CHEST TUBE REVIEW
Orientation Package

Reviewed 2011
Created by M Gordon, CNE Surgery (2008)
Adapted from the Chest tubes package by Nicky Holmes (2002), ICU/CCU, NYGH
**OBJECTIVES:**

After reading this package the nurse will be able to:

- Define what a chest tube is and how it works
- Identify indications for insertion of a chest tube
- Identify and describe the Atrium chest tube drainage system
- Describe the care of patient with an Atrium Chest tube in terms of:
  - Route care practice
  - Troubleshooting practices
- Identify the Heimlich portable chest drainage system
- Potential complications associated with chest tubes
- Documentation of Chest tube assessment and care
**Review of Anatomy & Physiology**

The chest wall is composed of the ribs, sternum, and thoracic vertebrae and are all interlaced and covered with intercostal muscle to form a semi-rigid structure. The lower boundary or floor of the thoracic cavity is known as the diaphragm.

The interior of the thoracic cavity can be divided into three distinct areas: the mediastinum and two separate chambers for each lung. The superior mediastinum consists of soft tissue which encloses the esophagus, trachea, heart, aorta, and other major vessels. The mediastinum acts as a flexible partition which extends from the front-to-back and top-to bottom of the central portion of the chest.

The inside of the rib cage is lined by a membrane called the parietal pleura while the lungs are covered by another membrane called the visceral pleura. Under normal conditions, these two pleural surfaces slide against each other allowing the lungs to expand and contract. These two surfaces are closely held to one another, being separated only by a very thin film of lubricating fluid called pleural fluid.

**Mechanism of Breathing**

During inspiration when the diaphragm is stimulated by the phrenic nerve, it contracts and moves downward. With the help of the external intercostal muscles, the rib cage moves up and out. The lung itself expands because of the movement of the diaphragm and the chest wall.
**What is a chest tube?**

A chest tube is a flexible catheter inserted through the chest wall and into the pleural space, to remove fluid and/or air. This removal will allow normal intra-pleural and intra-pulmonic pressure to resume so that normal lung function can occur.

Normally the pleural space [between the parietal and visceral pleura layers] is collapsed by **negative pressure**. Approximately 50ml of fluid sits within this space to lubricate these two layers so they glide smoothly across each other during respirations.

When air or fluid enters this space it is because the negative pressure pulling both surfaces together was disrupted. To re-establish intra-pleural pressure, a tube must be inserted and attached to negative pressure to pull the parietal and visceral pleural membranes together again.

There are various sizes of chest tubes available. The size of chest tube for an adult is usually between #28 to #32 french in diameter and the size inserted will depend on whether air or fluid is being removed.

Chest tubes are inserted into different places in the thorax depending on whether air of fluid is in the pleural space.

**If air** is present, the chest tube is inserted higher than the site where is air is located because air rises. Usually this is at the apex of the lungs- 2nd or 3rd intercostal space, anterior to the midclavicular line.

**If blood or fluid** is present in the pleural space the chest tube is inserted low or posterior/ lateral to the site where the fluid is. This is because fluid settles by gravity. Usually this means the tube is inserted at the base of the lungs- between the fourth and sixth intercostal space at the midaxillary line. Usually suction is applied to the drainage system if fluid is in the pleural space.
Indications for insertion of a chest tube.

- Pneumothorax (collection of air in the pleural space)
- Hemothorax (collection of blood in the pleural space)
- Chylothorax (collection of lymph in the pleural space)
- Pleural effusion (collection of fluid in the pleural cavity)
- Pyothorax (collection of pus in the pleural space)
- Empyema (collection of pus and fluid in pleural cavity)
- Thoracic surgery; such as lobectomy or pneumonectomy

A pneumothorax may be classified as open, closed and tension.

**Open:** occurs when an opening in the chest wall allows air to enter the pleural space or when damage to either the parietal pleura and/or both pleural membranes [visceral and parietal pleural membranes] occurs

Causes: stabbing, gunshot wounds, fractured ribs [ie. from CPR], thoracic surgery.

**Closed:** closed or spontaneous pneumothorax occurs when the outer chest wall and parietal pleura remain intact BUT the injured visceral pleura allows air to escape into the pleural space from the lungs, resulting in a loss of negative pressure.
Closed Causes: Iatrogenic as a result of therapeutic interventions such as lung biopsy, bronchoscopy, thoracentesis, mechanical ventilation [PEEP], central line insertion, endotracheal intubation.

Spontaneous causes: unknown usually occurs in teenagers (tall and thin) Patients at high risk of pneumothorax have history of COPD because their lungs are already overexpanded/ hyperinflated.

**Tension:** considered a potential complication of chest tube insertion this represents a medical emergency. This may occur whenever chest drainage is impeded. Air rapidly leaks directly from the lungs into the pleural space, during inspiration but has no way of escape, during expiration. Gradually as more and more air is pulled into pleural space pressures rises significantly resulting in a mediastinal shift (the entire mediastinal area- heart and other structures are pushed away from area where air is accumulated causing the vena cava to be compressed). Subsequently the size of the unaffected lung is reduced making breathing more difficult and if significant enough it can collapse the unaffected lung and interfere with cardiac function. Immediate intervention is required – thoracotomy.

**Atrium chest tube drainage system**

After the chest tube is inserted it is immediately connected to a closed drainage system. At NYGH we usually use the Atrium closed dry suction water seal chest drainage system. This unit is latex free and a single used item. The water seal system acts as a one way valve, allowing air or fluid to exit the pleural space but preventing air/ fluid from re-entering the space. Using the analogy of a straw in a glass of water lets think about how this system works. If you blow air into the straw, the air bubbles through the water. If you suck back on the straw only the water returns up the straw NOT air. This is basically how this system works.
The Atrium dry suction chest drainage system is a three chamber unit comprised of:

- A water seal
- Collection chamber
- Suction control chamber

**Atrium system components**

**Pre-attached sterile fluid twist top bottle** - during initial set up of chest tube, this is used to fill water to level of indicator [2cm].

Once filled, water becomes tinted blue for improved visibility of air leaks and convenient monitoring of patient pressures.

**Water seal chamber** - water seal turns blue when filled this allows for the detection of air leaks and patient pressures. The water seal column acts as a water manometer for measuring intra-thoracic
pressures. Water seal integrity is preserved during transport and accidental knock over—even when connected to suction.

Filtered manual vent—allows for control of vacuum pressures when connected to wall suction. You will see the height of the water seal column lower when on suction.

Dry suction regulator—continually adjusts to changes in patient air leaks and fluctuates in hospital wall suction.

Bellows suctions monitor—when bellows expanded to the delta mark this confirms suction operation. For suction settings less than -10cmH2O, any observed expansion of the bellows confirms suction operation.

Collection chamber—allows assessment of volume and appearance patient’s drainage. Fluid samples can be taken as follows:

- **obtaining a specimen** follow aseptic technique and use the provided needle free collection port located on the top of the system close to the connection site.
  - Swab the port with an alcohol or chlorhexidine swab
  - Using a 10 cc syringe attached to port form a dependent loop with the flexible tubing of the system.
  - Withdraw on the syringe the desired amount

High negativity float valve—controlled release valve provides automatic high negative pressure relief. This allows patient to draw as much intra-thoracic pressure as required to complete respiration while maintaining integrity of water seal. If you were lowering the wall suction pressure, you would need to press on this valve to release the excess pressure sitting in the system.

Positive pressure protection—located almost directly above water seal chamber at the top of system, this device protects patient from accumulating positive pressure and prevents tension pneumothorax during accidental suction line occlusion. NEVER obstruct this valve.
Swing out stand: seated on the bottom of the unit can be rotated out to provide maximum stability when placed on the floor

**Care of patient with a Chest tube: Routine of care**

<table>
<thead>
<tr>
<th>ACTION:</th>
<th>Rationale:</th>
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<tbody>
<tr>
<td>Always assess tubes from the insertion site/s on the patient along the entire tube outwardly all the way to the drainage container</td>
<td>Ensure nothing is missed and all is in the appropriate area</td>
</tr>
<tr>
<td>Place chest tube drainage system below the level of patient’s chest</td>
<td>Promotes gravity drainage and prevents backflow of chest drainage</td>
</tr>
<tr>
<td><strong>Tube Clamp:</strong> Ensure the Tube Clamp is open and visible suggest it be placed close to or on top of the container</td>
<td><strong>Assists with routine visual check done at the start of Q shift</strong></td>
</tr>
<tr>
<td>Ensure all connections points in drainage system are taped/ banded</td>
<td><strong>Rationale:</strong> Prevents air leakage around /at insertion site and prevents infection.</td>
</tr>
</tbody>
</table>
| **Dressing Changes:** Occlusive Dressing is changed Q 3 days and PRN when soiled  
  - Site is cleaned with NS  
  - Petroleum gauze (jelonet) around insertion site  
  - Gauze and ABD pad over top and secure with hypofix | **Rationale:** Provides airtight seal around |
<p>| ALWAYS tape chest tube to skin | <strong>Rationale:</strong> Prevents accidental dislodgement of chest tube |
| Assess insertion site for air and signs/ symptoms of infection / inflammation | <strong>Rationale:</strong> Dressing should be changed when soiled OR every 3 days. |
| <strong>Suction or Straight Drainage</strong> Ensure the order is clear if system is to straight drainage or if suction is required | A Common suction pressure is -20cm of H2O, it is already preset on the suction control dial |
| Monitor patient’s pain and intervene appropriately | <strong>Rationale:</strong> If not adequately managed pain may interfere with patient’s ability to deep breath, cough and mobilize |
| Maintain and check tube patency every 2- 4 hours. Ensure drainage | <strong>Rationale:</strong> Obstruction of drainage from the chest tube will interfere with lung re-expansion |</p>
<table>
<thead>
<tr>
<th>tubing of free of loops of kinks</th>
<th><strong>ACTION:</strong> Evaluate chest drainage system for bubbling in water seal chamber</th>
<th><strong>Rationale:</strong> Persistent / intermittent bubbling indicates an air leak. Report absence of fluctuations</th>
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<tr>
<td></td>
<td></td>
<td>It fluctuations with the fluid level</td>
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<td>It increases with inspiration</td>
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<tr>
<td></td>
<td></td>
<td>It decreases with expiration</td>
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<td></td>
<td></td>
<td>It pulsates with the heart beat</td>
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</table>

**Tidaling**  
Is norma for the patient pressure float bal to fluctuate up and down in the water seal column when the patient inspires and expires. This pattern is called tidaling and it verifies that the system is patent.  

Tidaling reflects changes in the intra-thoracic pressure during inspiration and expiration.

**Monitor amount of drainage from chest tubes**  
**Rationale:**  
If the drainage is more than 400ml/ 8 hrs, notify the MD immediately.  
Sudden decrease or absence of drainage may indicate a tube blockage.  
Change in nature of drainage – going from serous to sanguinous may indicate a fresh bleed.

**mark drainage level on outside of collection chamber at end of each shift and document on nursing flow sheet every shift**  
**Rationale:** Monitor for drainage loss

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It is important to know how one typically feels after a chest tube has been inserted:

**SENSATION**  
Pain is a normal response to having a chest tube in situ. Assess and provide analgesic regularly to ensure the patient’s respirations are full, oxygenation optimal and activity returning to normal.

**COLOUR**  
If inserted for a hemothorax, initially the fluid collected from the pleural space should be bright red in color. Later this color should gradually changes to a serous color.  
If inserted for a pleural effusion the fluid collected should be straw colored.  
If inserted for an empyema the fluid collected should be pus colored.
If inserted for a pneumothorax minimal or no drainage should be visible.

**QUANTITY**
During the period immediately after the tube is inserted a significant amount of drainage may be noted in the Atrium unit [up to 75ml/ 1 hr].

It is critical that you monitor this closely for a hemothorax. The amount draining into the collection chamber should decline gradually. A sudden change in this pattern may signal a problem such as:

- **A clot or obstruction in the tube causing the drainage to suddenly stop.**

**What to do:** Assess for the presence of tubing kinks, compressions or independent loops. If none, consider a clot – DO NOT MILK the tubing.
Assess the patient’s response for changes in respiratory status and vital signs. If the patient is symptomatic and the pattern persists notify the MD using the Communication/ Notification powerform.

- **A new bleed causing the drainage to suddenly increase.**
**What to do:** Assess the patient’s response and the drainage amount. Monitor the patient’s respiratory status and vital signs. If they are deteriorating and the drainage is more than 100ml/hr or if the drainage becomes more than 400ml/ 8 hrs notify the MD via phone immediately and document the conversation on eCare (Communication/ Notification).

**TROUBLE SHOOTING COMMON ISSUES: CARE OF PATIENT WITH A CHEST TUBE**

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>RATIONALE</th>
<th>INTERVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest tube falls out of patient</td>
<td>The CT wasn’t secured to patient’s skin</td>
<td>The insertion site must be covered with jelonet, dry gauze and secured. A chest xray may be ordered by the physician. Continue to monitor the patient’s respiratory status.</td>
</tr>
<tr>
<td>Chest tube disconnected from drainage system</td>
<td>Patient’s chest tube came loose at connector</td>
<td>Open bottle of sterile saline and submerge end of chest tube by 2cm Call colleague for help inserting new tubing and Atrium system.</td>
</tr>
<tr>
<td>Air leak /continuous bubbling</td>
<td>▪ Air leak results when CT is dislodged</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Air leak results when insertion sites and connections not secure.</td>
<td>If dislodged do not push tube back in! Apply occlusive dressing (petroleum gauze + 4x4 gauze) over site and holes in tubing exposed. Tape. Ensure site and connections are secured with pink waterproof tape.</td>
</tr>
</tbody>
</table>
### Helpful hints:

1. **ALWAYS** have a bottle of sterile water/ saline at bedside at all times

   **WHY?** If the chest tube accidentally becomes disconnected from the Atrium closed system microorganisms will be able to enter the system.

   **WHAT TO DO?** Take prompt action by submerging the end of the chest tube [2cm down] into bottle of sterile water/ saline solution. Ask the patient to take shallow breaths only. Then get another Atrium system and reconnect the chest tube (you will need help). This interim solution prevents microorganisms from entering the pleural space and preventing/ minimizing air from entering the pleural space.

2. **Have petroleum gauze at the bedside** at all times.

   **WHY?** If the chest tube is dislodged and holes at the insertion site become exposed to the air, air will rush into the pleural space.

   **WHAT TO DO?** Take prompt action- Do Not push the tube back into the patient. Cover exposed holes at the insertion site with the occlusive petroleum gauze and then with 4 x 4 gauze. This interim solution closes the port and minimizes the chance that air will enter the pleural space through the exposed holes.

3. **DO NOT** clamp chest tubes

   **WHY?** Clamping the chest tube can cause tension pneumothorax

   **WHAT TO DO?** The only time to clamp the tubing is when changing the Atrium collection chamber when it is full and then it should be done briefly. Ensure the clamp is open and placed on the top of the collection chamber where it can easily be visualized by all

4. **NEVER** milk or strip chest tubes – Milking refers to squeezing and releasing chest tubing between fingers along the length of the tube. Stripping is squeezing along the length of the tubing without releasing it.

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<table>
<thead>
<tr>
<th>No Drainage from chest tube</th>
<th>Full collection chamber full will stop drainage</th>
<th>Change chest drainage system aseptically</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dependant loops, kinks or clamped tubing will stop drainage</td>
<td>Remove dependent loops, kinks or clamps from tubing</td>
</tr>
</tbody>
</table>
WHY? Stripping /milking causes excess negative pressure in the lungs and will damage the sensitive pulmonary tissue.

WHAT TO DO? If a blockage is suspected, resolve tubing kinks, dependent loops or compressions. If this does not resolve that blockage, change the Atrium system. If still not resolved, speak to MD.

5. When obtaining a specimen follow aseptic technique and use the provided needle free collection port located on the top of the system close to the connection site. WHY? To collect a specimen:
   o Swab the port with an alcohol or chlorhexidine swab
   o Using a 10 cc syringe attached to port form a dependent loop with the flexible tubing of the system.
   o Withdraw on the syringe the desired amount

6. Patient Transport
   What to do: if they are on suction disconnect them, DO NOT CLAMP THE CHEST TUBES, place the Atrium collection chamber hanging below the pt chest on the stretcher, ensure dressing is intact, tube secured to pt skin, all connections are secure and chamber is not tilted or lying flat
   Why: ensure the tube continues to drain appropriately, and is not accidentally pulled out or connections dislodges during manipulation of Patient for procedures. Not tilting the drainage system is crucial to prevent drainage from moving into all chambers and making it difficult to maintain accurate drainage output

PORTABLE CHEST TUBE SYSTEM: The Heimlich Valve

The Heimlich valve (see diagram below): The oldest of the mobile devices, the Heimlich is a one-way flutter valve. It’s a simple device comprising a piece of latex rubber tubing (a Penrose drain) inside a round plastic housing with connectors on both ends—a blue end that attaches to the chest tube and a clear end that allows air to escape but not return.
When it used:

In clinical situations such as spontaneous pneumothorax, open thoracotomy, traumatic hemopneumothorax and recurrent pleural effusion, chest drainage can be simplified with the Heimlich Chest Drain Valve.

- If the patient has a small, uncomplicated pneumothorax with little or no drainage that doesn't require suction, his chest tube may be connected to a Heimlich valve instead of a traditional CDU. Less expensive and easier to assemble and use, this device is essentially a water-seal chamber connected to the chest tube.

Used commonly by:
- by Thoracic Surgeons
- by Emergency Room physicians
- by EMS Ambulance personnel
- for patients returning home (ie. patients HIV positive) because this valve allows them to be mobile.

How it works:

As the patient exhales, the positive pressure generated by the air leaving the chest enters the tubing, causing the valve to open so the air can be released.

During inspiration, the tube collapses on itself, preventing the air from re-entering.

The device has no reservoir so it should not be used for patients with fluid drainage. For years, nurses and doctors have experimented with ways to attach a collection bag to the valve. Like an Atrium chest drainage system do not milk or strip the chest tubing attached to a Heimlich. It increases the chances that air will be blocked from leaving the chest, which could cause a recurrence of the pneumothorax. And any fluid spillage will violate standard precautions.

**Nursing considerations:** The arrow on the housing should always point away from the patient—a fact that you should point out to your patient and other caregivers. An improper connection could block the chest tube, trapping the air and causing a recurrent pneumothorax.

To help prevent the Heimlich from becoming dislodged, tape both the chest tube and the valve to the patient’s chest. Check the positioning regularly to confirm not only that it’s in place, but that the distal end of the valve remains open and the tube is unobstructed.
At each assessment, observe the inner valve carefully for movement during exhalation, indicating airflow through the device. Finally, keep in mind that the absence of a reservoir in the Heimlich brings a high risk of exposure to the small amount of pleural fluid found even in a patient with a simple pneumothorax.

If attached to drainage appliance (such as ostomy bag or fluid trap). Don gloves and adhering to sterile technique empty and measure drainage. Replace drainage appliance and document as per hospital policy.

**Potential complications associated with Chest tubes**

<table>
<thead>
<tr>
<th>Complication</th>
<th>Cause</th>
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</thead>
<tbody>
<tr>
<td>Tension pneumothorax</td>
<td>This medical emergency is caused by increased thoracic pressure, lung collapse and mediastinal shift towards the opposite side</td>
</tr>
<tr>
<td></td>
<td>• Respiratory- dyspnea, SOB, chest pain, hypoxia, respiratory distress, tachypnea</td>
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<tr>
<td></td>
<td>• Cardiac- hypotension, tachycardia,</td>
</tr>
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<td></td>
<td>• Mechanical- tracheal shift, distended neck veins</td>
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<tr>
<td>Cardiac tamponade</td>
<td>Accumulation of blood/ fluid around/ within mediastinum (pericardial sac) causing the heart to be squeezed</td>
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<tr>
<td></td>
<td>• Decreased cardiac output</td>
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<td>• Decreased venous return</td>
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<td></td>
<td>• Increased jugular venous pressure</td>
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<td>• Neck vein distension. Will lead to PEA and death.</td>
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<tr>
<td>Subcutaneous emphysema</td>
<td>Collection of free air under the skin due to the bursting of small airways in the lungs. Small amounts can be reabsorbed</td>
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<td>• Swollen neck, chest, face</td>
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<td></td>
<td>• Spongy crackly [like Rice Krispies] on palpation. Area feels painful when palpated</td>
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<tr>
<td></td>
<td>• If severe may lead to dyspnea, bluish skin</td>
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</table>

**Other possible complications:**
- The chest tube is placed too low causing damage to the diaphragm or other internal organs
- If inserted too far in, it may puncture the heart
- Pain upon insertion or while the chest tube is in situ
- Occlusion of the chest tubes by clots or fibrin

**Chest tube removal:**

Chest tube removal is performed by a physician but may require assistance from a nurse. Upon removal, the patient is instructed to inhale deeply and hold it, and/or tighten their muscles (perform Valsalva’s maneuver). This will prevent air from being drawn into the pleural cavity, preventing a pneumothorax. The insertion site must then be covered with jelonet, dry gauze and secure dressing. This should be
changed daily until a dressing is no longer needed. After removal, a chest x-ray may be ordered by the physician. Continue to monitor the patient’s respiratory status.

**Documentation of Chest tube care on eCARE:**

<table>
<thead>
<tr>
<th>Breath Sounds</th>
<th>Clear</th>
<th>Absent</th>
<th>Bronchial</th>
<th>Coarse crackles</th>
<th>Diminished</th>
<th>Expiratory wheeze</th>
<th>Fine crackles</th>
<th>Friction rub</th>
<th>Inspiratory wheeze</th>
<th>Comment</th>
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<td>LUL</td>
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**Chest Tubes**

<table>
<thead>
<tr>
<th>Chest Tube</th>
<th>Activity</th>
<th>Location</th>
<th>Size</th>
<th>Connectivity</th>
<th>Water Seal Chamber</th>
<th>Site Description</th>
<th>Drainage Description</th>
<th>Dressing Condition</th>
<th>Interventions</th>
<th>Patient/System Complications</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest Tube #1</td>
<td>Alphabet</td>
<td>Alphabet</td>
<td>Alphabet</td>
<td>Alpha</td>
<td>Alphabet</td>
<td>Multiple</td>
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<td>Chest Tube #2</td>
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<tr>
<td>Chest Tube #3</td>
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<td>Chest Tube #4</td>
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See Above: View of the Respiratory Detailed tab in the Shift Assessment powerform

**On this Respiratory Detailed powerform document:**
- Post chest tube insertion x-ray results (if applicable)
- Location of chest tube and condition of tube
- Lung auscultation in each lobe
- Dressing – is it occlusive? gauze? pink tape?
- Drainage system – on gravity or suction
- Air bubbling/ air leaks noted
- Amount, color and consistency of drainage (if any)
- Fluctuation and tidaling of chest tube drainage (if any)

**On the Vital signs powerform document:**

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- The patient’s oxygen saturation and Vital signs

**On the PRN Response powerform document:**
- Any nursing interventions provided as needed (analgesia, sedation etc)

**SIGNS AND SYMPTOMS THAT SHOULD BE REPORTED TO MD**
- Tachypnea
- Decreased or absent breath sounds
- Hypoxemia
- Tracheal deviation
- Subcutaneous emphysema
- Neck vein distension
- Tachycardia
- Fever
- Dysrhythmias

**References**


## Chest Tube Test

<table>
<thead>
<tr>
<th>Name:</th>
<th>Unit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td></td>
</tr>
</tbody>
</table>

### Circle the Best Response for all:

1. **The anatomical structure located in the center of the thoracic cavity is the:**
   - A. Mediastinum
   - B. Visceral pleura
   - C. Parietal pleura
   - D. Diaphragm

2. **Which of the following statements is true about intrapleural (the space between the parietal and visceral or pulmonary pleurae) pressure under normal conditions?**
   - a. It is always positive
   - b. It is negative during inhalation; positive during exhalation
   - c. It is positive during inhalation; negative during exhalation
   - d. It is always negative

3. **The purpose of a chest drainage unit is:**
   - a. Evacuation of air from the chest cavity
   - b. Evacuation of fluid from the chest cavity
   - c. Assist in reestablishment of normal intra-thoracic pressure
   - d. All of the above

4. **Inhalation occurs when:**
   - a. The diaphragm contracts and moves downward
   - b. The external intercostal muscles move the rib cage up and out
   - c. The pressure inside the lungs is lower than atmospheric pressure and air flows in
   - d. All of the above

5. A patient with an opening in the chest wall, such as from a gunshot, stab wound or impalement, resulting in a "sucking chest wound" can be said to have:
   - a. An open pneumothorax
   - b. A closed pneumothorax
   - c. A hemothorax
   - d. A pleural effusion

6. A potentially life-threatening condition in which air and pressure rapidly accumulate in the pleural space and, if not treated, can result in a mediastinal shift is called:
   - a. An open pneumothorax
   - b. A tension pneumothorax
   - c. An iatrogenic pneumothorax
   - d. A spontaneous pneumothorax
7. A potentially life-threatening condition in which blood collects around the heart, particularly after heart surgery or chest trauma, is called:
   a. Cardiac insufficiency
   b. Mediastinal effusion
   c. Mediastinal shift
   d. Cardiac tamponade

8. The most important element in a chest drainage system is:
   a. The collection bottle/chamber
   b. The water seal
   c. The suction control
   d. The suction source

9. Bubbling in the water seal chamber of a chest drain indicates:
   a. Normal functioning
   b. An air leak
   c. The chest tube is ready to be removed
   d. Suction is too high

10. The fluctuation of the water level in the small arm of the water seal with respirations is called:
    a. Air leak
    b. Tidaling
    c. Cycling
    d. Suction

11. A commonly recommended suction pressure is:
    a. -10 cm H2O
    b. -20 cm H2O
    c. -50 cm H2O
    d. -450 cm H2O

12. A physician has inserted a chest tube for a pleural effusion. The order is for -20cm H2O of suction. How will the nurse set this up?
    a. Adjust the vacuum source until the dial on the vacuum regulator reads -20mmHg
    b. Adjust the vacuum source until constant, gentle bubbling just begins in the suction control chamber
    c. Ensures the suction pressure control dial on the container reads -20cm H2O, vacuum pressure is set to 80mm Hg or > until the ‘bellows’ expand to the △ mark
    d. none of the above

13. In addition to a respiratory assessment, nursing assessment of a patient with a chest tube should include:
    a. Assessing the insertion site/dressing outwardly following the tube all the way to the drainage system, for loops, kicks, clamp is open
    b. checking the drainage system for, air leaks, appropriate suction pressure (if ordered) and ‘bellows’ expand to the △ mark
c. Noting the colour, consistency, and amount of drainage
d. changing the occlusive dressing Q 3 days and PRN
e. All of the above

14. Nursing actions for a patient with a chest tube include:
a. Adjusting the water level in the suction control and water seal chambers if evaporation has occurred
b. Preventing dependent loops from forming in the patient drainage tube
c. Notifying the physician of a new or increase air leak
d. monitoring output, documenting assessments, interventions
e. All of the above

15. Which of the following statements is true regarding patient movement while requiring chest drainage?
a. Patients may go only from bed to a chair while the chest tube is connected to a chest drain
b. If the patient must leave the nursing unit, the suction tubing should be clamped shut while the chest drain is disconnected from suction
c. If a patient is ambulatory, the chest tube should be clamped shut while the chest drain is disconnected from suction
d. Patients may walk around once the nurse disconnects the drain from suction as long as the drain remains below the chest

16. When converting a chest drainage system from suction to gravity drainage:
a. turn source suction off and leave tubing connected
b. clamp patient drainage tube
c. raise chest drainage unit above the chest
d. disconnect suction tubing from the port

17. Milking or stripping tubes:
a. Can create dangerously high negative pressures
b. Is done routinely Q shift by nurses to assist with fluid removal from tube
c. Can put a patient at risk by damaging the sensitive pulmonary tissue
d. none of the above
e) A and C only

18. New bubbling is observed in the water seal chamber after a patient with a pleural chest tube returns from radiology. The appropriate nursing action/s is/are to:
a. Call the physician immediately and do not leave the patient's bedside because of the risk of respiratory failure
b. Check all the tube connections to ensure they did not loosen on transport
c. Remove the dressing and ensure the tube is in place, reapply a clean occlusive dressing
d. Continue to monitor the water seal chamber for bubbling every hour for the next four hours
e. Do nothing. This bubbling is normal for all patients with pleural chest tubes
f) b, c, d only

19. If the chest tube is pulled out of the patient's chest, after asking a colleague to call a physician STAT, emergency nursing management is to:
a. Cover the opening with occlusive petroleum gauze (jelonet),  4 x 4 gauze and secure
b. Try to put the tube back in place as quickly as possible
c. Leave the opening alone and monitor the patient until a physician can assess the situation
d. none of the above

20. Chest tube clamping is only recommended for:
   a. Changing the drainage container and this should be done quickly and then promptly unclamped
   b. Whenever a patient leaves the nursing unit and cannot be monitored
   c. When ambulating a postoperative patient with a chest tube
   d. It is never beneficial to clamp a patient's chest tube

/20