

**CHEST TUBE**

**PURPOSE:** To outline management of patients with one or more pleural/mediastinal chest tubes (CT) connected to a closed chest drainage system or who has a Heimlich Valve.

**SUPPORTIVE DATA:** A chest drainage system (CDS) is used to evacuate the air and/or fluid from the chest cavity to reestablish normal intrathoracic pressure.

A mediastinal chest tube is used to evacuate blood or clots from around the myocardium which can result in impaired ventricular filling, diminished stroke volume, and cardiac tamponade. Due to the mediastinal position, air leaks and fluctuation are not usually visible.

A pleural chest tube is placed in the pleural space to remove air (pneumothorax), blood (hemothorax), pus (empyema) or fluid (pleural effusion). The tube may be a standard chest tube, or a smaller “pigtail” (e.g. Blake).

A Pneumostat chest tube valve (PmV), Heimlich valve or “flutter valve” is a one-way valve attached to a chest tube or catheter that is placed in the pleural space for the treatment of uncomplicated, chronic or recurrent pneumothorax. Attachment to a drainage system is not required, but it may be attached to a drainage system and suction if ordered by the provider (for example if the patient requires mechanical ventilation). The end of the valve must be unobstructed to provide an exit for air.

- ASSESSMENT:**
1. Assess upon initial insertion, admission/transfer and a minimum of every 4 hours (ICU: every 2 hours)
    - Vital signs
    - Pain Score
    - Occlusive dressing dry, intact and dated (except NICU)
    - Chest drainage system
      - Suction at prescribed level
      - Suction operational (bellow is expanded)
      - Tidaling (rise and fall in water-seal chamber)
      - Tubing for drainage, color, consistency and clots
      - Presence of air leak (pleural chest tubes only)
      - Chest tube connections secured with non-stretch tape
      - Tubing unkinked
      - No dependent loops in tubing
      - Freely draining to collection chamber
    - Pleural
      - Breathing pattern, quality, symmetry
      - Signs of tension pneumothorax:
        - « Hypotension
        - « Tachypnea, tachycardia
        - « Respiratory distress
    - Mediastinal
      - ECG rhythm (dysrhythmias)
      - Signs of tamponade
        - « Narrowed pulse pressure
        - « Equalization of RA, PAWP, PAd (ICU only)
        - « Pulsus paradoxus >10 mmHg
        - « Tachycardia, tachypnea
  2. Assess upon initial insertion, admission/transfer and a minimum of every 8 hours (ICU: every 4 hours)
    - Pleural:
      - Breath sounds in all lung fields
      - Signs of tension pneumothorax: Unilaterally diminished or absent breath sounds
      - Presence of subcutaneous emphysema

- Presence of movement of the leaves of the Heimlich valve with respirations indicating patency (absence of movement indicates clogged Heimlich valve)
- Mediastinal:
  - Muffled heart sounds
  - Presence of friction rub

CHEST TUBE  
MAINTENANCE &  
DRAINAGE:

3. Maintain CT at prescribed parameters:
  - Suction at ordered amount
    - Water seal: refill the suction water level as needed (if using wet suction model)
  - Gravity drainage (Dry/water seal)
    - Leave suction port open to air if suction is discontinued or during transport
4. Mark drainage chambers at level of drainage after initial insertion and re-mark and record drainage every 8 hours. (Post cardiac surgery, with routine vital signs until chest tubes are removed).
5. Replace drainage system when filled to capacity, use clean technique:
  - First prepare the new drainage system using enclosed sterile water
  - Clamp chest tube with hemostat clamp to prevent entry of air
  - Next, clamp the full drainage system with attached clasp and carefully separate the device from the chest tube
  - Replace with the new drainage system and make sure attachment to the chest tube is secure
  - Discard old drainage system in red bin
6. Keep head of bed elevated 30-45 degrees to promote drainage (unless contraindicated).
7. Keep drainage system below chest level at all times, and keep tubing above chest drainage system with no dependent loops.
8. Ensure chest tube is patent a minimum of every 4 hours when there is potential for obstruction (e.g. accumulation of blood clot or pus). DO NOT strip chest tube. Manipulate gently (e.g., sequential squeezing or bending) (except NICU).
9. Wrap distal end of Heimlich valve loosely with 4x4 gauze (ensuring that the end is open and not occluded) and secure with tape. Do not occlude the end of the valve (e.g., with tape, tight dressing, glove).
10. Change gauze on distal end of Heimlich valve when soiled.

DRESSING:  
COLLABORATION:

11. Change dressing a minimum of every 72 hours and when soiled.
12. Assess skin integrity at chest tube insertion site (note; any irritation, inflammation, exudate or crepitus).
13. Assure sutures are secure and intact.
14. Collaborate daily with provider regarding:
  - Need for chest x-ray (usually post-insertion and intermittent)
  - Activity level
  - Anticipated discontinuation of suction/CT

PATIENT/  
CAREGIVER  
EDUCATION:

15. Instruct patient to cough and deep breath every 2 hours, and to use incentive spirometer 10 consecutive times every hour while awake.
16. Explain the following:
  - Purpose of CT
  - Precautions to prevent dislodgement/disconnection
  - Report sudden difficulty in breathing
  - Mediastinal CT may be very uncomfortable (request pain medication as needed)

EMERGENCY  
MEASURES:

17. Utilize the following measures in emergency situations and notify provider immediately:
  - **Disconnection:** If chest tube becomes disconnected from drainage system, clean off tubing ends with Chloraprep and reconnect them. Have patient exhale fully or cough several times to rid pleural space of air. If unable to reconnect, hold end of tubing a few cm under surface of sterile H<sub>2</sub>O/NS while new drainage unit is being set-up. Make sure end of tubing is below chest level. Turn on suction after reconnection.

- **Dislodgement:** If CT is pulled out, promptly apply sterile 4 x 4's firmly to chest wound. Tape only on 3 sides to allow for escape of air to prevent a tension pneumothorax.

SPECIMEN  
COLLECTION:

18. Do not aspirate drainage from the drainage collection unit but collect from an aspiration port (preferred) or self-sealing diaphragm or tubing. Most Self-sealing tubing requires that needles used for aspiration be  $\leq 20$  gauge. Utilize sterile technique and clean site with Chloroprep prior to collection of sample.

REPORTABLE  
CONDITIONS:

19. Notify provider immediately for:
  - Pleural/mediastinal:
    - Increase in bleeding
    - Increased drainage (greater than or equal to 100 mL/hr x 2 hr)
    - Bright red bleeding after drainage has been serosanguinous or serous
    - Steady oozing of blood from insertion site
    - Clogged or obstructed CT
    - Significant change in color/amount of drainage
    - Dislodgement
  - Pleural:
    - Significant change in vital signs or breathing pattern
    - New or increasing subcutaneous emphysema
    - Continuous bubbling in Air Leak Meter
    - Presence of air leak
    - Signs of tension pneumothorax
    - Clogged valve (Heimlich only)
  - Mediastinal:
    - Significant change in vital signs, ECG or hemodynamics
    - Signs of tamponade
    - Chest pain

ADDITIONAL  
STANDARDS:

20. Refer to the following as indicated:
  - Oxygen Therapy
  - Pain Management
  - Sedation/Analgesia (IV) – ICU
  - Restraints
21. Refer to Chest Tube Drainage System Set-Up, Maintenance & Troubleshooting Procedure

DOCUMENTA-  
TION:

22. Document in accordance with documentation standards.
23. Document in iView on Systems Assessment Navigator Band, customize add Chest tube, add dynamic group, label accordingly.

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