

Assessment of Healthcare Workers Knowledge Regarding Infection Control Practices in Operating Rooms

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Abstract

Background and Objective: The term “infection control” describes the methodical use of techniques, protocols, and guidelines intended to stop, lessen, and control the transmission of illnesses. It includes determining the risks of infection, putting standard and transmission-based measures, making sure that correct cleanliness is maintained, and encouraging patient and healthcare worker safety. This study aimed to assess the knowledge of healthcare workers towards infection control practices at Ranya Teaching Hospital and Maternal and Pediatric Teaching Hospital within at Raparin Administration, Kurdistan Region, Iraq.

Methods: This study employed a descriptive, cross-sectional design to assess the knowledge of healthcare workers towards the infection control process at Ranya Teaching Hospital and Maternal and Pediatric Teaching Hospital at Raparin Administration, Kurdistan Region, Iraq. The study population includes all healthcare workers working in the theatre room, a total 50 healthcare workers participated in the study. Data were collected during a three-months period, from December 5th , 2024, to March 5th , 2025.

Results: 50 healthcare workers, equally divided between male and female, participated in the study. The findings showed varying levels of awareness regarding infection control knowledge. 100% of respondents acknowledged the significance of hand hygiene and glove changing, demonstrating a high level of understanding of basic hygiene procedures. And critical knowledge gaps were identified, as 70% misunderstood the purpose of antiseptics, 88% incorrectly thought that needles should be recapped, and only 6% were aware of the “five moments “ of hand hygiene. There were no statistically significant correlations between knowledge level and demographic characteristics, according to chi-square analysis.

Conclusion: The findings indicate that although operation room staff members exhibit high levels of performance adherence to important infection control processes (such as hand hygiene, personal protective equipment (PPE), and sterilization protocols), there are notable some knowledge gaps, particularly with regard to fundamental infection control concepts like the "5 Moments of Hand Hygiene", the distinction between sterilization and disinfection, and safe sharps handling.

Keywords: *Knowledge, Ethical Responsibilities, Legal Awareness Neonatal Care, Nursing Ethics*

Introduction

Disease is caused by infection, which is the invasion of a vulnerable host by potentially harmful organisms (pathogens). The operating room or suite will be used for the procedure. No aspect of a nurse's job is more important than infection control, especially in the preoperative setting, especially the operating room. Due to the fact that wound infections remain a significant cause of costs, morbidity, and even death (Abou Elazayem Bayumi *et al.*, 2022). Healthcare-associated infections, sometimes referred to as hospital-acquired infections (HAIs), are illnesses that patients contract while they are receiving treatment in a medical facility, such as a hospital or clinic. These infections, which can impact different bodily parts, can be brought on by bacteria, viruses, fungi, or other pathogens. Because they can result in a variety of negative consequences, HAIs are a major concern in the healthcare industry. The rise in patient morbidity and death is one of the main effects of HAIs (Garboui, Mohammed and Elfaitouri, 2024), (Althiyabi *et al.*, 2024). According to conventional wisdom, the operating room (OR) is a complex setting with a significant risk of infection. Infection control is greatly aided by the location, equipment, and staff conduct with regard to access to the operating room, as well as by their clothing, the surgical team's readiness, and the use of antibiotics. Another factor to take into account is that the majority of airborne bacteria that could enter the surgical setting originate from the oral cavities or cutaneous flora of operation staff, and the quantity will vary depending on the number of staff members and the tasks they perform. Therefore, an effective ventilation system is essential to guarantee low levels of bacterial contamination by minimizing particle dispersion, as are appropriate surgical clothing use and material quality, proper patient preparation prior to surgery, and staff with the necessary training (Lo Giudice *et al.*, 2019). In order to avoid HCAI, infection control professionals (ICPs) are essential. By acting quickly, training and increasing healthcare workers' knowledge, creating and advocating policies and procedures, and maintaining important data and information, they can avoid infections. The implementation of infection prevention and control programs in low-resource settings is influenced by a number of factors, including personnel training deficiencies, sterilization techniques, and financial constraints (Calò *et al.*, 2023). Hand hygiene, personal protection equipment (PPE), cough etiquette or respiratory hygiene, sharps safety, safe injection practice, sterile instruments and devices, and clean and disinfected environmental surfaces are among the Standard Precaution aspects that the CDC documented. PPE is the term for the gear that nurses wear, such as face masks, gloves, jackets, and gowns, to shield oneself from infectious microorganisms. By protecting the skin and clothing that

may come into touch with blood, saliva, and infectious materials, it shields nurses from repeated patient contacts. Policies for the prevention and control of environmental infections are another component of SPs, suggesting that ecological surfaces are also included in the plan. Important bacteria are removed from environmental surfaces by cleaning, and pathogens must be destroyed by disinfection (Ghabayen *et al.*, 2023). There are two types of infection control measures: Regular safety measures as well as extra (transmission-based) safety precautions (Calò *et al.*, 2023). Adequate knowledge and adherence to standard infection control play a crucial role in reducing HAIs (Garboui, Mohammed and Elfaitouri, 2024), (Althiyabi *et al.*, 2024). According to the Centres for Disease Control and Prevention, approximately 1.7 million healthcare-associated infections—caused by bacteria, fungi, and other microorganisms—cause or contribute to 99,000 fatalities annually in the United States. Gram-negative infections are thought to be the cause of two-thirds of the 25,000 annual deaths in Europe, where hospital surveys have been carried out (CDC, 2020).

METHOD

Study Design

This study employed a descriptive, cross-sectional design to assess the knowledge of healthcare workers towards infection control practices at Ranya Teaching hospital and Maternal and Pediatric Teaching Hospital of the Raparin Administration, Kurdistan Region, Iraq.

The design was chosen to provide a snapshot of the current knowledge of healthcare workers during the specified timeframe.

Study Setting

The study was conducted at two hospitals Ranya Teaching Hospital and Maternal and Pediatric Teaching Hospital, both situated within the Raparin Administrative of the Kurdistan Region.

Study Population

The study population includes all healthcare workers (professional nurses, academic nurses, and also medical assistants) working in the theatre room a total 50 healthcare workers participated in the study.

Data Collection Period

Data were collected during three-months period, on December,5th 2024 to March,5th 2025.

Sampling Technique

A census sampling technique was used, meaning all 50 healthcare workers working in the theatre room at the time of the study were included. This approach ensured that the entire population of interest was represented in the study.

Study Tool

Based on extensive review of studies and literature related to the study topic, the questionnaire was constructed for the purpose of the study, which was consist of two parts.

Part 1: Socio-demographic characteristics of the study sample: This section included 11 items related to the healthcare workers age, gender, educational level, marital status, years of experience, years of employment, and participation in relevant training programs.

Part II:

This part of the questionnaire form consists of 31 items concerning healthcare workers knowledge towards infection control process at the theatre room.

Data Collection Procedure

The data were collected through the utilization of the constructed tool, by the Self-Administrative technique. The data collection process was performed from the periods on December 5th , 2024

to March,5th 2025. The healthcare workers by using the questionnaire were taken about 30 minutes for answers the questionnaire, after obtaining oral informed consent, it is worth mentioning. Prior permission is obtained from the respective hospital authorities. The purpose of the study, method of data collection and time duration were explained to the participants for getting free true responses. They were also given assurance regarding the confidentiality of the information. A verbal agreement was obtained from the respondents indicating their willingness to participate in the study.

Pilot study

A pilot study has been conducted at Ranya teaching hospital and Maternal and pediatric teaching hospital. It was carried out between the periods on November 24, 2024 to December 4, 2024. 10 healthcare workers involved in pilot study. The purpose of the pilot was to assess the reliability of the data collection tools and ensure their appropriateness for the study. And to confirm clarity and modify as necessary, and also to determine preliminary time requirements.

Data Analysis

The collected data were entered into the Statistical Package for Social Sciences (SPSS), version Descriptive 25, statistics, for analysis. including frequencies, percentages, and correlation coefficients, were used to summarize the data. Chi-square tests were employed to examine relationships between the healthcare workers' socio-demographic characteristics and their knowledge of healthcare workers..

Ethical Considerations

Ethical approval for the study was obtained from the Scientific Committee and Ethical Committee of the College of Nursing at Raparin University. All participants were informed of the study's purpose,

and their participation was voluntary. Confidentiality of the collected data was maintained, and no identifying information was disclosed.

RESULTS

The sample consists of an equal number of males and females, each making up 50.0% (n=25) of the total. The majority of participants are married (94.0%, n=47), while a small proportion are single (6.0%, n=3). The most common educational qualification is graduation from an Institute of Medical Studies (78.0%, n=39), followed by Nursing Secondary School graduates (14.0%, n=7), and a smaller percentage have completed college education (8.0%, n=4). More than half of the participants work as Surgical Assistants (54.0%, n=27), while the rest are Anesthesia Assistants (46.0%, n=23). And also a majority of participants are employed at Ranya Teaching Hospital (58.0%, n=29), with the remaining working at Maternity and Pediatric Teaching Hospital (42.0%, n=21).

The table presents the distribution of 50 respondents based on their residential area and whether they have received training in infection control. The majority of respondents (68%) reside in urban areas, while 30% live in suburban areas, and only 2% come from rural regions.

Regarding infection control training, 60% of the respondents reported not having any training, whereas 40% stated that they had received training. This information could help in targeting future training initiatives more effectively, especially in urban settings where most respondents are concentrated (Table 1).

The majority of participants have 11-15 years of experience (48.0%, n=24). A significant portion has 16-20 years (16.0%, n=8) and 21-25 years (16.0%, n=8) and of experience. A smaller group has 26 or more years (10.0%, n=5), while only 6.0% (n=3) have less than five years of experience. Most

participants fall in the 39-49 age group (46.0%, n=23). The 28-38 age group comprises 28.0% (n=14) of the sample. And 26.0% (n=13) of participants are 50 years or older. The largest portion of participants has been employed for 11-15 years (34.0%, n=17). 20.0% (n=10) have 16-20 years and another 20.0% (n=10) have 21-25 years of employment. 22.0% (n=11) have been employed for 26 years or more showing a significant portion with long term commitment. And also a very small number have been employed for less than 5 years (2.0%,n=1) or 6-10 years (2.0%, n=1) (Table 2).

The mean age of participants is 43.40 years, with a range from 28 to 56 years. Participants have an average of 16.38 years of experience, ranging from 1 to 32 years. The mean duration of employment is 19.54 years, with values ranging from 1 to 34 years (Table 3).

Most questions (around 75%) fall under the “Good” category, indicating high knowledge among participants towards infection control procedures. A smaller subset of questions was categorized as “Fair”, where knowledge could be improved. A few critical questions were classified as “Poor”, indicating significant gaps (Table 4).

Relationship Between Sociodemographic Characteristics and Knowledge of healthcare workers Chi-square tests revealed no statistically significant relationships between the healthcare worker’s sociodemographic characteristics (such as age, gender, marital status, and others) this suggests that inadequate care was prevalent across all demographic groups in the study (Table 5).

Table 1

Distribution of the Sociodemographic Characteristics of the Study Sample (N = 50)

Variable	Category	Frequency (n)	Percentage (%)
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Gender	Male	25	50.0
	Female	25	50.0
Marital Status	Single	3	6.0
	Married	47	94.0
Level of Education	Nursing Secondary School Graduate	7	14.0
	Institute Medical Graduate	39	78.0
	College Graduate	4	8.0
Current Position	Surgical Assistant	27	54.0
	Anesthesia Assistant	23	46.0
Hospital Name	Ranya Teaching Hospital	29	58.0
	Maternity and Pediatric Teaching Hospital	21	42.0
Residential Area	Suburban	15	30.0
	Urban	34	68.0
	Rural	1	2.0
Training in Infection Control	Yes	20	40.0
	No	30	60.0

Table 2

Distribution of Sample According to Clinical Experience (N = 50)

Variable	Category	Frequency (n)	Percentage (%)
Years of Experience	≤ 5 years	3	6.0
	6–10 years	2	4.0
	11–15 years	24	48.0
	16–20 years	8	16.0
	21–25 years	8	16.0
	≥ 26 years	5	10.0
Age Group (years)	28–38	14	28.0
	39–49	23	46.0
	≥ 50	13	26.0

Years of Employment			
	≤ 5 years	1	2.0
	6–10 years	1	2.0
	11–15 years	17	34.0
	16–20 years	10	20.0
	21–25 years	10	20.0
	≥ 26 years	11	22.0

Table 3

Analysis of Mean, Minimum, and Maximum Values (N = 50)

Statistic	Age (years)	Years of Experience	Years of Employment
Mean	43.40	16.38	19.54
Minimum	28	1	1
Maximum	56	32	34

Table 4

Distribution of the Study Sample's Knowledge Toward Infection Control (N = 50)

No.	Question	No (0) n (%)	Yes (1) n (%)	Mean Score	Category
1	Hand hygiene before and after patient contact	0 (0.0)	50 (100.0)	1.00	Good

2	Knowledge of hand hygiene moments	47 (94.0)	3 (6.0)	0.06	Poor
3	Clean high-touch surfaces after every surgery	5 (10.0)	45 (90.0)	0.90	Good
4	Cleanliness is the shared responsibility of all staff	1 (2.0)	49 (98.0)	0.98	Good
5	Difference between sterilization and disinfection	33 (66.0)	17 (34.0)	0.34	Poor
6	Sterilize surgical instruments after each use	1 (2.0)	49 (98.0)	0.98	Good
7	Knowledge of instruments suitable for autoclaving	26 (52.0)	24 (48.0)	0.48	Fair
8	Scrub for at least 2–5 minutes before each surgery	3 (6.0)	47 (94.0)	0.94	Good
9	Dry hands and arms after surgical handwashing	1 (2.0)	49 (98.0)	0.98	Good
10	Surgical masks required for all staff during surgery	1 (2.0)	49 (98.0)	0.98	Good
11	Change gloves between patients or if compromised	0 (0.0)	50 (100.0)	1.00	Good
12	Discard suspected contaminated sterile items	2 (4.0)	48 (96.0)	0.96	Good
13	Antiseptic must dry before draping	14 (28.0)	36 (72.0)	0.72	Good
14	Safety box used for disposing needles and sharps	0 (0.0)	50 (100.0)	1.00	Good
15	Antiseptics used for complete cleaning	35 (70.0)	15 (30.0)	0.30	Poor
16	Black waste bin used for normal waste	14 (28.0)	36 (72.0)	0.72	Good
17	Cuts may cause infection during work	0 (0.0)	50 (100.0)	1.00	Good
18	All body fluids can transmit diseases	1 (2.0)	49 (98.0)	0.98	Good
19	Nosocomial infections caused only by patients	11 (22.0)	39 (78.0)	0.78	Good
20	Needle syringes must be recapped	44 (88.0)	6 (12.0)	0.12	Poor
21	Removing bacteria is sterilization	39 (78.0)	11 (22.0)	0.22	Poor
22	Infection control method reduces cross-contamination	4 (8.0)	46 (92.0)	0.92	Good
23	Primary reason for using PPE	28 (56.0)	22 (44.0)	0.44	Fair
24	Technique to prevent infection during surgery	33 (66.0)	17 (34.0)	0.34	Poor
25	Correct way to open a sterile package	14 (28.0)	36 (72.0)	0.72	Good
26	Safety boxes are for sharps disposal	13 (26.0)	37 (74.0)	0.74	Good
27	Metal tools sterilized by heat	5 (10.0)	45 (90.0)	0.90	Good
28	Sterile gloves are used for invasive procedures	11 (22.0)	39 (78.0)	0.78	Good
29	Common microorganisms in nosocomial infection	17 (34.0)	33 (66.0)	0.66	Fair
30	Handwashing method while on duty	25 (50.0)	25 (50.0)	0.50	Fair
31	Most common risk factor for nosocomial infection	34 (68.0)	16 (32.0)	0.32	Poor

Table 5

Association Between Level of Knowledge and Sociodemographic Characteristics of Healthcare Workers (N = 50)

Variable	Category	Low n (%)	Medium n (%)	High n (%)	Total n (%)	χ^2	p-value
Gender	Male	3 (12.0)	17 (68.0)	5 (20.0)	25 (100.0)	1.530	0.465
	Female	6 (24.0)	16 (64.0)	3 (12.0)	25 (100.0)		
Marital Status	Single	1 (33.3)	2 (66.7)	0 (0.0)	3 (100.0)	0.928	0.629
	Married	8 (17.0)	31 (66.0)	8 (17.0)	47 (100.0)		
Level of Education	Secondary School	1 (14.3)	5 (71.4)	1 (14.3)	7 (100.0)	0.576	0.966
	Institute Graduate	7 (17.9)	26 (66.7)	6 (15.4)	39 (100.0)		
	College Graduate	1 (25.0)	2 (50.0)	1 (25.0)	4 (100.0)		
Current Position	Surgical Assistant	5 (18.5)	15 (55.6)	7 (25.9)	27 (100.0)	4.593	0.101
	Anesthesia Assistant	4 (17.4)	18 (78.3)	1 (4.3)	23 (100.0)		
Residential Area	Urban	8 (23.5)	22 (64.7)	4 (11.8)	34 (100.0)	7.560	0.109
	Suburban	1 (6.7)	11 (73.3)	3 (20.0)	15 (100.0)		
	Rural	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)		
Hospital Name	Ranya Teaching Hospital	4 (13.8)	20 (69.0)	5 (17.2)	29 (100.0)	0.837	0.658
	Maternity & Pediatric Teaching Hospital	5 (23.8)	13 (61.9)	3 (14.3)	21 (100.0)		

DISCUSSION

The study's participants' demographic and professional traits represent a broad and reasonably balanced sample of surgical and anesthesia assistants working in the chosen healthcare institutions. There was gender parity in these clinical roles, as evidenced by the equal gender distribution of male and female, this balance has remained steady, likely due to the higher number of female employed at the Maternal and Pediatric Teaching Hospital compared to the Ranya Teaching Hospital according to the culture issues. Married people made up the bulk of responders, indicating a possibly stable social background that could affect resilience and professional involvement. This result supported in this study (A.B.M. Alauddin, Chowdhury, Faisal, 2018).

Most participants in a study had a college degree, with a majority graduating from medical institutes and a smaller group completing secondary nursing schools, suggesting mid-level professional education is the most common path.

Surgical and anesthesia assistants were well represented in a study, with a little half from Maternal and Pediatric Teaching Hospital and over half from Ranya Teaching Hospital, providing insight into institutional settings.

In terms of home location, the majority of participants were urban, and a small percentage came from rural areas. This distribution may draw attention to differences in availability to medical professionals in remote areas and reflects staffing trends that are centered on cities.

The majority of participants, primarily aged 39-49, are middle-aged, indicating a more experienced and self-assured staff, possibly indicating maturity.

The study found that nurses with more experience had better knowledge and practices regarding infection control, with nearly half having 11-15 years of experience and a smaller proportion having 16-20 years (Desta *et al.*, 2018).

All participants reported correct glove-changing procedures between patients or when gloves are compromised, as well as consistent hand hygiene before and after patient contact. These findings show a high level of compliance with personal protective behaviors and basic hand hygiene, both of which are essential for avoiding healthcare-associated infections (HAIs). Similarly, a high culture of safety in waste handling and sharps management is reflected in the overwhelming majority, nearly all being aware of the need to discard contaminated sterile products and every participant acknowledging the requirement to dispose of needles in safety boxes.

The study found significant knowledge gaps among participants, with only one-third understanding antiseptic use in cleaning, and a small fraction correctly identifying hand hygiene concepts, and a lack of understanding about sterilization.

The study found significant differences in knowledge of aseptic procedures and personal protective equipment (PPE). Only one-third of respondents understood infection prevention during surgery and PPE use. Most participants recognized the need for sterilizing equipment after use and identified autoclaving as an appropriate method.

It's interesting to note that a sizable portion of respondents held the false belief that needle syringes ought to be capped after use, a practice that raises the possibility of needlestick injuries and the bloodborne diseases that follow. This highlights the urgent need to strengthen safe infection control procedures. A study in Pakistan found that over four-fifths of healthcare workers engaged in needle

recapping, with nearly one-third experiencing needlestick injuries, highlighting the serious risks involved (Qazi *et al.*, 2016). A Pakistani study revealed that over half of healthcare professionals were involved in needle recapping, with nearly a third sustaining needlestick injuries as a result (Al Qadire *et al.*, 2021). The study in Al-Madinah found that half of clinical laboratory workers recapping needles after use, a practice linked to lack of biosafety training and increased occupational infections and needlestick injuries (Khabour, Ali and Mahallawi, 2018).

A majority of respondents understand waste segregation, but only a small percentage can accurately describe the function of safety boxes, indicating partial comprehension of disposal procedures.

Most participants correctly identified common risk factors and microorganisms for nosocomial infections, but over one in five misunderstood transmission routes, including patients, environmental, and healthcare worker-associated sources.

The study found no significant correlation between infection control performance and professional and demographic characteristics, but job function and experience may impact knowledge more than demographics or formal education. Future studies should use larger sample sizes and more comprehensive evaluation instruments. This study found no significant association between the level of education and knowledge of infection control among ICU head nurses. However, work experience, particularly in specialized units, was linked to better knowledge (Karimian *et al.*, 2025). A study found that healthcare workers with over ten years of experience are more likely to perform proper infection control measures, with age and experience being more predictive than formal education (Desta *et al.*, 2018).

CONCLUSIONS

The study found that healthcare professionals' knowledge of infection control procedures in the operating room varies. In crucial areas including hand hygiene before and after patient contact, using safety boxes, donning surgical masks, and sterilising equipment after each use, a sizable majority showed high awareness and compliance. These show a high level of commitment to fundamental infection control procedures.

However, there are significant gaps in fundamental understanding. Many respondents were unaware of the "Five Moments for Hand Hygiene," the distinction between disinfection and sterilisation, the correct use of antiseptics, and the misconception that sterilisation is the same as eliminating bacteria, additionally, there was poor understanding regarding the correct handling of needles, such as not recapping them.

RECOMMENDATIONS:

The results show that more training is needed, in "Poor" and "Fair" locations, with a focus on the following topics: The Five Moments of Hand Hygiene, Distinguishing between disinfection and sterilisation The significance of avoiding recapping needles proper application of antiseptics and PPE.

To help people remember better, the training should use fun and active methods like role-plays, short tests, and pictures or videos.

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Conflicts of Interest

The authors declare that there are no conflicts of interest related to this work.

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