Managing a Chest Tube and Drainage System

RAJARAMAN DURAI, MD, MRCS; **HAPPY HOQUE,** FRCS; **TONY W. DAVIES,** FRCS

1.3 CE

ABSTRACT

Intercostal drainage tubes (ie, chest tubes) are inserted to drain the pleural cavity of air, blood, pus, or lymph. The water-seal container connected to the chest tube allows one-way movement of air and liquid from the pleural cavity. The container should not be changed unless it is full, and the chest tube should not be clamped unnecessarily. After a chest tube is inserted, a nurse trained in chest-tube management is responsible for managing the chest tube and drainage system. This entails monitoring the chest-tube position, controlling fluid evacuation, identifying when to change or empty the containers, and caring for the tube and drainage system during patient transport. This article provides an overview of indications, insertion techniques, and management of chest tubes. *AORN J* 91 (February 2010) 275-280. © AORN, Inc, 2010

Key words: intercostal drainage tube, chest tube, water-seal drainage, pneumothorax, hemothorax, pyothorax, chylothorax, pleural effusion.

A 70-year-old woman was admitted to the hospital with breathing difficulty six weeks after undergoing a gastrectomy for stomach cancer. The physician ordered a chest x-ray, which showed a pleural effusion (ie, excess fluid in the pleural cavity) (Figure 1). The physician inserted an intercostal drainage tube (ie, chest tube) to drain the pleural effusion and attached the tube to an underwater seal so that air could not enter the pleural cavity. On the following day, when the surgical team assessed the patient, the surgeon noted that the water-seal chamber was completely empty. A nurse had mistakenly emptied the entire chest-tube container to measure daily output, which is not an indication for emptying a chest-tube-drainage container. Furthermore, the nurse did not then refill the water-seal chamber. The surgeon immediately placed a clamp on the chest tube while the water seal was reinstituted. A chest x-ray was taken and indicated that a pneumothorax had not occurred. The surgeon completed a critical incident report. The nurse responsible for emptying the chest-tube container admitted to not knowing how to formally manage chest tubes.

A variety of drains are used in surgical practice; however, management of these drains is not the same. Closed-suction drains with a vacuum container draw fluid from the wound. Their containers are replaced when they are full or when there is a loss of vacuum. A chest tube and its water-seal

CE indicates that continuing education contact hours are available for this activity. Earn the contact hours by reading this article, reviewing the purpose/goal and objectives, and completing the online examination and learner evaluation at http://www.aornjournal.org/ce. The contact hours for this article expire February 28, 2013.

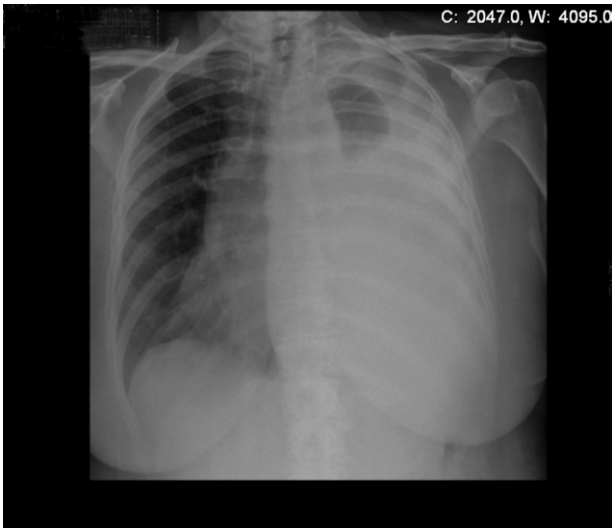

Figure 1. Chest x-ray, showing a pleural effusion on the left side.

container, which is a closed drainage system, requires a different approach. The water-seal chamber allows only one-way movement: air and liquid can escape from the pleural cavity but cannot flow in the reverse direction. Managing a chest tube requires monitoring the chest-tube position and controlling fluid evacuation. The water-seal chamber should not be emptied unless the drainage container is full.

Some health care facilities allow trained nurses to remove chest tubes[1] but not all nurses are familiar with this procedure,[2] and there is not sufficient published research describing the nursing management of chest tubes.[3] This article provides information for nurses about chest tubes and their management.

INDICATIONS FOR A CHEST TUBE

The potential space around the lungs is called the pleural cavity. Under normal conditions, the pleural cavity is maintained by negative pressure, which is important for ensuring lung expansion with deep inspiration. When blood (ie, hemothorax),[4] air (ie, pneumothorax),[5] pus (ie, pyothorax),[6] or lymph (ie, chylothorax)[7] collects in the pleural cavity, negative pressure is lost and lung expansion is restricted. The chest-tube drain allows fluid or air to drain from the pleural cavity. As a result of the negative pressure, however, the air may preferentially enter the pleural cavity, particularly if the size of the chest-wall defect or the chest tube is larger than the size of the trachea.

Whenever the pleural cavity is drained by a chest tube, whether it is for blood, air, pus, or lymph, the tube should be connected to a water-seal drainage container so that air is not inadvertently sucked into the chest. The water-seal drainage container normally is filled with approximately 375 mL of sterile water to the marked level.

In years past, a series of up to three reusable glass bottles were connected to one another and attached to the chest tube. Currently, clear plastic disposable containers are used instead. They consist of either a single chamber with an underwater seal (Figure 2) or a three-chamber container with a

- collection chamber,
- suction chamber, and
- water-seal chamber in the middle (Figure 3).

Chest tubes inserted for treating pneumothorax should not be clamped except for the briefest time possible when the container is being changed or the amount of drainage of a pleural effusion needs to be controlled to prevent re-expansion pulmonary edema.[8] Re-expansion pulmonary edema occurs when a collapsed lung expands rapidly, causing capillary damage that results in unilateral pulmonary edema. A specific care pathway for chest-tube insertion and management may be useful.[9]

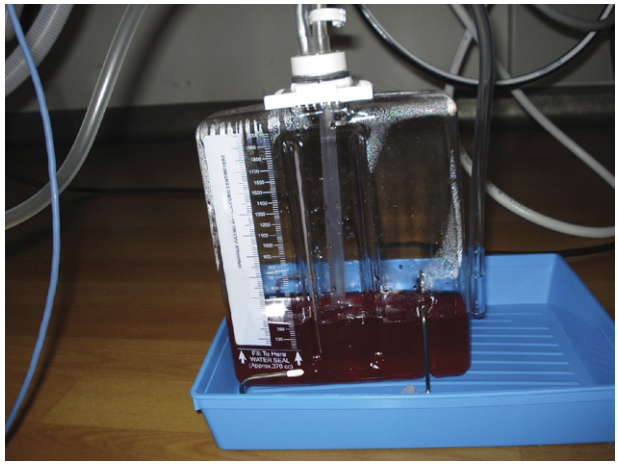

Figure 2. A single-chamber chest-tube drainage container with markings for a basic underwater seal.

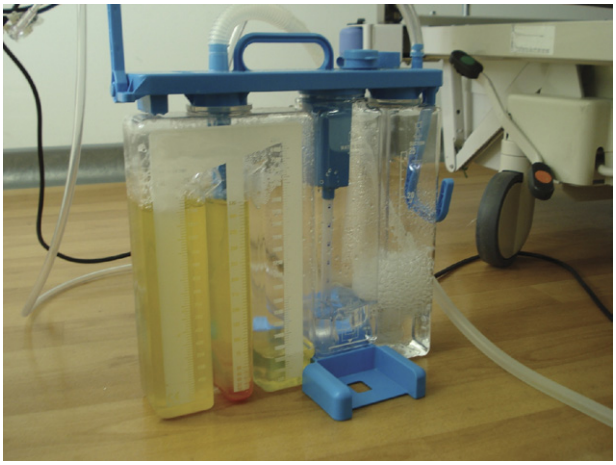

Figure 3. A three-chamber chest-tube drainage container system.

CHEST TUBE INSERTION

A variety of clinicians, such as surgeons, physicians, advance practice nurses (eg, nurse practitioners), and physician assistants, may insert chest tubes. The correct method of inserting a chest tube and appropriate aftercare may shorten the patient's duration of hospitalization.[10]

Typically, a single chest tube is inserted. To drain blood, pus, or lymph from the pleural cavity, the chest tube is inserted at a slightly lower intercostal space (eg, sixth or seventh). To drain air from the pleural cavity, the chest tube may be inserted at a higher intercostal space (eg, second). Sometimes, however, two tubes are inserted: one at a lower intercostal space to drain blood or pus and another at a higher intercostal space to resolve a pneumothorax.

After cleansing the patient's skin, the clinician infiltrates the patient's skin and chest wall with local anesthetic. A common site of insertion, the "safe triangle,"[11] is framed by the anterior border of the latissimus dorsi, the lateral border of the pectoralis major muscle, and a line superior to the horizontal level of the nipple and an apex below the axilla. In this space, the likelihood of damaging any vital structure during insertion is very low. The diaphragm can rise to the fifth rib at the nipple level during expiration, and, thus, chest tubes should be placed above this level to avoid inadvertently damaging abdominal structures. For a large hemothorax with a lot of pleural fluid, the posterior axillary line may be chosen at the seventh or eighth intercostal space. It is relatively safe to insert the tube at a lower space because the large amount of fluid displaces the diaphragm away. Current UK National Patient Safety Agency (NPSA) alert guidelines suggest that inserting chest tubes under ultrasound guidance decreases the risk of complications.[12]

Before chest-tube insertion, the nurse prepares a sterile table with a scalpel, local anesthetic, thick silk or a polypropylene suture on a cutting needle, a chest tube of an appropriate size, and the underwater seal with sterile water filled to the mark. There are two methods for inserting a chest tube. The first one is trocar based (ie, the Seldinger technique). The second is a blunt-dissection method by using a finger and an arterial forceps.

The trocar method allows for easier insertion but creates the risk of lacerating the lung from overpenetration. In the trocar method, the clinician incises the skin and inserts a trocar with a surrounding chest tube in a controlled manner until reaching the pleura. The clinician then removes the trocar and leaves the chest tube in place.

Blunt dissection may cause more discomfort to the patient, but it creates less risk for damaging vital structures. In this method, the clinician incises the patient's skin and splits (ie, separates) the intercostal muscles with a finger and a blunt arterial forceps until reaching the pleural cavity. The clinician then holds the tip of the chest tube with the artery forceps and introduces the tube into the pleural cavity.

Best practice is to use a "mattress" suture or a "stay-in closure" suture to secure the chest tube.[8,13] To do this, the clinician places an extra, loose mattress stitch when stitching the chest tube in place. Purse-string sutures are not recommended because they cause pain by changing a linear wound into a circular one and can leave unsightly scars.

A dummy model for practicing chest-tube insertion is commercially available.[14] A new type of forceps also is available for chest-tube insertion when using the blunt-dissection method, and one source claims that no complications have resulted from use

of this forceps.[15] The most common error committed by junior clinicians when inserting a chest tube is to place the tube too low.[16]

HOW TO MANAGE A CHEST TUBE AND DRAINAGE SYSTEM

After a chest tube has been inserted, a nurse trained in chest-tube management is responsible for managing the chest tube and drainage system. This entails caring for the tube and drainage system when transporting the patient, changing or emptying the drainage container, controlling fluid evacuation, being able to identify a bronchopleural fistula, and monitoring chest-tube position.

Caring for the Chest Tube and Drainage System During Transport

Nurses should facilitate transport of a patient with a chest tube without clamping the tube and should ensure that the container remains upright and attached safely to the bedside while also monitoring the drainage container.[13] The nurse should ensure that the water-seal drainage container remains below the chest-tube insertion site while transporting the patient; otherwise, the contents of the container can backflow into the pleural cavity.[13] If clamping a chest tube for transport is unavoidable (eg, it is not possible to keep the drainage container below the level of the chest), then a nurse trained in chest-tube management should monitor the patient for signs of deterioration in oxygen saturation or respiratory rate or an increase in respiratory distress and should unclamp the tube when the patient reaches the destination.[17]

Changing or Emptying the Drainage Container

There are only two indications for changing or emptying the container. The container is replaced when the fluid is turbid (ie, cloudy or muddy in appearance, with matter in suspension) or the container is full. The water-seal chamber itself should not be emptied unless the drainage container is full. If the drainage container needs to be changed or emptied, then the nurse must clamp the chest tube while the water is changed and ensure that the water-seal chamber is refilled to the marked level.

Controlling Fluid Evacuation

The nurse should alert the surgeon if the chest-tube drains more than 250 mL of bloody drainage in an hour or if a total of more than 500 mL is drained. Excessive blood loss may indicate that the patient requires a thoracotomy to repair any underlying damaged blood vessel. Another concern when controlling fluid evacuation is re-expansion pulmonary edema, which may occur after rapid evacuation of large pleural effusions or in association with spontaneous pneumothorax. Anecdotal evidence suggests that the tube be clamped for one hour after 1 L of drainage. Although there is no published evidence for actual amounts, good practice suggests that, depending on the patient's hemodynamic status,

- no more than 1.5 L should be drained at any one time or,
- no more than 1.5 L should be drained during a 24-hour period, or
- drainage should be slowed to approximately 500 mL per hour.[8,13]

Identifying a Bronchopleural Fistula

If bubbling occurs in the water-seal chamber, then the patient may have a bronchopleural fistula. In this situation, the chest tube should not be clamped because clamping the tube can cause a tension pneumothorax, which can be lethal.

Monitoring Chest-tube Position

Good nursing care is needed because the chest tube can migrate.[18] A postoperative chest radiograph is required to confirm the chest-tube position. If the chest tube is in the correct position, then the water column in the water-seal chamber moves during respirations. The column will not move when the lung is fully expanded.

HOW TO REMOVE THE CHEST TUBE

When the chest tube is removed, the lungs should be fully expanded, which minimizes the pleural space. This can only be achieved when the patient

holds his or her breath while performing the Valsalva maneuver (ie, trying to exhale against a closed glottis or bearing down) or at the end of expiration.[8,13]

Chest-tube removal can be very painful for the patient and requires appropriate analgesia.[19] After administering analgesia, the clinician cuts the holding stitch and removes the chest tube. He or she immediately tightens the mattress stitch to close the tract between the pleura and the atmosphere. Within a few days, the hole in the deeper layers of the chest wall will be closed by fibrous tissue. Often, a chest x-ray is taken after removal of a chest tube. Recent evidence indicates that a chest x-ray is required only if the patient develops clinical symptoms that suggest the original problem has reoccurred.[20]

COMPLICATIONS OF CHEST-TUBE USE

Numerous complications may occur when a chest tube is in place. These complications include the following:

- Dislodging the chest tube—Smaller chest tubes can fall out if they are not properly secured. In such cases, a sterile occlusive dressing with a one-way valve may be useful for treating an open pneumothorax from a penetrating chest trauma.[21] This unique, one-way valve lets air and blood escape but does not allow anything to enter from the outside.
- Damage to the diaphragm—On occasion, a chest tube may be inserted too low. If this occurs, then the diaphragm may be damaged.
- Injury to internal organs—According to the NPSA, the lungs, liver, and spleen can be injured during chest-tube insertion.[12] For instance, if the chest tube is inserted below the diaphragm into the abdomen, then the risk of injuring internal organs is increased. When the tube is pushed in too far, there is even a possibility of puncturing the heart.
- Pain—The parietal pleura is very sensitive; therefore, the patient will experience pain unless adequate anesthetic medication is administered. While inserting a chest tube, the clinician should note the site of local anesthetic infiltration so that the tube is inserted into the anesthetized skin. Alternatively, the clinician can mark the patient's skin with a skin marker at the site of infiltration.
- Bleeding—Intercostal arteries may bleed profusely when traumatized. Similarly, lacerated lung parenchyma also can bleed, but the bleeding normally stops without any intervention when the lung expands.
- Occlusion—Small chest tubes can become blocked by blood clot and fibrin.[22] Occlusion may be serious and can lead to a repeated pneumothorax. Clinicians should inspect the tubing regularly and change it as needed if it becomes occluded. "Milking" or "stripping" an occluded chest tube is no longer recommended because it increases the negative pressure in the intrathoracic cavity, which could damage lung tissue.[13]
- Serious harm and death—Although it is a minor procedure, 12 deaths and 15 incidences of serious body harm related to chest tubes were reported to the NPSA between January 2005 and March 2008.[12] Eight of the incident reports were related to the Seldinger insertion technique alone. Some causes of serious complications of chest-tube insertion include
  - anatomical abnormality,
  - too-deep dilation,
  - failure to consider patient's condition,
  - failure to follow facility policy or procedure,
  - failure to follow manufacturer's advice,
  - lack of knowledge,
  - poor imaging quality, and
  - poor technique.[12]

SUMMARY FOR MANAGING A CHEST TUBE AND DRAINAGE SYSTEM

Chest tubes are inserted to drain the pleural cavity of air, blood, pus, or lymph. An underwater seal should be maintained at all times, and the chest-tube-drainage container should not be emptied unnecessarily. During transport, the chest-tube

container should be maintained below the level of the patient's chest and clamping of the chest tube should be avoided. Chest-tube insertion can cause complications, such as bleeding, pain, damage to internal organs, and at times, death. All nurses who care for patients with chest tubes should be knowledgeable about managing chest tubes. AORN

References

1. Christensen M. Nurse-led chest drain removal in a cardiac high dependency unit. *Nurs Crit Care.* 2002;7(2):67-72.
2. Lehwaldt D, Timmins F. Nurses' knowledge of chest drain care: an exploratory descriptive survey. *Nurs Crit Care.* 2005;10(4):192-200.
3. Charnock Y, Evans D. Nursing management of chest drains: a systematic review. *Aust Crit Care.* 2001;14(4):156-160.
4. Jacoby RC, Battistella FD. Hemothorax. *Semin Respir Crit Care Med.* 2001;22(6):627-630.
5. Kang SN. Rib fractures, pneumothorax, haemothorax and chest drain insertion. *Br J Hosp Med (Lond).* 2007;68(9):M158-M159.
6. Klopp M, Pfannschmidt J, Dienemann H. Treatment of pleural empyema [in German]. *Chirurg.* 2008;79(1):83-96.
7. Townshend AP, Speake W, Brooks A. Chylothorax. *Emerg Med J.* 2007;24(2):e11.
8. Laws D, Neville E, Duffy J; Pleural Diseases Group, Standards of Care Committee, British Thoracic Society. BTS guidelines for the insertion of a chest drain. *Thorax.* 2003;58(Suppl 2):ii8-ii17.
9. Medford AR, Pepperell JC. Management of spontaneous pneumothorax compared to British Thoracic Society (BTS) 2003 guidelines: a district general hospital audit. *Prim Care Respir J.* 2007;16(5):291-298.
10. Dordeviæ I, Staniæ V, Nestoroviæ M, Vuloviæ T. Failures and complications of thoracic drainage [in Serbian]. *Vojnosanit Pregl.* 2006;63(2):137-142.
11. Ellis H. The applied anatomy of chest drain insertion. *Br J Hosp Med (Lond).* 2007;68(3):M44-M45.
12. Chest drains: risks associated with the insertion of chest drains. May 1, 2008. National Patient Safety Agency. National Report and Learning Service. http://www.nrls.npsa.nhs.uk/resources/?entryid45=59887. Accessed November 7, 2009.
13. Roskelly L. Intrapleural drainage. In: Doughtery L, Lister S, eds. *The Royal Marsden Hospital Manual of Clinical Nursing Procedures.* 7th ed. Hoboken, NJ: Wiley-Blackwell; 2008:428-433.
14. Hutton IA, Kenealy H, Wong C. Using simulation models to teach junior doctors how to insert chest tubes: a brief and effective teaching module. *Intern Med J.* 2008;38(12):887-891.
15. Andrews E, Ramesh BC, Nölke L, Redmond HP, Aherne T, O'Donnell A. A new specifically designed forceps for chest drain insertion. *Injury.* 2003;34(12):957-959.
16. Griffiths JR, Roberts N. Do junior doctors know where to insert chest drains safely? *Postgrad Med J.* 2005;81(957):456-458.
17. Henry M, Arnold T, Harvey J; Pleural Diseases Group, Standards of Care Committee, British Thoracic Society. BTS guidelines for the management of spontaneous pneumothorax. *Thorax.* 2003;58(Suppl 2):ii39-ii52.
18. Gossage JA, Chukwuemeka AO, Dussek JE. Intercostal drain migration post esophagectomy. *Dis Esophagus.* 2003;16(3):268-269.
19. Bruce EA, Howard RF, Franck LS. Chest drain removal pain and its management: a literature review. *J Clin Nurs.* 2006;15(2):145-154.
20. van den Boom J, Battin M. Chest radiographs after removal of chest drains in neonates: clinical benefit or common practice? *Arch Dis Child Fetal Neonatal Ed.* 2007;92:F46-F48.
21. Rathinam S, Steyn RS. Management of complicated postoperative air-leak: a new indication for the Asherman chest seal. *Interact Cardiovasc Thorac Surg.* 2007;6(6):691-694.
22. Davies HE, Merchant S, McGown A. A study of the complications of small bore "Seldinger" intercostal chest drains. *Respirology.* 2008;13(4):603-607.

Rajaraman Durai, MD, MRCS, is a specialist registrar at University Hospital Lewisham, London, UK. *Dr Durai has no declared affiliation that could be perceived as a potential conflict of interest in publishing this article.*

Happy Hoque, FRCS, is a consultant surgeon with the Department of Surgery at Queen Mary's Hospital, Sidcup, Kent, UK. *Dr Hoque has no declared affiliation that could be perceived as a potential conflict of interest in publishing this article.*

Tony W. Davies, FRCS, is a consultant surgeon with the Department of Surgery at Queen Mary's Hospital, Sidcup, Kent, UK. *Dr Davies has no declared affiliation that could be perceived as a potential conflict of interest in publishing this article.*

EXAMINATION

CONTINUING EDUCATION PROGRAM

1.3 CE

Managing a Chest Tube and Drainage System

PURPOSE

To educate perioperative nurses about managing a chest tube and drainage system.

OBJECTIVES

1. Explain the physiology of the respiratory system.
2. Discuss the pathophysiology of the respiratory system.
3. Describe a chest-tube drainage system.
4. Explain medical care of a patient who requires a chest tube.
5. Identify nursing responsibilities in caring for a patient with a chest tube.

The Examination and Learner Evaluation are printed here for your convenience. To receive continuing education credit, you must complete the Examination and Learner Evaluation online at http://www.aorn.org/CE.

QUESTIONS

1. A chest-tube drainage system
   1. has a water-seal chamber.
   2. allows only one-way movement or air or liquid.
   3. allows air and liquid to escape from the pleural cavity.
   4. allows air to enter the pleural cavity to reinflate the lung.
   a. 1 and 3 *b.* 2 and 4
   c. 1, 2, and 3 *d.* 1, 2, 3, and 4

2. The pleural cavity is maintained by _____ pressure, which is important for ensuring lung expansion with deep inspiration.
   a. negative *b.* positive

3. Re-expansion pulmonary edema occurs when a collapsed lung expands rapidly and causes capillary damage that results in unilateral pulmonary edema.
   a. true *b.* false

4. The chest tube is inserted at a lower intercostal space when _____ is being drained from the pleural cavity.
   1. air
   2. blood
   3. lymph
   4. pus
   a. 1 and 3 *b.* 2 and 4
   c. 2, 3, and 4 *d.* 1, 2, 3, and 4

5. To prepare for chest-tube insertion, the nurse prepares a sterile table with
   1. a chest tube of an appropriate size.
   2. a scalpel.
   3. a water-seal drainage system with sterile water filled to the mark.

4. local anesthetic.
5. thick silk or a polypropylene suture on a cutting needle.

a. 2 and 3 *b.* 1, 4, and 5
c. 2, 3, 4, and 5 *d.* 1, 2, 3, 4, and 5

6. Compared with the Seldinger technique, the blunt dissection method
1. allows for easier insertion.
2. may cause more discomfort to the patient.
3. presents an increased risk of lacerating the lung from overpenetration.
4. creates less risk for damaging vital structures.

a. 1 and 3 *b.* 2 and 4
c. 1, 2, and 3 *d.* 1, 2, and 4

7. A nurse's responsibility during transport of a patient with a chest tube includes
1. ensuring that the chest tube is always clamped during transport.
2. ensuring that the container remains upright and is attached safely to the bedside.
3. ensuring that the water-seal drainage container remains below the chest-tube insertion site.
4. monitoring the drainage container.
5. monitoring the patient for signs of deterioration in oxygen saturation or respiratory rate or an increase in respiratory distress.

a. 2 and 3 *b.* 1, 4, and 5
c. 2, 3, 4, and 5 *d.* 1, 2, 3, 4, and 5

8. The water-seal chamber should not be emptied unless the drainage container is full.

a. true *b.* false

9. During chest-tube removal, the patient is instructed to
a. cough and deep breathe.
b. hold his or her breath while performing the Valsalva maneuver.
c. take shallow panting breaths.

10. Complications that may occur when a chest tube is in place include
1. bleeding.
2. damage to the diaphragm or other internal organs.
3. dislodging of the chest tube.
4. occlusion.
5. pain.
6. serious harm or death.

a. 1, 3, and 5 *b.* 2, 4, and 6
c. 2, 3, 4, 5, and 6 *d.* 1, 2, 3, 4, 5, and 6

The behavioral objectives and examination for this program were prepared by Rebecca Holm, RN, MSN, CNOR, clinical editor, with consultation from Susan Bakewell, RN, MS, BC, director, Center for Perioperative Education. Ms Holm and Ms Bakewell have no declared affiliations that could be perceived as potential conflicts of interest in publishing this article.

LEARNER EVALUATION

CONTINUING EDUCATION PROGRAM

1.3 CE

Managing a Chest Tube and Drainage System

This evaluation is used to determine the extent to which this continuing education program met your learning needs. Rate the items as described below.

OBJECTIVES

To what extent were the following objectives of this continuing education program achieved?

1. Explain the physiology of the respiratory system. *Low 1. 2. 3. 4. 5. High*
2. Discuss the pathophysiology of the respiratory system. *Low 1. 2. 3. 4. 5. High*
3. Describe a chest-tube drainage system. *Low 1. 2. 3. 4. 5. High*
4. Explain medical care of a patient who requires a chest tube. *Low 1. 2. 3. 4. 5. High*
5. Identify nursing responsibilities in caring for a patient with a chest tube. *Low 1. 2. 3. 4. 5. High*

CONTENT

6. To what extent did this article increase your knowledge of the subject matter? *Low 1. 2. 3. 4. 5. High*
7. To what extent were your individual objectives met? *Low 1. 2. 3. 4. 5. High*
8. Will you be able to use the information from this article in your work setting? *1. Yes 2. No*
9. Will you change your practice as a result of reading this article? (If yes, answer question #9A. If no, answer question #9B.)

9A. How will you change your practice (*Select all that apply*)

1. I will provide education to my team regarding why change is needed.
2. I will work with management to change and/or implement a policy and procedure.
3. I will plan an informational meeting with physicians to seek their input and acceptance of the need for change.
4. I will implement change and evaluate the effect of the change at regular intervals until the change is incorporated as best practice.
5. Other: _____

9B. If you will not change your practice as a result of reading this article, why? (*Select all that apply*)

1. The content of the article is not relevant to my practice.
2. I do not have enough time to teach others about the purpose of the needed change.
3. I do not have management support to make a change.
4. Other: _____

10. Our accrediting body requires that we verify the time you needed to complete the 1.3 continuing education contact hour (78-minute) program: _____

This program meets criteria for CNOR and CRNFA recertification, as well as other continuing education requirements.

AORN is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation.

AORN recognizes these activities as continuing education for registered nurses. This recognition does not imply that AORN or the American Nurses Credentialing Center approves or endorses products mentioned in the activity.

AORN is provider-approved by the California Board of Registered Nursing, Provider Number CEP 13019. Check with your state board of nursing for acceptance of this activity for relicensure.

Event: #10006; **Session:** #9943 **Fee:** Members $6.50, Nonmenbers $13

The deadline for this program is February 28, 2013.

A score of 70% correct on the examination is required for credit. Participants receive feedback on incorrect answers. Each applicant who successfully completes this program will be able to print a certificate of completion.