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PART I: [CHEST DRAINAGE SYSTEM \(ATRIUM\) DRY SUCTION](#)

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### **PURPOSE:**

1. To identify the nursing responsibilities for the setup and collection of air and fluid to restore the chest to its normal condition.
2. To identify conditions that might result in request for chest tube placement:
  - a. Surgery, trauma, air leaks, and bleeding into the chest (hemothorax, pneumothorax)
  - b. Lung abscess (empyema)
3. To outline registered nurse responsibilities in assisting the physician with the insertion, ongoing management, changing, and removal of a closed system drainage chest tube.
4. If physician requests permanent chest drainage placement, refer to **Pleural/Peritoneal Drainage Catheter Care in the Home Setting Policy**, and initiate **RAD76 order set**.

### **POLICY STATEMENT:**

1. Upon written order of the physician, a registered nurse may, with informed consent, set up the Atrium dry suction chest drainage system.
2. Only physicians may insert, irrigate, instill medication, and remove chest tubes. Cardiovascular PA may also remove chest tubes.
3. Physician may request intracavitary tPA instillation through drainage system. Refer to **RAD89-INTRACAVITARY TISSUE-TYPE PLASMINOGEN (TPA) VIA DRAINAGE CATHETER ORDER SET**.
4. Management shall be in the hands of the RN, with specific areas being delegated to other licensed personnel.
5. Observations and assessment of chest tubes and suction set-ups shall occur at the beginning of each shift, and checked several times throughout the shift.
6. A licensed nurse may change the drainage system only when the collection chamber is full or tipped.

### **RISKS**

Although chest tube insertion is a commonly used as a therapeutic measure, there are several complications that can develop, including:

- bleeding from an injured intercostal artery (running from the aorta)
- accidental injury to the heart, arteries, or lung resulting from the chest tube insertion
- a local or generalized infection from the procedure
- persistent or unexplained air leaks in the tube
- the tube can be dislodged or inserted incorrectly
- insertion of chest tube can cause open or tension pneumothorax

### **SUPPORTIVE DATA**

1. Chest tubes drain accumulated air or fluids from the pleural space thereby expanding lung tissue by re-establishing negative pressure in the intrapleural space.
2. Tubes are usually placed in the second intercostal space anteriorly to remove air, and the eighth or ninth intercostal space posteriorly to remove fluids.
3. The drainage device used at St. Luke's Hospital is the disposable Atrium dry suction (a collection chamber, a water seal chamber, and a dry suction control).
  - a. Fluid drainage collects in the collection chamber.
  - b. The water seal chamber prevents re-entry of air into the pleural cavity.
  - c. The dry suction control dial controls the amount of negative pressure exerted by the drainage system.

### **PART I – CHEST DRAINAGE SYSTEM (ATRIUM)**

#### ***PROCEDURE***

#### ***STEPS***

1. Assemble equipment:
  - a. 3600 Atrium multipurpose system located in SPD.
  - b. Banding gun and nylon ties (available in SPD per physician request).
  - c. Continuous wall suction.
  - d. 72 inch connecting tubing.
2. Open package:
  - a. Remove non-sterile plastic wrap.

- b. Open first sterile wrap.
- c. Open second sterile wrap in sterile field.
- 3. Floor stand – Swing floor stand open for system setup and secure placement on floor. Floor stand should be closed during patient transit.
- 4. To fill water seal chamber – Sterile water vial is located on the back of each atrium unit. Twist top off sterile water vial and insert tip into suction port. Squeeze contents into water seal until fluid reaches 2cm fill line.
- 5. Remove patient tube connector cap and connect to patient’s chest tube. Connect chest prior to initiating suction. Make sure patient tube clamp is unclamped.
- 6. Apply suction:
  - a. Connect 72 inch connecting tubing to continuous wall suction. Then connect to suction control stopcock.
  - b. Set suction dial at ordered amount (Preset at -20 cm). Physician will usually order -20 cm suction. Turn wall suction up until bellows expands past triangle mark or beyond.
- 7. For optimal drainage results, place system below the patient’s chest in an upright position to avoid accidental knock-over, swing the floor stand to open or hand system bedside with the hanger provided.
- 8. Operation:
  - a. Water seal should be maintained at 2 cm line and suction control chamber should bubble gently.
  - b. Observe for air leaks. When bubbling is observed going from right to left in the air leak zone, this will confirm a patient air leak  
**NOTE:** The ball will normally oscillate at the bottom of the water-seal. Only bubbles indicate an air leak.
- 9. Manual high negativity vent – To manually lower the height of the water-seal column or patient pressure when connected to suction, temporarily depress the filtered manual vent, located on top of the drain, **until the float valve releases** and the water column lowers to the desired level. **Do not lower water-seal column when suction is not operating or when patient is on gravity drainage.**
- 10. Sampling patient drainage – Fluid samples can be taken directly from the patient tube at the needleless luer port on the patient tube connector. Alcohol swab the luer port prior to syringe attachment (no needle).
- 11. Disconnection:
  - a. Clamp off all indwelling thoracic catheters prior to disconnecting tube from patient.
  - b. Place atrium and all indwelling catheters into red disposable bag. Do not cut, disconnect or disassemble the unit and catheters prior to disposal. Place sealed red bag into large red container located in soiled utility room.

## **DOCUMENTATION**

- 1. EMR

## **PART II - INSERTION OF CHEST TUBE**

### **EQUIPMENT**

- 1. From SPD or floor stock in ED, ICU, Radiology:
  - a. Drainage system as specified by the physician, such as:
    - 1) Atrium drainage system dry suction
  - b. Chest tube, size and type as ordered by physician

- c. Chest Intubation tray
  - d. Unsterile chest tube clamps (2 for each chest tube)
  - e. Heimlich valve or pneumostat valve if requested by physician
  - f. Banding gun and nylon ties (if requested by physician)
2. Continuous wall suction (except in Special Units where suction is built in).
  3. From Nursing Unit:
    - a. Rubber band
    - b. Safety pin
    - c. 4x4 gauze
    - d. Tape as per physician preference

## **PROCEDURE**

### **STEPS**

1. Assemble equipment.
2. Explain procedure to patient and obtain informed consent. Perform a time out for procedure and document.
3. Pre-medicate per physician order and support patient during procedure.
4. Connect chest tube to system. Turn wall suction on until bellows past ▲ mark. Atrium is pre-set at -20 mmHg. Bellows must expand to arrow for suction at -20cm.
5. After procedure is complete (these are done immediately after procedure is completed in order to have a baseline for comparison):
  - a. Check system for proper functioning.
  - b. Secure all connections with tape or banding gun per physician request .
  - c. Check amount and color of initial drainage.
  - d. Check for air leak.
  - e. Assess bilateral lung sounds, patient vital signs, and respiratory status.
  - f. Assess for crepitus, and drainage on dressing.
  - g. To confirm placement, a STAT portable chest x-ray is ordered by physician.
  - h. Notify physician of changes such as:
    - 1) Development or change in air leak.
    - 2) Increased amount of drainage or development of bloody drainage that had not been present previously.
    - 3) Change or absence of lung sounds.
    - 4) Increase in crepitus.
    - 5) Change in vital signs or respiratory status.
6. Attach forceps for clamping chest tubes to head of the bed. See indications and contra-indications for information on when to clamp a chest tube.

### **INDICATIONS/CONTRAINDICATIONS FOR CLAMPING CHEST TUBE**

1. Never clamp a chest tube if the patient has a continuous air leak, as this may cause a tension pneumothorax.
  - a. If the chest tube becomes disconnected from the drainage system, reconnect immediately.
  - b. If reconnection is impossible, it is preferable to allow the chest tube to act as an open pneumothorax.

2. Never clamp a chest tube placed for relief of a tension pneumothorax.
  - a. Clamping may recreate the pneumothorax.
  - b. Clamping the tube next to the chest wall presents no danger, however, if the chest tube has stopped functioning prior to disconnection.
3. The chest tube may be briefly clamped next to the chest wall just long enough to correct a disconnection if no continuous air leak is present.
4. When transporting a patient, do not clamp the chest tube.

## **DOCUMENTATION**

1. EMR:
  - a. Key areas to note include:
    - 1) Procedure itself, who performed it, and suction applied.
    - 2) Baseline assessments:
      - a) Drainage (amount and color).
      - b) Lung sounds.
      - c) Dressing.
      - d) Areas of crepitus.

## **PART III - PATIENT AND EQUIPMENT**

### **PROCEDURE**

1. PATIENT ASSESSMENTS:
  - a. Assess patency of system and check all connections.
  - b. Assess vital signs.
  - c. Assess lung sounds.
  - d. Monitor dressing for intactness and any drainage.
  - e. Assess amount and color of drainage.
  - f. Assess for any signs of crepitus.
  - g. Report any changes from baseline.
2. CHEST TUBE FUNCTIONS/OBSERVATIONS (BEST DEMONSTRATED BY THE ATRIUM):
  - a. Collection chamber
    - 1) Drainage collected is often bloody at first, but should turn to serosanguineous.
    - 2) Always note and mark the amount of drainage at the beginning of your shift and at intervals throughout. 100 ml or more per hour is excessive and should be reported to the physician.
  - b. Water seal chamber
    - 1) Note the water level and refill as necessary to maintain the water seal.
    - 2) Fluctuation of water in the water seal indicates patency of the system. Pressure changes within the intrapleural space during respirations are communicated to the water seal chamber until the lungs are fully re-expanded.
    - 3) If fluctuation is not present, check the chest tube for occlusions (strip chest tube if ordered), kinks, reposition patient and have him cough and deep breathe.
    - 4) If fluctuation still does not return, check the patient's vital signs and respiratory status and notify the physician.

- 5) "Fluctuation" or "intermittent bubbling" with normal respirations is seen in the water seal chamber when there is no leak in the system. However, continuous bubbling with inspiration and expiration indicates an air leak in the patient or the system.
  - a) To differentiate, briefly clamp the chest tube near the insertion site. If the bubbling stops, the air leak is in the patient's intrapleural cavity. (If this is a new development, check the patient's vital signs and respiratory status and notify the physician.)
  - b) If bubbling continues after clamping the chest tube, the leak is in the mechanical system.
- c. Dry suction control
  - 1) The bellows located in the suction monitor will expand only when suction is operating.
  - 2) Suction is preset at -20 cm H<sub>2</sub>O and can be reset to any desired level between -10 cm H<sub>2</sub>O and up to -40 cm H<sub>2</sub>O.
  - 3) Changing the setting is accomplished by adjusting rotary control on the side of the unit, up to increase and down to lower setting.
3. IF THE CHEST TUBE IS ACCIDENTALLY DISLODGED:
  - a. Ask the patient to cough and occlude the site on expiration. This should be done immediately with whatever is available (i.e., a gloved hand) and then with petroleum gauze, dry sterile 4x4's, and occlusive tape.
  - b. Check the patient's vital signs and respiratory status.
  - c. Notify the physician.

### **DOCUMENTATION**

1. Collection Chamber:
  - a. At 2400 daily the amount of drainage shall be marked.
  - b. Exceptions: See orders for post-CABG patient.
2. EMR:
  - a. Areas assessed, which would include:
    - 1) Lung sounds.
    - 2) Dressings.
    - 3) Drainage (amount and color).
    - 4) Any call to physician.
    - 5) Daily total of drainage out. I&O
    - 6) Vital Signs.

### **PART IV - CHANGING THE CHEST TUBE DEVICE**

#### **EQUIPMENT**

1. From SPD
  - a. New drainage system - set up according to instructions provided.

#### **PROCEDURE**

#### **STEPS**

1. When the collection chamber is full, set up another drainage system according to instructions provided.

2. When using Atrium, clamp with clamp provided on tubing and disconnect from connection site on atrium. Reconnect unit and unclamp.
3. Disposal:
  - a. Place CT drainage system in red bags.
  - b. Secure top and leave in dirty utility room in large red containers.
  - c. Make sure the collection system doesn't get tipped over.

## **DOCUMENTATION**

1. EMR
2. (Treatment Flowsheets, Education Flowsheet, make focus note to document patient response).

## **PART V - REMOVAL OF CHEST TUBE**

### **SUPPORTIVE DATA**

1. When the lung is fully re-expanded, the lung will block the openings in the chest tube, within the intrapleural space, and the pressure differences will no longer be transmitted to the water seal chamber.
  - a. When this occurs, you will no longer see water fluctuation in the water seal chamber.
  - b. To confirm this, assess patient's breath sounds bilaterally for quality.
2. Physician will usually order daily chest x-rays while chest tube is in place for comparison and confirmation of lung re-expansion.

### **EQUIPMENT** - check physician preference

1. Vaseline gauze
2. Gauze
3. Betadine
4. Dressings
5. Suture removal kit

## **PROCEDURE**

### **STEPS**

1. Explain procedure to patient.
2. Place patient in semi-Fowlers position.
3. Prepare equipment.
4. Assist physician.
5. Secure dressing with tape.
6. Place atrium and all indwelling catheters into red disposable bag. Do not cut, disconnect or unassemble the unit and catheters prior to disposal. Place sealed red bag into large red container located in soiled utility room.

## **ONGOING MANAGEMENT**

Monitor the following for at least 24 hours:

1. Monitor dressing.
2. Monitor lung sounds.
3. Check for any signs of crepitus.

#### **DOCUMENTATION**

1. EMR
2. (Treatment Flowsheets, Education Flowsheet, make focus note to document patient response).  
Discontinue chest tubes from order screen.

#### **REFERENCE:**

“Chest Tube Insertion-Overview”- University of Maryland Medical Center (5/10/2011)

“Chest Tube Insertion”- [Encyclopedia of Surgery: A Guide for Patients and Caregivers - Ce-Fi](#) (2007-2013)

atrium video of how to redistribute fluid in the collection chambers

[http://www.atriummed.com/EN/chest\\_drainage/edu-files/oasis-video2.asp](http://www.atriummed.com/EN/chest_drainage/edu-files/oasis-video2.asp)