

chest tube drainage systems nursing

Mastering Chest Tube Drainage Systems Nursing: A Comprehensive Guide

chest tube drainage systems nursing plays a critical role in the management of various respiratory conditions, involving the insertion of a tube into the pleural space to drain air, fluid, or blood. For nurses, a thorough understanding of these systems is paramount for patient safety, effective treatment, and accurate assessment. This guide delves deep into the intricacies of chest tube drainage, covering system components, insertion and management principles, potential complications, and essential nursing interventions. We will explore the anatomy and physiology relevant to chest tube insertion, the different types of drainage systems available, and the nursing responsibilities at each stage of care. Mastering these aspects ensures optimal patient outcomes and equips nurses with the confidence to manage patients with chest tubes effectively.

Table of Contents

Understanding the Anatomy and Physiology of the Pleural Space

Indications for Chest Tube Insertion

Components of a Chest Tube Drainage System

Types of Chest Tube Drainage Systems

Nursing Management of Chest Tube Drainage Systems

Monitoring and Assessment of Chest Tube Drainage

Troubleshooting Common Chest Tube Drainage System Issues

Potential Complications and Nursing Interventions

Chest Tube Removal Procedures

Understanding the Anatomy and Physiology of the Pleural Space

The pleural space is a potential space between the visceral pleura, which covers the lungs, and the parietal pleura, which lines the thoracic cavity. This space normally contains a small amount of lubricating fluid, allowing the lungs to expand and contract smoothly during respiration. Maintaining a negative pressure within the pleural space is crucial for lung expansion. Any disruption that leads to the accumulation of air (pneumothorax), fluid (pleural effusion), or blood (hemothorax) in this space can compromise lung function and necessitate the intervention of a chest tube drainage system.

The mechanics of breathing rely heavily on the integrity of the pleural space. During inspiration, the diaphragm contracts and the intercostal muscles lift the rib cage, increasing the volume of the thoracic cavity. This expansion reduces intrapleural pressure, causing the lungs to inflate. Conversely, during exhalation, these muscles relax, decreasing thoracic volume and increasing intrapleural pressure, leading to lung deflation. When air or fluid enters the pleural space, it can obliterate this negative

pressure, leading to lung collapse.

Indications for Chest Tube Insertion

The decision to insert a chest tube is based on a variety of clinical scenarios where the accumulation of air, fluid, or blood within the pleural space poses a threat to respiratory function. These indications are diverse and can range from traumatic injuries to medical conditions. Prompt and accurate identification of these situations is a key nursing responsibility, often involving close collaboration with the medical team.

Pneumothorax Management

A pneumothorax, the presence of air in the pleural space, is a common indication for chest tube insertion. This can occur spontaneously, as a result of blunt or penetrating chest trauma, or iatrogenically, often following certain medical procedures. A tension pneumothorax, a life-threatening condition where air accumulates and creates positive pressure, leading to mediastinal shift and hemodynamic compromise, absolutely requires immediate chest tube decompression.

Pleural Effusion Drainage

Pleural effusions involve the abnormal accumulation of fluid in the pleural space. These can be caused by various factors, including infections (empyema), heart failure, liver disease, kidney disease, malignancy, and inflammatory conditions. When effusions are large enough to cause significant shortness of breath or are infected, a chest tube is often necessary for therapeutic drainage and to obtain specimens for analysis.

Hemothorax Management

A hemothorax is the accumulation of blood in the pleural space, typically resulting from trauma, such as rib fractures, pulmonary contusions, or injury to intercostal vessels. Significant bleeding into the pleural space can lead to hypovolemia and respiratory compromise. Chest tube insertion is crucial for evacuating the blood, allowing for lung re-expansion, and monitoring the rate of bleeding.

Postoperative Thoracic Surgery

Following procedures like thoracotomy, lobectomy, or pneumonectomy, chest tubes are routinely placed to drain any residual air, blood, or serosanguinous fluid from the pleural space. This drainage aids in the re-

expansion of the lung, prevents the formation of a pneumothorax, and helps to seal the pleural space, promoting healing.

Components of a Chest Tube Drainage System

Chest tube drainage systems are designed to safely and effectively remove air and fluid from the pleural space while preventing air from re-entering. These systems typically consist of three main components, each with a specific function in managing the flow of air and fluid away from the patient.

The Chest Tube Itself

The chest tube, also known as a thoracostomy tube, is a flexible plastic tube inserted into the pleural space. It has multiple drainage holes near its tip to facilitate the evacuation of air or fluid. The size and type of chest tube are selected based on the patient's condition and the material being drained (e.g., smaller tubes for air, larger tubes for fluid or blood).

The Collection Chamber

This is where the drained air and fluid are collected. It allows for visual monitoring of the volume, color, and consistency of the output, providing crucial information about the patient's status. Some collection chambers have markings to indicate the volume of drainage over specific time periods.

The Water Seal Chamber

This critical component acts as a one-way valve, preventing atmospheric air from entering the pleural space. It contains sterile water, and as air or fluid is drained from the pleural space, it bubbles through the water and exits the system. The rise and fall of the water level in this chamber with the patient's respirations (tidaling) is a normal finding, indicating the patency of the tube and the system. If tidaling ceases, it may suggest a blockage or lung re-expansion.

The Suction Control Chamber (Optional)

Some drainage systems incorporate a suction control chamber. This chamber regulates the amount of negative pressure applied to the pleural space. It often contains water, and when connected to wall suction, the bubbling rate in this chamber indicates the level of suction being applied. Controlled suction helps to re-expand the lung more effectively and can accelerate the drainage of fluid or air.

Types of Chest Tube Drainage Systems

Several types of chest tube drainage systems are available, each offering different features and functionalities. The choice of system often depends on clinical practice, available resources, and the specific patient needs. Understanding the nuances of each system is vital for effective nursing care.

Wet Drainage Systems

Wet drainage systems utilize water seals and suction control. They have three distinct chambers: a collection chamber, a water seal chamber, and a suction control chamber. The suction control chamber is filled with a specific amount of sterile water, typically to the level indicating the desired negative pressure (e.g., -20 cm H₂O). When connected to wall suction, air is drawn through the water, creating a controlled suction. Continuous bubbling in the suction chamber indicates that suction is active.

Dry Drainage Systems

Dry drainage systems are characterized by their lack of a water-filled suction control chamber. Instead, they often use a one-way mechanical valve or a bellows system to indicate negative pressure. When a certain level of negative pressure is achieved, the valve opens, allowing air to escape, or the bellows expand to a specific mark. These systems are often preferred for their portability and ease of use, as they do not require constant monitoring of bubbling in a water chamber for suction control.

Single, Double, and Triple Chamber Systems

Chest drainage units can be configured with one, two, or three chambers. A single-chamber system typically focuses on water seal drainage. A double-chamber system usually incorporates a collection chamber and a water seal chamber, allowing for observation of drainage and prevention of air entry. Triple-chamber systems, commonly found in both wet and dry configurations, include a collection chamber, a water seal chamber, and a suction control chamber, providing the most comprehensive management capabilities.

Nursing Management of Chest Tube Drainage Systems

Effective nursing management of patients with chest tubes is multifaceted and requires a proactive approach to ensure patient comfort, safety, and optimal recovery. This involves meticulous monitoring, vigilant assessment, and prompt intervention when deviations from the norm are observed. Establishing a strong foundational understanding of the system's mechanics is the first

step in this process.

Securing the Chest Tube

Properly securing the chest tube is paramount to prevent accidental dislodgement, which can lead to pneumothorax, bleeding, and significant patient distress. The tube should be securely sutured to the skin, and the drainage system should be anchored to the patient's gown or bed to minimize tension on the insertion site. Sterility must be maintained throughout the process of securing and dressing the site.

Maintaining the Drainage System

The drainage system must be kept below the level of the patient's chest at all times to ensure gravity assists in drainage and prevents backflow of fluid. The tubing should be free of kinks and dependent loops to allow for unimpeded drainage. Regular assessment for kinks or obstructions is a key nursing responsibility. When ambulating patients, special considerations must be made to ensure the system remains properly positioned.

Monitoring Drainage Output

Accurate and consistent monitoring of the chest tube drainage is essential. This includes measuring the volume of output at regular intervals (e.g., hourly for the first 24 hours, then as ordered), noting the color (e.g., serous, serosanguinous, sanguineous, purulent), and observing the consistency. Significant changes in output, such as a sudden increase in volume or a change in color to bright red, warrant immediate medical notification.

Assessing for Air Leaks

Air leaks are indicated by continuous bubbling in the water seal chamber when the patient exhales or coughs, provided suction is not actively applied. If suction is applied, a leak may manifest as intermittent bubbling. Nurses must assess for air leaks by observing the water seal chamber. If a leak is suspected, the tubing should be checked for kinks, and each connection should be tightened. If the leak persists, it may indicate an issue with the tube insertion site or the system itself.

Monitoring and Assessment of Chest Tube

Drainage

Continuous and thorough monitoring of the chest tube drainage system is fundamental to detecting subtle changes that could indicate patient deterioration or system malfunction. Nurses must possess a keen eye for detail and understand what constitutes normal versus abnormal findings. This vigilance directly impacts patient safety and the effectiveness of the treatment plan.

Assessing Drainage Volume and Characteristics

As mentioned previously, meticulously documenting the volume and characteristics of the drainage is critical. This data provides valuable insights into the patient's ongoing bleeding or fluid accumulation and helps guide treatment decisions. Any sudden, dramatic increase in drainage volume, or a change from serosanguinous to frank sanguineous (bright red) drainage, requires immediate attention and reporting to the physician.

Evaluating Tidaling in the Water Seal Chamber

Tidaling, the rhythmic fluctuation of the water level in the water seal chamber that corresponds with the patient's breathing, is a key indicator of a patent pleural space and a functioning chest tube. During inspiration, the water level rises, and during exhalation, it falls. If tidaling ceases, it can signify that the lung has fully re-expanded, the tube is blocked, or there is an air leak in the system. Nurses should assess for tidaling with each respiratory cycle.

Monitoring for Bubbling in the Water Seal and Suction Chambers

Bubbling in the water seal chamber, in the absence of suction, signifies an air leak. This should be investigated immediately. In a wet system with suction applied, continuous bubbling in the suction control chamber indicates that the suction is functioning correctly and is set at the prescribed level. Intermittent bubbling in the suction chamber might suggest that the suction source is not consistently active or that the system is experiencing an air leak.

Assessing the Insertion Site

The skin around the chest tube insertion site must be assessed regularly for signs of infection, such as redness, swelling, warmth, and purulent drainage. The dressing over the site should be clean, dry, and intact. Any signs of leakage of air or fluid from the insertion site itself are also concerning

and require immediate reporting and intervention. A sterile dressing change should be performed according to facility policy.

Troubleshooting Common Chest Tube Drainage System Issues

Even with meticulous care, chest tube drainage systems can encounter problems. Nurses must be prepared to identify and address these issues promptly to prevent patient harm. Effective troubleshooting relies on a solid understanding of the system's mechanics and potential failure points.

Accidental Dislodgement

If a chest tube becomes accidentally dislodged, the immediate priority is to cover the insertion site with a sterile occlusive dressing, such as a petroleum gauze dressing taped on three sides. This allows air to escape but prevents it from entering the pleural space, thus minimizing the risk of a tension pneumothorax. The physician must be notified immediately for further management, which may include reinsertion of the tube.

Blocked or Clotted Chest Tube

A blocked chest tube can lead to re-accumulation of air or fluid and lung collapse. Signs of blockage include absent tidaling, decreased or absent drainage, and increasing respiratory distress. If a blockage is suspected, nurses may be instructed to "milk" or "strip" the tube, which involves gently compressing and releasing the tubing to dislodge any clots. However, this technique should only be performed when ordered and with caution, as excessive force can cause trauma.

Loss of Water Seal

If the water seal chamber runs dry, atmospheric air can enter the pleural space, leading to a pneumothorax. This can happen if the drainage unit is tipped over or if evaporation occurs. The nurse must immediately refill the water seal chamber with sterile water and assess the patient for signs of pneumothorax. If the system has been compromised, it may need to be replaced.

Malfunctioning Suction

If wall suction is not effectively applied, or if the suction control chamber is not bubbling appropriately in a wet system, the intended negative pressure will not be maintained. This can hinder lung re-expansion. Nurses should verify that the suction source is turned on and set to the prescribed level,

and that the tubing is not kinked. In a dry system, the indicator for suction pressure should be checked.

Potential Complications and Nursing Interventions

While chest tube drainage is a life-saving intervention, it is not without potential complications. Vigilant nursing care is essential to identify and manage these complications proactively, thereby minimizing their impact on the patient's recovery.

Pneumothorax

Despite the chest tube's purpose, a recurrent or persistent pneumothorax can occur. This may be due to a persistent air leak from the lung parenchyma or a blockage in the drainage system. Signs include decreased breath sounds on the affected side, chest pain, and increasing shortness of breath. The nursing priority is to ensure the chest tube drainage system is functioning optimally and to report any changes in respiratory status to the physician.

Bleeding

Bleeding can occur from the insertion site, from the intercostal vessels during insertion, or from the lung itself. Significant bleeding is often indicated by a sudden, large increase in drainage volume or a change to bright red drainage. The nurse must monitor the drainage closely, assess vital signs for signs of hypovolemia, and notify the physician immediately. Maintaining adequate intravenous fluid resuscitation may be necessary.

Infection

The insertion site is a potential portal of entry for microorganisms. Signs of infection include increased redness, swelling, warmth, purulent drainage, and fever. Strict aseptic technique during insertion, dressing changes, and system maintenance is crucial for prevention. If infection is suspected, the wound may need to be cultured, and antibiotics may be prescribed.

Pain

Chest tube insertion and maintenance can be a source of significant pain. Nurses must assess the patient's pain level regularly and administer analgesics as prescribed. Non-pharmacological pain management strategies, such as repositioning and deep breathing exercises, can also be beneficial. The patient should be encouraged to report pain promptly so that effective

management can be implemented.

Subcutaneous Emphysema

This occurs when air leaks from the pleural space into the subcutaneous tissues of the chest wall and can sometimes extend to the face and neck. It is often palpable as a crackling sensation under the skin. While usually not immediately dangerous, it can be uncomfortable and may indicate a persistent air leak that needs further investigation and management.

Chest Tube Removal Procedures

Once the indication for the chest tube is resolved, such as complete lung re-expansion and cessation of air leak or significant fluid drainage, removal is planned. The process requires careful preparation, meticulous technique, and post-removal monitoring to ensure a smooth recovery and prevent complications.

Preparation for Removal

Prior to removal, the physician will assess the patient to ensure that the lung is fully re-expanded and that there is minimal or no drainage. The patient will be prepared for the procedure, which may include administration of pain medication to enhance comfort. The nurse's role includes gathering necessary supplies, such as sterile gloves, sterile dressings, petroleum gauze, adhesive tape, and a suture removal kit.

The Removal Process

The chest tube is typically removed by the physician. The sutures anchoring the tube are cut, and the tube is smoothly and steadily withdrawn. As the tube is removed, the nurse may be asked to apply pressure to the insertion site. Simultaneously, an occlusive dressing, often a petroleum gauze dressing taped on three sides, is applied to the site. This allows any residual air to escape but prevents air from entering the pleural space.

Post-Removal Monitoring

Following removal, the patient is closely monitored for signs of pneumothorax, such as shortness of breath, chest pain, and decreased breath sounds. The insertion site is assessed for bleeding, drainage, or signs of infection. A chest X-ray is typically performed within 24 hours of removal to confirm lung re-expansion and rule out pneumothorax. The patient is educated on activity restrictions and signs and symptoms to report to their healthcare

provider.

Frequently Asked Questions

Q: What is the primary function of a chest tube drainage system?

A: The primary function of a chest tube drainage system is to remove air, fluid, or blood from the pleural space, allowing the lungs to re-expand and restore negative intrapleural pressure, thereby improving respiratory function.

Q: How can a nurse assess for an air leak in a chest tube drainage system?

A: An air leak is typically indicated by continuous bubbling in the water seal chamber when the patient exhales or coughs, assuming suction is not actively applied. Intermittent bubbling in the suction chamber may also suggest a leak if suction is on.

Q: What is the significance of tidaling in the water seal chamber?

A: Tidaling, the rise and fall of the water level in the water seal chamber with the patient's respirations, signifies that the chest tube is patent, the pleural space is intact, and the lung is expanding and contracting normally. Absence of tidaling may indicate a problem.

Q: What should a nurse do if a chest tube becomes accidentally disconnected?

A: If a chest tube becomes accidentally disconnected, the nurse should immediately attempt to reconnect it. If disconnection is from the drainage unit, the open end of the chest tube should be placed in sterile water to create a temporary water seal and prevent air entry into the pleural space. The physician must be notified promptly.

Q: How is pain managed for a patient with a chest tube?

A: Pain management for a patient with a chest tube involves regular assessment of pain levels and the administration of prescribed analgesics. Non-pharmacological interventions like repositioning and deep breathing

exercises are also important. Patients should be encouraged to report pain promptly.

Q: What are the key nursing responsibilities when caring for a patient with a chest tube drainage system?

A: Key nursing responsibilities include monitoring drainage volume and characteristics, assessing for air leaks and tidaling, ensuring the system remains below chest level and is free of kinks, securing the tube, assessing the insertion site for infection, and administering pain management.

Q: When is a chest tube typically removed?

A: A chest tube is typically removed when the lung has fully re-expanded, there is minimal or no air leak, and the amount of drainage is significantly reduced, as determined by the physician.

Q: What are the signs and symptoms of subcutaneous emphysema?

A: Subcutaneous emphysema is characterized by the palpable feeling of crepitus (a crackling sensation) under the skin, usually around the chest wall, and can sometimes extend to the neck and face. It indicates air leaking into the subcutaneous tissues.

[Chest Tube Drainage Systems Nursing](#)

Chest Tube Drainage Systems Nursing

Related Articles

- [chicago citation examples for dissertations](#)
- [chemistry help with homework](#)
- [chicago citation examples for publisher location](#)

[Back to Home](#)