ORIGINAL ARTICLE

Practices and adherence of nurses with standard precautions of infection control in intensive care units of public sector hospitals in Lahore

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ABSTRACT

Background and objective: Severely ill patients are at a higher risk of carrying nosocomial infections especially when admitted to the intensive care units (ICUs). Therefore, it is the professional obligation of all health workers to adhere to the scientifically accepted criteria for infection control in clinical settings. This study was conducted to assess intensive care nurses' adherence to standard precautions (SPs) and to assess the practices of SPs in intensive care.

Methods: This cross-sectional study was carried out at ICUs of two public sector hospitals in Lahore, Pakistan, from March to September, 2022. A total of 150 nurses were selected for the study who worked in the medical-surgical, general, and specialized ICUs. The extent to which the behavior of a worker coincides with the prescribed standard (Adherence) and performing work repeatedly till it becomes a routine competency (Practice) was assessed using a structured questionnaire. The chi-square test was used to determine the link between adherence to SPs and the practice carried out by nurses. Data were analyzed and a *p*-value ≤ 0.05 was taken as significant.

Results: A total of 84.7% of nurses showed adherence while practice was demonstrated by 52.7% of nurses. No significant correlation (*p*-value:0.95) was however found between the practice and adherence to the SPs, despite the fact that a notable gap was observed between the practice and adherence to SPs among ICU nurses.

Conclusion: It is concluded that a compromised adherence to SPs of infection control in ICUs of public sector hospitals in Lahore is exhibited by the nurses.

Keywords: Precautions, adherence, practice, critical care nurses, hospital acquired infections, nosocomial infections.

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Introduction

Standard precautions (SPs) are a collection of guidelines intended to limit the threat of obtaining hospital-acquired contamination from both identified and unknown causes within healthcare settings and its goal is to safeguard healthcare personnel from percutaneous wounds and avoid the spread of nosocomial infections. It must be applied to all patients being treated in all hospitals, irrespective of whether an infectious agent is suspected or confirmed [1].

In hospitals around the globe, healthcare-related infections have become a problem nowadays. Acquisition of infections in hospitals affects an estimated 1.4 million individuals worldwide [2]. In comparison to industrialized countries, the risk of hospital-acquired illness has increased significantly in developing countries [3]. According to a recent study, hospital-acquired illness is 5 times more common in developing countries. In underdeveloped nations, the rate of device-associated infection ranges from 8.2 to 16.1 per 1,000 device-exposed days [2].

The Center for Disease Control established universal precautions as a new prevention approach called "standard precaution" in 1996. The two goals of SPs are to safeguard healthcare personnel from the occurrence of percutaneous wounds and to avoid nosocomial infection spread. Hand hygiene, routine working habits, and the use of individual protective equipment (using rubber gloves, gown, mask, face

shield, or eye protection as per the anticipated exposure) are all examples of SPs [4].

In healthcare environments, health personnel are open to a range of occupational dangers, such as biological, chemical, ergonomic, physical, and stress/violence. Blood-borne infections including hepatitis B and C virus, and the human immunodeficiency virus pose the greatest risk to healthcare workforces, predominantly those who are dealing with blood and body fluids or come across sharps or needle stick injuries while caring for patients [5].

Hence, this study aims to assess practice and adherence to standard precautionary measures of infection control among nurses working in intensive care units. It has the potential to yield data that will promote the understanding and importance of SPs with a strong positive attitude, which will prevent nurses, patients, and all medical staff from getting infected and will decrease healthcare costs by enhancing the standard of nursing practice regarding hospital infection control.

Methods

This cross-sectional study was conducted at the University of Health Sciences (UHS) Lahore, Pakistan, with the collaboration of ICUs of Jinnah Hospital and Sheikh Zaid Hospital, Lahore, from March to September, 2022. Data were collected from 150 ICU nurses selected by simple random sampling technique according to the inclusion criteria, i.e., nurses involved in direct patient care working in tertiary care hospital medical-surgical, general, and specialized ICUs. Nurses having a minimum of 1 year or above working experience in the ICUs of local or foreign hospitals were included. Head nurses or nurse managers or those nurses who were not involved in direct patient care at the ICUs were excluded.

A structured questionnaire [6] was used to collect data for adherence, i.e., the extent to which the behaviors of a worker coincide with the prescribed standards [7] and practice, i.e., to perform work repeatedly so as it becomes a routine competency [8] of ICU nurses to standardized precautions of infection control, i.e., a set of practices carried out while dealing with all patients irrespective of infection status to prevent infections, which is centered on the belief that every blood, body fluids, secretions, excretions except sweat, nonintact skin, and mucous membranes can potentially transmit contagious agents [9]. The subjects were guided for proper understanding and response to the questionnaire according to their own experience and knowledge. The confidentiality and anonymity of the respondents were maintained according to the declaration of Helsinki. The study was approved by the Ethical Review Committee of the UHS, Lahore, and written permission from the Medical Superintendent of both hospitals was taken before conducting the study.

Statistical Analysis: The data were analyzed using Statistical Package for the Social Sciences (SPSS) 23.0. Mean and standard deviation were calculated for the age and frequency and percentage was given for the gender, qualification, experience, adherence, and practice status. The chi-square test was used to determine the association between adherence to SPs and the practice of SPs among nurses. A p-value ≤ 0.05 was taken as significant.

Results

The demographic profile of the participant nurses is given in Table 1 which shows that the majority (94.7%) of nurses were females with a comparable number of nurses with Diplomas and Bachelors of Science in Nursing (BSN) Generic or Registered nurses (Post RN BSN).

Descriptive statistics related to the questionnaire for "Adherence" to the standard precautions' are shown in Table 2 which depicts that most of the nurses (76%) practice hand washing immediately after contact with potentially contaminated biological materials while 61.4% perform hand hygiene after removing the gloves.

The lowest value (33.3%) was observed for the knowledge regarding putting on the gloves while changing dressing.

Descriptive statistics related to the practice of SPs according to the validated checklist are shown in Table 3

Table 3 revealed that most of the nurses (95.3%) were washing hands before and after contacting the impaired skin of patients followed by 94.7% of nurses practicing hand washing or disinfecting techniques immediately after contacting blood, any other body fluid, secretion, or excreta. Only 50.0% of

Table 1. *Socio-demographic characteristics of the nurses (n = 150).*

Demographic variables	Category	Frequency	Percentage
Age	21-30 years	88	58.7
	31-40 years	54	36.0
	More than 40 years	8	5.3
Gender	Male	8	5.3
	Female	142	94.7
Hospital	Jinnah hospital Lahore	75	50
	Sheikh Zaid hospital Lahore	75	50
Qualification	Diploma in nursing	73	48.7
	Generic BSN	40	26.7
	Post RN BSN	37	24.7
Experience in ICU	1-5 years 5-10 years More than 10 years	64 54 32	42.7 36.0 21.3

Table 2. *Descriptive statistics of the questionnaire for adherence to SPs [6].*

S. No.	Question	Never	Rarely	Sometimes	Often	Always
1.	I perform hand hygiene in the interval between providing care to different patient	3	1	10	40	96
		2.0%	7%	6.7%	26.7%	64.0%
2.	I perform hand hygiene after removing the gloves	4	4	11	39	92
		2.7%	2.7%	7.3%	26.0%	61.3%
3.	I wash my hands immediately after contact with potentially contaminated biological materials	0	0	12	24	114
		0.0%	0.0%	8.0%	16.0%	76.0%
Frequency of glove use in procedures where there is a possibility of contact with potentially contaminated biological materials:						
4.	Blood collection	1	2	14	39	94
		7%	1.3%	9.3%	26.0%	62.7%
5.	Procedures involving the possibility of contact with urine or feces	1	2	21	32	94
		7%	1.3%	14.0%	21.3%	62.7%
6.	Procedures involving the possibility of contact with the patient's nonintegral skin	2	9	11	14	114
		1.3%	6.0%	7.3%	9.3%	76.0%
7.	Procedures involving the possibility of contact with the patient's mucosa	3	5	18	37	87
		2.0%	3.3%	12.0%	24.7%	58.0%
8.	Procedures involving the possibility of contact with secretions of the airway of patient	2	3	21	23	101
		1.3%	2.0%	14.0%	15.3%	67.3%
9.	Intramuscular or subcutaneous injection	0	4	15	25	106
		0.0%	2.7%	10.0%	16.7%	70.7%
10.	Dressing change	0	12	32	56	50
		0.0%	8.0%	21.3%	37.3%	33.3%
11.	Cleaning for blood and body fluid when there is possibility of contact with blood splash, body fluid, secretion, or excretion	2	5	15	17	111
		1.3%	3.3%	10.0%	11.3%	74.0%
12.	Venous puncture	0	1	11	25	113
		0.0%	.7%	7.3%	16.7%	75.3%
13.	Contact with blood samples	2	4	25	47	72
		1.3%	2.7%	16.7%	31.3%	48.0%
14.	I use protective mask when there is possibility of contact with blood splash, body fluid, secretion, or excretion	1	2	24	31	92
		0.7%	1.3%	16.0%	20.7%	61.3%
15.	I wear protective glasses when there is a possibility of contact with blood splash, body fluid, secretion, or excretion.	1	0	13	23	113
		0.7%	0.0%	8.7%	15.3%	75.3%
16.	I use protective apron when there is possibility of contact with blood splash, body fluid, secretion, or excretion	19	15	17	35	64
		12.7%	10.0%	11.3%	23.3%	42.7%
17.	I use disposable hats and surgical shoe when there is the possibility of contact with blood splash, body fluid, secretion, or excretion	8	12	17	34	79
		5.3%	8.0%	11.3%	22.7%	52.7%
18.	I do not perform active encapsulation of used needles or perform passive encapsulation of needles with only one hand.	13	9	23	37	68
		8.7%	6.0%	15.3%	24.7%	45.3%
19.	Discard needles, blades, and other sharps materials in specific waste containers	17	15	26	24	68
		11.3%	10.0%	17.3%	16.0%	45.3%
20.	After work accidents with potentially contaminated sharping materials, immediately squeeze the site, then perform the antisepsis and put on a dressing	0	4	8	24	114
		0.0%	2.7%	5.3%	16.0%	76.0%

Table 3. *Descriptive statistics of checklist for practice of SPs (6,10).*

S. No.	Question	Yes	No
1.	Washing hands/disinfecting hands if contacting with different patients	140	10
		93.3%	6.7%
2.	Washing hands/ disinfecting hands if taking off the gloves	131	19
		87.3%	12.7%
3.	Washing or disinfecting hands immediately if contacting any blood, body fluid, secretion, excretion, or dirty substances	142	8
		94.7%	5.3%
		92.0%	8.0%
4.	Wearing gloves during blood collection	138	12
		92.0%	8.0%
5.	Wearing gloves during disposal of urine and stool	138	12
		92.0%	8.0%
6.	Wearing gloves while contacting the impaired skin of patients.	143	7
		95.3%	4.7%
7.	Wearing gloves during contact with the mucosa of patients	140	10
		93.3%	6.7%
8.	Wearing gloves when even not dealing with the patients.	85	65
		56.7%	43.3%
9.	Wearing gloves while giving intramuscular or subcutaneous injection	89	61
		59.3%	40.7%
10.	Wearing gloves during dressing change	134	16
		89.3%	10.7%
11.	Wearing gloves and apron during cleaning blood trace	133	17
		88.7%	11.3%
12.	Wearing gloves and apron during venous puncture	99	51
		66.0%	34.0%
13.	Wearing apron and gloves during contact with blood samples	119	31
		79.3%	20.7%
14.	Wearing gloves during recapping and reusing of syringes	84	66
		56.0%	44.0%
15.	Wearing protective gown in the procedures that might induce the spraying of blood, body fluid, secretion, or excretions.	112	38
		74.7%	25.3%
16.	Wearing protective cap or shoes to protect hair or shoes where necessary	119	31
		79.3%	20.7%
17.	Wearing face mask in the procedures as it might induce the spraying of blood, body fluid, and secretion	121	29
		80.7%	19.3%
18.	Wearing gloves and apron using second-hand sharps such as needles and blades	75	75
		50.0%	50.0%
19.	If the skin is injured by contaminated sharps, it is going to be thoroughly cleaned and taped up by nurse.	141	9
		94.0%	6.0%
20.	Wearing gloves while performing active encapsulation of used needles or passive encapsulation of needles with only one hand.	128	22
		85.4%	14.6%

the respondents had a practice of hand washing after using second-hand sharps such as needles and blades.

Applying the chi-square test, a comparison of adherence and practice of SPs among nurses was calculated (Table 4).

Table 4 depicts that there is no significant difference in the practice of SPs between the nurses with or without adequate adherence patterns. A total of 52.8% of nurses with adequate adherence to SPs had adequate practices while quite a similar

Table 4. *Comparison of "Adherence" and "Practice" of SPs among nurses.*

Adherence	Practice		*p*-value
	Adequate	Inadequate	
Adequate	67	60	0.959
	52.8%	47.2%	

number (52.2%) of nurses with adequate adherence to SPs had inadequate practices.

Discussion

Adherence is the extent to which someone follows an approved set of actions in accordance with a specified standard. In our study, the results regarding the level of adherence with the SPs show that 127 (84.7%) nurses have adequate adherence while only 23 (15.3%) nurses have inadequate adherence (Table 4). These results are parallel with the research conducted by Hessels and colleagues [11] where most of the nurses (94%) reported. On the other hand, our results are dissimilar from the outcomes of research carried out in Italy [12] which reported a lower level (15.3%) of adherence to SPs of nurses and documented a gap among health care providers regarding adherence with standard precautions. Frequent ongoing infection control training sessions on standard precautions and proper equipment availability within the hospital are the potential factors behind the higher percentage of nurses having adequate adherence [13].

Adherence to hand hygiene, in case of more likelihood of interaction with possibly contaminated biological materials, is a key precaution to prevent the spread of infection. The findings of this study reflect that 96% of nurses have adherence to standard precautions regarding hand hygiene, 92% and 76%, respectively, by removing gloves and after contact with biologically contaminated material (Table 3). The results of this study are congruent with that of research conducted for the assessment of knowledge and practice of medical students trained in the ICU at a Singapore hospital. A total of 66.3% of students demonstrated positive scores regarding practice and 48.9% had good knowledge about hand hygiene. On the other hand, our study results were different from the results of a Nigerian study [14] where only 45 % of nurses had adequate adherence to standard precautions regarding hand hygiene and used proper protocol in hand washing and putting gloves when handling blood samples, bandages, and venipuncture to control the spread of infection. This nonadherence to proper protocols leads to an increase in nosocomial infection rate. In our study, the results reflect that the nurses of the public sector have frequent training sessions on hand washing and hygiene by the infection control department of the respective hospital.

As per the results of the present study regarding the use of personal protective equipment (PPE), the usage of gloves has the highest percentage among all the nurses studied (ranging from 75% to 80 %), except when using intramuscular and/or subcutaneous injections for which only 70% of the nurses stated that they used the gloves and the lowest has been the usage of apron, which is merely 40%. These results were parallel with one previous study conducted in Misurata Teaching Hospital, Libya [15], where most of the nurses (67.8%) were adherent with the usage of all PPEs (gloves, mask, apron, and so on) to perform different procedures and also changed their gloves from patient to patient to prevent nosocomial infections. Another Nigerian study[16], however, reported contrary findings where the majority of the healthcare workers were not adherent to the usage of PPE and complained of inadequate resources.

A task that is performed repeatedly, becomes a practice in nursing. In our study 79 (52.8%) nurses had adequate practice of standard precautions while 71 (47.2%) had inadequate practice. The practices of standard precautions in most of the developing countries remain either ineffective or nonexistent. Research has proved that the absence of knowledge is the major cause of noncompliance with the standard precautions [17]. The outcomes of the current study were similar to the findings of one earlier study published [14] where 50 % of nurses had good practices regarding the application of protective measures. On the other hand, findings as reported by the investigators at Kyrenia University, Dr. Suat Günsel Hospital, Kyrenia, were not congruent to the present study which revealed the majority of nurses showed poor practices in using protective measures. The dearth of resources has been reported as a major factor for the failure to adhere to or practice in all the above-mentioned studies. Factors that negatively influence the practice of standard precautions are amendable through reinforcement and continuous education of the health care workers. s modification This refinement in standard precautions may subsequently play a pivotal role in the control of nosocomial infections within intensive care units ICUs at public hospitals in Pakistan.

Conclusion

A significant gap exists between the adherence and practice of standard precautions by the nurses working in ICUs at the public sector hospitals of Lahore city. The most influencing factor on adherence and practice of standard precaution was found to be the workload followed by the unavailability of protective devices.

Limitations of the Study

This study has several limitations. First, it was questionnaire-based data which has the potential of respondents' bias. Interviews or in-depth analysis could be more reliable for reporting the findings. Second, a large sample size with the inclusion of more hospitals is needed to validate the findings of this study.

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List of Abbreviations

BSN	Bachelors of Science in Nursing
ICUs	Intensive care units
PPE	Personal protective equipment
SPs	Standard precautions
UHS	University of Health Sciences

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None to disclose.

Conflict of interest

None to declare.

Ethical approval

The study was approved by the Ethical Review Committee of the University of Health Sciences Lahore, Pakistan, vide Letter no. UHS/EAPC-22/ERC/22 dated 10-05-22.

Authors' Detail

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References

1. Ahsan A, Dewi ES, Suharsono T, Setyoadi S, Soplanit VG, Ekowati SI, et al. Knowledge management-based nursing care educational training: a key strategy to improve healthcare associated infection prevention behavior. SAGE Open Nurs. 2021;7:23779608211044601. https://doi.org/10.1177/23779608211044601
2. Ghalb O, Shebl A, Elzeky M. Evaluate nurses knowledge and adherence to infection prevention control measures during caring for Covid19 patients. Mansoura Nurs J. 2023;10(1):421–38. http://surl.li/pqklh
3. Sahiledengle B, Seyoum F, Abebe D, Geleta EN, Negash G, Kalu A, et al. Incidence and risk factors for hospital-acquired infection among paediatric patients in a teaching hospital: a prospective study in southeast Ethiopia. BMJ Open. 2020;10(12):e037997. https://doi.org/10.1136/bmjopen-2020-037997
4. Bouchoucha SL, Kilpatrick M, Lucas JJ, Phillips NM, Hutchinson A. The factors influencing adherence to standard precautions scale–student version (FIASP-SV): a psychometric validation. Infect Dis Health. 2021;26(2):85–94. https://doi.org/10.1016/j.idh.2020.10.001
5. Abuduxike G, Vaizoglu SA, Asut O, Cali S. An assessment of the knowledge, attitude, and practice toward standard precautions among health workers from a hospital in northern cyprus. Saf Health Work. 2021;12(1):66–73. https://doi.org/10.1016/j.shaw.2020.09.003
6. Quan M, Wang X, Wu H, Yuan X, Lei D, Jiang Z, et al. Influencing factors on use of standard precautions against occupational exposures to blood and body fluids among nurses in China. Int J Clin Exp Med. 2015;8(12):22450. http://surl.li/pqkkj
7. Donati D, Biagioli V, Cianfrocca C, De Marinis MG, Tartaglini D. Compliance with standard precautions among clinical nurses: validity and reliability of the Italian version of the Compliance with Standard Precautions Scale (CSPS-It). Int J Environ Res Public Health. 2019;16(1):121. https://doi.org/10.3390/ijerph16010121
8. Faryad S, Inayat M, Afzal M, Hussain M. Knowledge, attitude and practice of standard isolation precautions among registered nurses of allied hospital Faisalabad. Int J Sci Eng Res. 2018;9(5):461–84. http://surl.li/pqkiv
9. National infection prevention and control, National Health Services, England. Guidance on infection control for NHS healthcare staff of all disciplines in all care settings.Document first published:14 April 2022. Page updated:16 February 2024. Available from: https://www.england.nhs.uk/publication/national-infection-prevention-and-control/
10. Faria LBGd, Santos CTBd, Faustino AM, Oliveira LMdAC, Cruz KCTd. Knowledge and adherence of the nurse to standard precautions in critical units. Texto Contexto Enferm. 28(5):1–16. https://doi.org/10.1590/1980-265X-TCE-2018-0144
11. Hessels AJ, Guo J, Johnson CT, Larson E. Impact of patient safety climate on infection prevention practices and healthcare worker and patient outcomes. Am J Infect Control. 2023;51(5):482–9. https://doi.org/10.1016/j.ajic.2023.01.021
12. Alhumaid S, Al Mutair A, Al Alawi Z, Alsuliman M, Ahmed GY, Rabaan AA, et al. Knowledge of infection prevention and control among healthcare workers and factors influencing compliance: a systematic review. Antimicrob Resist Infect

Control. 2021;10(1):1–32. https://doi.org/10.1186/s13756-021-00957-0

13. Mohammedi SB, Landelle C. Review of literature: knowledge and practice of standard precautions by nursing student and teaching techniques used in training. Am J Infect Control. 2023;51(5):574–81. https://doi.org/10.1016/j.ajic.2022.08.032
14. Maitanmi JO, Abdulkareem SO, Maitanmi BT, Ogungbesan JO, Onisile DF. Factors influencing standard precaution practices among nurses in Lagos State University Teaching Hospital, Ikeja, Lagos State, Nigeria. Afr J Health Nurs Midwifery. 2021;4(5):14–25. https://doi.org/10.52589/AJHNM-IX3L8VO0
15. Alfar NM, EL-Sheikh OY, Hassan RE, Selim MAE. The effect of applying nursing care bundle on controlling central venous line infection in neonatal intensive care units. Mansoura Nurs J. 2020;7(1):56–74. https://doi.org/10.21608/mnj.2021.175762
16. Ogunrinde OE, Olukolade FT, Akpor OA, Ojo AA, Ojo IO, Alebiosu IA, et al. Attitude and compliance of nurses to standard precautions to infection control in Ekiti State, Southwest Nigeria. Afr J Reprod Health. 2023;27(6s):60–9. https://doi.org/10.29063/ajrh2023/v27i6s.8
17. Onubogu CU, Ofiaeli OC, Onyeyili AN, Aghanya IN, Ugwu NO, Okechukwu RC, et al. Knowledge and compliance with standard precaution among healthcare workers in A South-East Nigerian Tertiary Hospital. Orient J Med. 2021;33(1–2):22–34. http://surl.li/pqkfm