way valve to prevent air & fluid  
returning to the chest

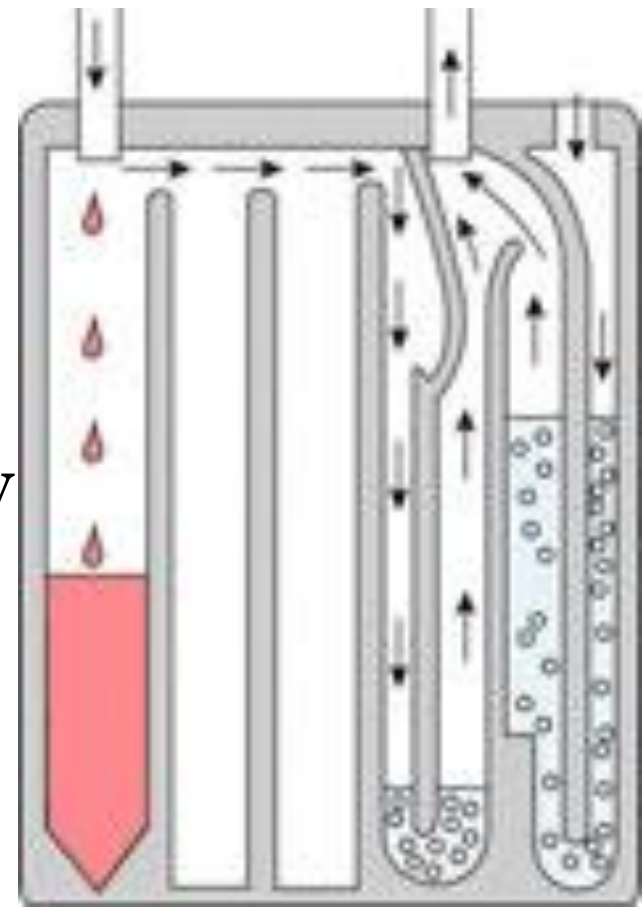
Designed so that the device  
is below the level of the  
chest tube for gravity drainage



# What the system looks like

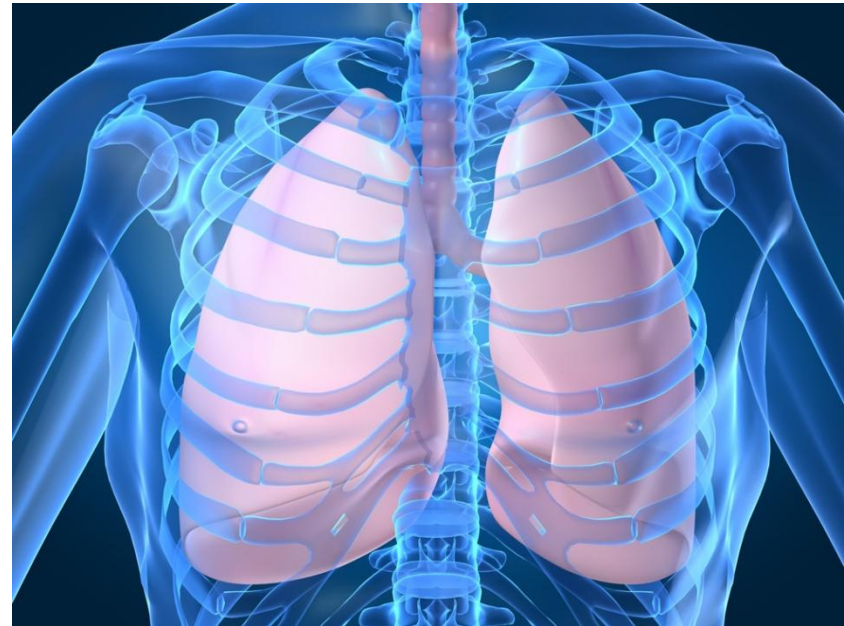
- To drain **blood, pus, or lymph** from the pleural cavity, the chest tube is inserted at a slightly lower intercostal space (6<sup>th</sup> or 7<sup>th</sup>)

To drain **air** from the pleural cavity the chest tube may be inserted at a higher intercostal space (2<sup>nd</sup>)



# Chest Tube Assessments

- **Verify that all connections are firmly secured with 2” silk tape**
- **Ensure that there are no kinks in tubing**
- **Maintain clean dressing as ordered by physician (Vaseline gauze should ONLY be used if requested by Physician!)**



# Chest Tube Assessment

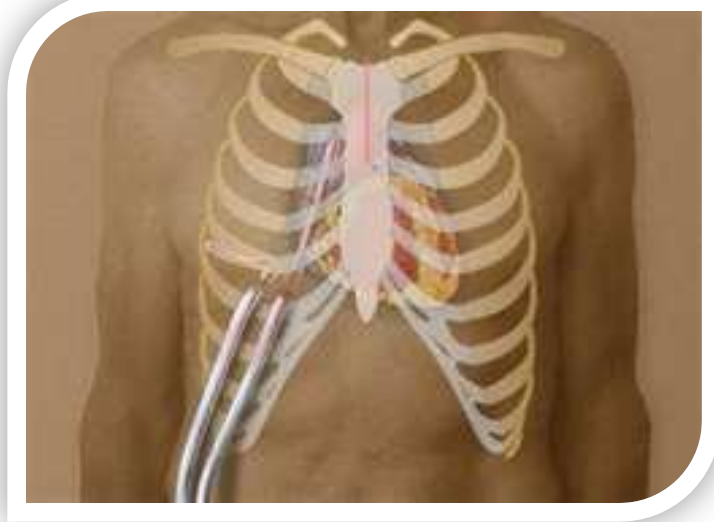
- **Site**
- **Tubing**
- **Output**
- **Patency**



# SITE

## Check for:

- ✓ Clean & Dry dressing
- ✓ Subcutaneous emphysema
- ✓ Swelling, redness, warmth & purulent drainage at site





# TUBING

## Check for:

- ✓ **Connections are secured**
- ✓ **All tubing unkinked & draining freely**
- ✓ **All connections secured with 2" silk tape**
- ✓ **Keep drainage system below the level of the patient at all times.**
- ✓ **Appropriate water pressure in suction chamber as ordered by physician**



# OUTPUT (Drainage)

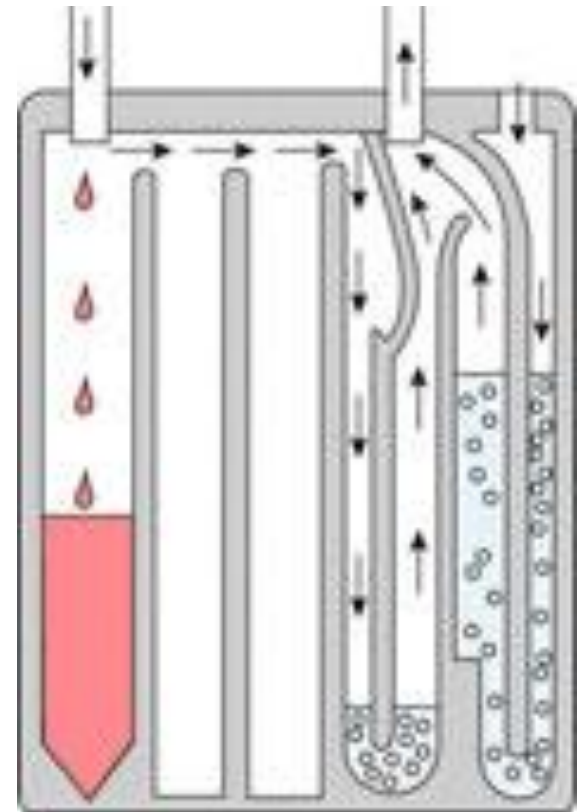


## Check for:

- ✓ Amount, type and color
- ✓ Mark regularly
- ✓ Document output of chest tube drainage q 8 hrs
- ✓ Mark level of drainage on container at end of each shift

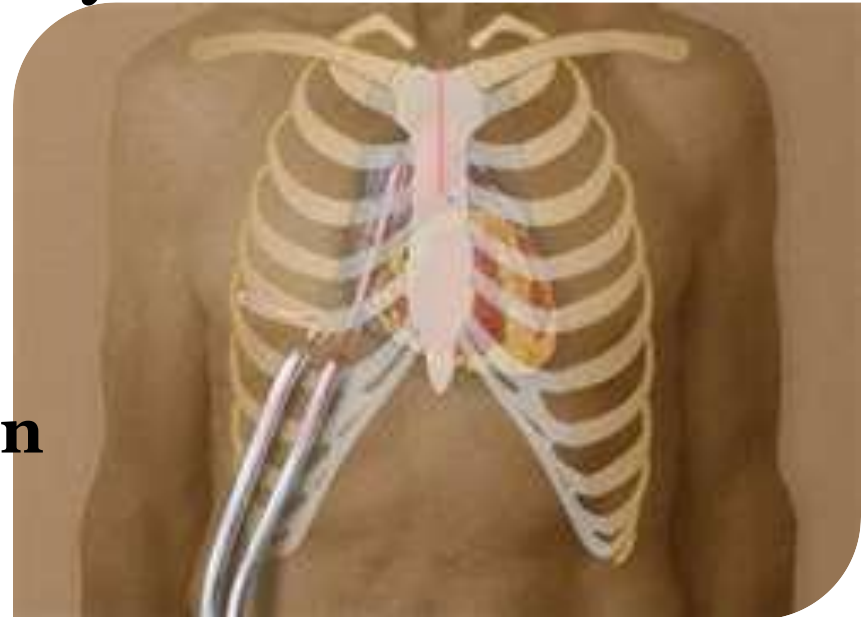
# PATENCY

- ✓ Assess the water seal with the suction off
- ✓ If water seal level is too high, it will be more difficult for air to leave the chest
- ✓ If water is too low= leaves water seal chamber at risk for exposure to air, can cause a Pneumothorax



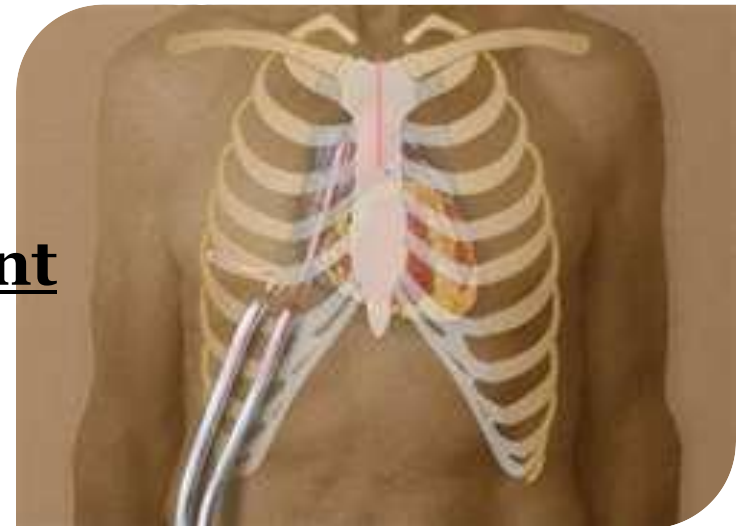
# **Nursing Care of Patient with Chest Tube**

- ✓ **Assess breathing pattern, rate, and symmetry q shift.**
- ✓ **Auscultate quality of breath sounds on both affected and unaffected sides q 4 hours and prn.**
- ✓ **Chest tube dressings should be changed at least daily & more often to keep incision dry.**
- ✓ **Vaseline gauze should ONLY be used if it was on the dressing removed!  
(Not all surgeons use it!)  
If no drainage, the dressing can be removed.**



# **Nursing Care of Patient with Chest Tube**

- ✓ **Place patients in semi-fowlers 30 – 45 degrees**
- ✓ **Monitor vital signs q 4hrs, prn or as ordered by MD**
- ✓ **Turn all patients q2 hrs from side to side, avoiding back for more than 1 hour**
- ✓ **Prevent patient from lying on and kinking chest tubes**
- ✓ **Be sure to know the ordered suction levels. Check & Document the suction level.**



# **Nursing Care of Patient with Chest Tube**

- ✓ **Have patient cough and deep breathe q2 hours**
- ✓ **Encourage active or passive ROM**
- ✓ **Hang drainage container from bed or place in support device**
- ✓ **Keep at the bedside at all times:**
  - ✓ **2 inch silk tape**
  - ✓ **Vaseline gauze**
  - ✓ **2 Chest tube clamps**



# **Nursing Care of Patient with Chest Tube**

✓ Help patient OOB and ambulate patient with appropriate staff – patient should be walking 2-3 times a day and more if tolerated

✓ **SUCTION CAN BE DISCONTINUED while walking but must be reconnected when in chair or bed.**

✓ Avoid aggressive chest-tube manipulation including stripping & milking – this can generate extreme negative pressures in the tube



# Reportable Conditions

**Report the following conditions to the physician immediately!**

- **Presence of bubbling in air leak chamber**
- **Deterioration in vital signs or any indication of clogged tubes, respiratory distress, hypovolemic shock, or excessive water seal air leak.**
- **Bleeding in excess of 100 ml/hour x2 hrs or more than 500 ml/shift.**
- **Collaborate daily with MD on need for CXR**





# Emergency Measures

## ➤ DISCONNECT:

➤ If chest tube becomes disconnected, the tube is to be immediately clamped (double) as close to the patient as possible. Both exposed ends cleaned with betadine swabs for 30 sec, left to air dry for 30sec, then reconnect system with fresh adhesive tape.

## ➤ DISLODGEEMENT

➤ If tube accidentally pulled out, promptly apply Vaseline gauze & 4X4's-tape on 3 sides.

**Page MD stat; prepare new tube insertion.  
Stay with pt.; observe for resp. distress from tension pneumothorax**



# Emergency Measures cont.....

## ➤ TENSION PNEUMOTHORAX

### ➤ Observe for acute resp. distress:

- ↑resp. rate, shallow resp., cyanosis
- shift in trachea, ↓ breath sounds
- asymmetrical breathing,
- failure of chest tube and/or water seal to fluctuate or bubble

### ➤ Notify MD Stat

- Check all connections for air leak
- Prepare for new tube insertion
- Stay with patient
- Place in high fowlers
- Start oxygen at 2 liters via nasal cannula
- Monitor vitals q 5 minutes
- Check apical pulse



# ASPIRA CATHETER (*Pleural Drainage System*)

- **The Aspira drainage catheter is a tunneled, long-term catheter used to drain fluid from the pleural cavity to relieve symptoms associated with pleural effusion.**
- **The purpose of the Aspira is to perform INTERMITTENT pleural effusion drainage at home.**

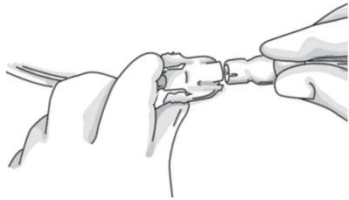


# ASPIRA CATHETER

- **Day of Insertion:** Catheter may be attached to continuous suction (Sahara system) by an adaptor to drain off large effusions.
- Once drainage lessens (less than 300 ml) the Sahara system will be removed and the catheter capped.
- The catheter will then be drained as needed depending on patient symptoms (usually daily) until discharge.

# Aspira Catheter Connection Procedure

**1. Remove cap from end of catheter and discard**



**2. Connect Aspira catheter to drainage bag by pushing together till hear a “click”**



**3. Place bag at least arms length below chest**

**4. Squeeze bulb ONCE**

**5. Let fluid drain until stops or bag fills to 1000ml**

**6. Disconnect by pinching wings**

**7. Wipe catheter end with alcohol**

**8. Place new sterile cap on end of catheter**

**9. Cut corner of bag measure then discard fluid**



# Aspira Catheter



- **If drainage exceeds 1 liter then inform MD, reconnection to standard chest tube suction may be indicated.**
- **NEVER leave Aspira drainage bags attached for continuous drainage.**
- **If it is necessary to reconnect to chest tube drainage system,, use of an adaptor is necessary...obtain from Central.**
- **When connecting to chest tube suction or syringe suction attach adaptor to suction FIRST then to catheter!**

# HEIMLICH VALVE



- Heimlich valve is a flutter valve that allows trapped air to escape from the thoracic cavity via chest tube when patient exhales and prevents more air from entering the patient's involved lung during inhalation.
- Drainage can escape through valve but are not designed for collection of major drainage.

# Function of the Heimlich Valve

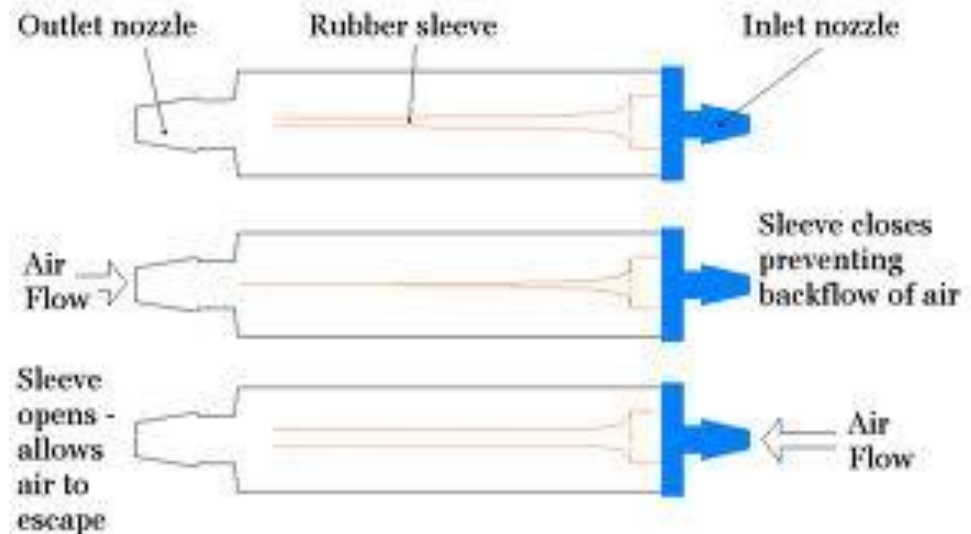
## Heimlich Valves (flutter valves)

Allow accumulated air and fluid to escape during expiration without admitting air during inspiration

- The **Blue** end of the Heimlich valve should be attached to the chest tube toward the patient.

- The tubing inside the valve flutters as the patient exhales indicating tube patency.

- The valve will stop fluttering when the pneumothorax has resolved.





# Heimlich Valve Drainage Set-up

- **For small amount of drainage, attach sterile disposable glove to Heimlich valve end with rubber band.**
- **For moderate to large amount of drainage:**
  - **Attach connection tubing to clear plastic end of Heimlich valve**
  - **Insert proximal end of connection tubing into plastic drainage bag . (i.e.: foley, nephrostomy bag)**

# Heimlich Valve Care

- Stopcock (if used) should be open to air.
- Assess patient for respiratory distress. If distress occurs, notify physician immediately.
- If Heimlich attached to drainage – empty contents q8 hours and observe amount, color, consistency and odor.
- Firmly attach the catheter's open end to the blue end of the valve. The catheter should be firmly taped to the valve to prevent accidental dislodging.

# Discontinuation of Chest Tubes

- The chest tube/drain is ready for removal after:
  - The patient's respiratory status has improved
  - Disappearance of air leaks present in water seal compartment
  - Chest film verifies re-expansion of lung
  - Drainage has decreased to 50 – 100 ml fluid per 25 hours

# Chest drain/tube removal

- Explain procedure to patient/significant other
- Administer pain medicine 1/2 hour prior to tube removal
- Assess patient including vital signs, respiratory rate, rhythm, and breath sounds
- Wash hands!
- Prepare dressing of Vaseline gauze and 4x4s or dressing of physician's choice
- Patient should be in semi-Fowler's position
- Have pt. take deep breath and hold while bearing down
- Check with physician about need for follow-up xray

# Documentation for chest drains

- **Time inserted**
- **Insertion site**
- **Size and type of tube**
- **Type of dressing & securement**
- **Type of drainage device if amount of suction used**
- **Color, consistency, character, & amount of drainage q8 hrs.**
- **Patient tolerance of insertion and post procedure vitals**
- **Respiratory assessment & vitals prior to removal of chest tube**
- **Date and time of removal**
- **Who implemented removal procedure**
- **Patient tolerance & post removal vitals and respiratory assessment**
- **Type of dressing applied**

**Review  
completed. Close  
this window and  
take test.**