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Implementation of Infection Handling Protocols as a Form of Protection for Nurses in Providing Health Services

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Abstract

Non-compliance with infection control protocols among nurses remains a significant issue that jeopardizes the quality and safety of healthcare services. As frontline workers, nurses are highly exposed to infectious agents, especially in hospital environments. This study aims to identify the factors hindering nurses' adherence to infection control protocols and evaluate institutional efforts to address these challenges. A qualitative descriptive approach was employed, using a literature review method to analyze existing publications, legal regulations, and institutional policies related to infection control in healthcare settings. Various sources, including peer-reviewed journal articles, academic books, and national health regulations, were systematically reviewed to gain a comprehensive understanding of the issue. The study refers to Law No. 17 of 2023 concerning Health, which outlines national infection control measures. Findings indicate that while healthcare facilities have established Standard Operating Procedures (SOPs) for infection control, their implementation remains inconsistent. The main barriers identified include high workload, limited personal protective equipment (PPE), inadequate supervision, and an underdeveloped safety culture. Furthermore, ineffective leadership and poor communication within teams exacerbate the problem. The study emphasizes stronger organizational leadership, a robust safety culture, better interprofessional coordination, and sufficient resources. The findings suggest that a more structured and collaborative approach between healthcare institutions and policymakers is necessary to enhance the implementation of infection control protocols. This research contributes to improving the protection of healthcare workers and ensuring high-quality healthcare services through effective infection control practices.

Keywords:
Infection Control Protocol, Nurse Compliance, Healthcare Safety, Legal Regulations

1. Introduction

High-quality healthcare services that prioritize patient safety cannot be separated from the consistent and comprehensive implementation of infection control protocols. Among all healthcare workers, nurses are the professionals who interact with patients most frequently both infectious and non-infectious making them one of

the most vulnerable groups to disease transmission. In this context, the implementation of infection control protocols serves as a critical measure of protection, not only for the nurses themselves but also for patients and the broader community.

Hospitals are high-risk environments for the spread of infectious diseases. Therefore, health protocols and Standard Operating Procedures (SOPs) have been established as guidelines to ensure safe, effective, and professional work practices. These protocols include the use of personal protective equipment (PPE), hand hygiene, sterilization of medical instruments, and proper handling of medical waste. Their implementation is mandatory and supported by various regulations, notably Law Number 17 of 2023 concerning Health, which comprehensively regulates the national health system, including efforts to prevent and treat infectious diseases. The law affirms that every healthcare worker has the right to protection while performing their duties and is equally obligated to comply with occupational safety standards.

Despite the existence of such legal and institutional frameworks, the implementation of these protocols in the field remains far from optimal. Kurniawati et al. (2013) and Mapanawang et al. (2017) found that many workplace injuries particularly needlestick injuries from used syringes occurred due to nurses' failure to adhere to established procedures. In Mapanawang's study, 62% of nurses who suffered needlestick injuries admitted that they had not followed proper injection procedures, such as using a safety box or avoiding recapping needles. These findings clearly demonstrate the gap between policy and actual practice, where having SOPs in place does not necessarily lead to compliance among healthcare workers.

In support of this, Ariani et al. (2020) highlighted that hospital-acquired infection (HAI) rates could be significantly reduced through improved adherence to protocols. Their study showed that appropriate PPE use, consistent hand hygiene, and thorough decontamination of instruments contributed to a 30% reduction in nosocomial infection rates over the course of a year. This illustrates a direct correlation between protocol compliance and improved clinical outcomes.

However, protecting nurses extends beyond procedural compliance. Immunological protection, particularly through vaccination, plays a vital role in infection prevention though it is often overlooked. The World Health Organization (WHO, 2016) recommends that healthcare workers be vaccinated against high-risk infectious diseases such as Hepatitis B, Influenza, and Tuberculosis (via the BCG vaccine). Unfortunately, Susanti et al. (2018) revealed that only 41% of healthcare workers had received the Hepatitis B vaccine, due to limited outreach, insufficient vaccine availability, and a lack of institutional policy support. This underscores the fact that infection prevention requires not only individual awareness but also strong systemic backing.

Another critical issue lies in the unequal distribution and use of SOPs across hospital units. Some service units lack formal, written SOPs, resulting in inconsistencies and improvisations in care delivery. This is problematic, as SOPs serve as performance benchmarks and support hospital governance in ensuring accountability, consistency, and responsiveness.

Several barriers contribute to poor protocol compliance. These include heavy workloads, limited PPE availability, inadequate supervision, weak workplace safety culture, and lack of enforcement of consequences for noncompliance. Furthermore, ineffective team communication and the absence of role modeling from nursing leadership exacerbate the issue. In the long term, these factors can erode the overall quality of care, increase the risk of cross-infection, and compromise the safety of the healthcare workforce.

This research is driven by the concern over the insufficient implementation of infection control protocols among nurses, despite the availability of regulatory frameworks and procedural guidelines. The study aims to describe how nurses currently implement infection control protocols and to identify the obstacles that hinder optimal implementation.

Based on these various conditions, the focus of this study is to describe the extent to which nurses implement infection control protocols and identify the barriers that prevent optimal implementation. Therefore, the research problem is what are the barriers that affect healthcare workers particularly nurses in implementing infection control protocols and what does the implementation of infection control protocols look like in practice?

Through this discussion, it is hoped that a comprehensive understanding can be gained regarding the field implementation of infection control protocols, as well as the improvement strategies that can be applied to strengthen protection for healthcare workers especially nurses in performing their duties in hospital settings.

2. Literatur Review

The issue of nosocomial infections and non-compliance of healthcare workers with infection prevention protocols has become a major concern in various studies. A study by Mita et al. (2022) stated that nurses' behavior in preventing healthcare-associated infections is strongly influenced by internal factors such as knowledge, risk perception, and comfort in using personal protective equipment (PPE). Even nurses with good knowledge do not always consistently follow protocols due to work pressure and limited facilities.

Yulia and Yunashastuti (2024) found that fatigue resulting from night shifts and high workloads significantly reduces concentration and increases the likelihood of non-compliance with safety protocols. This is supported by Laili and Susilawati (2024), who observed that occupational stress negatively impacts the quality of nursing care, particularly in compliance with hand hygiene and PPE usage.

Externally, the World Health Organization (2020) emphasized that availability of facilities such as hand rubs, masks, and handwashing stations is a fundamental requirement for successful protocol implementation. However, in practice, Pabebang et al. (2021) reported that poorly placed handwashing stations often lead healthcare workers to skip critical hand hygiene moments.

Purwacaraka & Islamy (2023) further identified the lack of supervision by Infection Prevention and Control Nurses (IPCNs) as a key factor contributing to non-compliance. Without regular evaluation and feedback, it becomes difficult to correct improper practices. Additionally, Hanum (2021) noted that the absence of a clear

reward and punishment system fails to provide sufficient motivation for nurses to follow standard operating procedures (SOPs).

Yanti et al. (2023) argued that infrequent IPC training sessions result in healthcare workers being inadequately informed about updated protocols, particularly in response to emerging infectious diseases. Moreover, Widyanti (2016) emphasized the importance of an organizational culture that promotes patient safety, which, in many cases, remains an individual rather than collective value within healthcare teams.

3. Research Method

This study employed a qualitative descriptive approach. The primary data collection technique used was a literature review, which is a widely accepted method in qualitative research. This technique involves systematically identifying, analyzing, and synthesizing existing written and oral information from previously published sources. The literature review was conducted to gather descriptive data relevant to the topic under investigation, particularly regarding the implementation of infection control protocols as a form of protection for nurses in healthcare settings.

The sources reviewed included academic books, peer-reviewed journal articles, scholarly papers, and other scientific references that provided insights into infection control practices, occupational health for nurses, and healthcare service delivery. This method was selected to ensure a comprehensive understanding of the existing body of knowledge and to identify patterns, challenges, and best practices documented in previous studies. It is important to clarify that this study did not involve the collection of primary data. No interviews, surveys, or direct interactions were conducted with nurses, hospital administrators, or other healthcare professionals. The research relied solely on secondary data obtained through the literature review process.

4. Result and Discussion

Sinulingga (2025) stated that the implementation of infection control protocols is a crucial indicator in the governance of healthcare quality. Law Number 17 of 2023 concerning Health serves as the legal foundation that comprehensively regulates the national health system, including efforts to prevent and control infectious diseases. Several articles in this law explicitly emphasize the importance of implementing health protocols. For instance, Article 152 states that the central and regional governments are obliged to carry out early detection, tracing, isolation, quarantine, public education, and systematic implementation of health protocols. Articles 153 and 154 reinforce the importance of protocol implementation during outbreaks and risk factor control through a multisectoral approach, such as environmental hygiene, clean water, hand hygiene, and medical waste management.

Although the legal framework has clearly outlined these responsibilities, there remains a gap between regulation and implementation in practice. Many healthcare workers, particularly nurses, still do not fully comply with infection control

protocols. This non-compliance is influenced by various factors, both from within the individual healthcare workers themselves (internal factors) and from their work environment and organizational systems (external factors). Therefore, to gain a deeper understanding of why infection control protocols are not optimally implemented, it is essential to analyze the internal and external factors that affect healthcare workers' compliance. The following discussion will explore these two categories of factors as a basis for formulating more effective and sustainable strategies to improve protocol implementation [3].

4.1 Barriers That Affect Healthcare Workers, Particularly Nurses, in Implementing Infection Control Protocols

The implementation of infection prevention and control (IPC) protocols is a standard that must be followed by all healthcare workers, especially nurses, who have a direct role in patient care and service [3]. Non-compliance with these protocols can have serious consequences, increasing the incidence of nosocomial infections (Healthcare-Associated-Infections/HAIs), prolonging the length of stay, increasing service costs, and even reducing public trust in healthcare facilities [4]. However, in practice, the implementation of PPI protocols by nurses still often encounters obstacles. Based on the results of various studies analyzed, including those conducted at Bayung Lencir Regional General Hospital, GMIM Pancaran Kasih Manado Hospital, and several other hospitals, it was found that nurse compliance is greatly influenced by complex and interrelated factors. These obstacles can be classified into several large groups, namely internal obstacles (from individual nurses), external obstacles (environmental and organizational), system and policy obstacles, and cultural and communication obstacles.

4.1.1. Lack of Knowledge and Understanding

Internally, one of the main obstacles faced by nurses in implementing infection control protocols is a lack of knowledge and understanding of the basic principles of PPI (Infection Prevention and Control), which include proper handwashing techniques, proper use of personal protective equipment (PPE), and safe medical waste management [5]. This lack of knowledge leads to improper implementation of the protocols and even tends to be perceived as an additional burden on the job. Research by Ajeng Setianingsih et al. (2022) revealed that although most nurses understood the function of PPE, non-compliance was still observed due to discomfort or a lack of practical understanding regarding its use in the field. Even in initial observations, nurses were found not to replace medical masks due to limited supplies, indicating a weak awareness of the risk of cross-infection. Thus, a shallow understanding of IPC principles is a significant barrier to ensuring occupational safety and patient safety.

4.1.2. Negative Attitudes and Perceptions

Nurses' negative perceptions of infection risk are a significant factor contributing to low compliance with the Infection Prevention and Control (IPC) program. Some nurses tend to believe that the use of personal protective equipment (PPE) and consistent hand hygiene practices are not always necessary, especially if the patient does not appear high-risk. This attitude indicates a low assessment of the potential dangers of nosocomial infections, which are not always visible to the naked eye. This misperception of risk leads some nurses to perceive IPC procedures as complicated and impractical. Research shows that a positive perception of infection risk correlates with increased nurse compliance with IPC protocols at Bayung Lencir Regional Hospital [7].

4.1.3. Fatigue and Work-Related Stress

Fatigue due to night shifts, high workloads, and psychological stress are major factors affecting nurses' adherence to occupational safety protocols. Fatigue can lead to decreased concentration, leading to neglect of important procedures such as the use of complete PPE or hand hygiene. A study by Yulia et al. (2024)[8] Studies have shown that work shifts, sleep quality, and work duration are significantly related to work fatigue, which ultimately impacts nurses' performance in carrying out their duties according to standards. A similar finding was emphasized in a study by Laili & Susilawati (2024) [9], which found that work stress triggered by fatigue worsens performance and reduces the quality of nursing care. When nurses are unaware of the risk of infection due to fatigue, compliance with SOPs is vulnerable to neglect. This condition becomes an obstacle to creating a safe and patient-safety-oriented work culture.

4.1.4. Limited Facilities and Infrastructure

Externally, constraints such as the availability or lack of facilities (PPE, hand rub, and handwashing facilities) are the most important factors in determining the success or failure of implementing infection prevention and control (IPC) protocols. WHO (2020) emphasizes that the use of personal protective equipment (PPE) must be rational and supported by adequate logistics, including the availability of alcohol-based hand rub, handwashing facilities with clean water and soap, masks, gloves, and environmental disinfectants. Without these facilities, implementing infection protocols will be difficult to implement consistently, even by healthcare workers with high knowledge and motivation. In real-world situations, nurses often face these limitations. Based on findings in a journal written by Pabebang et al. at Elim Hospital Rantepao (2021), one of the main reasons nurses do not perform *hand hygiene* is the unstrategic placement of hand rub and sinks, such as not being available near

the patient's bed or having to be searched for in a specific location. When hygiene facilities are not quickly accessible, nurses tend to skip handwashing procedures, especially during busy times and high patient numbers. WHO also stated that easy access to hygiene facilities is an important factor in ensuring compliance with the five moments of hand hygiene [10].

Many healthcare facilities experience limited supplies, uneven distribution between units, or even inappropriate use of PPE due to the lack of risk-based guidelines. These conditions can undermine nurses' trust in the system and lead to decreased compliance with PPI SOPs. Limited facilities and infrastructure not only create technical barriers but also reflect weak organizational support for healthcare worker occupational safety. When nurses perceive that safety, procedures are not adequately facilitated by management, their motivation to comply can decrease. This is reinforced by observations in a previous journal that suggest that even high motivation does not guarantee compliance if nurses feel constrained by an unsupportive work environment. [10]

4.1.5. Imbalance Between Nurse Staffing and Workload

The imbalance in the nurse-to-patient ratio also hinders nurses from implementing infection control protocols [11]. The high number of nurses per patient means they have to handle too many patients at once. This situation overwhelms nurses, as all patient needs, from basic care and condition monitoring to minor medical procedures, must be handled simultaneously within a limited time. As a result, many important procedures, such as handwashing, glove changes, and cleaning medical equipment, are often overlooked. This isn't due to ignorance, but rather due to lack of time.

When there is a nurse-patient imbalance, nurses also tend to rush from one patient to another without properly following infection prevention measures. If this occurs consistently, a habit of disobeying hygiene standards can develop and become commonplace. The heavy physical and mental burden also causes nurses to lose focus and easily forget simple but important actions, such as hand hygiene [12]. All of this indirectly increases the risk of infection transmission in the hospital environment.

4.1.6. Lack of Strict or Consistent Supervision

Weak supervision from Infection Prevention Control Nurses (IPCNs) exacerbates the situation, as without active and effective oversight, nurses tend to ignore standard procedures for the use of PPE in nursing care. The absence of reprimands, direct guidance, or routine evaluations leads to decreased compliance and increasingly difficult to correct negligent habits in implementing infection prevention protocols. As a result, nursing care is carried out without regard for safety standards, for both nurses and patients, increasing the risk of nosocomial infections. Ineffective supervision means that

the IPCN's role as controller, guide, and guarantor of the implementation of safety protocols is not functioning as it should [13]. Consistent supervision with the right approach has been shown to encourage nurses to be more aware and accustomed to using PPE correctly.

4.1.7. Absence of Clear Reward or Punishment Systems

The absence of a clear reward and punishment system discourages nurses from adhering to protocols. When rewards for disciplined PPE use are inconsistent or perceived as less valuable by staff, efforts to comply tend to decline. Similarly, if protocol violations are not followed by reprimands or firm sanctions, there is no sense of responsibility or concern about the consequences of non-compliance. In such situations, nurses rely more on personal awareness or old habits, rather than on systems that encourage behavioral change. As a result, PPE use is often inconsistent, not due to ignorance, but because there is no system that explicitly rewards compliance or imposes consequences for violations [14]. Over time, this creates a permissive work environment, where safety protocols are no longer seen as a shared priority but as mere formalities. Furthermore, poor communication between medical and non-medical teams also has the potential to lead to miscommunication regarding the implementation of infection protocols, such as PPE donning and doffing techniques, medical waste management, and environmental disinfection.

4.1.8. Lack of Regular Training on Infection Prevention and Control (IPC)

Systemic barriers play a significant role in healthcare workers', particularly nurses', non-compliance with infection prevention and control (IPC) protocols. One prominent issue is the limited regularity of IPC training. A journal by Budi Yanti et al. (2023) [15] explains that IPC training is often only conducted at the beginning of employment (in-house training) and has not become a continuous program implemented annually. This training is crucial for ensuring that all healthcare workers, both medical and non-medical, understand and are able to implement infection prevention measures according to applicable standards. IPC training needs to be conducted routinely and continuously, not just as an occasional program. Without regular training, healthcare workers risk losing their ability to implement protocols optimally, especially when there are policy changes, the emergence of new infectious diseases, or the challenge of antimicrobial resistance.

4.1.9. The patient safety culture remains underdeveloped

On the other hand, a culture of patient safety that has not yet been collectively established and a lack of role models from nursing leaders are equally significant obstacles. Poor communication between medical and non-medical teams also has the potential to lead to miscommunication regarding

the implementation of infection protocols, such as donning-doffing PPE techniques, medical waste management, and environmental disinfection.

The absence of a collective culture within the work unit for adherence to protocols is evident in the lack of a dominant organizational culture within the work environment, resulting in a lack of shared values, habits, or perspectives on the importance of patient safety. When there is no culture that strongly influences collective behavior, the implementation of safety protocols tends to be inconsistent across individuals and units. Furthermore, low incident reporting rates and weak non-punitive responses to errors indicate that staff are not yet accustomed to working within a system that encourages openness and learning from mistakes [17]. The absence of a climate that supports open evaluation and continuous improvement also indicates that adherence to protocols has not yet become part of the collective culture. This indicates that the safety culture remains individual and has not been fully internalized within the organization. As a result, various efforts to improve patient safety are suboptimal because they are not supported by a shared commitment from all elements within the work unit.

4.1.10. The absence of exemplary behavior from nursing leaders

The lack of exemplary leadership from nursing leaders (heads of wards, heads of installations) and subordinates also follows. This is reinforced by findings showing that ward head leadership has a significant relationship with nurse performance in implementing patient safety [18]. When ward heads do not carry out their roles properly, such as being indecisive in enforcing rules, not providing specific feedback, and minimally encouraging staff participation, nurse motivation and discipline in implementing infection control protocols decline. Furthermore, some ward heads still do not implement empowering leadership optimally, such as not leading by example or being inconsistent in providing information and guidance to the team [18]. This ineffectiveness implies a lack of encouragement for staff to work according to standards, because there is no figure who serves as a role model or driving discipline in the work environment. As a result, a culture of collective discipline in implementing health protocols is not formed comprehensively in the work unit.

4.1.11. Ineffective communication within the team

Infection protocols can be neglected due to miscommunication between team members (doctors, nurses, cleaning staff, etc.). This is reinforced by the finding that in over 30% of transfers of patients with MRSA or VRE, standard infection precautions were not followed [19]. Observations indicate that the primary cause of this non-compliance is ineffective communication regarding the patient's infectious status during the transfer process. Although standard protocols require precautions to be implemented at all times, they are only implemented if transport staff are directly informed that the patient is

infectious. This lack of communication leads to neglect of critical procedures such as hand antisepsis, glove use, and gowning. Even with clear protocols in place, miscommunication between team members still leads to inconsistent practices. This demonstrates that poor communication not only results in lost information but also directly impacts patient and staff safety throughout the healthcare process.

By examining these various obstacles, it can be concluded that the problem of nurses' non-compliance with IPC protocols cannot be viewed from a single perspective. A comprehensive approach involving training, work culture, organizational management, and system improvements is needed to create a work environment that supports ongoing adherence to infection protocols.

4.2 Implementation of Infection Control Protocols Look Like in Practice

The success of infection prevention and control programs in hospitals is greatly influenced by the behavior of healthcare workers in providing services. Nurses play a crucial role in ensuring the quality of healthcare services while contributing to reducing the incidence of nosocomial infections [20]. The level of nurse compliance in implementing infection control protocols is a major factor in determining the effectiveness of infection prevention programs, both in hospitals and other healthcare facilities. Nurses, as healthcare workers on the front lines of healthcare services, are at high risk of exposure to various infectious agents [21]. Therefore, the implementation of infection control protocols is not merely an administrative procedure, but rather a key foundation in protecting the safety of healthcare workers and patients. Various studies have shown that the effectiveness of nurse protection is highly dependent on the consistency and systematic and standardized implementation of infection control protocols.

4.2.1 Application of precaution standards

One important component of infection control is the application of standard precautions. These precautions require nurses to always be alert to the potential for infection in every interaction with a patient, regardless of the patient's infection status. This principle assumes that all blood, body fluids, secretions, excretions (except sweat), non-intact skin, and mucous membranes can contain infectious agents [22]. Standard precautions aim to prevent the transmission of microorganisms to patients and healthcare workers, including those with known and unknown pathogens. The application of standard precautions includes several actions, such as maintaining hand hygiene in accordance with WHO guidelines, the use of appropriate personal protective equipment (PPE) such as masks, gloves, gowns, and eye protection, and an understanding of transmission risk zones in the work environment [22]. These

steps must be carried out by all healthcare workers during direct contact with patients.

4.2.2 Compliance with hand hygiene protocols

One of the most important aspects of standard precautions is the implementation of proper hand hygiene. The incidence of nosocomial infections remains relatively high, both globally and in Indonesia. Hand hygiene must be carried out properly before and after contact with patients, even if gloves or other protective equipment are used. This step aims to eliminate or reduce microorganisms on the hands, so that the spread of disease can be minimized and the environment remains protected from the risk of infection [23]. Therefore, hand hygiene is a very effective primary prevention measure. The World Health Organization (WHO) launched the Global Patient Safety Challenge with the slogan "Clean Care is Safer Care," which makes hand hygiene the primary benchmark in infection control efforts [23].

In addition to understanding the importance of hand hygiene, nurses also need to understand the basic principles of its implementation. There are six steps in hand hygiene that nurses must carry out correctly to ensure the effectiveness of removing microorganisms from the hands [24]. In general, hand hygiene can be done in two ways: using an alcohol-based antiseptic liquid (handrub) or washing hands with antiseptic soap and running water (handwash). According to guidelines from the World Health Organization (WHO), washing hands with soap and water for 40 to 60 seconds is one of the most effective ways to prevent the spread of disease and consists of several stages.

The first step in washing your hands is to wet both hands with clean, running water. After that, pour a sufficient amount of liquid soap into your palms. Rub both palms thoroughly, then continue by rubbing the back of your right hand with your left palm and vice versa. The spaces between your fingers should also be scrubbed thoroughly to ensure no areas are missed. Next, the fingertips are cleaned by clasping them in your palms alternately. Then, the fingers of your left hand are closed and rubbed in a circular motion against your right palm, and the same is done on the opposite side. The thumbs of each hand are cleaned by rubbing them in a circular motion in the grip of the other hand. This step is continued by rubbing the nails of your right hand against your left palm in a circular motion, and the same is repeated for the opposite hand. After all parts of your hands have been scrubbed thoroughly, rinse your hands under running water until clean. Next, dry your hands with a clean, dry tissue, as using a towel is not recommended due to the potential for germs to grow. The same tissue is used to turn off the faucet to maintain hand hygiene. Each step has an important function in cleaning areas of the hands that are often missed, so it is effective in preventing the transmission of microorganisms that cause infection [24].

4.2.3 Safe management of medical waste and equipment

Hand hygiene is crucial, especially in hospitals, which are healthcare facilities where both sick and healthy individuals congregate. This places hospitals at high risk for disease transmission, environmental pollution, and health problems. Every healthcare facility, whether managed by individuals or institutions, inevitably produces waste. Hospital waste encompasses all waste or waste generated from medical and other supporting activities, which can potentially become a source of infection if not managed properly [25].

Proper waste management, from collection, separation, storage, transportation, to final processing, must be carried out safely to prevent nosocomial infections, such as hepatitis B, hepatitis C, and HIV/AIDS, which are a major concern in medical waste management. Personnel involved in handling medical waste are at high risk of exposure to disease if management is carried out without proper procedures. Therefore, awareness of the dangers of hospital waste is needed by all parties. Problems in medical waste management in hospitals are quite complex. Various types of waste, such as sharp objects, have the potential to cause danger in the form of injuries due to punctures or scratches, as well as the risk of transmitting infectious diseases. Chemical waste originating from the use of chemicals in medical and laboratory procedures can also cause corrosion in water pipes, potential explosions, and have adverse impacts on health and the environment. Hospital waste, when compared to waste from other institutions, has complex characteristics and is included in the category of hazardous and toxic waste (B3). Therefore, its management must be carried out carefully to prevent negative impacts on the hospital community and the surrounding environment [25].

Medical waste management in hospitals includes sorting, transportation, storage, and final processing. Each service unit is equipped with two trash bins and one safety box. Trash bins must meet the requirements of the Minister of Health Decree Number 1204 of 2004, namely easy to clean, tightly closed, resistant to sharp objects, waterproof, not easily rusted, and not leak. Safety boxes are used for sharp waste and must be puncture and leak resistant, according to WHO standards. Trash bins are lined with colored plastic bags according to the type of waste, namely yellow for medical waste and black for non-medical waste. However, chemical and pharmaceutical waste must be separated and placed in brown plastic bags, as regulated in the Minister of Health Decree Number 1204 of 2004, to prevent mixing and the risk of danger [25].

Medical waste is transported to the Temporary Storage Site (TPS) more than twice a day. Transport is carried out by cleaning staff using trolleys or by lifting plastic bags. However, some staff still carry waste by hand, which risks spillage and contamination. Furthermore, medical and non-medical waste are sometimes transported simultaneously using the same equipment, resulting in waste mixing and spillage on the bottom of the equipment [25].

Medical waste storage must be carried out by separating waste based on its characteristics. This provision is in accordance with the Decree of the Head of Bapedal Number 1 of 1995, which requires waste with different characteristics to be stored separately or in appropriate sections. The final processing of medical waste must meet regulatory requirements. Based on the Regulation of the Minister of Environment and Forestry Number 56 of 2015, the incinerator chimney must have a minimum height of 1.5 times that of the tallest building within a 50-meter radius [25].

4.2.4 Provide Regular Education and Training

On the other hand, providing regular education and training is an important part of infection prevention and control efforts in hospitals. Hospitals conduct training aimed at improving the understanding and skills of healthcare workers, particularly nurses, in terms of infection control and the use of personal protective equipment. Training materials are adapted to the latest developments in guidelines from national and international health institutions (WHO and the Indonesian Ministry of Health) and are conducted routinely to ensure that every nurse has the latest knowledge and is able to implement appropriate procedures in the work environment [26]. This effort is carried out as a form of institutional responsibility to protect healthcare workers and patients from the risk of infection transmission that can occur during the service. Consistently implemented education and training are part of the hospital's strategy to create a safe and quality work environment.

Nurses have a positive attitude toward nosocomial infection prevention, although implementation is not always optimal. This attitude is crucial for increasing awareness and compliance with infection prevention standards in accordance with hospital standards. Hospitals have the potential to be a source of nosocomial infections, which can spread through patients, healthcare workers, visitors, and the surrounding environment. [27]. Prevention is achieved through maintaining hand hygiene, using personal protective equipment (PPE), and adhering to sterilization and infection control procedures.

The use of PPE according to procedures must be strictly implemented, and violations should be sanctioned. Risk factors for nosocomial infections include invasive procedures, IV insertion, crowded rooms, antibiotic misuse, and non-compliance with protocols. Nurses' compliance with handwashing is crucial in reducing infection rates. Policies, supervision, and the provision of adequate facilities and infrastructure are essential to support infection prevention. Regular audits are necessary to monitor nurses' adherence to infection prevention. Good self-management and a conducive work environment help maintain the quality of nursing care despite high workloads and stress [25].

There is a relationship between knowledge and attitudes and nurses' compliance with handwashing. Nurses must implement handwashing according to established procedures to reduce the rate of nosocomial infection

transmission in hospitals. Policies and supervision also play a role in the implementation of infection prevention by nurses. Improving the implementation of procedures and the provision of facilities and infrastructure needs to be continuously carried out. Routine monthly audits of infection prevention implementation should be maximized to monitor nurses' compliance with infection prevention and control. Good self-management is necessary for nurses to control workload and stress, thus preventing a decrease in service quality. Education and a supportive work environment also play a role in improving the quality of nursing services. The relationship between workload and the quality of nursing services is very important to note [28].

4.2.5 Patient Isolation and Environmental Engineering

Furthermore, patient isolation is a crucial initial step in preventing infection transmission in healthcare facilities, particularly acute respiratory infections (ARI). Early identification of patients with symptoms of infectious diseases allows healthcare workers to take immediate preventive measures. In practice, this requires a robust clinical triage system, organized patient flow, and the allocation of separate waiting and treatment rooms for patients with symptoms of infectious diseases. These efforts aim to minimize contact between patients with suspected or confirmed infections and other patients and healthcare workers, thereby reducing the risk of pathogen transmission within healthcare facilities [28].

Ventilation and environmental engineering also play a crucial role in infection control. Healthcare environments must have adequate ventilation systems to ensure clean air circulation and reduce the concentration of infectious particles in the air. Treatment room layout must also consider maintaining a minimum distance of one meter between patients, especially when personal protective equipment (PPE) is not being used. This physical distance is a form of environmental engineering intervention aimed at preventing the spread of pathogens through droplets or the air. Therefore, room design and ventilation systems must be a priority in any infection control effort [28].

4.2.6 The Use of Personal Protective Equipment (APD) in Infection Prevention

The use of high-level personal protective equipment (PPE) is crucial for protecting healthcare workers from the risk of infection, particularly for infectious diseases such as tuberculosis and COVID-19. PPE use must be rational, consistent, and tailored to the level of risk. Surgical masks, N95 masks, gloves, eye protection, and gowns are common items used when caring for patients with highly contagious infections. Hand hygiene should also be practiced before and after using PPE. Masks should be changed immediately if wet or soiled and disposed of according to safe procedures to prevent further

contamination. Consistency in the use and proper disposal of PPE is crucial to reduce the risk of infection spread in the hospital environment [28].

4.2.7 Strengtheining PPI Policies and Administrative Management

In addition to physical interventions, administrative controls and infection prevention and control (IPC) policies are also key components that must be strengthened. IPC management in hospitals includes regular training for healthcare workers, controlling crowding in waiting rooms, and strict monitoring of compliance with standard operating procedures (SOPs). This policy is designed to ensure all healthcare workers have sufficient knowledge and skills to implement infection control practices, while simultaneously building a culture of safety in the healthcare environment. With good administrative management, IPC strategies can be implemented comprehensively and sustainably [28].

4.2.8 Hand Hygine as a Pillar of Infection Prevention

In addition to understanding the importance of hand hygiene, nurses also need to understand the basic principles of doing it. There are six steps in performing hand hygiene that nurses must carry out correctly to ensure the effectiveness of removing microorganisms from the hands [24]. In general, hand hygiene can be done in two ways: using an alcohol-based antiseptic liquid (handrub) or washing hands with antiseptic soap and running water (handwash). According to guidelines from the World Health Organization (WHO), washing hands with soap and water for 40 to 60 seconds is one of the most effective ways to prevent the spread of disease and consists of several stages.

The first step in washing hands is to wet both hands with clean, running water. After that, pour a sufficient amount of liquid soap into the palms of your hands. Rub both palms together evenly, then continue by rubbing the back of your right hand with your left palm and vice versa. The spaces between your fingers should also be rubbed thoroughly to ensure no areas are missed.

Next, the fingertips are cleaned by clasping them in your palms alternately. Then, the fingers of your left hand are closed and rubbed in a circular motion against your right palm, and the same is done on the opposite side. The thumbs of each hand are cleaned by rubbing them in a circular motion in the grip of the other hand. This step is continued by rubbing the right fingernails against your left palm in a circular motion, and the same is repeated for the opposite hand.

After all parts of your hands have been thoroughly scrubbed, rinse your hands under running water until clean. Next, dry your hands with a clean, dry tissue, as using a towel is not recommended due to the potential for germs to grow. The same tissue is used to turn off the faucet to maintain hand hygiene. Each step plays an important role in cleaning frequently missed areas of your

hands, thus effectively preventing the transmission of infection-causing microorganisms [24].

Hand hygiene is crucial, especially in hospitals, which are healthcare facilities where both sick and healthy individuals congregate. This places hospitals at high risk for disease transmission, environmental pollution, and health problems. Every healthcare facility, whether managed by individuals or institutions, inevitably produces waste. Hospital waste encompasses all waste or waste generated from medical activities and other supporting activities, which can potentially become a source of infection if not managed properly [25].

4.2.9 Medical Waste Management to Prevent Nosocomial Infections

Proper waste management, from collection, separation, storage, transportation, to final processing, must be carried out safely to prevent nosocomial infections, such as hepatitis B, hepatitis C, and HIV/AIDS, which are a primary concern in medical waste management. Personnel involved in handling medical waste are at high risk of exposure to disease if management is carried out without proper procedures. Therefore, awareness of the dangers of hospital waste is essential for all parties. Problems in medical waste management in hospitals are complex.

Various types of waste, such as sharp objects, have the potential to cause injuries from punctures or scratches, as well as the risk of transmitting infectious diseases. Chemical waste from the use of chemicals in medical and laboratory procedures can also cause corrosion in water pipes, potential explosions, and have adverse impacts on health and the environment. Hospital waste, when compared to waste from other institutions, has complex characteristics and is included in the category of hazardous and toxic waste (B3). Therefore, its management must be carried out carefully to prevent negative impacts on the hospital community and the surrounding environment [25].

Medical waste management in hospitals includes sorting, transportation, storage, and final processing. Each service unit is equipped with two trash bins and one safety box. Trash bins must meet the requirements of the Minister of Health Decree Number 1204 of 2004, namely easy to clean, tightly closed, resistant to sharp objects, waterproof, not easily rusted, and not leak. Safety boxes are used for sharp waste and must be puncture and leak resistant, according to WHO standards.

4.2.10 Supporting Facilities and Infrastructure for Waste Management

Trash bins are lined with colored plastic bags according to the type of waste, namely yellow for medical waste and black for non-medical waste. However, chemical and pharmaceutical waste must be separated and placed in brown plastic bags, as regulated in the Decree of the Minister of Health Number 1204

of 2004, to prevent mixing and the risk of danger [25]. The process of transporting medical waste to the Temporary Storage Place (TPS) is carried out more than twice a day. Transportation is carried out by cleaning staff using trolleys or directly by lifting plastic bags.

However, some officers are still found carrying waste by hand, which risks causing spills and contamination. In addition, transportation of medical and non-medical waste is sometimes carried out simultaneously using the same tool, resulting in mixing of waste and liquid spills on the bottom of the transportation tool [25]. Storage of medical waste must be carried out by separating waste based on its characteristics. This provision is in accordance with the Decree of the Head of Bapedal Number 1 of 1995 which requires waste with different characteristics to be stored separately or in the appropriate section.

The final processing of medical waste must meet the requirements according to regulations. Based on the Regulation of the Minister of Environment and Forestry Number 56 of 2015, the incinerator chimney must have a minimum height of 1.5 times the highest building within a radius of 50 meters [25]. On the other hand, providing regular education and training is an important part of infection prevention and control efforts in hospitals. Hospitals hold training aimed at improving the understanding and skills of health workers, especially nurses, in terms of infection control and the use of personal protective equipment.

4.2.11 Trainning and Docomentation in Waste Management Systems

The training material is adjusted to the latest developments in guidelines from national and international health institutions (WHO and the Indonesian Ministry of Health) and is carried out routinely to ensure that every nurse has the latest knowledge and is able to apply appropriate procedures in the work environment [26]. This effort is carried out as a form of institutional responsibility to protect health workers and patients from the risk of infection transmission that can occur during the service. Consistently implemented education and training are part of the hospital's strategy in creating a safe and quality work environment. Nurses have a positive attitude towards preventing nosocomial infections, although the implementation is not always optimal.

This attitude is important to increase awareness and compliance in infection prevention according to hospital standards. Hospitals have the potential to become a source of nosocomial infections that can spread through patients, healthcare workers, visitors, and the surrounding environment [27]. Prevention is carried out by maintaining hand hygiene, using personal protective equipment (PPE), and complying with sterilization and infection control procedures. The use of PPE according to procedures must be strictly implemented, and violations must be sanctioned.

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4.2.12 Self-Management and Work Environment in Maintaining Care Quality

Prevention and control. Nurses need to have good self-management skills to manage workload and stress, preventing a decline in service quality. Education and a supportive work environment also play a role in improving the quality of nursing care. Risk factors for nosocomial infections include invasive procedures, IV insertion, crowded rooms, antibiotic misuse, and non-compliance with protocols. Nurses' compliance with handwashing is very influential in reducing infection rates. Policies, supervision, and the provision of adequate facilities and infrastructure are important to support infection prevention. Regular audits are needed to monitor nurses' compliance with infection prevention.

Good self-management and a conducive work environment help maintain the quality of nursing services despite facing high workloads and stress [25]. There is a relationship between knowledge and attitudes and nurses' compliance with handwashing. Nurses must implement handwashing according to established procedures to reduce the rate of nosocomial infection transmission in hospitals. Policies and supervision also play a role in the implementation of infection prevention by nurses.

Improvements in the implementation of procedures and the provision of facilities and infrastructure need to be continuously carried out. Routine monthly audits of infection prevention practices should be maximized to monitor nurses' compliance with infection

4.2.13 Patient Isolation as a Primary Strategy in Infection Prevention

The relationship between workload and the quality of nursing care is crucial [28]. Furthermore, patient isolation is a crucial first step in preventing infection transmission in healthcare facilities, particularly acute respiratory infections (ARI). Early identification of patients with symptoms of infectious infections allows healthcare workers to take immediate preventive measures. In practice, a sound clinical triage system, patient arrival flow management, and separate waiting and treatment rooms are required for patients with symptoms of infectious infections.

4.2.14 Ventilation and Environmental Engineering in Infection Control

These efforts aim to minimize contact between suspected or confirmed patients with other patients and healthcare workers, thereby reducing the risk of pathogen transmission within healthcare facilities [28]. Ventilation and environmental engineering also play a crucial role in infection control. Healthcare environments must have adequate ventilation systems to ensure clean air circulation and reduce the concentration of infectious particles in the air. Treatment room layout must also consider a minimum distance of one

meter between patients, especially when personal protective equipment (PPE) is not used.

4.2.15 Prevention of Transmission Through Contact Limitation Strategies

This physical distance is a form of environmental engineering intervention aimed at preventing the spread of pathogens through droplets or air. Therefore, room design and ventilation systems must be a priority in every infection control effort [28]. The use of high-level personal protective equipment is crucial in protecting healthcare workers from the risk of exposure to infection, particularly for infectious diseases such as tuberculosis and COVID-19. PPE use must be carried out rationally, consistently, and adjusted to the level of risk.

Surgical masks, N95 masks, gloves, eye protection, and protective gowns are common equipment used when caring for patients with highly contagious infections. Hand hygiene must also be implemented before and after using PPE. Masks should be changed immediately if wet or soiled and disposed of according to safe procedures to prevent further contamination. Consistency in the proper use and disposal of PPE is crucial to reduce the risk of infection spread in the hospital environment [28].

5. Conclusion

Implementing infection control protocols is a crucial step in protecting nurses from the risk of exposure to infectious diseases while delivering healthcare services. These protocols serve not only as technical guidelines but also as part of a broader strategy to create a safe and professional work environment. However, implementation still faces numerous challenges, such as individual non-compliance, inadequate facilities, insufficient supervision, and weak management systems and safety culture. Research suggests that regular hands-on training, adequate provision of personal protective equipment (PPE), and the integration of electronic monitoring systems can significantly improve protocol adherence among healthcare workers. Therefore, healthcare institutions should prioritize continuous education, ensure the consistent availability of essential resources, and establish real-time compliance audits to strengthen accountability. A collective commitment from all organizational levels is vital to fostering a culture of discipline and safety. These efforts are essential in enhancing the quality of healthcare services and ensuring the protection of both healthcare workers and patients.

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