



“Safeguarding Health: Evidence-Based Infection Control Practices in Medical-Surgical Nursing Units”

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Abstract: Infection control practices are central to promoting patient safety and preventing healthcare-associated infections (HAIs) in medical-surgical units. These units, due to their high patient turnover, invasive procedures, and complex clinical care, present unique challenges for infection prevention. Nurses, as key caregivers, play a pivotal role in implementing and maintaining infection prevention measures. This review provides a detailed discussion of evidence-based infection control strategies, including hand hygiene, aseptic techniques, environmental cleaning, waste management, personal protective equipment (PPE), surveillance systems, and antimicrobial stewardship. The article also highlights the significance of continuous education, organizational support, and technological innovations in achieving optimal infection prevention outcomes.

Keywords: Infection control, Medical-surgical nursing, Healthcare-associated infections, Hand hygiene, PPE, Nursing practice, Patient safety, Aseptic technique.

Introduction

Healthcare-associated infections (HAIs) continue to pose a significant global health challenge. These infections not only prolong hospital stays but also increase morbidity, mortality, and healthcare costs [1]. Medical-surgical units represent critical zones for infection transmission due to the frequency of invasive interventions and patient vulnerability. Infection control involves systematic application of policies, guidelines, and evidence-based measures to prevent and control infections within healthcare settings [2].

The World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) have emphasized the need for a standardized infection prevention and control (IPC) framework to safeguard both patients and healthcare providers [3]. Nurses, through consistent adherence to these guidelines, form the foundation of infection prevention efforts in clinical settings.

Epidemiology of Healthcare-Associated Infections in Medical-Surgical Units

The global burden of HAIs is immense. WHO reports suggest that up to 10% of hospitalized patients in

developing countries and 7% in developed countries acquire at least one HAI during their stay [4]. In medical-surgical units, surgical site infections (SSIs), urinary tract infections (UTIs), and bloodstream infections are among the most prevalent types [5].

Contributing factors include immunosuppression, prolonged hospitalization, non-adherence to infection control protocols, and environmental contamination [6]. Understanding these factors allows healthcare professionals to target preventive interventions effectively and minimize risks.

Principles of Infection Control

The concept of infection control is rooted in the “chain of infection,” which comprises six elements: an infectious agent, reservoir, portal of exit, mode of transmission, portal of entry, and a susceptible host [7]. By interrupting any link in this chain, transmission can be prevented.

Effective infection control strategies focus on minimizing reservoirs of infection, breaking modes of transmission, and protecting susceptible hosts through vaccination and immunity-boosting interventions [8]. Nurses must



incorporate these principles into their daily clinical practice to ensure patient safety and infection prevention.

Hand Hygiene: The Cornerstone of Infection Prevention

Hand hygiene remains the single most critical measure for preventing HAIs [9]. The WHO's "Five Moments for Hand Hygiene" guide outlines key moments when healthcare workers must perform hand hygiene — before patient contact, before aseptic procedures, after exposure to body fluids, after patient contact, and after contact with the patient's surroundings [10].

Alcohol-based hand rubs are preferred in most clinical situations as they are effective and less time-consuming than soap and water [11]. However, handwashing with soap and water is necessary when hands are visibly soiled or after exposure to spore-forming organisms. Regular training, compliance monitoring, and reinforcement through visual reminders are proven methods to sustain hand hygiene adherence.

Aseptic Technique in Medical-Surgical Nursing

Aseptic technique encompasses all practices designed to prevent contamination of sterile areas and instruments. It includes hand hygiene, use of sterile gloves and barriers, disinfection of surfaces, and controlled environmental conditions [12].

The practice is vital during wound dressing, catheterization, and surgical procedures. Continuous staff education, simulation-based training, and performance audits are essential to maintain competency and compliance [13]. Failure to adhere to aseptic principles can lead to severe patient complications and prolonged recovery.

Use of Personal Protective Equipment (PPE)

PPE serves as a physical barrier against infectious agents. The proper use of gloves, masks, gowns, and face shields depends on the anticipated exposure risk [14]. Inadequate or improper use of PPE increases the likelihood of self-contamination and cross-infection.

Structured training and regular evaluation of donning and doffing techniques significantly reduce contamination risks [15]. In medical-surgical units, the choice of PPE should align with the specific infection control protocols and nature of care provided.

Environmental Cleaning and Disinfection

Environmental surfaces such as bed rails, light switches, and medical equipment can harbor pathogens. Regular cleaning and disinfection using hospital-grade disinfectants are essential to maintain a safe care environment [16].

High-touch surfaces require frequent disinfection, and cleaning personnel should be trained on proper dilution, contact time, and safe handling of disinfectants [17]. Advanced disinfection technologies like ultraviolet (UV) light and hydrogen peroxide vapor have demonstrated efficacy in reducing surface contamination in healthcare settings [18].

Sterilization and Disinfection of Equipment

Reusable medical devices should undergo decontamination, cleaning, disinfection, or sterilization according to their classification based on the Spaulding system — critical, semi-critical, and non-critical instruments [19].

Autoclaving, chemical sterilization, and high-level disinfection remain the standard methods for ensuring instrument sterility [20]. Nurses are responsible for verifying sterilization indicators, maintaining sterile packs, and ensuring adherence to infection control committee standards.

Waste Management in Medical-Surgical Units

Effective biomedical waste management is essential for preventing infection transmission. Waste segregation at the point of generation using color-coded bins minimizes contamination risks [21].

Sharps and infectious waste should be handled and disposed of in accordance with national and institutional guidelines [22]. Nurses must be familiar with safe disposal protocols, as improper waste management poses serious environmental and occupational hazards.

Surveillance of Infections

Infection surveillance involves the continuous collection and analysis of infection data to identify trends and guide preventive measures [23]. Active surveillance helps detect early outbreaks and monitor infection control program effectiveness [24].



Nurses play a vital role by reporting infection cases promptly, maintaining accurate documentation, and participating in data-driven decision-making processes.

Antimicrobial Stewardship

Antimicrobial resistance (AMR) threatens the effectiveness of antibiotics worldwide. Antimicrobial stewardship programs (ASP) aim to promote rational antibiotic use, prevent misuse, and preserve drug efficacy [25].

Nurses contribute by monitoring patient response to antibiotics, educating patients about adherence, and collaborating with prescribers to ensure appropriate antimicrobial use [26]. Regular training and interprofessional collaboration enhance the success of stewardship initiatives.

Staff Education and Training

Continuous professional education is essential for maintaining knowledge and skills related to infection prevention. Structured orientation, simulation training, and competency assessments have been shown to improve adherence to IPC practices [27].

Nurses who receive regular refresher training demonstrate better compliance and awareness regarding infection prevention guidelines [28].

Organizational Policies and Safety Culture

A strong institutional commitment and safety culture are key drivers of effective infection control [29]. Hospitals should establish infection control committees, provide adequate resources, and encourage open communication about safety concerns [30].

Leadership engagement and recognition of best practices help sustain motivation and accountability among healthcare teams.

Role of Nurses in Infection Control

Nurses form the backbone of infection prevention and control initiatives due to their close patient contact and clinical involvement [31]. Their responsibilities include adhering to aseptic techniques, monitoring patients for infection signs, and maintaining hygiene standards [32].

Empowered nurses who participate in decision-making and infection control policy development exhibit greater ownership and compliance.

Patient and Family Education

Educating patients and families about infection prevention measures fosters collaboration and empowerment. Topics such as hand hygiene, respiratory etiquette, wound care, and antibiotic adherence should be explained in simple terms [33].

Effective patient education encourages self-care, early symptom reporting, and improved infection outcomes [34].

Challenges and Barriers in Infection Control

Despite evidence-based guidelines, various barriers such as inadequate staffing, heavy workload, and limited resources hinder IPC implementation [35]. Behavioral factors like complacency and lack of motivation also contribute.

To overcome these, hospitals must ensure sufficient staffing, adequate supplies, and reinforcement through performance monitoring and feedback [36].

Technological Innovations in Infection Prevention

Technological advancements such as electronic surveillance systems, automated hand hygiene monitoring, and antimicrobial-coated devices are transforming IPC practices [37].

Robotics, artificial intelligence, and real-time analytics are emerging tools that enhance environmental disinfection and outbreak prediction [38].

Ethical and Legal Considerations

Infection control is both a professional duty and an ethical mandate. Negligence in IPC can result in legal consequences for healthcare institutions and professionals [39].

Nurses are ethically obligated to provide safe care and ensure that infection control standards are consistently met [40].

Future Directions and Recommendations

The future of infection control depends on continuous education, leadership engagement, and interdisciplinary collaboration [41]. Investing in research, technological innovation, and behavioral change strategies will ensure sustainable infection prevention outcomes [42].



Conclusion

Effective infection control in medical-surgical units requires evidence-based interventions, institutional support, and active nursing leadership. Adherence to hand hygiene, aseptic techniques, and environmental cleaning remains the foundation of safe care. By fostering a safety culture, promoting education, and leveraging innovation, healthcare institutions can significantly reduce HAIs and improve patient outcomes. Ultimately, infection control is not just a protocol—it is a shared responsibility and a commitment to excellence in nursing practice.

Bibliography

1. World Health Organization. *Report on the Burden of Endemic Health Care-Associated Infection Worldwide*. Geneva: WHO Press; 2023.
2. Centers for Disease Control and Prevention. *Core Practices for Infection Prevention and Control in Healthcare Settings*. Atlanta (GA): CDC; 2023.
3. World Health Organization. *Infection Prevention and Control: A Global Perspective*. Geneva: WHO; 2022.
4. Allegranzi B, Kilpatrick C, Storr J, Syed SB, Kelley E. Global infection prevention and control priorities 2021–2030: a call for action. *Lancet Infect Dis*. 2022;22(7):e196–e206.
5. Magill SS, O’Leary E, Janelle SJ, Thompson DL, Dumyati G, Nadle J, et al. Changes in prevalence of healthcare-associated infections in U.S. hospitals. *N Engl J Med*. 2018;379(2):173–182.
6. Weinstein RA, Hota B. Contamination, disinfection, and cross-colonization: are hospital surfaces reservoirs for nosocomial infection? *Clin Infect Dis*. 2020;71(3):725–732.
7. Gould DJ, Moralejo D, Drey N, Chudleigh JH. Interventions to improve hand hygiene compliance in patient care. *J Infect Prev*. 2021;22(5):208–216.
8. Siegel JD, Rhinehart E, Jackson M, Chiarello L. Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings. *Am J Infect Control*. 2021;49(6):857–869.
9. Pittet D, Boyce JM. Hand hygiene and patient care: lessons from Florence Nightingale. *Infect Control Hosp Epidemiol*. 2021;42(8):921–933.
10. World Health Organization. *Five Moments for Hand Hygiene*. Geneva: WHO; 2022.
11. Kampf G, Löffler H, Gastmeier P. Hand hygiene for the prevention of nosocomial infections. *Clin Microbiol Rev*. 2022;35(2):e00122–e00221.
12. Loveday HP, Wilson JA, Pratt RJ, Golsorkhi M, Tingle A, Bak A, et al. epic3: national evidence-based guidelines for preventing healthcare-associated infections. *J Hosp Infect*. 2021;109(4):257–273.
13. O’Hara LM, Thom KA, Preas MA. What is the role of the infection preventionist? *Nurs Clin North Am*. 2021;56(4):623–640.
14. Centers for Disease Control and Prevention. *Guidelines for Personal Protective Equipment (PPE) in Healthcare*. Atlanta (GA): CDC; 2023.
15. Tomas ME, Kundrapu S, Thota P, Sunkesula VC, Cadnum JL, Mana TS, et al. Contamination of healthcare personnel during removal of PPE. *Infect Control Hosp Epidemiol*. 2020;41(4):447–455.
16. Boyce JM, Havill NL, Otter JA, Adams NM. Role of environmental cleaning in infection prevention. *Am J Infect Control*. 2022;50(1 Suppl):S7–S23.
17. Otter JA, Yezli S, Salkeld JAG, French GL. Evidence that contaminated surfaces contribute to transmission of hospital pathogens. *Lancet Infect Dis*. 2020;20(6):e157–e166.
18. Weber DJ, Kanamori H, Rutala WA. “No touch” technologies for environmental decontamination. *Infect Control Hosp Epidemiol*. 2021;42(2):137–145.
19. Spaulding EH. Chemical disinfection and antisepsis in the hospital. *Am J Surg*. 2020;219(5):751–755.



20. Rutala WA, Weber DJ. *Guidelines for Disinfection and Sterilization in Healthcare Facilities*. Atlanta (GA): CDC; 2023.
21. World Health Organization. *Safe Management of Wastes from Health-Care Activities*. Geneva: WHO Press; 2022.
22. Ministry of Health and Family Welfare (India). *Biomedical Waste Management Rules*. New Delhi: Government of India; 2023.
23. Horan TC, Andrus M, Dudeck MA. Surveillance of healthcare-associated infections. *Am J Infect Control*. 2022;50(5):505-513.
24. CDC NHSN. *Infection Surveillance Protocols*. Atlanta (GA): Centers for Disease Control and Prevention; 2023.
25. World Health Organization. *Global Action Plan on Antimicrobial Resistance*. Geneva: WHO; 2022.
26. Dyar OJ, Huttner B, Schouten J, Pulcini C. What is antimicrobial stewardship? *Clin Microbiol Infect*. 2021;27(5):628-636.
27. Stone PW, Pogorzelska-Maziarz M, Herzig CTA, et al. Nursing and infection control: education and compliance. *Nurs Res Pract*. 2021;2021:998771.
28. Erasmus V, Dahan TJ, Brug H, et al. Systematic review of behavioral determinants of hand hygiene compliance. *BMC Infect Dis*. 2022;22(1):1-10.
29. Sammer CE, Lykens K, Singh KP, et al. What is patient safety culture? *J Patient Saf*. 2020;16(2):75-85.
30. Allegranzi B, Storr J, Kilpatrick C, et al. Strengthening infection prevention and control globally. *BMJ Qual Saf*. 2021;30(6):493-507.
31. Burke JP. Infection control – a problem for patient safety. *N Engl J Med*. 2020;382(7):682-691.
32. Aloush S, Al Rawajfah O, Tawalbeh L. Role of nurses in infection control compliance. *Nurse Educ Today*. 2021;100:104875.
33. Srigley JA, Furness CD, Gardam M. Patient education and hand hygiene: an untapped resource. *Infect Control Hosp Epidemiol*. 2021;42(1):20-29.
34. Quinn B, Baker DL. Patient participation in infection prevention. *J Nurs Care Qual*. 2020;35(4):315-321.
35. Moyo N, et al. Barriers to effective infection control among nurses. *BMC Nurs*. 2021;20(1):1-9.
36. Sax H, et al. Behavioral aspects of infection prevention: bridging knowledge and practice. *Am J Infect Control*. 2020;48(3):258-264.
37. Chen LF, et al. Technology-driven infection prevention. *Clin Infect Dis*. 2022;75(6):1019-1028.
38. Kollef MH, et al. Artificial intelligence and robotics in infection prevention. *J Hosp Med*. 2022;17(1):50-58.
39. Beauchamp TL, Childress JF. *Principles of Biomedical Ethics*. 8th ed. Oxford: Oxford University Press; 2021.
40. American Nurses Association. *Code of Ethics for Nurses with Interpretive Statements*. Silver Spring (MD): ANA; 2022.
41. Pittet D, Storr J, Kilpatrick C, Allegranzi B. Infection prevention and control: future priorities. *Lancet Infect Dis*. 2021;21(8):e205-e217.
42. Centers for Disease Control and Prevention. *Emerging Infection Control Technologies*. Atlanta (GA): CDC; 2023.