

# Optimizing Hand Hygiene and Infection Control in Chest Drain Care: Essential Guidelines for Nurses

Mana benaya shaher alanazi, Tahani rady mohdaf aldfery, Madiha zwinny rakies aldfery, Gamillah khallaf aldhafeeri, Sara zwinny rakies aldfery, Harbiyyah abdullah aldhafeeri, Nadia eidan aldhafeeri, Amal eidan aldhafeeri, Nouf rumayd aldhafeeri, Ebtesam awad ahmad alanazi, Qaydah khalif hawi alanazi, Fatimah salem alanazi, Khatar Khalaf Aldafiri, Mohammed Khalif Aldafiri, Ebtasam Khalaf Aldafiery, Nofah Awied Alruwaili, Manal Awaid Alanazi, Khaznah Merweh Alteel Aldhafeeri, Sami hawas Alharbi, Fizah hadad awdah albathaly.

Ministry of health of Saudi Arabia

## Background

Chest drain management is a vital nursing intervention for patients requiring the drainage of air, fluid, or pus from the pleural cavity. This procedure is essential for conditions such as empyema, pneumothorax, pleural effusion, and other thoracic disorders. Nurses are responsible for handling, monitoring, and supervising patients with chest tubes. However, research indicates that nurses often rely on informal sources such as peer interactions and personal experience rather than standardized resources like guidelines, seminars, or conferences. While informal knowledge exchange plays a role in practice, its inconsistency may impact patient outcomes negatively.

The initial step in nursing care—assessment—plays a crucial role in identifying risks and complications related to chest tube placement. A structured approach that incorporates evidence-based guidelines, ongoing education, and individualized treatment plans can enhance patient outcomes and mitigate complications.

## Aim

This study aims to:

1. Examine current nursing practices in chest drain management.
2. Evaluate the effectiveness of formal and informal educational resources for chest drain care.
3. Assess the impact of nursing assessment and critical thinking on improving patient outcomes related to chest tube placement and maintenance.

## Conclusion

This study highlights the importance of an evidence-based approach in chest drain nursing care. While informal knowledge-sharing remains prevalent, structured education, training, and adherence to research-based guidelines are essential. Providing access to up-to-date resources through in-service education, seminars, and university courses can significantly reduce complications such as infection, dislodgement, and bleeding. By integrating critical thinking and a patient-centered approach throughout the nursing process, nurses can enhance patient care and reduce adverse events.

**Keywords:** Chest drain management, Nursing care, Evidence-based practice, Critical thinking in nursing, Nursing assessment.

## Introduction

Nurses have access to various educational resources, including in-service training, libraries, conferences, seminars, university courses, and peer-reviewed discussions, to stay updated on chest drain management. However, research indicates that nurses often rely more on personal experience and peer interactions than formal knowledge sources. A study by Mander et al. found that 62% of nurses identified word-of-mouth from colleagues as their primary source of chest drain care information.

The nursing process begins with assessment, which involves systematically collecting, analyzing, and organizing patient data. This process is crucial for developing an effective care plan and making evidence-based decisions. Critical thinking plays a vital role in nursing, guiding clinical judgment and ensuring adherence to best practices. According to Dunham and MacInnes (2018), precision education—customizing treatment to meet individual cultural, spiritual, and physical needs—is more effective than a generic, trial-and-error approach.

Comprehensive patient assessment encompasses mental, social, spiritual, and physical well-being. It involves collecting subjective and objective data, including vital signs, pain levels, and patient history. This assessment aids in forming nursing diagnoses and identifying current and future care requirements. Jamieson et al. (2019) emphasized that understanding normal and abnormal physiological processes helps nurses prioritize patient care effectively.

Subjective and objective data, alongside psychological, family, medical, and surgical histories, form the foundation of the nursing process. Clinical judgment helps assess and diagnose the patient's condition, leading to the formulation of care plans with defined goals and expected outcomes. Implementation follows, where interventions are carried out, and finally, outcomes are evaluated to determine their effectiveness.

The five interrelated steps of the nursing process—assessment, diagnosis, planning, implementation, and evaluation—provide a structured framework for patient-centered care. Data collection in the assessment phase includes subjective input from patients and caregivers and objective metrics such as height, weight, vital signs, and dietary intake. Electronic health records facilitate efficient data entry and analysis, supporting evidence-based decision-making (Toney-Butler & Thayer, 2023).

Studies by Shih et al. (2019) highlight that clinical judgment in nursing diagnosis significantly improves patient treatment planning and implementation. The North American Nursing Diagnosis Association (NANDA) provides an updated database of nursing diagnoses, which are guided by Maslow's Hierarchy of Needs. This framework prioritizes physiological and safety needs as essential foundations of nursing interventions, ensuring holistic patient care.

Maslow's hierarchy also addresses psychological and emotional well-being, including self-esteem and social relationships. Developing healthy relationships, active listening, and therapeutic communication contribute to emotional support in patient care. Toney-Butler & Thayer (2023) suggest that fostering an empathetic and culturally competent environment enhances patient outcomes.

In the planning phase, goal setting and evidence-based practice (EBP) are crucial for effective treatment. Individualized care plans ensure continuity, clear communication, and proper documentation. Achievable, measurable, and time-bound goals facilitate meaningful patient progress. Implementation involves executing care plans, including medication administration, procedural interventions, and patient monitoring.

The final phase, evaluation, is critical for assessing the success of interventions. Continuous assessment allows for necessary modifications in treatment plans based on patient responses. Nebulization therapy, for example, plays a crucial role in managing respiratory disorders. It is widely used due to its effectiveness, rapid onset, and minimal side effects (CCEP, 2019).

Nebulization therapy is particularly beneficial for patients with acute respiratory distress, severe pneumonia, aspiration-induced lung injury, and other critical conditions. Its accessibility and ease of use make it an essential component of emergency care, both pre- and post-hospitalization (CCEP, 2019).

The effectiveness of long-term nebulization therapy for chronic obstructive pulmonary disease (COPD) depends on proper cleaning and maintenance of nebulizers. Patients and caregivers must be educated on hygiene practices to prevent infections, which can significantly impact lung function (Ari & Restrepo, 2012). Routine assessments every six months ensure the ongoing safety and efficacy of nebulization therapy (Ghoshal et al., 2017). Educational interventions have demonstrated a 43% reduction in contaminated nebulizers and improved daily maintenance adherence.

A thoracostomy tube, commonly known as a chest tube, provides access to the pleural space for draining air or fluid. These tubes, typically made of silicone or PVC, vary in size and feature radiopaque markings for accurate placement. The pleural-evac system consists of three key components: collection, water seal, and suction chambers, which work together to facilitate drainage and lung re-expansion (Goncalves & Jabuonski, 2018).

Chest tube insertion is crucial for managing pleural effusion, pneumothorax, empyema, and other conditions. However, complications such as bleeding, organ injury, and tube dislodgement occur in 1-10% of cases (Santos et al., 2019). Advances in chest tube technology have introduced smaller, more comfortable tubes that improve patient tolerance and outcomes.

### Infection Control and Hand Hygiene

Infection control is paramount in chest drain management, as healthcare-associated infections (HAIs) are frequently transmitted through contaminated hands. Proper hand hygiene significantly reduces infection rates, healthcare costs, and hospital stays. Despite widespread awareness, studies indicate that healthcare professionals often fail to comply with recommended hand hygiene practices (Gold et al., 2022).

The Centers for Disease Control and Prevention (CDC) advocates regular handwashing as a primary defense against infections. Best practices include using alcohol-based hand rubs or soap and water, scrubbing thoroughly, and drying with disposable towels. Ensuring compliance with hygiene protocols enhances patient safety and minimizes infection risks (WHO, 2009).

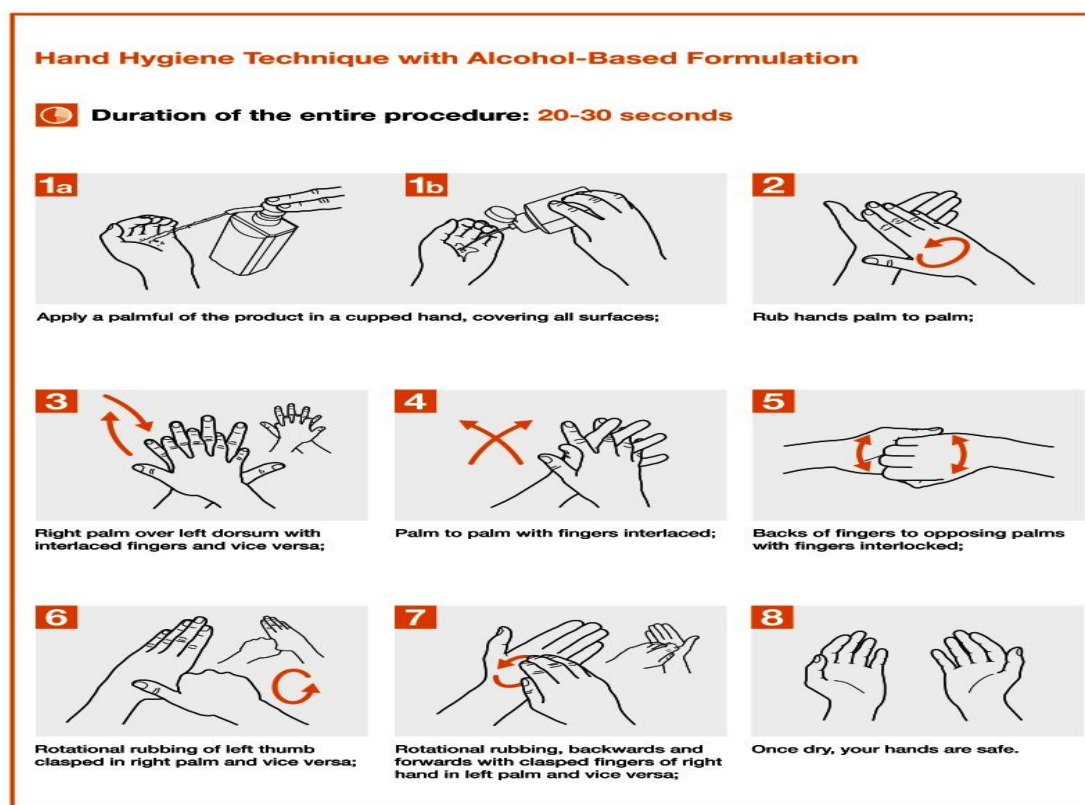


Figure (1): Hand rubbing (Spruce; 2013)



Figure (2): Hand washing (Saha et al; 2021)

### Healthcare Workers and Personal Protective Equipment (PPE)

Prior to the COVID-19 pandemic, the significance of protective gear for healthcare workers was not widely acknowledged. The Centers for Disease Control and Prevention (CDC) and the Occupational Safety and Health Administration (OSHA) establish PPE standards to ensure the safety of healthcare personnel. According to Kening and Groen (2023), ensuring the availability, correct usage, and proper disposal of PPE is critical in a healthcare system focused on patient safety.

Wearing protective gear is a standard practice for healthcare professionals to safeguard against hazardous occupational exposures. Hospital environments present numerous risks, including chemical, biological, radioactive, and nuclear contamination (Groen & Kening, 2023). This discussion explores PPE from a healthcare perspective, emphasizing its role in reducing exposure to infectious diseases and enhancing both worker safety

and patient care. Properly designed PPE prioritizes user safety and comfort, and its effectiveness relies on correct donning and doffing procedures (McCarthy et al., 2020). However, compliance with PPE guidelines is often hindered by inadequate training and education.

### Nursing Responsibilities in Chest Drain Management

Nurses play a crucial role in the management of chest drains, overseeing pre-procedure preparations, intra-procedure assistance, and post-procedure care. Prior to chest drain insertion, nurses ensure that all necessary equipment is available, position the patient appropriately, administer analgesics and sedatives, and provide clear patient education about the procedure. Post-insertion responsibilities include monitoring wound sites, tracking drainage output, maintaining the underwater seal, and keeping both patients and their families informed. The chest drain is removed once its intended function is achieved (Abuejheisheh et al., 2021).

### Conclusion

This study highlights the importance of nurses maintaining current knowledge and skills in chest drain management. Although nurses have access to formal educational resources such as in-service training, libraries, conferences, and university courses, many still rely on informal sources, particularly peer discussions, for practice guidance. Dependence on peer communication rather than structured education may lead to inconsistencies in care and potential negative patient outcomes.

Delivering high-quality, individualized care requires adherence to the nursing process, which includes systematic diagnosis, assessment, planning, implementation, and evaluation. By adopting an evidence-based approach and applying critical thinking, nurses can improve chest drain management, minimize complications, and enhance patient outcomes. While peer-to-peer learning is valuable, the findings emphasize the need for additional structured training materials and updated policies.

To ensure optimal patient care, nurses should prioritize formal educational resources to stay informed about the latest evidence-based practices. Healthcare systems should support and encourage nurses' continuous professional development, enhancing both theoretical knowledge and practical application in chest drain management. While peer knowledge exchange plays a role in learning, integrating formal, evidence-based education into nursing practice is essential to improve patient outcomes, reduce complications, and elevate the overall quality of care.

### References

1. Abuejheisheh, A., Qaddumi, J. A. S., & Darawad, M. W. (2021). Chest drains: Prevalence of insertion and ICU nurses' knowledge of care. *Heliyon*, 7(8), e07719. <https://doi.org/10.1016/j.heliyon.2021.e07719>
2. Ari, A., & Restrepo, R. D. (2012). Aerosol delivery device selection for spontaneously breathing patients: 2012. *Respiratory Care*, 57, 613–626.
3. Chinese College of Emergency Physicians (CCEP), Emergency Committee of PLA, Beijing Society for Emergency Medicine, & Chinese Emergency Medicine. (2019). Expert consensus on nebulization therapy in pre-hospital and in-hospital emergency care. *Annals of Translational Medicine*, 7(18), 487. <https://doi.org/10.21037/atm.2019.09.44>
4. Dunham, M., & MacInnes, J. (2018). Relationship of multiple attempts on an admissions examination to early program performance. *Journal of Nursing Education*, 57(10), 578–583.
5. Ghoshal, A. G., Salvi, S., Dhar, R., Guleria, R., Mahashur, A., Mukhopadhyay, A., et al. (2017). Consensus document on home nebulization for maintenance treatment of obstructive airway diseases: A joint initiative by the National Allergy Asthma Bronchitis Institute (NAABI) and Chest Research Foundation (CRF). *Journal of Association of Physicians of India*, 65, 60–73.
6. Gold, N. A., Mirza, T. M., & Avva, U. (2022). Alcohol Sanitizer. In *StatPearls* [Internet]. StatPearls Publishing. Available from <https://www.statpearls.com>
7. Goncalves Mendes Neto, A., & Jabuonski, T. A. (2018). Pigtail catheter vs chest tube as the initial treatment for pneumothorax. *Chest*, 154(3), 725.
8. Jamieson, H., Abey-Nesbit, R., Bergler, U., Keeling, S., Schluter, P. J., Scrase, R., & Lacey, C. (2019). Evaluating the influence of social factors on aged residential care admission in a national home care

- 
- assessment database of older adults. *Journal of the American Medical Directors Association*, 20(11), 1419–1424.
9. Kening, M. Z., & Groen, K. (2023). Personal Protective Equipment. In StatPearls [Internet]. StatPearls Publishing. Available from <https://www.ncbi.nlm.nih.gov/books/NBK589639/>
  10. Magner, C., Houghton, C., Craig, M., & Cowman, S. (2013). Nurses' knowledge of chest drain management in an Irish children's hospital. *Journal of Clinical Nursing*, 22(19-20), 2912–2922.
  11. McCarthy, R., Gino, B., d'Entremont, P., Barari, A., & Renouf, T. S. (2020). The importance of personal protective equipment design and donning and doffing technique in mitigating infectious disease spread: A technical report. *Cureus*, 12(12), e12084. <https://doi.org/10.7759/cureus.12084>
  12. Ravi, C., & McKnight, C. L. (2023). Chest tube. In StatPearls [Internet]. StatPearls Publishing. Available from <https://www.ncbi.nlm.nih.gov/books/NBK459199/>
  13. Santos, C., Gupta, S., Baraket, M., Collett, P. J., Xuan, W., & Williamson, J. P. (2019). Outcomes of an initiative to improve inpatient safety of small bore thoracostomy tube insertion. *Internal Medicine Journal*, 49(5), 644–649.
  14. Shih, C. Y., Huang, C. Y., Huang, M. L., Chen, C. M., Lin, C. C., & Tang, F. I. (2019). The association of sociodemographic factors and needs of haemodialysis patients according to Maslow's hierarchy of needs. *Journal of Clinical Nursing*, 28(1-2), 270–278.
  15. Toney-Butler, T. J., & Thayer, J. M. (2023). Nursing Process. In StatPearls [Internet]. StatPearls Publishing. Available from <https://www.ncbi.nlm.nih.gov/books/NBK499937/>
  16. World Health Organization. (2009). WHO guidelines on hand hygiene in health care: First global patient safety challenge clean care is safer care. World Health Organization. Available from <https://www.ncbi.nlm.nih.gov/books/NBK144035/>
  17. Widmer, A. F., et al. (2007). Introducing alcohol-based hand rub for hand hygiene: The critical need for training. *Infection Control and Hospital Epidemiology*, 28, 50–54.
  18. Spruce, L. R. (2013). Back to basics: Hand hygiene and surgical hand antisepsis. *AORN Journal*, 98(5), 449–457; quiz 458-460.
  19. Saha, A., Yadav, P., Das, S., Chakrabarty, A., & Choudhury, P. (2021). Guideline for dental office in the wake of novel coronavirus-19: A summary of proposals. *International Journal of Applied Dental Sciences*, 7, 187–197. <https://doi.org/10.22271/oral.2021.v7.i1c.1135>