The Factors Impacting Nurses Awareness on Prevention Healthcare-Associated Infections: A Systematic Review

Diah Arruum1,3, Enie Novieastari1*, Dewi Gayatri2, Nur Meity Sulistia Ayu1

1Doctorate Study Program, Faculty of Nursing, Universitas Indonesia, Depok, Indonesia; 2Departement of Basic Science and Fundamentals Nursing, Faculty of Nursing, Universitas Indonesia, Depok, Indonesia; 3Faculty of Nursing, Universitas Sumatera Utara, Medan, Indonesia

Abstract

BACKGROUND: Healthcare-Associated Infections (HAIs) are significant causes of illness and mortality, and nurses are healthcare professionals with the most consistent contact with patients, therefore nurses need to possess adequate knowledge, and awareness. AIM: This study aims to analyze factors impacting nurses awareness of the prevention of HAIs, such as their knowledge, attitude, and practice compliance. METHODS: A systematic review was conducted from the sources of data collection, namely ProQuest, ScienceDirect, PubMed, and Google Scholar from 2011 to 2020, with English guidelines used to review the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement. RESULTS: Data were obtained through a questionnaire survey, direct observation, and self-report from 4329 nurses with a total of 12 inclusion criteria. The result showed that a significant number of nurses do not possess an acceptable level of knowledge and practice, although nurses have a positive attitude. Hand hygiene and other protective personal equipment need to be used by nurses and other health personal to prevent urinary tract infection, respiratory, and surgical site infection in the hospital. CONCLUSION: Nurses had low levels of knowledge with higher positive attitudes and low level of practice compliance. Nurses need to possess the right knowledge, attitude, and guidelines. Standard precaution is important for patient safety management, and nurses need to be adequately trained to increase awareness.

Introduction

One of the common causes of the increase in patients’ mortality and morbidity rate is Healthcare-Associated Infections (HAIs). Several factors lead to the occurrence of HAIs, such as the use of invasive devices, poor nurse-to-patient ratio interaction, surgical procedures, ineffective programs designed to reduce HAI, the severity of the underlying illness, and prolonged stay at the hospital [1]. According to the World Health Organization, some factors associated with the occurrence of HAIs are invasive devices, insufficient equipment, overcrowding, understaffing, inadequate knowledge and use of basic infection control measures, poor safety knowledge of injection and blood transfusion, ineffective procedures, and absence of local as well as national guidelines and policies [2].

There are numerous simple and cheap infection prevention and control measures, such as hand hygiene and the use of basic health precautions techniques. However, these measures need staff accountability and behavioral change. One of the solutions to this problem is implementing standard precautions (SPs), such as best hand hygiene practices while attending to patients, improving staff education and accountability [2]. During the COVID-19 pandemic, CDC recommended using infection prevention methods with standard practices as a routine healthcare delivery to all patients. This process is conducted by wearing facemask, gloves, goggles, and washing the hands before and after coming in contact with patients [3]. However, some of the reasons associated with health worker infections during the pandemic COVID-19 are inadequate awareness and precautionary measures, patient overload, and staff burnout [4].

A urinary tract infection (UTI) is one of the most common HAI in developed countries, with surgical site infection is popular in one-third of the areas with limited resources. Furthermore, in developed countries, approximately, 30% of the patients in intensive care units (ICU) are affected by at least one HAI [2]. Therefore, it is important to determine HAIs capable of harming patients, health workers and hospitals. Research carried out in Brazil on 3 sectors of the ICU using 1048 adults, showed that 947 patients were in the Neonatal ICU, and semi-intensive unit due to the poor compliance of nurses to the five policies of hygiene on infection prevention in the hospital. The neonatal ICU
had a higher rate of adherence to hand hygiene when compared to other sectors [5].

In Vietnam, the staff possessed adequate knowledge, unaware of hospital infection control, including lack of resources, poor awareness, and patient overload. According to Lien, Johansson, and Lan et al. that the HAIs available for health workers can improve staff awareness and put their existing knowledge into practice, thereby decreasing the know-do gap in infection control [6]. The systematic review focused on knowledge, attitude, and compliance to practice as factors impacting nurses’ awareness. Furthermore, personal value (attitude, behavior), learning style (process information), and orientation toward change (environment, locus of control) are part of self-awareness areas [7]. However, irrespective of the numerous studies on Healthcare-Association Infections in hospitals, there is a gap on the right prevention strategies that need to be adopted by nurses such as knowledge, attitude, practice and compliance. Therefore, a systematic review is specifically needed to examine the factors impacting these factors to enable the proper prevention of HAIs.

Methods

Study design

This study used a systematic review to address the question related to the factors impacting nurses’ awareness of the prevention of HAIs. Therefore, the review was conducted on the ProQuest, ScienceDirect, PubMed, and Google Scholar sources of data collection. Four design studies were used to carry out the research, namely, cross-sectional, descriptive, observational, and survey. The guidelines used were the Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

Search strategy

The search equations used were nurses’ awareness OR knowledge OR consciousness AND nurse compliance AND adherence AND infection prevention control OR HAI. Four electronic databases were available in English from 2011 to 2020, namely ProQuest, ScienceDirect, PubMed, and Google Scholar with n values of 255, 120, 51, and 41. After the duplicates were removed, 459 articles were left, with their titles and abstracts subsequently screened by two reviewers to assess the eligibility based on inclusion and exclusion criteria.

Selection of studies

The inclusion criteria were nurses as a sample population, awareness, knowledge, attitude, and compliance with prevention regulations, which consists of hand hygiene, personal protective equipment, and prevention policies on HAIs. Furthermore, a questionnaire survey, direct observation, and self-reported strategies were used to obtain prevention policies.

Data extraction process

Thirteen Full-text articles were assessed for eligibility and full-texts were independently reviewed with twelve studies eligible for inclusion.

Results

Type of studies

Out of a total of 467 articles, 8 were duplicated, thereby producing 459 eligible articles. Furthermore, examining their title and abstract, 446 articles were excluded, and after full review on the remaining 13, a total of 12 articles met the inclusion criteria as shown in Table 1. The main reason for excluding 1 the last article was because it was related to assessing the hepatitis B vaccine, which exposed nurses to bloodborne pathogens and needles. The sample population was 4329 nurses that provided direct patient care in the ICU, Neonatal ICU, surgical ward, mix nursing ward and critical care unit with n values of 1, 1, 3 and 7. All studies focused on preventing HAIs regarding SP.

Nurses knowledge and attitude on prevention HAIs

The knowledge and attitudes of nurses based on this study, had gaps and differences thereby leading to inadequate knowledge related to HAIs. Out of the total number of studies, few stated that urinary and respiratory tract infections (RTIs) were the two most common HAIs in the surgery ward due to higher educational levels. Therefore, nurses with a higher educational level tend to perform the right antisepsis while working on surgical wounds. They also tend to adhere to the principle of handwashing before and after medication to prevent transmitting infectious diseases. Several hospitals reported that they employed qualified HAIs nurses with an adequate understanding of the guidelines for disinfection procedures and hygiene, with a more positive attitude [8].

Similar results also found that half the number of nurses understood the need to carry out preoperative hair removal, when necessary, such as shortly before surgery [9]. Lobo et al. stated that nurses have average knowledge on infection control in surgical [10].
A risk factor for surgical site infection [9], Nurses sterilization, to prevent character-related Bloodstream HAIs which is associated with cleaning, disinfection, sufficient levels of knowledge regarding guidelines of nurses' adherence to handwashing. The results out by [14], which showed positive attitudes regarding hygiene in ICU [13]. This was similar to the study carried by [14], which showed positive attitudes regarding nurses’ adherence to handwashing. The results of research by Accardi stated that nurses possess sufficient levels of knowledge regarding guidelines of HAIs which is associated with cleaning, disinfection, sterilization, to prevent character-related Bloodstream Infections (BSI), SSI, RTI, and UTI [15].

Some studies also showed excellent precaution on nurses' knowledge using obesity as a risk factor for surgical site infection [9]. Nurses need to possess adequate knowledge of infection control [16], [17], and self-rated hand hygiene [18]. The majority of the participants have an excellent level of knowledge regarding hand hygiene, with the lowest score associated with the definition of its domain [17]. The overall knowledge of nurses on the different infection control practices was excellent. However, Sodhi et al. stated that other infection control practices include care bundles, standard and transmission-based precautions, and general infection control practices [16]. Nurses’ practice compliance on Prevention HAIs The non-compliance of nurses in preventing HAIs was also reported in many studies. This is because their practice to SPs HAIs was low for those working in surgical, medical, and ICU wards. This includes their inability to wear a mask, goggles, face shield, gown, apron, decontaminate hand after removal of gloves, hand wash/rub between patient contacts, and disposal of boxes filled with sharp objects [18]. According to Zucco et al., gloves need to be worn during this practice to Tabriz teaching hospitals [12].

Furthermore, half of the nursing employees participating, in the study, had good knowledge of hand hygiene in ICU [13]. This was similar to the study carried out by [14], which showed positive attitudes regarding nurses’ adherence to handwashing. The results of research by Accardi stated that nurses possess sufficient levels of knowledge regarding guidelines of HAIs which is associated with cleaning, disinfection, sterilization, to prevent character-related Bloodstream Infections (BSI), SSI, RTI, and UTI [15].

Some studies also showed excellent precaution on nurses' knowledge using obesity as a risk factor for surgical site infection [9]. Nurses need to possess adequate knowledge of infection control [16], [17], and self-rated hand hygiene [18]. The majority of the participants have an excellent level of knowledge regarding hand hygiene, with the lowest score associated with the definition of its domain [17]. The overall knowledge of nurses on the different infection control practices was excellent. However, Sodhi et al. stated that other infection control practices include care bundles, standard and transmission-based precautions, and general infection control practices [16]. Nurses’ practice compliance on Prevention HAIs The non-compliance of nurses in preventing HAIs was also reported in many studies. This is because their practice to SPs HAIs was low for those working in surgical, medical, and ICU wards. This includes their inability to wear a mask, goggles, face shield, gown, apron, decontaminate hand after removal of gloves, hand wash/rub between patient contacts, and disposal of boxes filled with sharp objects [18]. According to Zucco et al., gloves need to be worn during this practice to Tabriz teaching hospitals [12].

According to Zucco et al. that nurses adhere to the use of hand antisepsis before and after invasive procedures and always reported the utilization of single-use protective equipment in patients with infectious diseases [9]. After coming in contact with patients, their fluids or instruments, they are expected to thoroughly disinfect their bodies to prevent the transmission of HAIs [14]. The other results related to nurses' compliance to HAIs regulations found that the ability

<table>
<thead>
<tr>
<th>Author/topic</th>
<th>Study design</th>
<th>Setting</th>
<th>Sample</th>
<th>Measurement</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goodarzi (2020) Iran</td>
<td>Descriptive cross-sectional using questionnaire</td>
<td>University of Medical Sciences</td>
<td>600 nurses</td>
<td>Knowledge and attitude with hand hygiene</td>
<td>Nursing employees who participated had good knowledge of hand hygiene, a neutral attitude towards this practice and a high perception of its importance.</td>
</tr>
<tr>
<td>Lobo et al. (2019) India</td>
<td>Descriptive Cross-sectional, using Observation</td>
<td>1550 bed A. J. Hospital</td>
<td>80 nurses</td>
<td>Knowledge, self-report practice compliance, observation infection control, attitude</td>
<td>Knowledge, self-report practice compliance, and observation of nurses were average. The attitude was positive.</td>
</tr>
<tr>
<td>Zucco et al. (2019) Italy</td>
<td>Cross-sectional survey using questionnaire</td>
<td>36 hospital</td>
<td>1305 nurses</td>
<td>Knowledge, the attitudes and the adherence on the Surgical Site Infection (SSI)-HAIs</td>
<td>Nurse’s knowledge and attitude needed to increase as nurses just knew that pre-operative hair removal, did not know the right definition of the bundle, but nurses always performed hand antisepsis.</td>
</tr>
<tr>
<td>Lim et al. (2019) Korea</td>
<td>Cross-sectional using questionnaire</td>
<td>Tertiary teaching, university-affiliated hospital</td>
<td>329 nurses</td>
<td>Adherence and perception of patient safety management associated SP</td>
<td>Adherence of nurses was approximate.</td>
</tr>
<tr>
<td>Gawad et al. (2017) Yemen</td>
<td>Cross-sectional using questionnaires</td>
<td>The governmental and private hospitals</td>
<td>196 nurses</td>
<td>Knowledge of SP and infection nosocomial</td>
<td>Nurses had poor knowledge.</td>
</tr>
<tr>
<td>Accardi et al. (2017) Italy</td>
<td>Descriptive using Observation</td>
<td>16 ward of clinical Medicine and Surgery area</td>
<td>245 nurses</td>
<td>Knowledge and adherence of nurses to the guidelines on the HAIs</td>
<td>Knowledge and practice compliance of nurses has sufficient level, but for hand hygiene had good than the other to prevention HAIs.</td>
</tr>
<tr>
<td>Sarani et al. (2016) Iran</td>
<td>Descriptive study using questionnaires</td>
<td>Two teaching Hospital</td>
<td>145 nurses</td>
<td>Knowledge, attitude, and practice regarding SP for HAIs</td>
<td>Most nurses had poor knowledge, an average practice and a moderate attitude about HAIs control.</td>
</tr>
<tr>
<td>Assadiollahi et al. (2015) Iran</td>
<td>Descriptive cross-sectional using questionnaire</td>
<td>NICUs affiliated to Tabriz teaching hospitals</td>
<td>150 nurses</td>
<td>Knowledge regarding hand hygiene</td>
<td>Most nurses had a good level of knowledge about hand hygiene, but nurses had reported a need to renew their training in this regard.</td>
</tr>
<tr>
<td>Sodhi et al. (2013) India</td>
<td>Cross-sectional using questionnaire</td>
<td>350 bed Hospital</td>
<td>100 nurses</td>
<td>The hand hygiene, standard and transmission-based precautions, care bundles and general infection control practices</td>
<td>Knowledge and awareness were excellent, including hand hygiene, but standard and transmission-based precautions, care bundles and general infection control practices were average.</td>
</tr>
<tr>
<td>Darrawad et al. (2012) Jordan</td>
<td>Cross-sectional using questionnaires</td>
<td>3 hospital from 31 hospital</td>
<td>198 nurses</td>
<td>Knowledge, attitude and compliance of nurses</td>
<td>The nurses showed positive attitudes, lack of knowledge regarding handwashing. The awareness is needed to increase compliance.</td>
</tr>
<tr>
<td>Al-Wazzan et al. (2011) Kuwait</td>
<td>Cross-sectional using observation and questionnaire</td>
<td>Public secondary care hospital</td>
<td>454 nurses</td>
<td>To assess compliance with hand hygiene among nursing staff such as observed hand hygiene &amp; hand hygiene opportunity</td>
<td>Observed hand hygiene compliance among nursing staff in secondary care hospitals in Kuwait was poor.</td>
</tr>
<tr>
<td>Sessa et al. (2011) Italy</td>
<td>Cross-sectional using questionnaire</td>
<td>Hospital</td>
<td>527 nurses</td>
<td>Knowledge, attitude, and practices regarding disinfection procedures</td>
<td>Nurses' knowledge related to HAIs was poor. Nurses having positivity attitude</td>
</tr>
</tbody>
</table>

**Table 1: Nurses awareness on prevention HAIs**

Summary: The role of nurses in preventing Healthcare-Associated Infections (HAIs) is crucial. Nurses' knowledge and practice compliance are essential to control these infections. The awareness and practice of hand hygiene significantly reduce the risk of HAIs. However, there is a need for continuous training and education for nurses to improve their knowledge and compliance with infection control guidelines.
to clean, disinfect and sterilize clinical equipment was important to prevent SSIs, RTIs, UTIs, and catheter-related to BSI [15].

Nurses’ awareness is based on knowledge and practice on the prevention of HAIs

The nurses having low awareness in washing hand. According to Sodhi et al., the awareness of nursing staff on different infection control practices, such as hand hygiene, was not sufficient [16]. Therefore, information on transmission-based precautions, and general infection control practices are needed to protect patients from contracting HAIs. Therefore, nurses need to possess adequate knowledge of infection control guidelines and compliance with handwashing. They also need to possess adequate knowledge of removing gloves, washing hands after various activities, and practice hand hygiene [18].

Discussion

This study research was carried out to determine the nurses’ awareness of the various strategies needed for the prevention of HAIs. This determines the suboptimal knowledge of nurses regarding HAIs, although some had good knowledge; however, almost all nurses in the prevention of HAIs were a positive attitude. Regarding knowledge of Infection Control Precautions (ICPs) revealed that nurses had low levels of knowledge, with higher positive attitudes toward ICPs in the medical, surgical, ICUs, pediatric ward, and emergency units in Jordan [20]. In another study carried out in Nigeria, nurses had poor knowledge of injection safety, which few were aware of the dangers associated with recapping sharp objects, and the disadvantages of bending or breaking sharps or needles. However, they had adequate knowledge of hand hygiene, such as washing hands before and after touching a patient and wearing gloves before venipuncture [21].

This study also described that nurses had low practice compliance on the prevention of HAIs, as well as a lack of guidelines, SP, and inconsistency in policies and practices in the healthcare setting. Furthermore, the study carried out in Nigeria showed that few the Health Care Workers (HCWs) are aware of the guidelines/protocols for infection control, by wearing a mask and gown before entering the ICU [22]. Other studies carried out on compliance with SPs among the HCWs in Ethiopia showed that nurses’ knowledge on HAIs is very low [23]. A similar study carried out in Nigeria showed that nurses adhered to the health safety policies; however, there were inadequate resources to practice SPs such as hand hygiene, injection safety, and handling sharps objects [21]. Regarding compliance to policies, nurses scored higher grades than ICPs [20]. Nurses tend to comply with hand hygiene, such as washing their hands when dirty or after coming in contact with patient’s body fluids. Burnett stated that higher compliance was associated with hand hygiene using alcohol-based disinfectants [24]. The overall knowledge, attitude, and compliance showed that lack of knowledge and inadequate practice affected. Sarani et al. stated that nurses with more knowledge of infection control had better practice [12].

In general, deficiency in the knowledge was observed; the nurses provided average or below-average responses to other infection control practices. The research in Nigeria indicated that HCWs adhered poorly to the hygiene policies [22]. There was contradiction among these factors in SPs of HAIs in the nursing area due to lack of awareness, thereby leading to poor knowledge, attitude, and practice. Nevertheless, supervision on the precaution against infection is indispensable. Although nurses possess adequate knowledge and received training, supervision and feedback are needed for sustainability and to prevent infection. Storr et al. stated that the monitoring and feedback of infection control practices are needed to demonstrate existing gaps and possess behavioral change toward good practices [25]. Three studies related to the surgical ward stated that the majority failed to comply with the policy. Other studies stated that HCWs were not aware of the HAIs situation and own role in preventing it from avoiding infections, RTIs, and HIV through the use of unsterilized needles. Their inability to detect these infections were due to poor awareness of hospital staff, lack of facilities, insufficient equipment and supplies, as well as a patient overload [6]. However, the results of research from Rizk, EL-Raghi, and Zein found that although the availability of adequate facilities, based on observations time, the implementation of handwashing is still low, where only 10% of the 20 nurses wash hands [26]. Therefore, efforts are needed to improve awareness of staff hospitals by providing alcohol-based hand rub solutions, carrying out annual training on infection control, and availability of standard protocols [6]. Support from management is very important in increasing motivation to wash hands.

The results of the study from Shahrbabaki, et al. stated that the workload, lack of knowledge and wrong behavior patterns and not yet optimal management such as planning, training, and lack of availability of equipment were obstacles to handwashing for health workers including nurses in the Intensive Care room, have not awareness in preventing infection which can result in increased costs [27]. In line with research from Daulay, Sudiro, dan Amirah that in supporting the implementation of handwashing, it is necessary to contribute from management, namely supervision and providing training, so that 45.3% of infection control management is in the insufficient category [28].

598 https://oamjms.eu/index.php/mjms/index
Based on the 12 articles found, the most problems in handwashing were in the intensive care room and implementation of supervision from managers and continuous training is needed.

Educational programs are also needed to improve awareness of universal protocol for the prevention of HAIs [22]. The studies in the twelve selected articles indicated that the education program for nurses was needed. This is supported by the result of the study that perception of training on SP, accessibility of PPE, and management support, which are statistically significant [23], and they were the most essential participants with knowledge on hand hygiene [17].

Based on the results obtained from hospitals in Vietnam, no staff received education on infection control [6]. Approximately, 56.8% of the nurses attended a training course on ICPs [20].

Education and training program for nurses in health care centers is essential, therefore, when conducted continuously, it becomes a critical unit of care. Conversely, studies with guidelines and practices had lower compliance. Storr et al. stated that the education and training program needs to be undertaken to achieve successful implementation of the guidelines with HWCs [25]. Almost all of the study in this systematical review was conducted in critical care, such as ICU, Neonatal ICUs, emergency, surgery and pediatric wards. According to the study, lack of knowledge and low level of practice compliance were the causes of poor infection prevention, particularly in intensive/critical units. The research indicates that nurses lacked awareness and this means that they have problems with personal value, (attitude, behavior), learning style (process information), and orientation toward change (environment, locus of control). This led to the provision of guidelines, which was ignored by almost all nurses. Therefore, supervision or direct observations need to be conducted by managers to increase awareness.

Conclusion

Nurses had low levels of knowledge with higher positive attitudes and low level of practice compliance. Knowledge, attitude, and practice compliance to guidelines on the prevention of HAIs are an indication of nurses’ awareness in hospitals. Therefore, a SP that is important to patient safety management was given a high priority. Nurses’ training education program to prevent HAIs such as hand hygiene, wearing personal protective equipment, direct observation and for which targeted activities are needed and support nurse managers or supervisor to implement on prevention HAIs focused at enabling to increase awareness.

Acknowledgments

The authors are grateful to the University of Indonesia Rector and Dean of nursing faculty.

References


PMid:32952688


PMid:22245246


PMid:28244579


PMid:23806701


PMid:25821578


PMid:21576991


PMid:31783559


PMid:28989525


PMid:28989394


PMid:29977260


PMid:28191020


PMid:29972291


PMid:28078082

