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EXPLORING THE CLINICAL COMPETENCES REGARDING INFECTION CONTROL MEASURES AMONG NURSING STUDENTS AT PEOPLE'S NURSING SCHOOL JAMSHORO

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ABSTRACT

Background: Infection is one of the most important problems in health care services worldwide; also, it constitutes one of the most important causes of morbidity and mortality associated with clinical, diagnostic and therapeutic procedures. Nursing students are more exposed to infections during their clinical training, so they need to improve their performance related to infection control measures. Standard precautions are set of measures formulated to prevent transmission of blood borne pathogens when providing health care.

Objective: The objective of this study was to assess nursing students' knowledge regarding infection control measures and to identify factors affecting adherence to infection control guidelines.

Methodology: A cross-sectional study was conducted among 60 graduates at People's Nursing School Liaquat University Jamshoro. Data were collected using a structured questionnaire consisting of 18 multiple-choice questions related to Infection and Infection Control measures. Data were analyzed using SPSS version 26. Descriptive statistics, including percentages, were used to summarize the data.

Results: The study results show 60 participants, with the majority being male 56.67% (n=34), were male, aged between 22–27 years and are in 4thYear of BS Nursing Generic. Out of 60 respondents 34 participants (56.7%) fell within the Good category, 15 participants (25.0%) demonstrated a Moderate level of knowledge and 11 participants (18.3%) were classified in the Poor category. However, notable gaps existed in understanding Infection and Infection Control Measure and recognizing unhygienic practices as a key contributing factor.

Conclusion: This study indicates that nursing students generally demonstrate a **Good** level of competency in infection control practices. However, certain knowledge gaps remain, particularly in areas such as the reporting of needlestick injuries and adherence to consistent hand hygiene protocols. These shortcomings suggest a need for further emphasis on both theoretical understanding and practical application of infection control measures. Addressing these issues is essential to ensure that students are not only knowledgeable about infection control guidelines but are also capable of implementing them effectively in clinical settings.

INTRODUCTION

The Centers for Disease Control and Prevention reports approximately 1.7 million hospital associated infections (HAIs) occur annually in U.S. healthcare facilities, resulting in an estimated 99,000 deaths each year [1]. Despite significant advancements in medical care and technology, the incidence of healthcare-associated infections (HAIs) continues to rise globally, presenting ongoing challenges to patient safety and quality improvement [2]. According to the World Health Organization's 2024 Global Report on Infection Prevention and Control, the prevalence of healthcare-associated infections (HAIs) varies globally. [3].In high-income countries, approximately 7 out of every 100 patients in acute-care hospitals acquire at least one healthcare-associated infection (HAI) during their hospital stay [4]. The report also highlights that intensive care units (ICUs) have an overall healthcare-associated infection (HAI) rate of about 30%, which can be 2 to 20 times higher in low- and middle income countries compared to high-income countries [4]. Infection control standard precautions include certain measures such as hand hygiene, sharps safety, staff health, use of personal protective equipment (PPE), equipment safety, waste management and environmental cleaning [5]. Nursing students are also at risk of such infections and injuries due to accidental contamination during their practical occupational exposure [6]. Nosocomial infections occur during the process of care and contribute to patient mortality and morbidity [7]. Exposure to infectious material can be minimized by adherence to standard precautions which are designed to reduce the risk of acquiring occupational infection from both known and unexpected sources in the healthcare setting [8,9]. Standard precautions are set of measures formulated to prevent transmission of any type of pathogens when providing health care. Since identification of patients infected with these pathogens cannot be reliably made by medical history and physical examination, in 1996, the Centers for Disease Control (CDC) included the universal precautions in a new prevention concept the so-called “standard Vol. precautions", which are devised to be used for providing care of all patients in hospitals regardless of their diagnosis or presumed infection status, now replace the “universal precautions.” The fact that “standard precautions” are recommended for the care delivery to all patients, regardless of their presumed infection state, it is important when handling equipment and devices that are contaminated or suspected of contamination with blood, body fluids, secretions and excretions except sweat, Standard precautions include hand washing; use of barriers (e.g.gloves, gown, cap, mask); care with devices such as fetal external and internal fetal monitoring, insertion of intrauterine device

(IUD‟s), insertion of cannula and injections, equipment and clothing used during care; environmental control (e.g., surface processing protocols, health service waste handling); adequate discarding of sharp instruments including needles [10-12]. All standards of care provide a guide to the knowledge, skills, judgment and attitudes that are needed to practice safely. They describe what each nurse is accountable and responsible for practice. The aim of standard of Infection Control (IC) precautions is to prevent HCAI [13]. Infection control standards become an integral part of the accreditation program for all medical settings in Egypt, where the National Guidelines for Infection Control" (NGIC) are produced and established by the infection control team at the Ministry of Health & Population (MOHAP) since the year 2003 [14-16] .Therefore, adequate nursing staff is necessary because a higher patient-to nurse ratio increases the risk of nosocomial infection [17]. Compliance is the extent to which certain behavior such as; following physician‟s orders or implementing healthier lifestyles can be influenced or controlled by a variety of factors like culture, economic and social factors and self-efficacy. Guidelines that guide an individual‟s behavior exist in a variety of settings including health care settings, but people do not always comply with them [18-20]. Studies have shown that compliance with precautions among nurses in order to avoid exposure to microorganisms is low. More specifically, compliance was found inadequate concerning regarding hand hygiene guidelines, use of gloves when exposure to body fluids was anticipated, eye protection, mouth and nose protection (mask use), wearing a gown when required , avoid recapping the needle after it was used for a patient, and provision of care considering all patients as potentially infectious [21-24].Nursing students play a critical role in the prevention efforts so, they are an important population needed to study their level of knowledge, attitudes, and behavior regarding infection control measures, and obtaining this information are useful for developing programs to improve their performance [25-26]. Infection control is a fundamental aspect of patient safety and healthcare quality [28]. With rising concerns about healthcare-associated infections (HAIs), it is essential for nursing students to acquire strong clinical competencies in infection prevention [29]. This literature review aims to assess the current knowledge, practices, attitudes, and education gaps related to infection control among nursing students [30].Recent studies have revealed that nursing students generally have moderate knowledge levels regarding essential infection prevention and control (IPC) practices [31]. According to a cross-sectional study involving 300 nursing students in a tertiary care institution found that only 56.3% of participants had adequate knowledge of hand hygiene practices [32].

Although most students recognized the importance of hand hygiene in preventing healthcare associated infections, only 47.8% could correctly identify the WHO's Five Moments for Hand Hygiene [32]. This gap between theoretical understanding and practical compliance suggests the need for enhanced training, especially in real clinical environments where time pressure and workload can impact adherence [32].In terms of personal protective equipment (PPE), according study evaluated 250 nursing students and found that 62% had a basic understanding of the types and purposes of PPE [33]. However, only 41% of them knew the correct sequence of donning and doffing PPE as per CDC guidelines [33]. Improper use of PPE was commonly reported, especially in high-stress or emergency settings [33]. The study emphasized that although the majority of students (over 70%) had received some form of training on PPE, the training was often limited to theoretical instruction without practical demonstrations or simulations [33].When it comes to biomedical waste disposal, assessed knowledge and practices among 200 final-year nursing students [34]. The results showed that only 39% of participants could correctly categorize waste into color-coded bins as per national biomedical waste management guidelines [34]. A significant number (around 61%) were unaware of the risks associated with improper waste disposal, such as the spread of infections and environmental contamination [34]. Alarmingly, 28% admitted to having disposed of infectious waste in general bins due to a lack of supervision or unclear guidelines during clinical placements [34].These findings are consistent with the results of study who reported that while 68% of nursing students acknowledged the importance of IPC practices, only 35% could consistently apply them in practical scenarios [35]. The study emphasized that ongoing monitoring, regular refresher courses, and the integration of simulation-based training are crucial for bridging the gap between knowledge and practice [35].Although nursing students may have a fair understanding of infection prevention and control (IPC), their adherence to protocols in clinical settings is often inconsistent [32]. Various studies have shown a significant gap between what students know and what they actually do during their clinical rotations [32].For instance, found that although 56.3% of nursing students had adequate knowledge of hand hygiene, only 38.2% were compliant with hand hygiene practices before and after patient contact in the clinical setting [32]. The study attributed this poor compliance to factors such as time constraints, high workload, and limited availability of hand sanitizers at bedside units [32]. Similarly, reported that while 62% of students understood the purpose and types of personal protective equipment (PPE), only 44% consistently wore gloves and masks during patient care [33]. Observational audits during their

clinical rotations revealed lapses in the proper donning and doffing sequence, often due to a lack of supervision and practical training [33]. Identified a concerning disparity in waste disposal practices. While 39% of nursing students could correctly categorize biomedical waste, actual compliance with proper waste segregation protocols was observed in only 27% of cases [34]. Factors such as poorly labeled bins, absence of on-site training, and unclear responsibilities were major contributors to this gap [34] Moreover, this study highlighted that only 35% of students consistently adhered to infection control practices despite 68% acknowledging their importance [35]. The study found that students often followed protocols only when under the direct supervision of faculty or senior nurses, suggesting a lack of internalized responsibility or accountability [35]. Attitudes play a pivotal role in determining how consistently nursing students follow infection control protocols [40]. While knowledge provides the foundation and skills allow implementation, it is a positive attitude toward infection control that often determines whether these practices are consistently applied in clinical settings [40]. According to study although 68% of nursing students agreed that infection control practices are essential for patient and staff safety, only 35% demonstrated regular compliance [35]. This disparity highlights that attitudes toward IPC are not always aligned with actions, especially in unsupervised situations [35]. Many students perceived infection control as an "extra task" rather than an integral part of patient care, leading to lower prioritization during busy shifts [35]. Identified a variety of barriers that negatively affect students' attitudes and subsequent compliance [32]. The most commonly cited challenge was workload, with 72.5% of students reporting that they sometimes skipped hand hygiene or PPE due to time constraints and high patient loads [32]. Furthermore, lack of direct supervision was reported by 64% of participants as a factor that discouraged adherence [32]. Another significant factor influencing attitude is peer behavior. In a study 58% of students admitted that they were more likely to follow IPC practices when surrounded by peers who also adhered to the rules [33]. Conversely, when peers were non-compliant, students felt less motivated to stand out or correct others, reflecting the impact of peer pressure and clinical culture on individual attitudes [33]. In addition, Ali and Khan noted that some students developed a false sense of security—believing that short patient interactions or asymptomatic patients carried less risk—leading to neglect in using PPE or performing hand hygiene [34]. This attitude can undermine infection control efforts, especially in the context of asymptomatic carriers of infections such as COVID-19 or hepatitis B [34]. Effective infection prevention and control (IPC) relies not only on knowledge and attitude but also on robust

educational strategies that bridge the gap between theory and clinical practice [35]. However, several studies suggest that current nursing curricula may lack depth and consistency in infection control education [35]. Reported that although 78% of nursing students received classroom lectures on IPC, only 42% had participated in any hands-on training or simulation-based exercises [32]. This imbalance suggests that while theoretical instruction is present, practical skill development is often overlooked [32]. Students trained with simulation labs showed significantly higher scores in knowledge retention and practice compliance compared to those taught through traditional lectures alone [32]. Study highlighted that the use of interactive teaching tools such as video demonstrations, group discussions, and clinical case-based learning improved student engagement and understanding of IPC guidelines [35]. In their study, students who received such interventions showed a 25% increase in correct PPE usage and hand hygiene practices during practical assessments [35]. More recently, explored the use of Virtual Reality (VR) as an emerging educational tool [36]. Nursing students who engaged in immersive VR-based IPC scenarios were more confident and accurate in donning and doffing PPE and demonstrated higher long-term retention of protocols [36]. However, access to VR technology remains limited in many institutions due to cost and resource constraints [36]. Another critical concern is the inconsistency of IPC content across nursing curricula. Ali and Khan found that only 53% of final-year nursing students were aware of national infection control guidelines, and 31% reported never having formal instruction on biomedical waste disposal [34]. Many nursing programs focus heavily on clinical procedures but provide minimal dedicated hours to infection control beyond basic orientation sessions [34]. Recent studies highlight that while nursing students possess moderate knowledge of Infection Prevention and Control (IPC) guidelines, a significant gap remains between theoretical understanding and practical application [32]. For example, although over 50% of students know basic hand hygiene and PPE guidelines, far fewer demonstrate consistent compliance during clinical practice [32]. Major barriers include time constraints, high workloads, lack of supervision, and inadequate practical training [32]. Attitudes toward IPC are generally positive, yet many students treat protocols as secondary tasks, especially when unsupervised or influenced by non-compliant peers [35]. Educational methods remain heavily lecture-based, with limited use of simulations or interactive tools [35]. Innovative approaches such as virtual reality training have shown promise but remain underutilized due to cost and accessibility [35]. Key contradictions include students reporting adequate training while still showing poor compliance, and recognizing

IPC's importance yet failing to integrate it into routine care [33]. Limitations across the studies include reliance on self-reported data, lack of longitudinal tracking, and minimal focus on the influence of clinical culture and supervision [33]. Overall, the evidence underscores the urgent need for integrated, practical, and behaviorally informed IPC education, supported by stronger mentorship, regular monitoring, and system wide curriculum reforms [35].

METHODOLOGY:

Research Design: A cross-sectional design was dispensed to examine the knowledge and practices of Nurses regarding antibiotic use, resistance and prevention practices.

Study Setting: The study was conducted at People's Nursing School Liaquat University of Medical and Health Sciences Jamshoro, the major Public Nursing institution with various study programs such as BSN and MSN.

Study Population: The study population consisted of Undergraduate Nursing students studying at People's Nursing School Liaquat University of Medical and Health Sciences Jamshoro.

Sample Size: The sample size 60 calculated for this study was determined using RaoSoft online sample size calculator, with the following parameters:

- Confidence Level: 95%
- Margin of Error: 5%

Sampling Technique:

A non-probability convenience sampling technique was employed to select participants due to its feasibility and resource limitation.

Data Collection Process:

Permission was granted by the Director of People's Nursing School Liaquat University of Medical and Health Science Jamshoro. Participants were fully informed about the study's purpose, procedures, risks, and benefits. Verbal and written informed consent was obtained, ensuring that participation was voluntary and that participants could withdraw at any time without affecting their care.

Data Collection Tool:

Data were collected using a structured questionnaire, divided into two sections.

Section A: Gathered demographic information, including Age, gender and level of qualification.

Section B: Assessed nurses' knowledge through 18 multiple-choice questions.Each question had Two options, with one correct answer. A score of 1 was assigned for each correct answer, and 0

for incorrect answers. The scoring system categorized knowledge as follows: 14 to 18 correct answers (>75%) as “Good knowledge,” 9 to 13 correct answers (50-72%) as “Moderate knowledge,” and 1 to 8 correct answers ((<50%) as “Poor knowledge.”

Data Analysis: Data were analyzed using SPSS version 26. Descriptive statistics, including percentages, were used to summarize the data.

Ethical Considerations:

Permission was granted by the Director of People’s Nursing School Liaquat University of Medical and Health Science Jamshoro. Participants were informed about the study’s purpose, procedures, risks, and benefits, and written and verbal informed consent was obtained. Participation was voluntary, and participants had the right to withdraw at any time without affecting their care.

Results

Demographic Analysis

Figure 01: Classification Of Gender

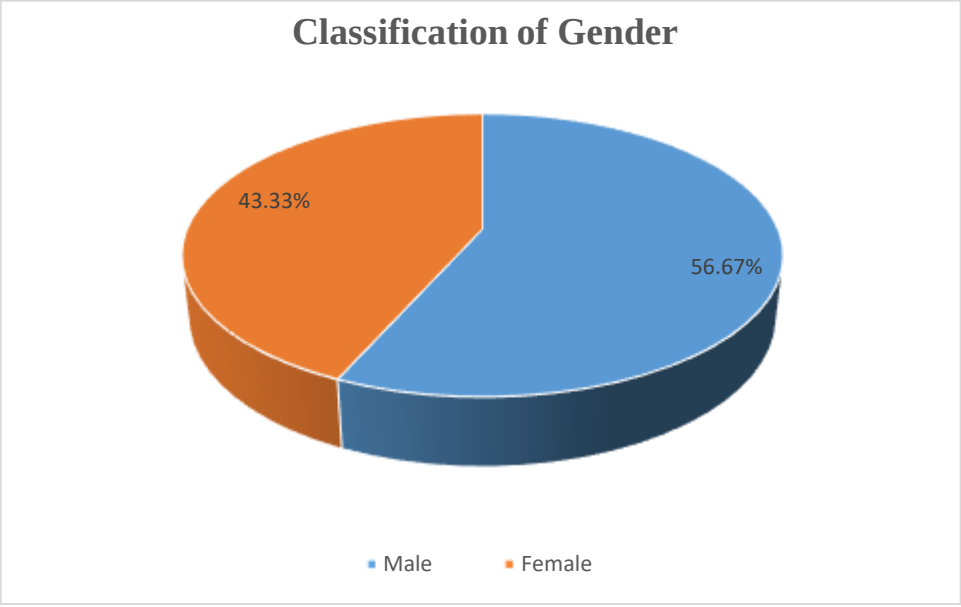

Figure 01 shows the distribution of gender among the participants. It shows that the majority of participants, 56.67% (n=34), were male, while 43.33% (n=26) were female.

Figure 02: Year Of Study

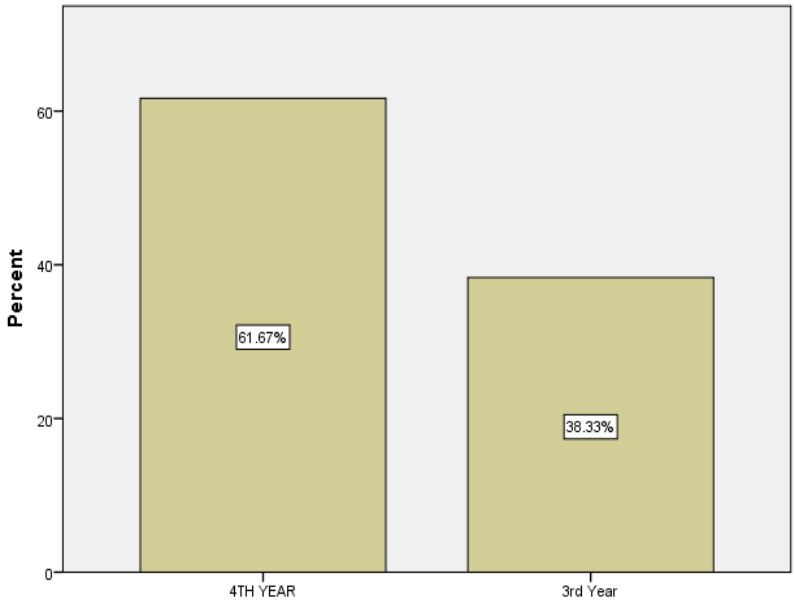

Figure 2, shows the study year of Participant. It shows that the majority of participants, 61.67% (n=37), were from 4th year, while 38.3% (n=23) were male.

Table No 1: Age of participants

Categories	Frequency	Percent
18-22	27	45.0
23-27	33	55.0
Total	60	100.0

Table No. 01, shows that majority of participants, comprising 55.0% (n=33), were in the range of age 23-27 years and 45.0% (n=27) were in the range of 18-22 years.

Table No 2: Item Asked to Assess Competency Regarding Infection Control

Gloves must be changed during patient care if you move hands from 'contaminated body site' to 'clean body site'.	**Freq**	**47**	**13**
	%	78.3	21.7
Surgical masks can protect the nose and mouth when procedures and activities are likely to generate splashes or sprays of blood and body fluids.	**Freq**	53	7
	%	88.3	11.7
The purpose of using a gown or apron is to protect clothes from splashes or sprays of blood and body fluids.	**Freq**	42	18
	%	70.0	30
Removed all personal protective equipment (PPE) before leaving the patient's environment.	**Freq**	47	13
	%	78.3	21.7
Stationary, telephones kept in wards, and doorknobs can be sources of infections	**Freq**	48	12
	%	80.0	20
Segregation of clinical and non-clinical waste is important for preventing the spread of infection.	**Freq**	43	17
	%	71.7	28.3
Recapping of needles, in general, is not appropriate.	**Freq**	42	18
	%	70.0	30
If you puncture hand with sharp instruments, you must report to the concerned authorities.	**Freq**	26	34
	%	43.4	56.7
Puncture-proof containers should be used for disposal of sharps objects.	**Freq**	47	13
	%	78.3	21.7
Mask must be placed on coughing patients to prevent potential dissemination of infectious respiratory secretions from the patient to others.	**Freq**	45	15
	%	75.0	25.0
Standard precautions are used for the care of all patients regardless of their diagnosis and perceived infection status.	**Freq**	39	21
	%	65.0	35.0
Isolation precaution is one of the elements in standard precaution.	**Freq**	42	18
	%	70.0	30.0
Washing hands after contact with the patient's environment is one of the elements in standard precaution.	**Freq**	40	20

Table 2 represents the the responses of 60 respondents from 3rd and 4th year at People's Nursing School to 18 key statements aimed at assessing their competency in infection control practices, based on standard precaution guidelines. Each correct response (typically marked as "Yes") contributes one point, resulting in a maximum possible score of 18 per participant. The data includes the frequency and percentage of respondents who answered "Yes" (agree) or "No" (disagree) to each statement.

Washing hands after contact with the patient's environment is one of the elements in standard precaution.	**Freq**	**40**	**20**
	%	66.7	33.3
Alcohol-based rubs are used after removing gloves.	**Freq**	39	21
	%	65.0	35.0
Performing hand hygiene is required before and after patient care.	**Freq**	45	15
	%	75.0	25.0
Hands should be washed with soap and water before and after handling potentially infectious materials irrespective of wearing gloves.	**Freq**	41	19
	%	68.3	31.7
PPE is important in infection control because it acts as a barrier between infectious materials.	**Freq**	51	9
	%	85.0	15
Gloves must be worn every time during handling potentially infectious materials.	**Freq**	50	10
	%	83.3	16.7

A majority (65%) of participants correctly identified that standard precautions should be used for the care of all patients, regardless of diagnosis or infection status. However, 35% were unaware or did not adhere to this guideline. 70% of the respondents recognized that isolation precautions are a component of standard precautions, indicating moderate awareness. 66.7% acknowledged the necessity of washing hands after contact with a patient's environment, while 33.3% demonstrated a gap in this essential practice. 65% agreed with using alcohol-based rubs post glove removal, while 35% did not, suggesting a need for reinforcement of hand hygiene practices. A strong majority (75%) agreed that performing hand hygiene before and after patient care is necessary, reflecting good compliance with standard protocols. 68.3% affirmed that hands should be washed with soap and water before and after handling infectious materials, even when gloves are worn,

though 31.7% showed noncompliance. A high percentage (85%) of respondents understood the importance of PPE in acting as a protective barrier against infectious materials. 83.3% agreed that gloves must always be worn when handling potentially infectious materials, reflecting good practice. 78.3% correctly stated that gloves must be changed when moving from a contaminated to a clean body site, indicating solid procedural knowledge. The highest agreement (88.3%) was observed for the use of surgical masks when procedures could cause splashes of blood or body fluids, indicating strong understanding. 70% recognized that gowns or aprons protect clothing from contamination, while 30% did not. 78.3% agreed with the removal of PPE before leaving the patient area, demonstrating sound procedural knowledge. 80% identified common surfaces such as telephones and doorknobs as potential infection sources, indicating awareness of environmental hygiene. 71.7% acknowledged the importance of proper waste segregation in preventing infection spread. 70% understood that recapping needles is an unsafe practice, whereas 30% still considered it acceptable, highlighting a critical area for training. Alarmingly, only 43.4% of respondents stated they would report injuries caused by sharp instruments, while 56.7% would not, representing a significant risk to personal and public health. 78.3% supported the use of puncture-proof containers for sharp disposal, reflecting adherence to safety standards. 75% agreed that masks should be provided to coughing patients to prevent the spread of respiratory infections.

Table No 3: Overall knowledge

Score Range	Frequency	Percent
Poor	11	18.3
Moderate	15	25.0
Good	34	56.7
Total	60	100.0

Table 3 represents that out of 60 respondents 34 participants (56.7%) fell within the Good category, 15 participants (25.0%) demonstrated a Moderate level of knowledge and 11 participants (18.3%) were classified in the Poor category

CONCLUSION

This study indicates that nursing students generally demonstrate a satisfactory level of competency in infection control practices. However, certain knowledge gaps remain, particularly in areas such

as the reporting of needlestick injuries and adherence to consistent hand hygiene protocols. These shortcomings suggest a need for further emphasis on both theoretical understanding and practical application of infection control measures. Addressing these issues is essential to ensure that students are not only knowledgeable about infection control guidelines but are also capable of implementing them effectively in clinical settings.

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