THE ROLE OF NURSES IN HAND HYGIENE PRACTICE FOR HOSPITAL INFECTION CONTROL

Thanh Tung Vo

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Thanh Tung Vo

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Abstract:

Ensuring that all healthcare professionals, including nurses, practice proper hand hygiene in hospital settings is extremely important, as it is a primary measure for preventing and controlling infections. In order to guarantee that nurses understand the important role of hand hygiene and strictly comply with hand hygiene guidelines, it is essential to establish an awareness of the nurse's responsibility in this matter. In addition, nurses are able to figure out the most effective methods for preventing the spread of hand hygiene by acknowledging the challenges that they face. The objective of this study is to identify the responsibilities and difficulties that nurses encounter in hand hygiene compliance in hospital settings. Furthermore, approaches that guarantee effective hand hygiene practices are discussed along with this study.

The data for this literature review were gathered from the CINAHL (ESBCO), Academic Search Complete (ESBCO), ScienceDirect, and PubMed databases. A total of ten articles were chosen for analysis, following predetermined inclusion and exclusion criteria established before conducting the database search. The articles underwent inductive content analysis, and the findings were categorized to address various aspects of the research question. The research question is: "What is the role of nurses regarding hand hygiene and its challenges in controlling infection in hospital settings?" The data analysis revealed ineffective practices, insufficient levels of knowledge and training, and unfavorable attitudes among nurses toward hand hygiene due to a lack of adequate recognition of its importance. At the same time, this study looks at the challenges of nursing management and organization in hand hygiene. Hence, comprehensive approaches are necessary to improve the involvement of nurses and promote hand hygiene compliance in the hospital environment.

Keywords: nursing roles, hand hygiene, preventing, infection, Florence Nightingale, Environmental Theory.

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Acronyms

ABHR - Alcohol-based hand rub

HCAIs - Healthcare-associated infections

HCWs - Health Care Workers (HCWs)

HH - Hand hygiene

ICUs - intensive care units

WHO - World Health Organisation

1 Introduction

Practicing good hand hygiene (HH) is the most effective and inexpensive way to prevent the spread of microorganisms between people. The positive effects of this intervention counteract the negative consequences of healthcare-associated infections, which include extended hospitalizations, long-term disabilities, antimicrobial resistance, financial and psychological strain. Although there is ample scientific evidence that supports the advantages of hand hygiene in enhancing the safety of healthcare providers and patients, reducing expenses, and promoting a favorable working environment, most healthcare workers continue to face difficulties in complying with hand hygiene requirements (Chauke & Mugweni, 2021).

The significance of maintaining proper hand hygiene in ensuring patient safety is highlighted by its designation as the primary element to protect patient safety (WHO, 2009). The "My 5 Moments for Hand Hygiene" strategy is one of the World Health Organization's recommended practices for enhancing patient and healthcare provider safety and reducing the spread of infection associated with healthcare. This is a component of the global awareness campaign for health workers' hand hygiene, which involves washing hands before aseptic procedures, after contact with patients, after exposure to bodily fluids, and after contact with the patient's surroundings (WHO, 2009).

2 Background

Infectious symptoms or diseases that patients are infected with during the process of treatment at healthcare premises are called healthcare-associated infections (HCAIs). HCAIs are initially detected within 48 hours or more after a patient is admitted to the hospital, or within 30 days after receiving medical care. The majority of negative circumstances that impact patients who are admitted to the hospital are adverse drug events, HCAIs, and situations related to surgery. (Haque et al., 2018).

According to the US Centers for Disease Control and Prevention, approximately 1.7 million patients who are admitted to hospitals each year in connection to HCAIs while receiving treatment for other medical conditions. Out of these patients, more than 98,000 (which is equivalent to one in every 17 patients) die as a result of these infections. Based on data provided by The Agency for Health Care Research and Quality, HCAIs contribute to the popularity of

reasons for medical treatment and rank among the top 10 causes of mortality in the United States. Among every 100 patients admitted to the hospital, 17 were diagnosed with HCAIs (Haque et al., 2018).

Additional research conducted in wealthy nations revealed that 5% to 15% of patients who are admitted to hospitals acquire HCAIs. These infections may influence anywhere from 9% to 37% of individuals admitted to intensive care units (ICUs). Various research studies indicate that the overall rates of HCAIs in European hospitals range from 4.6% to 9.3%. According to the WHO, HCAIs typically gain the public's focus during epidemic outbreaks. (Haque et al., 2018).

Infection control is the synchronous application of measures to prevent the spread of infectious agents in medical examination and treatment practice, and it is an important component of improving the quality of care. Among infection control measures, hand hygiene has long been considered the simplest and most effective measure, not only in patient care but also in the community when facing many dangerous epidemics occurring on a large scale such as Noro, COVID-19, and Flu. Hand hygiene is the most important measure in preventing hospital infections because hands are an important means of spreading infectious agents that have been studied a lot and are no longer a matter of debate. Hand hygiene prevents the transmission of bacteria and minimizes infectious diseases (Allegranzi & Pittet, 2009, WHO guidelines on hand hygiene in health care, 2009; WHO Patients Safety, 2009). Since the last two decades, The hospital's infection control department has used many types of methods to improve hand hygiene (Ojanperä et al., 2020). Compliance with hand hygiene measures has improved especially in hospitals and healthcare facilities with multimodal incentives (Pires & Pittet, 2017).

3 Theoretical Framework

Florence Nightingale, regarded as the foremost nurse of all time, was recognized as one of the 100 women who influenced the course of world history (Breigeiron et al., 2021). Her biography is engraved in young children in England as one of the greatest English heroines. It initiated what is presently referred to as modern nursing through its actions and principles, which fundamentally transformed the way in which patients were attended to. During that period,

nursing underwent a process of institutionalization, which required systematic, interactive, and scientific instruction (Breigeiron et al., 2021).

After doing thorough investigation of the teachings of Florence Nightingale, it has become evident that the nursing team's efforts to prevent infections in healthcare facilities consist of an abundance of crucial aspects. In particular, hygiene and cleaning are essential components. This literature review aims to examine an aspect of hygiene and cleaning in relation to the role of nurses in hand hygiene that Nightingale's theory identifies as crucial. Florence Nightingale introduced the Environmental Theory in 1859. This theory centers on the environment and its impact on the development of the human body, which can either encourage or prevent the progression of diseases. Within this particular context, the nurse's responsibility is to maintain environmental stability by advocating for elements that nurture a health-stimulating atmosphere, with the ultimate goal of retaining the patient's vital energy in preparation for his recovery from the illness (Breigeiron et al., 2021).

Clean air and water, basic sanitation, light, cleanliness, and sanitation are the five pillars that constitute Florence Nightingale's environmental theory. She considered these elements to be indispensable for establishing a healthy home, as she argued that an environment that is healthy was critically important to the healing process (Riegel et al., 2021). The Environmental Theory has a significant impact on nursing practices, particularly in areas such as hand hygiene and maintaining a clean environment to prevent the spread of diseases. It emphasizes the importance of physical and mental well-being, as well as the organization of work through management methods. Patient-centered care is prioritized over focusing solely on the health-disease process. Nursing assistance is based on scientific evidence and delivered through high-quality education and training. Patient safety is given utmost importance, and care is provided with a strong emphasis on professional ethics (Breigeiron et al., 2021). The importance of hand and environmental hygiene, as well as social distancing, has reached unprecedented levels. From this standpoint, WHO acknowledges that hand hygiene practices, as advocated by Florence Nightingale, are essential measures to mitigate the spread of diseases in the cleaning and hygiene domain.

Florence Nightingale was a forward-thinking individual who made significant advancements in the field of healthcare. The validity of her studies on the Environmentalist Theory remains unchanged, even after nearly two centuries since her initial work. The methods she described, particularly hand washing and environmental hygiene, have been officially acknowledged by

WHO as effective strategies to mitigate the transmission of the novel coronavirus. In order to effectively prevent infection, it is crucial that nurses who deliver care and treatments and promote health in the field have a comprehensive understanding of their responsibilities in maintaining proper hand hygiene. Hence, the Environmentalist Theory, developed by Florence Nightingale, within the scope of this study, will serve as a conceptual framework for the roles of nurses in the prevention of infections in hospital settings.

4 Aim and Research Questions

4.1 Aim

The objective of the study is to elucidate the specific responsibilities of nurses in promoting hand hygiene and determine the significance of it as a means of limiting infection within hospital settings. The study delineates the roles of nurses in hand hygiene across various expert aspects.

4.2 Research Question

The research question is: What is the role of nurses regarding hand hygiene and its challenges in controlling infection in hospital settings?

5 Methodology

The thesis was a literature review developed by conducting a comprehensive literature evaluation of relevant papers. This thesis aimed to gain a deep understanding of the issue and provide answers to the research questions. Research has investigated the responsibilities of nurses in promoting hand hygiene to manage infection in hospital environments. The research uses an evidence-based approach using data-derived evidence to substantiate all claims.

5.1 Data Collections

To access data, a multitude of search engines employing a vast array of keywords have been utilised. Google Scholar and Arcada's academic databases are primarily utilised for data retrieval, encompassing Academic Search Elite (EBSCO), Cinahl, Pubmed, and ScienceDirect.

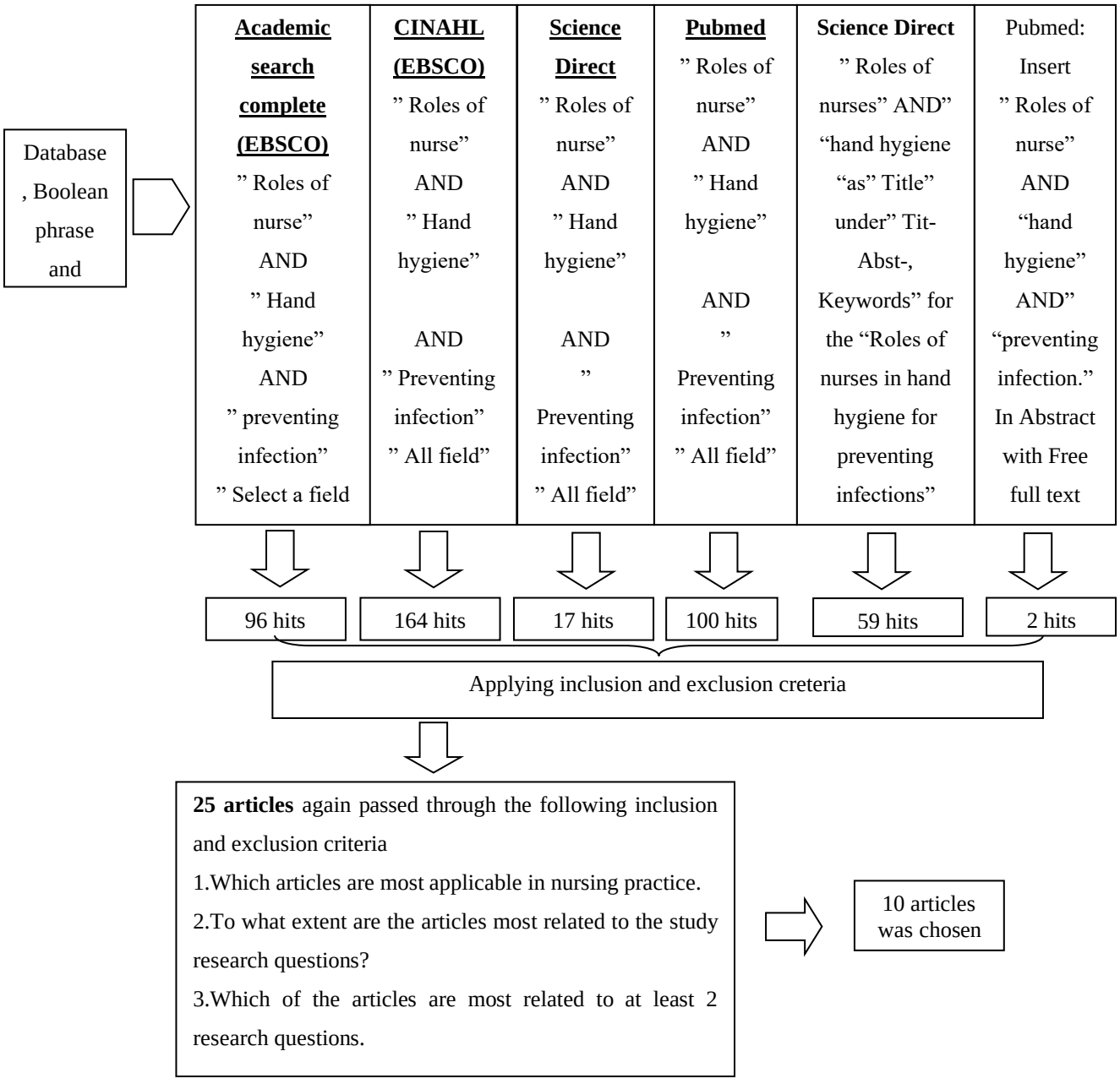

Figure 1: Data collection

The three primary search phrases are "Roles of nurses," "Hand hygiene," and "Preventing Infection". A total of ten articles were selected from a pool of articles that contained no fewer than one keyword and were relevant to the research issues addressed in this study in a 10-year duration based on the inclusion and exclusion principles. This selection of article also follows the emphasis of environmental theory that focuses on the importance of physical and mental

well-being, the organization of work and management methods regarding hand hygiene and maintaining a clean environment to prevent spreading infection.

Inclusion criteria	**Exclusion criteria**
Articles written in English language	Articles in other languages
Articles had the keywords "Roles of nurses AND Hand hygiene" or had the keywords in text	Articles deal with others matters than roles of nurses in hand hygiene for preventing infections
Articles from 2013-to date	Articles older than 2013
Free full text articles accessible with Arcada credentials	Articles were not freely available

Table 1: Inclusion and Exclusion criteria

5.2 Content Analysis

Content analysis has a history of almost six decades and is utilized across several academic disciplines. Initially, content analysis was characterized as a method for objective, analytical, and quantitative communication content description (Berelson, 1952, p. 18). However, it has since evolved to encompass interpretations of the implicit content as well. Content analysis can be accurately described as a collection of methods used to draw reliable and accurate conclusions. The analysis of the text focuses on its content and describes the apparent and obvious components, which are known as the manifest elements (Kondracki. K 2002). content analysis as a qualitative examination of messages that adhere to the scientific method. This includes objectivity, consideration of multiple perspectives, having a predetermined design, ensuring reliability and validity, allowing generalization and testing theory-based hypotheses (Kimberly, 2016) Content analysis is not limited to specific message variables or contexts.

This thesis is grounded in Graneheim and Lundman's (2004) qualitative content analysis in the nursing research approach. To enhance comprehension and knowledge acquisition, the

inductive content analysis method is used to identify both implicit and explicit meanings within their texts. Concepts are introduced through the use of this method. The manifest content of a text is its apparent meaning, while its latent meaning is recognized as its basis or core. The unit of analysis is the thoroughly read and reviewed full text. The ten selected articles serve as the unit of analysis in this instance. As meaning units, all words, texts, phrases, and paragraphs that are related in terms of their content or context are recognized. Codes are the markers that are applied to meaning units in order to group them together. Following this, codes containing similar data are added to the categories. Themes comprise a series of categories that serve to identify an essential element within the content analysis. Through iteratively reviewing ten articles in accordance with the inclusion and exclusion criteria, the meaning units according to the text's manifest content are identified and categorized. The coding procedure is executed in accordance with the correlation between codes and the research keywords that were used. For the purpose of accurate identification, these keywords are clearly highlighted with vivid colors. This enhances coding as well.

5.3 Listing and Categorizing the Codes

During the review phase, the material is reexamined and organized into suitable groups based on its relevant codes. Afterward, the developing sub-themes are investigated and categorized based on their underlying meaning. In order to reduce the influence of irrelevant articles and irrelevant data, each article is read individually. The articles that are carefully reviewed and picked are called units of analysis. The valuable information during the review process is written down on the outer edges of the papers and is called codes. Subsequently, these codes which consist of essential keywords are labeled to quickly find and examine specific sections. In addition, these codes are distinguished by various colors, and keywords are indicated by either underlining, circling, or using other unique symbols. Alternatively, in certain cases, they are also marked with an asterisk. Markers and asterisks are used to denote the degree of relevance of the codes to the maximum extent feasible. For instance, in order to determine which ten out of twenty-five articles satisfied the research question's requirements for concise information and the required set of keywords, they were thoroughly read to identify the relevant data regarding the impact of nurses' roles in hand hygiene practices on infection prevention. This information was highlighted using a colored pen, specifically focusing on topics such as "role regulations," "training information," and "hand hygiene instructions". The highlighted sections were then organized into content groups to establish the structure of the research

findings. Updated content was indicated by asterisks. Ultimately, a total of 10 articles were chosen from a pool of 25 articles based on their high value and up-to-date information.

5.4 Themes

Themes were used to organize data to obtain clear outcomes.

Theme I: Positive effects
Primary sub-theme A: Roles of nurses
1. What makes hand hygiene improve? 2. Competences of nurses
Them II: Negative effects (challenges)
Secondary sub-themes: 1. Unfriendliness / Anxiety / Pessimistic attitudes / Criticism / 2. Dissolution of patient care/ Reduction of practicing hand hygiene skills 3. Insufficient knowledge and background to satisfy hand hygiene requirements 4. Insufficient resources or facilities to enable the implementation of effective hand hygiene

Table 2: Identified emergent themes and sub-themes

5.5 Research Ethics

The research process was conducted in full compliance with the guidelines established by the Finnish Advisory Board on Research Integrity (TENK). All the appropriate sources have been included and the authors have been adequately acknowledged and respected throughout the literature review (Polit & Beck, 2004). No instances of research misconduct occurred, and the thesis maintained a high level of integrity throughout.

In addition, according to the writing instructions and ethical guidelines provided by Arcada University of Applied Sciences, the academic thesis must not be a verbatim reproduction of any other sources. Valuable information from publications is utilized by employing a system of referencing that follows the Harvard referencing style. The procedure of reading and assessing articles is carried out sequentially during the data analysis process to effectively reduce the occurrence of redundant information in the generalization phase. As the purpose of each article is not to simply restate the information in its exact words; instead, it should offer a more thorough explanation of the concepts that have been addressed in the previous article. When writing a thesis, it is crucial to avoid being opinionated and prejudiced while explaining the technique. Conversely, the writer exhibits rationality and self-awareness while engaging in the activities of gathering, analyzing, and interpreting data.

6 Results

The results of the content analysis, based on five pillars of Florence Nightingale's environmental theory, indicated that participants' encounters with nurses regarding hand hygiene were diverse, involving both positive as well as negative consequences in terms of infection prevention. Positive interactions with nurses occur when hand hygiene is addressed and improved, whereas negative interactions involve nurses neglecting hand hygiene behaviors, lacking the necessary skills or knowledge, and facing resource or equipment constraints. Poor hand hygiene was identified as a primary cause of transmission infections in the healthcare field. These infections are characterized by their time-consuming nature, unpredictability, and potential unfixability, all of which are emphasized as issues within healthcare environments.

6.1 Nurses’ responsibilities in the rise of HCAIs

Healthcare-associated infections pose a significant challenge in contemporary healthcare settings. Endogenous sources, which exist typically on the body's skin and digestive tract, and exogenous sources, such as infectious environmental agents, are both capable of producing infections. The most frequent route of transmission for these infections is through the hands of healthcare professionals. Significant emphasis should be placed on this matter, and nurses, in their capacity as healthcare providers, should make a valuable contribution to the prevention

of these infections. As a result, and due to its recognition as the primary method to prevent HCAIs, the promotion of hand hygiene should be consistently emphasized (10).

The World Alliance for Patient Safety has focused its attention on healthcare-associated infections. Accordingly, practicing hand hygiene is widely recognized as the most crucial method for decreasing infections in healthcare facilities and preventing the spread of antimicrobial resistance. This is emphasized in various guidelines, including the World Health Organization's recommendations on hand hygiene in healthcare from 2005, the WHO Patient Safety guidelines from 2009, and The African Partnerships for Patient Safety guidelines from 2012 (7). Enhanced compliance with hand hygiene measures has resulted in improved patient well-being and safety, as well as reduced instances of complications, hospitalization duration, and mortality rates (8).

Nurses, as a category of Health Care Workers (HCWs), play a crucial role in providing primary care within their communities, particularly during infectious disease outbreaks. Nurses and midwives constitute approximately 50% of the worldwide health workforce and are the healthcare professionals who have the highest frequency of interaction with patients. These individuals play a crucial role in combating HCAIs, as well as neonatal and maternal sepsis (1,5). The hands of healthcare workers are a significant source of transmitting bacteria, viruses, and microorganisms (3,5). Microorganisms can remain viable on hands for a duration of up to three hours. Watches and bracelets may store millions of germs, and rings can potentially have an even greater number of germs.

Healthcare-associated infections are a significant contributor to illness and death within the healthcare industry (5). Individuals who are at a greater vulnerability to infectious diseases include infants, the elderly, individuals with preexisting medical conditions, and those with a weakened immune system (6). HCAIs pose a significant issue, with healthcare professionals' hands as the primary route of transmission (1). Hand hygiene should be consistently promoted as it is regarded as the primary ubiquitous measure for controlling HCAIs (1, 2, 3, 6, 8, 9, 10).

Each year, a considerable number of individuals are impacted by HCAIs. These complications primarily affect the urinary tract, surgical sites, airways, and blood. However, HCAIs can also develop during routine clinical activity (1). Every year, hundreds of thousands of individuals are reported to be affected by preventable HCAIs. The occurrence of HCAIs is influenced by

many factors, including deficiencies in health-related policy, infrastructure, organization, and knowledge in addition to inadequate practices and behaviors of professionals (3,10). Annually in Europe, HCAIs result in an additional 16 million hospitalization days with a range of 5 to 29.5 days in which 37,000 deaths are directly caused by HCAIs and a minimum of 110,000 deaths are related to HCAIs annually. Estimates indicate a direct cost loss of 7 billion euros in economic terms (1). Furthermore, the expenses linked to prolonged hospital stays have also risen, which can be attributed to the costs associated with the implementation of infection prevention and control measures (10). In the United States, 99,000 patient deaths occur annually as an effect of HCAIs. Research has indicated that although healthcare workers express predominantly positive attitudes towards hand hygiene practices, the actual rates of compliance observed are less than 30%. Ensuring sufficient hand hygiene among hospital staff has the potential to prevent approximately 15% to 30% of HCAIs (7). At the burns unit in Kamuzu Central Hospital, it was discovered that 50% of patients had contracted pseudomonas infections. One of the main contributing reasons is insufficient hand hygiene (9).

HCAIs can result in prolonged hospitalization, long-term health issues, resistance to antimicrobial treatments, and substantial financial burdens on healthcare facilities, patients, and their families. Furthermore, when analyzing the costs associated with HCAIs, it is important to consider the personal and familial aspects. Prolonged hospitalization negatively impacts the patient's physical and emotional health as well as the family's financial situation (10).

HCAIs occur after a patient has been admitted to the hospital, rather than at the time of admission. Inpatients frequently experience these complications, primarily in the urinary tract, surgical site, airways, and bloodstream. Healthcare professionals can also acquire HCAIs while performing their routine clinical tasks (10). Hand hygiene is crucial in preventing HCAIs as microorganisms are primarily transmitted through the hands of healthcare professionals (5). Therefore, hand hygiene guidelines play a crucial role in enhancing this process, establishing goals for managing HCAIS risks, and educating teams on the implementation of infection prevention measures (10).

Given all of the above, it is crucial that nurses have an important role to strictly follow hand hygiene practices, especially after receiving training on the subject. Although there has been a

lot of talk about nurses' understanding of the significance of hand hygiene, it can be challenging to guarantee consistent compliance with this straightforward and cost-effective practice.

6.2 Role of nurses in hand hygiene practices

According to Nightingale's environmental theory, it is the nurse's responsibility to maintain environmental stability by promoting elements that foster a health-promoting atmosphere, There are numerous factors contributing to these infections, but a straightforward and highly effective method of reducing them is by ensuring that nurses practice effective hand hygiene. Practicing hand hygiene among nurses not only protects them from acquiring illnesses but also minimizes the possibility of transmitting infections to others. Insufficient hand hygiene before interacting with others can result in the transmission of infections to both patients and family members (1,2,3,4,5,6,7,8,9,10).

The professional identity of nurses was explored to understand their role. Professional identity refers to the individual's view of themselves in relation to their professional role. This identity provides professionals with a clear understanding of their role and consists of the objectives, principles, standards, and ways of interacting that are linked to their occupation. Professionals' understanding and behavior in different work situations are heavily influenced by their identity, which is formed by such situations and also influences their behavior within them. Identity is expected to impact individuals' motivation. It involves the cognitive processes through which individuals understand and interpret themselves and others. It involves the individuals' behaviors and emotions to manage and govern themselves (2).

By understanding the qualities, skills, and traits that nurses value, the role of nurses comprises the responsibility of practicing hand hygiene with comprehensive knowledge and heightened awareness. Hand hygiene has the potential to be integrated into the nurses' qualities that define a "good" or "ideal" nurse. The following qualities and traits are listed below:

Empathy	Reliability
Respect	Awareness
Confidence	Critical Thinking
Technical Competence	Stress Management
Leadership	Flexibility

Good Communication Skills	Physical Endurance
Mental Endurance	Patient Advocate
Friendliness	Resourcefulness
Patience	Responsiveness
Good judgment	Cooperativeness

Table 3: Qualities and traits of nurses

6.2.1 The purpose of hand hygiene

Practicing hand hygiene reduces the spread of healthcare-associated infections among patients who are in the hospital. The necessity of hand hygiene was initially recognized in a hospital in Vienna during the 19th century. A large number of maternity patients suffered from a high mortality rate. Dr. Ignaz Semmelweis implemented a policy mandating that his staff members wash their hands before they started caring to patients, resulting in a significant reduction in the mortality rate. Hand washing is considered essential by today's medical professionals. The act of regularly washing hands with soap and water has the capacity to preserve more lives than any individual vaccine or medical intervention. It is a highly efficient and cost-effective method that reduces an increase of diarrheal diseases and pneumonia, both of which result in over 3.5 million fatalities annually among children under the age of 5 worldwide (7).

Hand hygiene is the most basic and efficient method to avoid healthcare-associated infections (1,2,3,4,5,6,7,8,9,10). Due to the high frequency of patient care interactions, nurses have more opportunities to implement hand hygiene procedures (1,2,3,4,5). Existing reports indicate that hand hygiene, a crucial aspect of infection prevention and control, is often ignored by HCWs in both developed and developing countries. Compliance rates have been known to drop below 20% in certain situations (1,3,4). An association has been observed between higher compliance with hand hygiene practices and a decrease in HCAIs (1,2,3,4).

Hand rubbing is the most efficient method for preventing infections in different healthcare environments (6). Practicing hand hygiene by nurses not only safeguards their own health but also lessens the potential of transmitting infections to others. Alcohol-based hand rub (ABHR) is a commonly used method of hand hygiene worldwide. It is recognized to be highly effective, easy to use, and cost-efficient in preventing the spread of infections. Alcohol deactivates enveloped viruses, such as coronaviruses, by denaturing proteins. Therefore, hand hygiene

formulations containing at least 60% ethanol, known as ABHR, have been scientifically proven to be effective.

Effective personal hygiene is crucial in reducing and preventing the transmission of infectious diseases between individuals. Additionally, it contributes to lowering the transmission of contagious diseases, such as colds, influenza, and other respiratory infections. The increasing rate of hospital-acquired transmission of COVID-19 highlights the urgent need to enhance the execution of measures to prevent and control infections in healthcare settings worldwide (1). Compliance with infection prevention and control guidelines is crucial in preventing the majority of infections in healthcare settings. Hand hygiene is a crucial aspect of personal hygiene and is a safety measure to prevent illnesses so that the transmission of germs and infections can be effectively minimized (7). Effective prevention of most HCAIs can be achieved through diligent compliance with proper hand hygiene practices and the use of appropriate protective equipment by skilled nurses (1).

6.2.2 Optimal hand hygiene timing

Healthcare practitioners should comply with the framework recommended by WHO when practicing hand hygiene namely Five Moments which recommends the following moments for hand hygiene: before patient contact, before an infection-free required practice, and after having contact with patients, body fluids, and surroundings (1).

To provide further clarification, it is imperative that hand hygiene is consistently practiced within healthcare systems. This is illustrated in the following manner:

- Before the start of the shift and after its ending.
- Before and after any interaction with a patient, their bodily fluids, or any objects contaminated by them.
- Among various medical interventions performed on a single patient.
- Before engaging in any activities involving food preparation, handling, serving, eating, or feeding a patient/resident.
- After providing patients with personal care, such as assisting them with blowing their nose, using the toilet, or performing wound care.
- Before and after the execution of invasive procedures
- Before wearing and after removing gloves.
- After engaging in personal activities such as using the restroom or blowing your nose.
- Whenever hands are visibly dirty or come into contact with secretions, excretions, blood, or body fluids and it is important to use soap and running water to clean them.
- After the individual has come into contact with pathogens through the act of coughing or sneezing.
- After touching doorknobs or handles after using the restroom (2,7).

Figure 2: Time to perform hand hygiene.

While there are numerous circumstances that require frequent handwashing, there are also instances when it may not be easily seen but is still essential (7)

6.2.3 Handwashing techniques

The process of washing, rinsing, and drying eliminates temporary bacteria that are found on the hands. Hand washing using soap and running water is necessary whenever hands are visibly dirty. Bar soaps should not be used in healthcare settings unless they are intended for the personal use of individual patients. It is advisable to keep using liquid soap containers until they are completely depleted and subsequently disposed of. It is important not to refill soap containers, as doing so can lead to the contamination of leftover soap. Antibacterial soaps are suitable for use in critical care areas like ICUs, as well as in locations where invasive procedures are conducted. According to guidelines from the WHO on hand hygiene in health

care, using a brush or hot water for hand washing should be avoided. This is because these methods can cause bruises and dryness of the skin, which creates an environment suitable for the growth of microorganisms (1,7)

The guidelines issued by WHO advocate for the use of specific techniques in order (1,7):

- Use water to wet hands.
- Wash hands and cover all of their surfaces with enough soap.
- Hands need to be rubbed palm to palm.
- Place the interlaced fingers of the right palm over the other hand, and vice versa. • Place the interlaced fingers of the palm to palm.
- The interlocked fingers of opposing palms against the backs of the fingers.
- Rotational rubbing of the right palm clasped around the left thumb, and vice versa.
- Rotational rubbing, with the right hand clasped in the palm of the left, moving backward and forwards, and conversely.
- Rinse hands with water.
- Completely dry hands and then switch off the faucet by using the same towel/paper. The minimum duration of the procedure is 15 seconds.

Figure 3: The proper technique for handwashing

Alcohol-based hand rubs, which contain more than 60% alcohol, are the preferred method for decontaminating hands (WHO Patients Safety, 2009). They demonstrate a range of immediate advantages, such as the complete removal of almost all bacteria within a brief period of 20 to 30 seconds, accessibility in healthcare environments, enhanced skin tolerability, and no infrastructure requirement. They are available in healthcare environments when running water is not accessible. Hand rubbing with alcohol is preferable to hand washing when the hands are not visibly soiled.

6.3 Barriers affecting nursing hand hygiene practices

Although hand hygiene performance is simple and there have been improvements in infection control, hospital healthcare workers generally do not follow hand hygiene recommendations

(1,2,3,4,8). The findings indicate that barriers to hand hygiene practice can be categorized into three main groups including nurses, nursing organizations, and nursing management (1,2,6,7,8)

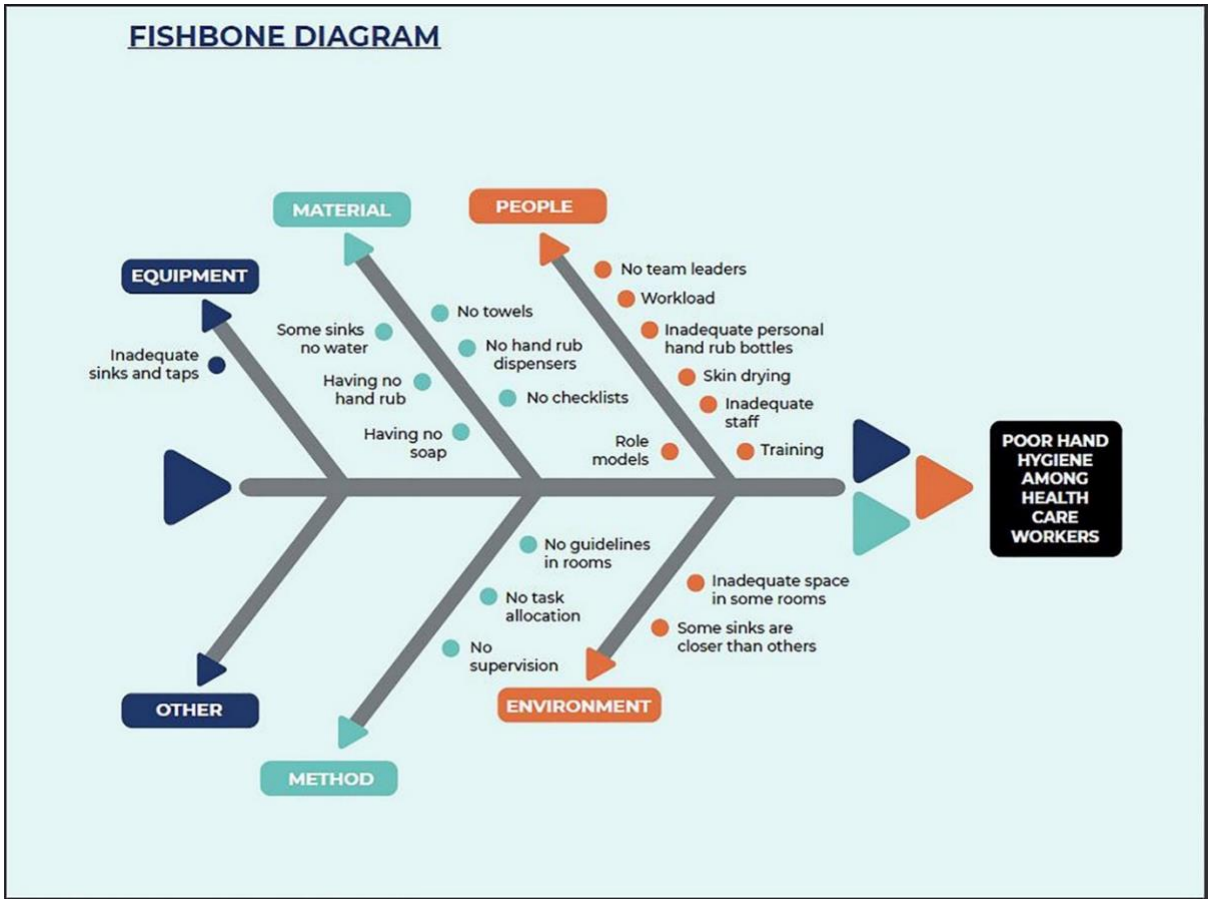

Figure 4: A fishbone diagram for causes in connection to poor hand hygiene among healthcare workers (9)

Professionals identify the lack of compliance with hand-cleaning practices with multiple factors, such as limited time due to work conditions insufficient equipment in the facilities, inadequate training, negative influence from superiors, colleagues, and patients in the human environment, and skin irritations caused by frequent hand-cleaning affecting the health of medical and nursing staff (7,8). Although good hand hygiene behavior of nurses could prevent a significant percentage of multidrug-resistant infections in the healthcare industry, organizational factors including hygiene training, resource availability, and enhanced role modeling of nursing managers influence this behavior (6).

6.3.1 Barriers related to nurses

The primary factors that contribute to the obstacles that nurses present to HH are the inadequate knowledge and improper attitude of healthcare workers. Hand hygiene, an important factor in

the prevention and control of infections, is frequently dismissed by HCWs in both developed and developing nations, as evidenced by compliance rates that occasionally fall below 20% (1). In Europe, 426,277 cases of healthcare-associated infections caused by multi-resistant bacteria were reported in 2015 (6). Insufficient training in infection prevention and control was identified as a contributing factor to the increase in infection cases within healthcare systems (1,2,6,8).

Many studies have identified individual knowledge inadequacies that impact safe practices for HH in the healthcare sector, including inadequacies in the recommended duration of hand washing and hand rubs. It was also demonstrated that serious infection incidences could be reduced in healthcare settings through the implementation of comprehensive programs designed to increase HH compliance (6,8).

Healthcare professionals have a lack of awareness regarding the severe effects associated with inadequate hand hygiene, such as nosocomial infections, prolonged hospital stays, antibiotic resistance, and even fatalities. Staff's ignorance was a contributing factor to noncompliance with HH procedures. The use of alternative gloves for HH contributed to considering HH as non-essential. Consequently, hand hygiene compliance was diminished (2,8,10).

The experiences of the majority of participants showed that the lack of compliance with HH procedures was significantly influenced by the unfavorable beliefs and attitudes of healthcare workers. This was revealed through feelings of despondency, decreased productivity, reduced enthusiasm, and decreased confidence. One aspect of the HCWs' attitudes is their influence on their fellow staff members within the ward. Consequently, a pessimistic outlook toward HH could have significant effects on the actions of fellow HCWs, leading to reduced compliance with HH procedures (8).

6.3.2 Barriers related to nursing organization

The issues of nurses facing heavy workloads, poorly designed hospital wards, insufficient equipment, and low-quality equipment have been discovered. The high workload challenges hand hygiene practices. The cause is connected to stress, lack of peace, and the haste to complete the assigned tasks especially when dealing with a large number of patients or caring for two patients at the same time, the practice of hand hygiene is inevitably neglected. The

nurses' tiredness resulting from excessive work and nocturnal shifts hindered their ability to adhere to appropriate hand hygiene practices. The set of numbers is (1, 2, 5, 6, 8)

According to WHO, there is a global need for an additional 9 million nurses and midwives to attain universal health coverage by the year 2030 (5). Nurses, as a group of HCWs, play a crucial role in providing primary care within their communities, particularly during infectious disease outbreaks. Due to their frequent exposure to germs, extended working hours, stressful work environment, and fatigue, they are more likely to contract or spread infections such as COVID-19, complying with infection prevention and control guidelines is crucial in combating the ongoing COVID-19 pandemic (1). Incorporating the knowledge and skills of nurses and midwives in the process of creating, executing, and assessing hand hygiene promotion efforts plays a significant role in maintaining a hygienic healthcare environment. Evidence has demonstrated that allocating resources toward education and the establishment of employment opportunities in the health and social sectors will yield enhanced health outcomes, bolster global health security, and foster economic expansion. Optimal healthcare worker staffing mitigates the likelihood of HCAIs and the development of antimicrobial resistance (5). Furthermore, the absence of clearly defined areas for patients and the lack of reliable and sufficient alcohol-based hand rub (ABHR) are some of the numerous obstacles that prevent the implementation of effective hand hygiene protocols in healthcare settings with limited resources (1,7,8).

The availability of sufficient and efficient equipment in the ward will enhance compliance with hand hygiene procedures and minimize the occurrence of adverse consequences caused by inadequate hand hygiene (1,2,5,4,6,8,9). Hand hygiene practice can be challenging in certain situations, such as when there is a shortage of easily accessible handwashing sinks and when the sinks are far away from the patients' beds. These factors create inconvenience and dissatisfaction, making it difficult to maintain proper hand hygiene. It is revealed that the health system infrastructure was ineffective in terms of implementing proper hand hygiene practices. Consequently, the installation of handwashing sinks and the reduction of the distance between sinks and patients' beds will make it easier to access and encourage improved hand hygiene practices (6,8). Based on the experiences of numerous nurses, the lack of sinks and intelligent faucets for hand washing posed a significant obstacle to maintaining proper hand hygiene. A significant number of participants reported inadequate hand drying facilities, specifically the absence of tissue paper and a hand dryer, resulting in suboptimal hand hygiene. Additional

obstacles to hand hygiene practices encompassed inadequate supplies of detergents or personal protective equipment, absence of skin moisturizers following hand washing, and insufficient financial resources to procure hand washing equipment (6,8,9).

6.3.3 Barriers related to nursing management

In the majority of cases, incorrect supervisory behavior patterns and inadequate planning and management training have been addressed. It is imperative to identify inappropriate behaviors prior to creating approaches to stop and adjust them.

HCWs are required to follow the principles, rules, and guidelines in healthcare settings. Furthermore, managers have the ability to encourage hand hygiene practices by means of effective monitoring, training, and planning (8,9). The majority of HCWs' experiences indicated that HCWs imitated the incorrect behaviors of managers in leadership roles, such as head nurses, physicians, and department heads. As a result, the performance of other HCWs was negatively affected by the noncompliance of colleagues, managers, and doctors with regard to hand hygiene procedures. (1,2,6,8)

Furthermore, the experiences of the nurses demonstrated how insufficient training resulted in HCWs lacking a distinct understanding of their professional responsibilities, as evidenced by the absence of guidelines or posters. As a consequence, they will encounter challenges in carrying out all responsibilities, including practicing proper HH. The lack of positive feedback, inadequate support, ineffective planning, and poor monitoring by managers have negatively impacted the adherence of healthcare workers to hand hygiene. In addition, the managers failed to adequately address the issues and obstacles related to hand hygiene practices, which consequently led to insufficient hand hygiene. Inadequate supervision of evening and night shifts is also an obstacle to the implementation of hand hygiene practices (8,9).

7 Discussion

The aim of this study was to illuminate nurses’ roles in hygiene practice and infection control. It has been shown that HCAIs occur during hospitalization and is not present at the time of admission. The simplest and most successful approach to control HCAIs in healthcare settings is proper hand washing. However, the compliance with hand hygiene procedures by hospital

healthcare workers remains generally inadequate (2,3,4). Therefore, it is crucial to discuss and clarify the factors that influence nurses' HH practice. To assess the potential impact of various underexplored factors on HH based on the five pillars of Nightingale's environmental theory, initial research was conducted to examine norms and nursing improvement contributing to the safety working environment (2).

7.1 Nursing norms in hand hygiene

A social norm is a behavioral rule that individuals comply with based on the conditional belief that most people in their relevant network are also committed to this behavior. They hold the belief that they should engage in the behavior, and the majority of individuals in their healthcare network believe they should execute this HH practice as deviating from the norm may lead to possible consequences (2,9). In order to recognize and forecast human behavior, it is crucial to identify the specific social norms that individuals consider significant in different situations, as these norms are likely to vary depending on the particular settings. The assessment of the normative system of nursing regarding hand hygiene behavior can be conducted by examining individuals' attitudes towards appropriate hand hygiene, their anticipations of others' hand hygiene behavior, and their beliefs about the expectations others hold for them in this matter. Given their profession as nurses, they acquire the necessary knowledge and understanding of their tasks, thus requiring only occasional reminders. As a registered nurse, the nurse in the scenario is expected to have a compliance rate of 90% due to the presence of hand sanitizer outside rooms and our established habit of hand washing (2,4). The majority of nurses regarded hand washing as the paramount aspect of infection control and hygiene practice (2,4).

7.2 Nursing behavior improvement

Hand hygiene is a diverse behavior influenced by a wide variety of factors that either encourage or discourage compliance. Although extensive research has been conducted on the fundamental behavioral aspects of hand hygiene practices in hospital settings, there are still knowledge gaps concerning the psychological promotion of hand hygiene compliance that is effective. The influence of psychological frameworks on behavior change has been proven in numerous contexts, with a particular emphasis on their impact on HCWs. Thus, psychological models and a focus on behavior change aspects can provide more precise direction for approaches to improve HH (2).

In line with the environmental theory, strategies for improving nurses' behavior toward HH in hospital settings are possible. The development and implementation of continuing education programs to improve the compliance of healthcare professionals to infection control guidelines has been suggested (3). HH is a complex and challenging phenomenon. Consequently, in order to promote this, integrated teaching strategies are necessary. Learning can be enhanced by supplementing textual and verbal instructions with visual information (8).

7.3 Nursing knowledge improvement

Knowledge was one of the primary factors that could be identified as crucial for carrying out effective hand-washing hygiene practices including ensuring that personnel were well-informed, that aseptic conditions were maintained, and that patients and family members were informed about HCAIs and their way of transmission within hospital settings. This was the subject of this study, which concluded that staff ignorance of hygiene procedures at their hospital contributed to the low level of compliance. Research indicates that healthcare professionals, on average, fail to wash their hands more than half as often as they ought to. This phenomenon aids in the transmission of healthcare-associated infections, which have an annual impact on 1 in 31 patients admitted to the hospital (4). Nurses ought to receive proper training to ensure that they adhere to infection prevention and control protocols, which include proper hand hygiene while delivering patient care. Irrespective of the gravity of disease outbreaks at large.

The majority of nurses regarded hand washing as the paramount aspect of infection control and hygiene practice. Incorporating the knowledge and skills of nurses in the process of creating, executing, and assessing hand hygiene promotion efforts is essential for maintaining a hygienic healthcare environment. The occurrence of multidrug-resistant infections in the healthcare sector can be significantly reduced by ensuring that nurses adhere to proper hand hygiene practices. However, the knowledge of nurses in this regard is influenced by various organizational factors, including hygiene training and the availability of resources (2,4).

7.4 Nursing habit and motivation improvement

Habits are psychological responses to environmental stimuli learned through repeated practice in specific contexts. Strong habits are performed more often than weak ones. Nurses and managers must have strategies to promote hand hygiene to prevent HCAIs (2,4).

Motives are sophisticated psychological mechanisms that assist individuals in selecting the most suitable goal-directed behavioral approach when confronted with a given circumstance. A proper action would almost certainly result in a favorable consequence with regard to the advantages gained from that engagement with the surroundings (2). Positive feedback from a manager or direct supervisor, colleagues, and patients was found to be one of the primary motivators for hand hygiene, according to one study. The extent to which they believe this feedback influences nurses' propensity to utilize hand sanitizer beyond their typical routine (2).

7.5 Supportive environment for hand hygiene training

The findings indicate that efforts to enhance hand hygiene should prioritize implementing methods that make hand disinfectant materials readily available in the nearby area of nurses' workstations (5,10). Managers should also determine how the placement and configuration of props in the setting around the act of HH can either limit or provide favorable conditions for practicing HH. Furthermore, it is crucial for nursing managers to have a clear understanding of the influence they have in their position, and they should actively apply this understanding to their daily healthcare practices (2,4,10).

Several studies have reported a decrease in the occurrence of severe infections following the implementation of the HH program aimed at improving compliance with hand hygiene practices in the healthcare sector (1,9,10). Many researches have demonstrated that improving knowledge, behavior, and attitudes can lead to higher levels of compliance with hand hygiene practices (6).

By implementing rigorous, standardized quality improvement procedures, various measures were implemented to ensure hand hygiene compliance and maintenance of the facility. These measures included the use of checklists to monitor hand hygiene practices, the establishment of a hand hygiene committee to manage and sustain project activities, and the distribution of hand rub and soap at easily accessible locations (8,10).

8 Conclusion

Hand hygiene is the most effective method for preventing hospital infections due to the fact that the hands of nurses are a significant vector for the transmission of infectious agents. This fact has been the subject of numerous research and is no longer debatable. As a result, the World Health Organization recommends that health workers practice proper hand hygiene as one of the primary measures to improve infection control in hospitals and prevent the spread of diseases between patients and health professionals during the delivery of medical services. Additionally, good hand hygiene significantly reduces treatment expenses.

This study examines the specific influence of nurses' role in hand hygiene on infection control in the hospital setting. After analyzing the research in this literature review, it can be concluded that the need for hand hygiene in the role of nurses is important to avoid the development of nosocomial infections while providing nursing care.

Nevertheless, nurses showed inadequate hand hygiene practices and adherence during their working time, even though they understood the need for this important procedure. The reasons behind this problem are the lack of enough facilities in the clinical areas for handwashing and drying, the scarcity of resources, the time limits, the prevalence of hand injuries, the heavy workload, and ignorance.

Nursing personnel need to continuously improve and assess their knowledge and use it in hospital settings. All nurses agree that talking about this issue is important since they are in charge of making sure that hands are clean and raising awareness of the need for changes, which will only be possible by providing excellent care. One can achieve quality by putting into practice, instructing, and creating enough efficient hand hygiene procedures.

Standard infection control protocols and raising awareness of the value of good hand hygiene through education sessions and the distribution of useful materials are two easy ways to deal with the problem. As part of their duties as professionals, nurses must, however, individually be reminded of the need to maintain good hand hygiene. Implementing these measures would lead to a substantial decrease in healthcare expenses and the incidence of illness and death related to healthcare-associated infections.

8.1 Strengths and Limitations

The strengths of this study were highlighted by the selection of articles according to rigorous inclusion and exclusion criteria. Conversely, the results of this study can be broadly applied to all nurses in different fields in hospitals because there were no restrictions on the various areas of expertise of the nurses. As a coin always has two sides, this study has its limitations as well. The research question was answered by a selection of only articles published in the last ten years. Older articles were thus not used even though their material has a connection to this investigation. This study carefully chose English free-access articles that can be accessible by Arcada's credentials. In order to complete this research at the level of a bachelor's degree, the quantity of information cited from ten selected articles may be sufficient to reflect the objective of this study. However, it might not be enough to cover every aspect of the nurses' roles regarding hand hygiene in the hospital environment. Regardless of the limitations that were placed on this study, the objectives of the study were accomplished without a conflict or contradiction between the information that was referred to in the literature.

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Appendices

According to the criteria for inclusion and exclusion provided in the table above, the 10 selected articles are listed below in the order:

1. Lotfinejad, N., Peters, A., & Pittet, D. (2020). Hand hygiene and the novel coronavirus pandemic: the role of healthcare workers. The Journal of hospital infection, 105(4), 776–777. https://doi.org/10.1016/j.jhin.2020.03.017

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3. Perna, A., Maruccia, F., Gorgoglione, F. L., Barletta, F., Vitiello, R., Proietti, L., Tamburrelli, F. C., & Santagada, D. A. (2022). Increased Frequency of Hand Hygiene and Other Infection Prevention Practices Correlates with Reduced Surgical Wound Infection Rates in Spinal Surgery during the COVID-19 Pandemic. Journal of clinical medicine, 11(24), 7528. https://doi.org/10.3390/jcm11247528

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5. Peters, A., Lotfinejad, N., Guitart, C., Simniceanu, A., Padoveze, M. C., Borzykowski, T., Allegranzi, B., & Pittet, D. (2020). “Nurses and midwives: Clean care is in your hands”: The 5th May 2020 World Health Organization SAVE LIVES: Clean Your Hands campaign. American Journal of Infection Control, 48(5), 471–472. https://doi.org/https://doi.org/10.1016/j.ajic.2020.02.009

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care units during the COVID-19 pandemic: A qualitative study. Frontiers in public health, 10, 968231.

9. Kamanga, P., Ngala, P., & Hebron, C. (2022). Improving hand hygiene in a low-resource setting: A nurse-led quality improvement project. International Wound Journal, 19(3), 482-492.

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