JOURNAL OF INTERNATIONAL CRISIS AND RISK COMMUNICATION RESEARCH
ISSN: 2576-0017
2024, VOL 7, NO S8

The Role of Nurses in Perioperative Infection Control: A Comprehensive Literature Review

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ABSTRACT

Infection prevention is a critical aspect of healthcare, particularly in perioperative settings. This comprehensive literature review explores the role of nurses in maintaining asepsis and preventing infections during surgical procedures. The study focuses on the application of aseptic techniques within surgical units in the KSA region, where nearly 90,000 surgeries were performed in 2016. The purpose of this

review was to develop an aseptic checklist for registered nurses in the perioperative units in KSA. The literature review covers key topics such as perioperative nursing, asepsis, aseptic conscience, sterility, personal hygiene, and protective equipment. The findings emphasize the importance of proper hand hygiene, including surgical hand disinfection and handwashing, as well as the appropriate use of personal protective equipment like aprons, gowns, face masks, and gloves. Maintaining an aseptic conscience among staff is crucial for minimizing infection transmission risk. Operating rooms should be meticulously prepared, and unnecessary movement in and out of the room should be minimized. Perioperative nurses play a vital role in infection prevention, with scrub nurses maintaining the sterility of the surgical field and instruments and circulating nurses overseeing the aseptic practices of the entire surgical team. The final aseptic checklist, informed by the literature review, comprises two themes with 10 true/false statements each and one additional theme with five true/false statements. Regular assessments of nurses' knowledge of aseptic practices should be conducted, and the checklist could be integrated into daily practices across different perioperative units to enhance patient safety and minimize infection risk.

KEYWORDS: Perioperative Nursing, Infection Control, Surgical Site Infections, Sterilization and Disinfection, Aseptic Techniques, Operating Room Protocols

1. Introduction

In a hospital setting, infection prevention is one of the most critical aspects of healthcare. Asepsis refers to measures aimed at preventing the transmission of microorganisms and infections. This is achieved through the application of aseptic techniques, which include proper hand hygiene, surface disinfection, sterilization of instruments, and adherence to aseptic workflow protocols. During surgical procedures, the operating room should be restricted to essential personnel only, with unnecessary movement in and out of the room minimized. Maintaining asepsis is crucial for ensuring the health and safety of both patients and healthcare personnel (Kurvinen & Terho, 2013).

The importance of hand hygiene was first highlighted in 1847 by Dr. Ignaz Semmelweis, an Austrian physician, who observed that washing hands between patient interactions significantly reduced mortality rates. Prior to his intervention, medical staff often proceeded directly from performing autopsies to assisting with childbirth without disinfecting their hands, resulting in the spread of bacteria and high maternal mortality rates. To address this, Semmelweis mandated handwashing with a chloride solution, leading to a significant decrease in deaths (World Health Organization, 2009). Similarly, Florence Nightingale made significant contributions to the understanding of hygiene and its impact on mortality during her work as a volunteer nurse in the Crimean War in 1854. She identified poor sanitation, including unclean conditions, food, and inadequate sewage management, as key contributors to high mortality rates among the soldiers under her care (Fee & Garofalo, 2010).

This study focuses on asepsis and its application within the surgical units. The KSA

region specializes in a wide range of surgical interventions, encompassing both general and complex procedures across all anatomical regions. These operations follow a triphasic process: the preoperative, intraoperative, and postoperative phases. In 2016, nearly 90,000 surgeries were performed within the KSA region. In KSA, approximately 40,000 hospital-acquired infections are reported annually.

The purpose of this study was to develop an aseptic checklist tailored for registered nurses in the perioperative unit in KSA. Ensuring that all nursing staff possess a uniform understanding of aseptic practices is essential for infection prevention. Enhancing nurses' knowledge about infection control measures can significantly improve patient safety in this context (Mäkelä & Karhe, n.d.).

2. Background

2.1 Perioperative Nursing

Perioperative nursing involves addressing both health and illness, with the healthcare team focusing on the patient's illness and the implications of the treatment provided. The aim is to enhance the patient's well-being while supporting their significant others. Additionally, the healthcare team assists patients in performing health-related tasks that they are unable to manage independently. Perioperative nursing relies on evidence-based practice, grounded in scientific research and empirical studies (Lukkari, Kinnunen, & Korte, 2013).

The perioperative pathway is divided into three phases: preoperative, intraoperative, and postoperative. The preoperative phase begins with the decision to proceed with surgery and concludes when the patient enters the operating room. This phase involves both the physical and psychological preparation of the patient, as well as an initial patient assessment. The intraoperative phase starts when the patient enters the operating room and ends when they are transferred to the recovery room. This stage includes administering anesthesia, preparing and draping the patient, and performing the surgical procedure. Following the surgery, the patient is moved to the post-anesthesia care unit, marking the start of the postoperative phase. This phase continues until the patient is discharged and involves monitoring their recovery and managing pain with appropriate medications (Goodman & Spry, 2014; Karma, Kinnunen, Palovaara, & Perttunen, 2016).

2.2 Asepsis and Aseptic Conscience

Asepsis refers to practices aimed at preventing the introduction of microorganisms into sterile tissue or materials. Common post-surgical infections include pneumonia, sepsis, vascular catheter-related infections, and urinary tract infections. Maintaining good personal hygiene forms the basis of aseptic practices. Appropriate work attire and protective clothing reduce the risk of infection transmission, while proper hand hygiene is crucial for preventing contact-based infections (Lukkari et al., 2013).

The aseptic technique encompasses procedures designed to minimize microbial transmission, thereby protecting patients from infections. Situations involving patient contact or the use of invasive devices necessitate aseptic methods, as these

circumstances can introduce pathogens and elevate the risk of infection. The aseptic non-touch technique involves avoiding contact with sterile equipment surfaces to prevent contamination (Jones, 2014).

Aseptic conscience entails healthcare practitioners adhering to and recognizing aseptic principles, as well as identifying when these principles are compromised. Education on topics such as proper attire, sterile field maintenance, sterilization, disinfection, and adherence to controlled traffic patterns is foundational for safe perioperative nursing. Adopting aseptic techniques reduces the incidence of surgical site infections (McNamara, 2011).

An aseptic conscience requires healthcare professionals to make independent decisions, take responsibility, and possess a thorough understanding of patient safety principles. Consistency in aseptic practices among all operating room staff is essential to ensuring effective infection prevention (Lukkari et al., 2013).

2.3 Sterile and Disinfected

Sterility refers to the complete absence of any living microorganisms, including bacterial and fungal spores. Sterilization is the process aimed at eliminating all living microorganisms and their spores, whereas disinfection only eliminates living microorganisms but does not remove spores (Goodman & Spry, 2014). The sterile field represents the area around the patient that is intended to remain free from all living microbes. For this purpose, the patient's skin is disinfected, and the sterile field is established using sterile drapes. Personnel operating within the sterile field are required to wear protective, sterile attire (Lukkari et al., 2013).

The circulating nurse begins by disinfecting the surgical site and allowing the skin to air dry. During this process, the scrub nurse performs a surgical hand scrub and dons sterile protective clothing. Subsequently, the scrub nurse creates the sterile field by setting up the sterile drapes and preparing the Mayo table. At this stage, the surgeon is instructed to begin their surgical hand scrub. Proper timing in establishing the sterile field is crucial to ensure patient safety and to prepare for the surgical procedure without unnecessary delays (Lukkari et al., 2013).

2.4 Personal Hygiene

Maintaining personal hygiene is an essential aspect of a perioperative nurse’s professional competence. This includes daily showers, adequate hair washing, and proper oral hygiene. For male staff, maintaining a clean-shaven face is also necessary. On a perioperative ward, long hair must be tied back, and touching or brushing it is discouraged. Similarly, excessive talking or touching the mouth and nose is avoided, as the oral and nasal areas harbor a high concentration of microbes. Staff should also be knowledgeable about proper techniques for blowing the nose and coughing. When blowing the nose, a disposable tissue should be used and discarded immediately. Coughing should be directed into the armpit of the non-dominant hand while turning away from the patient. Hands must be disinfected immediately after such actions. Additionally, strong perfumes are avoided in perioperative wards, as they may trigger adverse reactions in allergic or asthmatic patients (Karma et al., 2016).

Hand hygiene is a cornerstone of infection prevention in perioperative care. Effective hand hygiene includes washing hands with soap, applying alcohol-based disinfectants, caring for the skin, and performing surgical hand scrubs. Skin health is critical; all wounds or sores should be treated, and the skin kept moisturized. Soap should only be used when hands are visibly dirty, while alcohol-based disinfectants are preferred in all other instances. Disinfectants must be applied before and after patient contact, between different work tasks, before and after procedures, before and after donning protective gear, and upon entering or leaving the perioperative area. The disinfectant eliminates bacteria and viruses while preventing infections. Hands should be rubbed for at least 30 seconds or until they feel completely dry. Surgical hand scrubbing, performed before surgical procedures, removes transient microbial flora and reduces the resident microbial flora on the skin. Before starting a surgical hand scrub, dirt under the nails should be removed with a brush, and the hands carefully washed with soap. After washing, the hands and arms are disinfected three times: the first application extends to the elbows, and subsequent applications cover progressively smaller areas (Karma et al., 2016).

Jewelry and watches are prohibited in perioperative settings because they harbor microbes in trapped moisture and hinder proper handwashing. Long earrings and necklaces may contaminate the sterile field, posing a risk of infection, while piercings are a potential source of infection for the wearer, as they may allow bacteria to enter through broken skin (Karma et al., 2016).

Nails must be kept short and clean in the perioperative environment, as long nails can accumulate more microorganisms. Long nails also risk scratching the patient's skin or damaging protective gloves. Nail polish, which is prone to softening and cracking when exposed to disinfectants, provides a surface for bacteria to grow and should not be used. Artificial nails are also prohibited, as they accumulate more bacteria and debris than natural nails. If a nurse has nail infections such as fungal infections, these must be promptly treated (Karma et al., 2016).

2.5 Protective Equipment

In perioperative wards, the nurse's standard uniform consists of a short-sleeved shirt, long trousers, socks, and work shoes. Uniforms must be changed daily and donned before entering the ward. Shoes should fully enclose the feet and have anti-slip soles. In the operating room, additional protective equipment is worn, including coverings for the hair, nose, mouth, eyes, and hands. Hair must be completely covered to prevent particles and microbes from falling into the sterile field and to protect the nurse from patient secretions. A disposable surgical mask covering the nose and mouth is always used in sterile areas. This mask protects both the patient and the nurse from droplet and airborne infections as well as exposure to blood and secretions. The mask should fit snugly over the nose bridge and completely cover the mouth and nose. Eye protection is used to guard against secretions entering the eyes.

Disposable gloves are worn to protect nurses from bloodborne pathogens and prevent the transmission of microbes to patients. There are two types of gloves: sterile and non-sterile. Sterile gloves are used during surgical procedures, while non-sterile gloves are appropriate for non-invasive tasks or procedures involving

secretions. For example, non-sterile gloves are used during tasks like skin disinfection and intubation in the operating room (Karma et al., 2016).

3. Literature review

3.1 literature review of Proper Implementation of Hand Hygiene in Perioperative Nursing

The proper implementation of hand hygiene in perioperative nursing plays a critical role in preventing the transmission of microbes and pathogens. Effective pre-surgical hand hygiene involves the correct performance of surgical handwashing and disinfection. Surgical hand disinfection using an alcohol-based solution is deemed more effective than antiseptic solutions for surgical handwashing. Consequently, the surgical team must pay particular attention to thoroughly disinfecting their hands (Rintala et al., 2014). Surgical handwashing is specifically designed to reduce the risk of infection by removing microorganisms from the hands, nails, and forearms, provided the skin is intact and healthy (Slade, 2017).

Surgical site infections are predominantly caused by bacteria transmitted through inadequate hand hygiene (Arrowsmith & Taylor, 2014). Proper hand hygiene should always be observed both before and after contact with a patient (The Joanna Briggs Institute, 2016). Handwashing constitutes a key component of hand hygiene and effectively reduces the risk of infection. To ensure proper handwashing, all jewelry and nail polish should be removed, and artificial nails should not be worn in aseptic environments, as they tend to harbor significant bacterial colonies (The Joanna Briggs Institute, 2017). Hands must be entirely free of any foreign particles to maintain adequate hygiene (Chu, 2016). Interestingly, a small study conducted by Arrowsmith and Taylor (2014) revealed that polished, short nails had lower bacterial counts compared to natural nails.

3.2 Personal Protective Equipment and Clothing in Perioperative Nursing

Infection control can be significantly improved through the appropriate use of personal protective equipment such as aprons, gowns, and face masks. Proper use of aprons and gowns entails utilizing them as single-use items. These protective garments not only safeguard the patient but also protect healthcare workers from exposure to infectious agents. They act as barriers against the spread of infections and diseases through uniforms and prevent contact with the patient's blood and bodily secretions. Face masks are an inexpensive and effective means of shielding staff from inhaling airborne infectious particles while simultaneously protecting patients. Eye protection is also essential when there is a risk of infectious materials entering the eyes through the conjunctiva (Slade, 2016).

Shoe covers are another component of the surgical outfit, protecting shoes from contamination by blood and bodily fluids. Wearing shoe covers in the operating room is recommended, though not mandatory, as contaminated footwear can increase the risk of spreading infectious agents (Adam, Korniewicz & El-Masri, 2011). Gloves, available in sterile and non-sterile variants, are essential in the perioperative setting. Sterile gloves are used during invasive procedures, while non-

sterile gloves are employed for non-invasive tasks. Both types serve to protect patients and healthcare workers alike (Mann, 2018).

3.3 Aseptic Conscience in Perioperative Nursing

Maintaining an aseptic conscience among staff is crucial for minimizing the risk of infection transmission. It is essential to continually emphasize its importance to ensure adherence to proper aseptic techniques. For instance, failure to comply with hand hygiene protocols is both unethical and indicative of professional incompetence. Measures such as installing time-monitoring devices near sinks, displaying informational posters, and developing faster-acting disinfectants could enhance compliance. However, high-alcohol-content disinfectants, which work more rapidly, may cause skin irritation. The recommended duration for disinfection is approximately three minutes to ensure its effectiveness. Addressing negligent attitudes toward hand hygiene should begin during educational training, with teachers and superiors serving as role models for best practices (Rintala et al., 2014).

Acknowledging and addressing breaches in sterile technique is vital. It is the ethical responsibility of nurses to identify, report, and document such breaches, as this fosters a culture of safety rather than discomfort or blame. This practice reduces the risk of surgical site infections and improves patient safety overall (Adams et al., 2011).

3.4 Asepsis in Perioperative Nursing

Operating rooms should be meticulously prepared prior to the commencement of surgery, and unnecessary movement in and out of the room should be minimized (Chu, 2016). Proper preparation promotes a hygienic environment, and any lapses in aseptic technique in perioperative nursing can significantly increase the risk of infection (The Joanna Briggs Institute, 2017). By adhering to proper aseptic practices, which is the shared responsibility of all perioperative staff, it is possible to prevent 40-60% of surgical site infections.

Perioperative nurses play a key role in infection prevention, acting as the first line of defense. Scrub nurses are responsible for maintaining the sterility of the surgical field and instruments, while circulating nurses oversee and monitor the aseptic practices of the entire surgical team (Adams et al., 2011). Infection control can be further improved by designing operating rooms to prevent airborne contamination through microscopic particles. Although such measures may involve significant costs, they ultimately enhance patient safety and should not be overlooked (Chu, 2016).

4. Discussion

The findings of this literature review were derived from three articles authored by various researchers and six recommended practices and evidence summaries from the Joanna Briggs Institute. Due to the scarcity of recent scientific articles on this subject, the recommended practices provided by the Joanna Briggs Institute were incorporated as material for this review. The results distinctly demonstrated a

correlation between infection prevention and the appropriate implementation of hand hygiene alongside the correct use of personal protective equipment. Additionally, the data highlighted critical concerns related to infection control and the aseptic conscience of healthcare staff.

The appropriate execution of hand hygiene in perioperative nursing was frequently emphasized across multiple articles. Chu (2016) noted that aseptic techniques minimize the risk of infection and impede microbial transmission. Hands should be washed whenever visibly dirty, and disinfection should occur both before and after patient contact to safeguard both patients and healthcare providers. Similarly, the Joanna Briggs Institute (2016) underscored the necessity of disinfecting hands between patient interactions and washing them when visibly soiled.

Most articles, except one, agreed on the removal of artificial nails, nail polish, and jewelry before performing procedures, as these interfere with proper hand cleaning. However, an article by Arrowsmith and Taylor (2014) presented a differing view, suggesting that short, polished nails harbor fewer bacteria than natural, unpolished nails. Despite this deviation, the result from Arrowsmith and Taylor (2014) was not incorporated into the aseptic checklist, as the majority of sources provided opposing evidence. This discrepancy highlights the need for additional scientific research on the matter.

Rintala et al. (2014) concluded that surgical hand disinfection using alcohol-based solutions is more effective than traditional handwashing with antiseptic solutions. However, no additional articles supported this finding, indicating the need for further research. As such, this topic was not included in the checklist, as more evidence is required to substantiate these claims.

The importance of single-use equipment and its replacement between patients was consistently highlighted across several articles. According to Slade (2017), changing protective equipment such as gowns and aprons between patient interactions reduces the transmission of infections and protects both patients and healthcare workers. Additionally, protective gear prevents the transfer of microbes through staff uniforms. Articles also outlined proper glove use, emphasizing that sterile gloves are required for scrub nurses and non-sterile gloves for circulating nurses in perioperative settings. Other forms of personal protective equipment, such as face masks and eye protection, were also addressed and deemed significant for aseptic practices in the operating room. These concepts were emphasized in the aseptic checklist due to their relevance and alignment with the hygiene instructions.

While the literature reviewed mentioned the use of shoe covers, the hygiene instructions did not include them as part of the standard surgical attire. Consequently, statements about shoe covers were excluded from the final checklist, although further research into their usage is recommended.

A study cited in the review revealed that most participants rarely or never identified breaches in sterile techniques (Adams et al., 2011). This finding may reflect a lack of emphasis on the significance of aseptic conscience in perioperative nursing. Rintala et al. (2014) reported that perioperative staff adhered to the recommended three-minute hand disinfection duration in only 40% of cases and often failed to dry their

hands correctly. These lapses suggest a lack of awareness or inadequate prioritization of aseptic conscience. Consequently, several statements addressing aseptic conscience were included in the final checklist.

Chu (2016) emphasized minimizing unnecessary movement in and out of the operating room during procedures, identifying this as a critical element of aseptic practice. The hygiene guidelines also reinforced this principle. However, since the checklist was focused on two specific areas of interest, this particular concern was not included, as it fell outside the chosen thematic categories.

Preparing the operating room properly is vital for maintaining hygiene, as inadequate aseptic practices increase the risk of infection (The Joanna Briggs Institute, 2017). Adams et al. (2011) highlighted the role of nurses as key agents in preventing surgical site infections, although they noted that this responsibility extends to all operating room staff. Surgeons and other personnel must also adhere to aseptic principles. Educational efforts should continuously emphasize the significance of proper aseptic practices and the correct preparation of the operating environment. It is particularly important to provide ongoing training to scrub nurses and circulating nurses to reinforce their roles in maintaining the sterile field and monitoring aseptic practices within the surgical team.

Proper aseptic practices in perioperative nursing should remain a focal point of research and education to enhance patient safety and minimize the risk of infection. The aseptic checklist developed through this literature review was informed by the identified areas of importance, including hand hygiene and the proper use of personal protective equipment. Aseptic conscience was also considered, given its crucial role in infection prevention. Other related concepts, although significant, were excluded from the checklist as they required further exploration.

The final aseptic checklist comprised two themes with 10 true/false statements each and one additional theme with five true/false statements. Regular assessments of nurses' knowledge of aseptic practices should be conducted, and the checklist developed in this study could be integrated into daily practices across different perioperative units.

5. Conclusion

Infection prevention is a cornerstone of perioperative nursing, requiring strict adherence to aseptic principles. This literature review underscores the critical role of proper hand hygiene, the use of personal protective equipment, and the development of an aseptic conscience in minimizing the risk of surgical site infections. The findings emphasize the need for ongoing education and training to ensure consistent application of these practices.

The development of a tailored aseptic checklist for perioperative nurses offers a practical tool for standardizing infection control measures, enhancing patient safety, and fostering accountability among healthcare personnel. While areas such as the use of shoe covers and differing opinions on nail hygiene warrant further research, this

study provides a foundation for improving aseptic practices in surgical settings. By maintaining a focus on evidence-based strategies, perioperative nursing can continue to advance its role as a vital component of patient care and infection prevention.

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