HEALTH SERVICES

NURSING PROCEDURE

TITLE: CHEST TUBE

A. Assisting with Insertion
B. Assessment and Maintenance
C. Transport of Patients with Chest Tubes
D. Dressing Change
E. Replacing Chest Drainage Collection System
F. Obtaining a Pleural Fluid Sample
G. Attaching a Heimlich Valve
H. Removal: Accidental or Physician

CATEGORY:

RN – General
LPN – General (except clamping of chest tube)

PURPOSE

- To drain air, blood or fluid from the pleural space or thoracic cavity.
- To restore negative pressure in the pleural space resulting in re-expansion of the lung.

NOTE: A mediastinal tube differs from a chest tube as it is placed in the mediastinal space, primarily after open heart surgery to drain blood or fluid.

NURSING ALERT:

- Aseptic technique must be maintained when preparing and handling equipment.

A. ASSISTING WITH INSERTION

EQUIPMENT

1. Personal protective equipment (PPE)
2. Chest drainage system
3. Wall suction gauge
4. Disposable Hydrophilic Suction Filter special order # 6730-0350-800 from supplier AMVEX
5. Clear plastic suction tubing
6. Line Insertion tray
7. Chest Tube according to physician’s order  
   *i.e. size range: Adult #16 - #32 French; Pediatric #10 - #12 French*
8. Two rubber-tipped covered forceps
9. Sterile gloves
10. Sterile physician gown
11. Sterile drapes
12. Vial of local anesthetic (local anesthetic without epinephrine may be preferred for neonates)
13. Chlorhexidine 2% with 70% alcohol (ChloraPrep®) (10.5 mL)
14. Sutures - 2.0 or 3.0 silk
15. #11 scalpel blade
16. Sterile 4 X 4 gauze pads
17. Sterile 4 x 4 pre-slit gauze pads
18. Wide tape (i.e. soft cotton tape)
19. Water-proof tape for connections

PROCEDURE

1. Collect equipment and prepare chest drainage system according to manufacturer’s instruction  
   (see Appendix 3).
   1.1 Fill water seal chamber up to 2 cm line by adding 45 mL of sterile water from  
   prepackaged syringe provided. Add sterile water via suction port located on top of  
   drain.

NOTE: Water will turn blue.

* Image taken from “Managing Chest Drainage” Manual from Atrium Medical Corporation
2. Explain procedure to patient.
3. Don PPE.
4. Assess and document baseline vital signs and breath sounds.
5. Administer analgesia prior to insertion, when possible.
6. Position patient as directed by physician (sitting up, leaning over a bed table, or lying on unaffected side).
7. Open sterile insertion tray and add cleansing agent, chest tube and suture to tray.
8. Provide local anesthetic vial for physician to access.
9. Reassure and support patient during procedure.

**NOTE:** Observe patient's color, pulse and respirations throughout procedure.

10. Attach drainage system to chest tube when directed by physician.

**NOTE:** Connections from chest tube to drainage tubing must be secured with waterproof tape wrapped in a spiral fashion extending 5 cm on each side of connection.

11. Tape all tubing connections at chest tube to chest drain unit securely with water-proof tape.

**NOTE:** Never tape the locking in-line tube connector (see image in Section E, point 5).

12. Initiate suction as ordered:
   12.1 Attach suction filter to wall suction gauge if not already attached.
   12.2 Attach continuous suction line to suction filter.
   12.3 Attach continuous suction line-to suction port on chest drainage system.
NURSING ALERT:

- **DO NOT** directly connect chest drainage system to wall suction.
- **MUST ALWAYS** be connected to a drainage system (gravity bag, Heimlich valve or dry suction water seal).
- **MUST** have a suction filter between suction gauge and continuous suction line.

12.4 Adjust rotary dry suction control dial on drainage system to level of suction as ordered by physician.

* Image taken from “Managing Chest Drainage” Manual from Atrium Medical Corporation

**NOTE:** Oasis dry suction water seal chest drainage system is pre-set at -20 cm of H₂O (can be adjusted between -10 cm H₂O and -40 cm H₂O by turning dial up or down to appropriate selection).

**NOTE:** Set continuous wall suction vacuum pressure to a minimum -80 mmHg.

**NOTE:** For multiple chest tubes connected to a single suction source, wall suction gauge should be greater than -80 mmHg.
13. Monitor suction bellow (window E) to ensure bellow is expanded.

**NOTE:** For -20 cm H₂O or higher:
- Bellows should be expanded to delta mark (Δ) or beyond to confirm proper suction. If bellows is observed to be expanded, but less than delta mark, wall suction must be increased to -80 mmHg or higher.

For less than -20 cm H₂O:
- Any observed bellows expansion across monitor window will confirm suction operation.

* Image taken from “Managing Chest Drainage” Manual from Atrium Medical Corporation

14. Apply dressing around chest tube at insertion site.
   14.1 Apply sterile pre slit gauze pads in opposing directions around chest tube.
   14.2 Apply 4 x 4 gauze pad on top.
   14.3 Secure dressing using wide tape, ensuring chest tube is not kinked at site.
   14.4 Tape chest tube to chest wall below dressing.

* Image taken from “AACN procedural manual for high acuity, progressive, and critical care” (2017)

**NOTE:** In some situations (i.e. traumas, neonates), elastoplast tape may be used to help secure the chest tube.

**NOTE:** Do not use waterproof tape on skin as it leads to skin breakdown.
NOTE: If an air leak is noted at insertion site, sterile petroleum gauze may be wrapped around site, document and report findings and action to physician. Petroleum gauze should not be used routinely because it can macerate skin.

NOTE: A chest x-ray following the procedure should be ordered by physician.

15. Document chest tube size, insertion site, drainage and patient’s response.

B. ASSESSMENT AND MAINTENANCE

NOTE: See Appendix 3 for troubleshooting.

NURSING ALERT:

- Ensure that tubing is never kinked or looped.
- Ensure connection between chest tube and drainage tubing are securely taped with waterproof tape in a spiral fashion, extending 5 cm on either side of connection.
- Never tape in-line connector (see picture in section E, step 5). Doing so would increase risk of tube disconnection.
- Always keep chest drainage system upright and below the level of patient’s chest.
- Do not clamp chest tube during transport (i.e. to X-ray department), unless ordered by physician.
- Never clamp chest tube for more than one minute unless specifically ordered by physician.
- Ensure a container of sterile water is at bedside. In case of disconnection, rapidly prepare and attach new drainage system while submerging distal end of chest tube in sterile water.
- If there are visible clots in tubing, obtain a physician’s order to gently “milk” chest tube. Starting at proximal end, gently squeeze and release chest tube between your fingers along length of tubing.
- Never “strip” chest tube, which means squeezing length of tube without releasing it.
- Milk chest tube only as directed by physician.
- Neonatal patients with a chest tube may lay supine and must be on continuous oxygen saturation monitoring.

1. Assess and document respiratory status and patient drainage for amount and color every 30 minutes for first 4 hours; then every 4 hours and prn.

2. Assess and document every four hours and prn, including:
   - respiratory status, i.e. color, respiratory rate, depth, rhythm, use of accessory muscles, $O_2$ saturation, chest sounds.
   - level of discomfort.
   - chest tubing is free of kinks, dependent loops, or air leaks.
   - connection of chest tube to drainage tubing must be secured with waterproof tape. Tape should be wrapped in a spiral fashion extending 5 cm on each side of connection. (Refer to procedure section Step 11 for correct technique).
   - tidaling and bubbling are present in water seal chamber (refer to Appendix 1).
3. Assess and document every shift and prn:
   • dressing to ensure that it is dry and intact and that no air leaks exist at site.
   • insertion site to ensure that it is free of signs of infection, inflammation or subcutaneous emphysema.

4. Ensure suction control dial is set at level ordered by physician.

5. Ensure bellows are expanded appropriately (see section A, step 13). Adjust wall suction as required.

6. Administer analgesia according to patient’s self-assessment of pain.

7. Measure and document patient drainage at end of shift and prn.
   7.1 Place container upright on floor.
   7.2 Mark and date drainage, at eye level, on collection chamber.
   7.3 Record.

8. Alert physician if drainage greater than:
   • Adult – 100 mL per hour
   • Pediatric: 3 mL/Kg/hour in a 3 hour period or 5 to 10 mL/Kg in any 1 hour period.

C. TRANSPORT OF PATIENTS WITH A CHEST TUBE

<table>
<thead>
<tr>
<th>NURSING ALERT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Adult patients with a chest tube who are stable may be transported without being accompanied by a nurse. Nurse must assess that patient is being transported safely. Transport by stretcher may be indicated.</td>
</tr>
<tr>
<td>● Pediatric and neonatal patients with a chest tube must be accompanied by a nurse.</td>
</tr>
<tr>
<td>● Patients may have a physician’s order that indicates they must stay on suction at all times. In this case, do not disconnect suction for tests without checking with physician.</td>
</tr>
</tbody>
</table>

1. Disconnect patient from suction (if permitted).

2. Check all connections to ensure they are securely taped.

3. Ensure that chest tube drainage system is upright and hung securely at a level below patient’s chest.
D. DRESSING CHANGE

NURSING ALERT:

- In adults, chest tube dressing should be changed every other day and prn.
- In pediatric patients, if it is an uncomplicated chest tube insertion site, the dressing should be left as is until it is soiled or lifting. Changed **ONLY** when necessary and with a physician present.
- In neonatal patients, frequency of dressing changes are ordered by physician.

EQUIPMENT

1. PPE
2. Cleaning solution (normal saline)
3. Sterile 4 x 4 gauze pads
4. Sterile 4 X 4 pre-slit gauze pads
5. Sterile dressing set/bundle
6. Wide tape (i.e. soft cotton tape)

PROCEDURE

1. Assemble equipment.
2. Inform patient of procedure and position patient.
3. Wash hands.
4. Don PPE.
5. Remove old dressing, being careful not to dislodge or place tension on chest tube.
6. Note characteristics of drainage, if present.
7. Observe skin and sutures for inflammation.
8. Inspect skin around tube insertion site for redness, edema and signs of subcutaneous emphysema.

NURSING ALERT:

- Signs of subcutaneous emphysema are swelling, crepitus of upper torso, arms or face. Crackling around chest tube will be felt on palpation and heard on auscultation.
- If these signs are present, notify physician.
9. Cleanse site using normal saline.

10. Apply sterile 4 x 4 pre-slit gauze pads in opposing directions around chest tube.

11. Apply 4 x 4 gauze pads on top.

12. Secure dressing using wide tape, ensuring chest tube is not kinked.

**NOTE:** Avoid using waterproof tape to secure dressing, as this leads to skin breakdown.

13. Tape chest tube to chest wall below dressing using soft cloth tape to prevent tension from being applied to chest tube site.

14. Check drainage tube to eliminate any kinks or dependent loops that may impair drainage.


16. Notify physician of any abnormal findings.

**E. REPLACING CHEST DRAINAGE COLLECTION SYSTEM**

**EQUIPMENT**

1. PPE
2. Chest drainage collection system
3. Rubber-tipped forceps

**PROCEDURE**

1. Explain procedure to patient.

2. Don PPE.
3. Prepare new chest drainage collection system as per procedure (see Appendix 3).

4. Clamp chest tube close to chest wall.

**NURSING ALERT:**
- Clamp chest tube close to chest wall just prior to changing collection chamber.
- Clamping should not exceed one minute.

5. Remove tubing from new unit, clamp it using blue clamp provided and attach it to old unit.

**NOTE:** This prevents accidental spill or body fluid exposure.

6. Disconnect and remove existing chest drainage collection system at locking in-line tube connector.

7. Attach new drainage collection system at locking in-line tube connection.

**NURSING ALERT:**
- Never tape in-line tube connection. Doing so may increase risk for tube disconnection.

8. Unclamp chest tube.


F. OBTAINING A PLEURAL FLUID SAMPLE

EQUIPMENT

1. PPE
2. Alcohol swab
3. 12 cc luer lock syringe
4. Collection tubes or containers as directed by lab manual or lab personnel

PROCEDURE

1. Assemble equipment.
2. Gather appropriate collection tubes or containers.

NOTE: Refer to lab manual or call lab.
3. Explain procedure to patient.
4. Don PPE.
5. Alcohol swab luer lock port of chest drainage collection system. Let air dry.
6. Attach luer lock syringe and pull back on plunger to obtain sample.
7. Fill appropriate collection tube or container with required amount.
8. Label each collection tube or container with patient’s name, MRN#, date of birth, date and time of specimen collection.
9. Send specimen along with appropriate requisition to lab as per unit protocol.

G. ATTACHING A HEIMLICH VALVE

NOTE: A Heimlich valve may be attached to a large bore chest tube or a small bore pleural tube. The following procedure is for the large bore chest tube.

EQUIPMENT

1. PPE
2. Alcohol swab
3. 2 rubber tipped forceps
4. Vinyl connecting tube with adaptive ends (SPD#310480)
5. Heimlich valve
6. Waterproof tape
7. Soft cloth tape or 2" wide silk tape
PROCEDURE

1. Assemble equipment.
2. Explain procedure to patient.
3. Don PPE.
4. Remove tape, gently loosen, but do not disconnect tubing.
5. Place 2 rubber-tipped forceps on chest tube from either direction as close to patient as possible.
6. Disconnect existing tubing.
7. Connect Heimlich valve to chest tube.

**NOTE:** It may be necessary to cut beveled edge of chest tube to obtain a secure connection to Heimlich valve.

NURSING ALERT:

- The arrow indicating air flow direction located on Heimlich Valve **MUST** point **AWAY FROM** patient and blue end **MUST** be closest to patient. Failure to do so would cause a one-way valve allowing air to enter and not exit pleural space creating potential for a tension pneumothorax.

Clear end left open to release air.  
Blue end attaches to chest tubes or pleural tube.
8. Unclamp chest tube.


10. Secure Heimlich valve to chest wall using soft cloth tape.

11. Assess and document Heimlich valve function and respiratory status q4h and prn.

   **NOTE:** Fluid may plug Heimlich valve. Observe Heimlich Valve leaflets for movement with expiration (get patient to cough). If leaflets do not flutter, assume it is plugged and change valve as needed. Notify Physician.


**H. REMOVAL: ACCIDENTAL OR PHYSICIAN**

**ACCIDENTAL REMOVAL**

1. Apply gauze pad over exposed insertion site immediately and tape on three sides only.

   **NURSING ALERT:**

   - Do not tape on all 4 sides. Air will not have an escape route therefore causing risk for tension pneumothorax.

2. Notify physician immediately.


4. Assess patient for signs and symptoms of tension pneumothorax.

   **NURSING ALERT:**

   - Signs and symptoms of tension pneumothorax are: Shortness of breath, diaphoresis, tracheal shift, hypotension and other signs of shock.
   - If these symptoms are present remove above dressing and call physician immediately.
PHYSICIAN REMOVAL

NURSING ALERT:

- Chest tubes are not removed by an RN. Only small bore pleural tubes may be removed by R.N.’s certified in that procedure. Refer to Procedure P.1.

EQUIPMENT

1. PPE
2. Disposable protective pad (SPD # 310696)
3. Sterile single use petroleum jelly packet
4. Sterile 4 x 4 gauze pads
5. Wide tape (i.e. soft cloth tape)
6. Stitch cutter
7. Sterile gloves
8. Sterile dressing set/dressing bundle
9. Normal Saline

PROCEDURE

1. Administer prescribed pain medication 30 minutes before procedure, if possible.
2. Ensure procedure has been explained to patient.
3. Don PPE.
4. Assist patient into a semi-fowler’s position, or onto their unaffected side, with disposable protective pad underneath patient.
5. Discontinue suction if applicable.
6. Remove old dressing, observe site and note any drainage.
7. Cleanse around chest tube with Normal Saline.

NOTE: Physician may instruct patient to perform Valsalva maneuver to help prevent air from entering pleural cavity.

If patient is pediatric and cannot take a deep breath and hold it, instruct child to yell loudly while physician pulls out chest tube.

8. Apply occlusive dressing following removal of tube by physician.
   8.1 Apply sterile petroleum jelly to 4x4 gauze.
   8.2 Apply 4x4 gauze with petroleum jelly to insertion site.
   8.3 Apply wide tape over 4x4 gauze.
NOTE: Some Physicians use a “purse-string suture” which is a suture that circles around chest tube under skin and is pulled tight when chest tube is removed to close insertion site. If a purse-string suture is used, an occlusive dressing may not be required. Physician will instruct you of their preference.


10. Clamp tubing and leave system intact.

11. Discard supplies following hospital protocol.

12. Check with physician whether chest x-ray is required following removal of chest tube.

13. Continue to assess patient for signs of respiratory distress q30 minutes for 1 hour or prn.

14. Maintain dressing over insertion site for 48 hours.
REFERENCES


Revised by: Denise Hextall, Stephen Selinger, Teresa Vall, Chris Cave, CNE’s RQHR
Date: January 2013

Revised by: Angela Payne, Crystal Sommers, Carey Sims, CNE’s RQHR
Date: October 2017

Approved by:
Date: Dec 6/17

Regina Qu’Appelle Health Region
Health Services
Nursing Procedure Committee

Approved: December 6, 2017
Page 16 of 21
APPENDIX 1

ASSESSING TIDALING AND BUBBLING / AIR LEAK

Tidaling
- Rise and fall of fluid in the water seal column (window B).
- Degree of tidaling is directly related to extent of lung collapse.

Is there tidaling in water seal column (window B)?

YES

Document and report

NO

Are any of the following true?
- Tubing is kinked
- Tubing is clamped
- Patient is lying on the tubing
- There is a fluid-filled portion of tubing that is not allowing air to escape.

YES

Fix problem if appropriate

NO

Could indicate lung re-expansion has been obtained
Air Leak

- Bubbling in water seal (window C).
  - Air leak bubbling can range from 1 (low) to 5 (high).
- Shortly after chest tube is inserted, bubbling should stop as long as no other air is entering closed chest tube system.

How to Identify an Air Leak:

- Using rubber tipped hemostats, clamp tube where it leaves dressing.
  - If bubbling stops, leak is likely from lung. Document and report to physician.
  - Leak may be due to a displaced chest tube. Take down dressing and inspect for any eyelet of the chest tube outside of chest cavity.
  - Leak may be from insertion site. Apply a petroleum gauze around tube, directly over insertion site to obtain occlusive seal. Document and report to physician.

- If bubbling continues, place clamp on patient side of connector between chest tube and chest drainage collection system tubing.
  - If bubbling stops, leak is between patient and clamp. Document and report to physician.

- If bubbling continues, place clamp on other side of connector.
  - If bubbling stops, leak is likely from connector. Ensure tubing is connected tightly on each side of connector, and push together as tight as possible. Check to see if bubbling stops. May need to replace connector.
  - If bubbling continues, leak may be coming from a hole in chest drainage collection system tubing. Inspect tubing and replace chest drainage collection system if necessary.
  - If bubbling does not stop after you have clamped at intervals all the way down tubing, drainage unit may be cracked and may need to be replaced.

NOTE: If the client has 2 chest tubes that are Y’d together, it may be necessary to assess each tube individually.

Is there a bubbling in water seal?

YES

Does the bubbling occur intermittently and correspond with respirations?

YES

NO

Suspect an air leak. Try to identify source.

Document and Report

Document and Report

Suspect an air leak. Try to identify source.
APPENDIX 2: Operation and Troubleshooting

What To Check During System Operation

- Verifying Suction Operation Via The Suction Monitor Bellows
  The bellows located in the suction monitor will expand only when suction is operating. The monitor bellows will not expand when suction is not operating or disconnected. The calibrated mark allows quick and easy confirmation of vacuum operation over a wide range of continuously adjustable suction control settings.

- Changing Suction Pressures
  Suction regulator is preset to -20cmH₂O and can be adjusted from -60cmH₂O to -40cmH₂O. To change suction setting, adjust rotary suction regulator dial located on the side of the drain. Dial down to lower suction pressure and dial up to increase suction pressure.

- Verifying Water Seal Operation
  This water seal must be filled and maintained at the 2cm level to ensure proper operation and should be checked regularly when used for extended periods. As required, additional water may be added by a 20 gauge or smaller needle and syringe via the grommet located on the back. Fill to the 2cm line.

- Recording Drainage Volume
  The collection chamber incorporates a writing surface with easy-to-read fluid level graduations. Please refer to individual product inserts for specific model calibrations.

- Observing Water Seal For Patient Air Leaks
  Abru offers superior air leak detection with rapid air leak assessment and improved visibility due to the tinted water. When air bubbles are observed going from right to left in the air leak monitor, this will confirm a patient air leak.

- Continuous Bubbling
  Continuous bubbling in the bottom of the water seal air leak monitor will confirm a persistent air leak.

- Intermittent Bubbling
  Intermittent bubbling in the air leak monitor with float ball oscillation will confirm the presence of an intermittent air leak. No bubbling with minimal float ball oscillation at bottom of the water seal will indicate no air leak is present.

- Graduated Air Leak Monitor
  For those models with a graduated air leak monitor, air leak bubbling can range from 1 (low) to 5 (high). Air bubbles create an easy to follow air leak pattern for monitoring patient air leak trends.

- Manual High Negativity Vent
  To manually vent the system of high negative pressure, depress the filtered manual vent located on top of the drain until bubbling occurs in the air leak monitor.

- High Negativity Float Valve
  Abru's high negativity float valve, with its controlled release action, enables any thoracic patient to draw as much intrathoracic pressure as required during each respiratory cycle. During prolonged episodes of extreme negative pressure, Abru's controlled release system will automatically relieve excess vacuum to a lower, more desirable pressure level.

- Observing Calibrated Water Seal Column For Changes In Patient Pressures
  Patient pressure can be determined by observing the level of the blue water and small float ball in the calibrated water seal column. With suction operating, patient pressure will equal the suction control setting plus the calibrated water seal column level. For gravity drainage (no suction) patient pressure will equal the calibrated water seal column level only.

Have a question or need help in a hurry?
Call Abru toll free at 1-800-528-7486.
What To Check During System Operation

**Positive Pressure Protection**

Atrium’s positive pressure valve, located on top of drain, opens instantly to release accumulated positive pressure. Do not obstruct the positive pressure valve.

**Sampling Patient Drainage**

Sampling of patient drainage must be in accordance with approved hospital infection control standards. Selected models include a needleless luer port on the patient tube connector for sampling patient drainage. Alcohol swab the luer port prior to syringe attachment (no needle). Fluid samples can also be taken directly from the patient tube by forming a temporary dependent loop and inserting a 20 gauge needle at an oblique angle. Alcohol swab the patient tube prior to inserting syringe at a shallow angle. Do not puncture patient tube with an 18 gauge or larger needle.

**System Disconnection**

For models equipped with an in-line connector, close the patient tube slide clamp prior to disconnecting the chest drain patient tube from patient. Clamp off all indwelling thoracic catheters prior to disconnecting chest drain from patient.

Troubleshooting

**Q** How do I determine patient pressure with a dry suction chest drain?

**A** Whether using a traditional wet or dry suction system, one cannot overemphasize the importance of the calibrated water seal column when it comes to diagnosing the patient's condition or monitoring normal system operation. Patient pressure can be determined by observing the level of the blue water and small float ball in the calibrated water seal column. With suction operating and the bellows expanded across the suction monitor window, patient pressure will equal the suction control setting (read directly from the regulator dial) plus the calibrated water seal column level. For example, when the suction monitor bellows is expanded to the ▲ mark or beyond to confirm a −20cmH₂O suction setting, and the calibrated water seal column reads −15cmH₂O, patient pressure is −35cmH₂O (−20cmH₂O + −15cmH₂O = −35cmH₂O). For gravity drainage (no suction) patient pressure will equal the calibrated water seal column only.

**Q** What should I do when the bellows is not expanded to the ▲ mark when the regulator is set at −20cmH₂O or higher?

**A** The position of the bellows across the suction monitor window will alert the operator that the suction source has fallen below the minimum operating range for the prescribed suction control setting. Simply increase the vacuum source to −80mmHg or higher. The suction monitor bellows must expand to the ▲ mark or beyond for a −20cmH₂O or higher suction regulator setting.

**Q** What should I do when the bellows does not fully expand to the ▲ mark after I increase the suction source vacuum?

**A** Dry suction chest drains require higher levels of vacuum pressure and air flow from the suction source to operate efficiently at each suction control setting as compared to traditional water controlled operating systems. The suction source should provide a minimum vacuum pressure of −80mmHg at 20 liters of air flow per minute for chest drain operating efficiency at a suction control setting of −20cmH₂O. The suction source should be greater than −80mmHg when multiple chest drains are connected to a single suction source. If the bellows does not fully expand to the ▲ mark, it maybe be that the suction source is not functioning to its full potential to provide the minimum vacuum pressure or air flow required to "drive" the suction control regulator. Additionally, conditions may exist that can reduce, or "restrict" air flow from the suction source. A restrictor clamp, connector, or kink in the suction line tubing can potentially "starve" the chest drain of air flow. A leak in a connection or wall canister, along with excessive lengths of suction tubing can also reduce air flow to the unit.

To troubleshoot this situation, first check to be sure that all connections are air-tight. Inspect the suction tubing and connections for possible cracks, leaks, kinks, or occlusion. You may need to simply bypass a “leaky” wall canister. Try connecting the chest drain to a different suction source or wall regulator. When multiple chest drains are “Y” connected to a single suction source, it possible, reconnect the drains to separate suction sources. Finally, replace the chest drain if you suspect the unit is cracked or damaged.

**Q** Does the bellows need to expand beyond the ▲ mark for a −10cmH₂O regulator setting?

**A** No. For a regulator setting less than −20cmH₂O suction (−10cmH₂O), any observed bellows expansion across the monitor window will confirm suction operation. The bellows need not be expanded to the ▲ mark for suction pressures less than −20cmH₂O, just visibly expanded to confirm suction operation.

**Q** How do I confirm my patient has an air leak when there is:

**A** No bubbling in the water seal?

If there are no air bubbles observed going from right to left in the air leak monitor, there is no patient air leak. In order to confirm that your patient’s chest catheter is patent, temporarily turn suction off and check for oscillation of the patient pressure float ball in the water seal column coinciding with patient respiration.

Bubbling present in the water seal?

Whenever constant or intermittent bubbling is present in the water seal air leak monitor, this will confirm an air leak is present. Oscillation of the patient pressure, float ball at the bottom of the water seal without bubbling will indicate no apparent air leak. Bubbling from right to left must be present to confirm an air leak. To determine the source of the air leak (patient or catheter connection), momentarily clamp the patient tube close to the chest drain and observe the water seal. If bubbling stops, the air leak may be from the catheter connections or the patient’s chest. Check the catheter connectors and patient dressing for a partially withdrawn catheter. If bubbling continues after temporarily clamping the patient tube, this will indicate a system air leak requiring system replacement.
APPENDIX 3: Set-up

SET UP

Step 1. Fill Water Seal to 2cm Line
Add 45ml of sterile water or sterile saline via the blue suction port located on top of the drain. A pre-packaged water ampoule is provided on the back of each Oasis drain (illustration 1).

Twist top off the ampoule and insert tip into suction port (Illustration 2). Squeeze contents into water seal until fluid reaches 2cm fill line.

Step 2. Connect Patient Tube to Patient
Connect chest drain to patient prior to initiating suction.

Step 3. Connect Suction to Chest Drain
Attach suction line to blue suction port on top of chest drain (Illustration 3).

Step 4. Turn Suction Source On
Increase suction source vacuum to >-80mmHg or higher. Suction regulator is preset to -20cmH2O. Adjust as required.

100% Latex-Free  100% MRI Compatible