PURPOSE:
To evacuate air or fluid from the pleural space to allow full expansion of the lungs.

CONSIDERATIONS:
1. The chest tube dressing must remain occlusive to prevent the possible introduction of air or microorganisms into the pleural space.
2. The drainage collection system should be positioned below the level of the patient. The collection tube should remain free of kinks or loops.
3. There should be two shod clamps and two 3x9 petroleum gauze packages within close proximity to the patient at all times.
4. Observe the collection chamber to monitor volume, rate and character of drainage. Little or no drainage may indicate:
   a. There is no fluid in the pleural space to drain (e.g. tube placement for pneumothorax only).
   b. The tube is occluded or kinked.
5. DO NOT routinely strip or milk tubes. If a tube appears occluded, gently milk no more than 12 inches of the tube at a time in the area that appears occluded.
6. If suction is being used:
   a. Assess water level in the suction chamber.
   b. Fill suction control chamber, as needed, to appropriate level for amount of suction ordered.
   c. Ensure “gentle” bubbling is present. Too much bubbling will cause water to evaporate quickly. Not enough bubbling will not provide adequate suction.
7. If no suction is ordered suction tubing must be disconnected from the suction machine.
8. Observe water seal chamber for tidaling and bubbling.
   a. Tidaling is the normal rise and fall of fluid in the water seal chamber due to change in intrathoracic pressure. The water seal column moves up with inspiration and down with expiration. Tidaling will be absent when:
      (1) The lung is re-expanded.
      (2) The tube is occluded.
      (3) Suction is applied. (To observe tidaling when suction used, temporarily disconnect the suction.)
   b. Bubbling indicates that there is a system air leak, a leak around the chest tube insertion or continuing pneumothorax.
   c. An increase in or development of new bubbling in the patient’s chest should be reported to the physician.
   d. Bubbling will slowly disappear as the lung re-expands and any existing leak stops.
   e. An absence of bubbling may indicate that the lung is re-expanded or that the tubing is occluded. If occlusion is suspected, gently milk the tubing at the suspected occlusion site.
9. See table at end of procedure for trouble shooting guide.
10. Instruct the patient/caregiver in management of a disconnected chest tube:
    a. If the tube pulls completely out of the insertion site, immediately cover with your hand until you can apply the petrolatum-impregnated gauze dressing. DO NOT permit the opening to remain exposed. Call 911.
    b. If the tube disconnects at another site, such as the connection to the drainage system tubing or to the drainage system collection unit, immediately reconnect tubing and notify physician.

EQUIPMENT:
Personal protective equipment
Antimicrobial wipes
Gloves
Sterile gauze, 3x3, 4x4 and split gauze pads
Petrolatum-impregnated gauze dressing
Liquid skin barrier (optional)
Tape (adhesive, silk or transparent - NOT paper)
Chest tube drainage collection system
Chest tube shod clamps; 2 clamps for each chest tube
Sterile normal saline and/or sterile water
Water-proof trash bag

PROCEDURE:
1. Adhere to Standard Precautions.
2. Explain the procedure to the patient.
3. Assemble equipment in a clean and conveniently located work area.
4. Perform patient assessment per standard policy and procedure with particular attention to cardiopulmonary status and patient tolerance of the chest tube.
5. Notify the physician regarding abnormal findings or deviations from the patient baseline status and concerns or problems with patient tolerance of the chest tube.
6. Place the patient in a supine position and uncover the chest to expose the catheter.
7. Aseptically open 1 or 2 packages of sterile split gauze.
8. Cut 3 or 4 (6 inches long x 2 inches wide) pieces of tape.
9. Wash hands and don gloves.
10. Remove and dispose of old dressing and tape from tube and site.
11. Wash hands and change gloves.
12. Cleanse site with antimicrobial wipe, moving from the center outward in circular area. Allow the area to air dry.
13. Apply a liquid skin barrier to prevent skin breakdown and to secure the dressing, if needed.
14. Apply new petrolatum gauze firmly around the chest tube insertion site to prevent air from entering the chest.
15. Apply dry gauze dressing over the tube site.
16. Apply tape, overlapping the edges slightly, to form an occlusive dressing. Be sure to completely encase the chest tube dressing and the chest tube with tape. Make sure there is no tunneling where the chest tube exits the dressing. A separate piece of tape may be needed to seal the tunnel from below.
17. Secure the connection between the chest tube and connecting tubing to the drainage system tightly, using SPIRAL TAPING at all connections, so that the site is not obscured by tape. The 5-in-1 connectors should remain accessible.
18. Tape the chest tube to the patient's chest or abdomen to prevent pulling as the patient moves. (Use the hinge-tape method; pinch the tape together under the chest tube before taping it to the patient. This prevents the chest tube from slipping through the tape and allows much stronger resistance to applied forces.)
19. Assess the water seal for bubbling. If bubbling present, locate the source of the air leak:
   a. Clamp chest tube close to patient.
   b. If bubbling stops, source of air leak is above clamp, (i.e. at the tube insertion site or inside patient's pleural space).
   c. Remove clamp and apply pressure to skin around chest tube. If bubbling stops, leak is at insertion site around tube.
   d. Apply petroleum gauze to insertion site and occlusive dressing to stop leak.
   e. If bubbling continues with pressure to skin or petroleum gauze around insertion site, leak is most likely inside patient's chest.
   f. If bubbling persists when clamped close to patient, move clamp down tube at intervals above and below connections toward the drainage collection system.
   g. When bubbling stops, the leak is at the connection just above the clamp. Tighten and tape leaky connections.
   h. If bubbling persists when clamped just above the chest drainage container, the container is cracked or broken. Replace the drainage collection system.
20. Evaluate the need to change the drainage bottle or collection system and perform set-up procedure per manufacturer's instructions. If suction is being used, fill the suction chamber to the level ordered by the physician; usually 20 mL H₂O.
   c. Remove the tape from the 5-in-1 connector.
   d. Clamp The Chest Tube Close To The Patient And Just Proximal To The 5-In-1 Connector.
   e. Disconnect the chest tube from the 5-in-1 connector and connect the new chest tube drainage system tubing.
   f. Tighten the connection and secure it with spiral wrapped tape.
   g. Remove the clamps.
22. Provide patient comfort measures.
23. Clean and replace equipment.
24. Discard soiled supplies in appropriate containers.

AFTER CARE:
1. Document in the patient's record:
   a. The procedure and patient's tolerance of the procedure.
   b. Patency of the chest tube.
   c. Presence and absence of bubbling in the water seal chamber or air evacuation from Heimlich valve patency (sounds like flatus or a duck quack).
   d. Volume and characteristics of fluid drainage in the chest tube system or on the dressing.
   e. Amount of suction in suction control chamber.
   f. Presence/absence of fluctuation in water seal chamber with the patient's inspiration (tidaling).
   g. Cardiopulmonary assessment, including the rate, rhythm, effort, depth and pattern of breathing, percussion notes and auscultation findings in all fields.
   h. Safety measures, such as clamps and petroleum gauze at bedside, intactness of dressing and taped connections, and any adverse events such as incidental disconnection.
   i. Instructions given to patient/caregiver, compliance with procedures and ability to perform/repeat instructions accurately
      TIDALING
   j. Tidaling is the rise and fall of fluid in the water seal tube chamber, which is a direct reflection of the degree of lung re-expansion. Tidaling decreases as the lung re-expands. In order to observe tidaling when suction is used, suction may be temporarily disconnected. Tidaling occurs with respiration and is a sign that all is well.
### Assessment and Management of Air Leak

<table>
<thead>
<tr>
<th>Water Seal Tube</th>
<th>Under-water Seal Bottle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes Tidaling</td>
<td>Yes Bubbling</td>
<td>Indicates patient air leak exists and lungs are not re-expanded. The greater the degree of bubbling and tidaling, the greater the extent of air leak (pneumothorax) and the greater the degree of lung collapse.</td>
</tr>
<tr>
<td>No Tidaling</td>
<td>No Bubbling</td>
<td>Indicates resolution of air leak and lung re-expansion (slight tidaling may be seen). Be sure patient collection tubes are not kinked or obstructed; verify re-expansion.</td>
</tr>
<tr>
<td>No Tidaling</td>
<td>Yes Bubbling</td>
<td>Indicates a possible connection or system air leak. Momentarily pinch off the thoracic catheters. If bubbling continues, a connection leak exists. Secure and tape all connections.</td>
</tr>
<tr>
<td>Yes Tidaling</td>
<td>No Bubbling</td>
<td>Can be observed with partial or total pneumonectomy and disease states associated with decreased lung compliance (stiff lungs).</td>
</tr>
</tbody>
</table>