

RESEARCH ARTICLE

Assessment of Adherence to Infection Control Practices Among ICU Nurses and its Impact on Patient Outcomes

Prasanna Kumar E¹, Anitha J², Akila K³, Prathiba S⁴, P.V. Hari Hara Subramayan⁵ and K Sudhakar⁶

¹Arulmigu Meenakshi College of Nursing, Meenakshi Academy of Higher Education and Research.

²Meenakshi College of Nursing, Meenakshi Academy of Higher Education and Research.

³Department of Microbiology, Meenakshi Medical College Hospital & Research Institute, Meenakshi Academy of Higher Education and Research

⁴Department of Pharmacology Meenakshi Ammal Dental College and Hospital, Meenakshi Academy of Higher Education and Research.

⁵Meenakshi College of Physiotherapy, Meenakshi Academy of Higher Education and Research

⁶Meenakshi College of Pharmacy, Meenakshi Academy of Higher Education and Research

*Corresponding Author
Prasanna Kumar E

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Abstract: HAIs continue to be a significant contributor to morbidity and mortality, as well as healthcare expenses, especially in Intensive Care Units (ICUs), where patients are in a rather critical state and are highly prone to infections. The aim of the study was to evaluate the compliance rate with the ICU nurses towards infection control practices and the effects on the patient outcome. It was a cross-sectional study that was conducted among the nurses of the ICU of a tertiary care hospital using a structured questionnaire and a checklist of direct observation. The information regarding hand hygiene, the use of personal protection equipment (PPE), the utilization of an aseptic procedure, and the waste disposal were received. The outcomes of the patients such as infection rates, length of stay at the ICU, and mortality were interpreted against the level of adherence. Results indicated that nurses with high adherence to infection control protocols demonstrated significantly lower rates of patient infections and reduced ICU stay durations. Workload, untrained constantly and insufficient resources were the primary contributors of noncompliance. The research highlights the significance of routine training modules, supervision, and staffing to provide the best compliance and patient safety. Infection control practices by ICU nurses can be reinforced to reduce HAIs significantly and improve quality of healthcare.

Keywords: Infection control, ICU nurses, hospital-acquired infections, adherence, patient outcomes, hand hygiene, personal protective equipment (PPE), nursing practice, healthcare-associated infections, patient safety.

INTRODUCTION

Introduction

Contamination of infections has been one of the pillars of quality care delivery, particularly in the critical care units, like Intensive Care Unit (ICUs), where the patients are highly susceptible to infections because of invasive diagnostic and therapeutic procedures, defective immunity, and extended durations of hospitalization. Hospital-acquired infections (HAIs) are called nosocomial infections and are one of the most severe complications of ICUs that are linked to higher morbidity, mortality, and spend on healthcare. The World Health Organization (WHO) states that approximately one in every ten hospitalized patient acquires at least one HAI, by a considerably higher rate of the happening to report in ICU patients [1].

The leading part of the healthcare employees is corresponds to by nurses and they are key to ensuring the standard of infection control is maintained. This is due to the fact that their loyal adherence to the measures of infection prevention and control, (IPC) such as good hand hygiene, use of personal protective equipment (PPE), sterilization of equipment, aseptic handling of medical equipment, proper management of biomedical waste, and good cleaning of the environment are critical in the prevention of spread of pathogens. Despite well-established guidelines, adherence levels among ICU

nurses vary considerably due to multiple influencing factors, including increased workload, lack of awareness, insufficient training, time constraints, inadequate resources, and organizational barriers [2].

It has been shown that enhanced compliance with infection control measures by healthcare workers is highly associated with the reduction of HAIs, the decreasing period of ICU treatment, and the reduction of the rate of patient mortality. On the other hand, lack of compliance may result in cross contamination, spread of multidrug resistant organisms and worsening of patient outcomes [3]. High compliance levels are therefore the keys to constant education, strengthening of the infection control policies, resources available, and supervision (Figure 1).

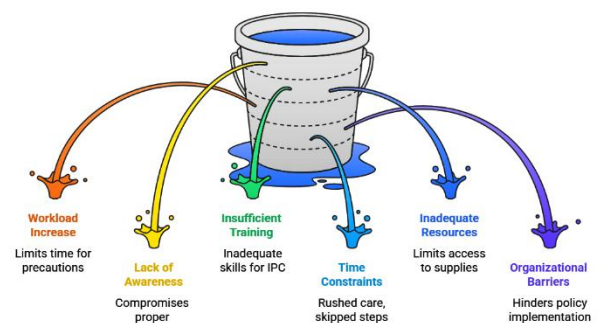


Figure 1: ICU Infection Control Crisis

Within the framework of the developing healthcare systems, when the issue of infrastructural and staffing problems tend to dominate, it becomes even more crucial to evaluate the extent of compliance with the guidelines on infection control measures. The results of such tests may be useful in identifying the available gaps and implement the development of specific measures to be taken with them to enhance the current situation with infection control practices [4].

Therefore, the current case was conducted to determine the compliance of ICU nurses to infection control measures and its consequential effects on patient outcomes. In this study, I will endeavor to bring out the significance of the relationship between the nursing practice and the quality of healthcare in general by comparing the rates of compliance among nurses with the rates of infection, length of stay in an ICU, and patient recovery [5].

MATERIALS AND METHODS

Study Design and Setting:

In the present case, the longitudinal study was a cross-sectional descriptive study conducted in Intensive Care Units (ICUs) of a tertiary care teaching hospital that evaluated the adherence of the nurses to infection control measures and the effect of the same on patient outcomes. The research will be conducted in the 6-month period of January 2025-June 2025 [6].

Study Population:

The participants of the study were registered nurses operating in the medical, surgical and neonatal ICUs and having at least six months experience in the ICU. Nurses that were on leave during the study time or the nurses who were unwilling to take part were also not included. Purposive sampling was done to enroll 60 ICU nurses [7].

Data Collection Tools:

Data were collected using two validated instruments [8]:

1. **Structured Questionnaire:** Designed to assess the nurses' knowledge and self-reported adherence to infection control measures, including hand hygiene, use of personal protective equipment (PPE), sterilization, waste disposal, and aseptic techniques.

2. **Observation Checklist:** Used to evaluate actual compliance through direct observation during routine nursing activities, based on WHO and CDC infection control guidelines.

Patient Data:

Information regarding patient infection rates, duration of ICU stay, and clinical outcomes (recovery or mortality) was recorded from hospital records to assess the impact of nurses' adherence levels [9].

Data Collection Procedure:

After obtaining institutional ethical clearance and informed consent, nurses were observed unobtrusively during their shifts. Each nurse was evaluated on multiple occasions to ensure reliability of data. The corresponding patient data were collected from the hospital's infection control registry and case records [10].

Data Analysis:

Collected data were analyzed using SPSS version 25. Descriptive statistics (mean, percentage, and standard deviation) were used to summarize nurse characteristics and adherence scores. The association between adherence levels and patient outcomes was examined using the chi-square test and Pearson's correlation coefficient, with a significance level set at $p < 0.05$ [11].

Ethical Considerations:

Ethical approval was obtained from the Institutional Ethics Committee prior to data collection. Participation was voluntary, and confidentiality of both staff and patient data was strictly maintained throughout the study [12].

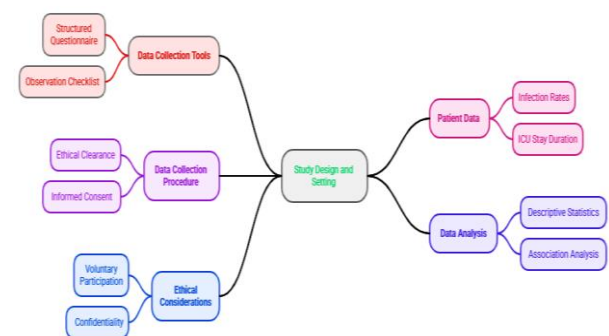


Figure 2: Study design and Methodology

RESULTS

Demographic Characteristics of Participants:

A total of 60 ICU nurses participated in the study. The majority were female (85%), and the mean age of participants was 29.4 ± 4.8 years. Most nurses (65%) had between 1-5 years of ICU experience, while 25% had 6-10 years, and 10% had more than 10 years of experience. About 70% of the nurses had received formal training in infection control within the past two years (Table 1).

Table 1. Demographic Characteristics of ICU Nurses (n = 60)

Parameter	Category	Frequency (n)	Percentage (%)
Gender	Female	51	85
	Male	9	15

Age (years)	Mean $\pm$ SD	29.4 $\pm$ 4.8	—
ICU Experience (years)	1-5 years	39	65
	6-10 years	15	25
	>10 years	6	10
Infection Control Training	Yes	42	70
	No	18	30

Adherence to Infection Control Practices:

Overall adherence to infection control practices was categorized as high ($\geq 80\%$), moderate (60-79%), or low ($< 60\%$) based on the combined questionnaire and observation checklist scores.

- High adherence was observed among 55% of the nurses,
- Moderate adherence in 35%, and
- Low adherence in 10%.

The highest compliance was seen in hand hygiene practices (88%), followed by use of PPE (82%) and aseptic techniques (79%). The lowest adherence rates were noted for proper biomedical waste segregation (68%) and environmental cleaning protocols (65%)(Table 2, Figure).

Table 2. Adherence Levels to Infection Control Practices

Adherence Category	Score Range (%)	Number of Nurses (n)	Percentage (%)
High	≥ 80	33	55
Moderate	60-79	21	35
Low	< 60	6	10

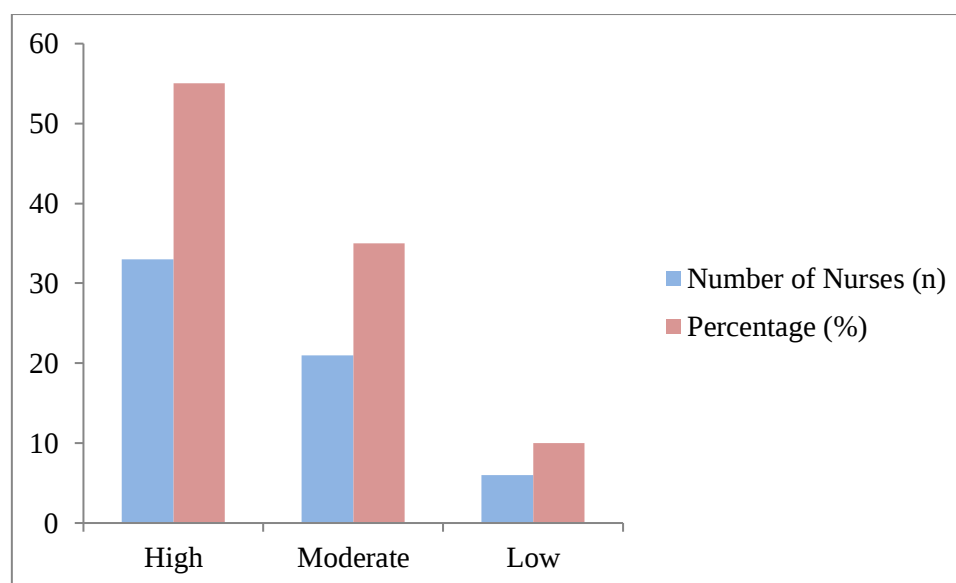


Figure 3: Graphical Presentation of Adherence Levels to Infection Control Practices

Factors Influencing Adherence:

Analysis of self-reported barriers revealed that workload (45%), insufficient staff (30%), and lack of continuous training (25%) were the most common reasons for non-compliance. Nurses who attended regular infection control training programs demonstrated significantly higher adherence scores ($p < 0.05$) compared to those who did not (Table 3, Figure 4).

Table 3. Barriers to Adherence Reported by Nurses

Reported Barrier	Frequency (n)	Percentage (%)
Heavy workload	27	45
Inadequate staffing	18	30
Lack of continuous training	15	25

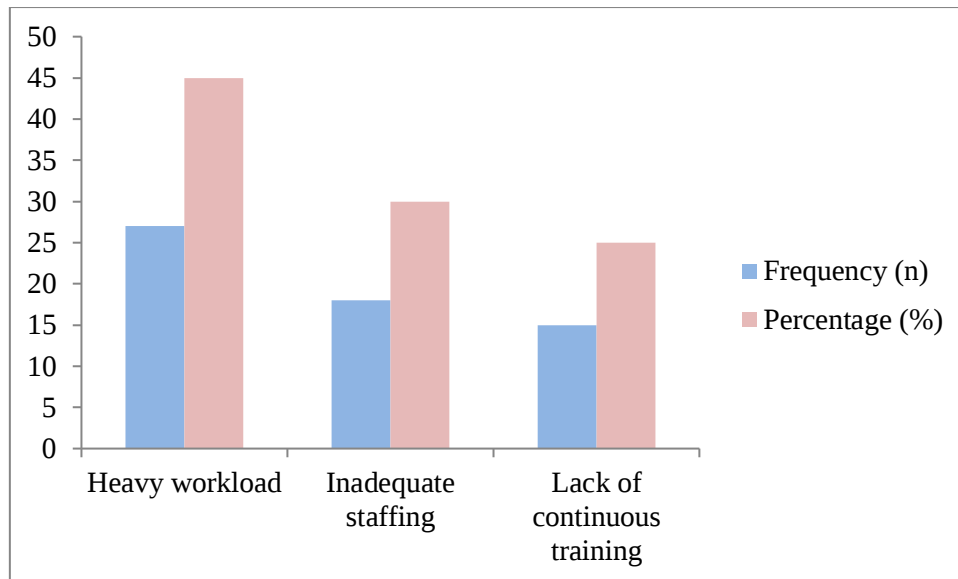


Figure 4: Graphical Presentation of Barriers to Adherence Reported by Nurses

Impact on Patient Outcomes:

Patient outcome data were analyzed for 180 ICU patients who received care from the participating nurses.

- The overall rate of hospital-acquired infections (HAIs) was 12.7%.
- Patients managed by nurses with high adherence showed a significantly lower infection rate (7.5%) compared to those under moderate (15%) or low adherence (28%) groups ($p < 0.01$).
- The average ICU stay was 6.2 ± 2.3 days for patients in the high adherence group and 9.1 ± 3.8 days in the low adherence group.
- The mortality rate among patients cared for by high-adherence nurses was 8%, whereas it was 20% in the low-adherence group (Table 4, Figure 5).

Table 4. Impact of Nurse Adherence on Patient Outcomes (n = 180 Patients)

Adherence Level	HAI Rate (%)	Mean ICU Stay (Days $\pm$ SD)	Mortality Rate (%)
High (nurses = 33)	7.5	6.2 ± 2.3	8
Moderate (nurses = 21)	15.0	7.8 ± 3.1	14
Low (nurses = 6)	28.0	9.1 ± 3.8	20

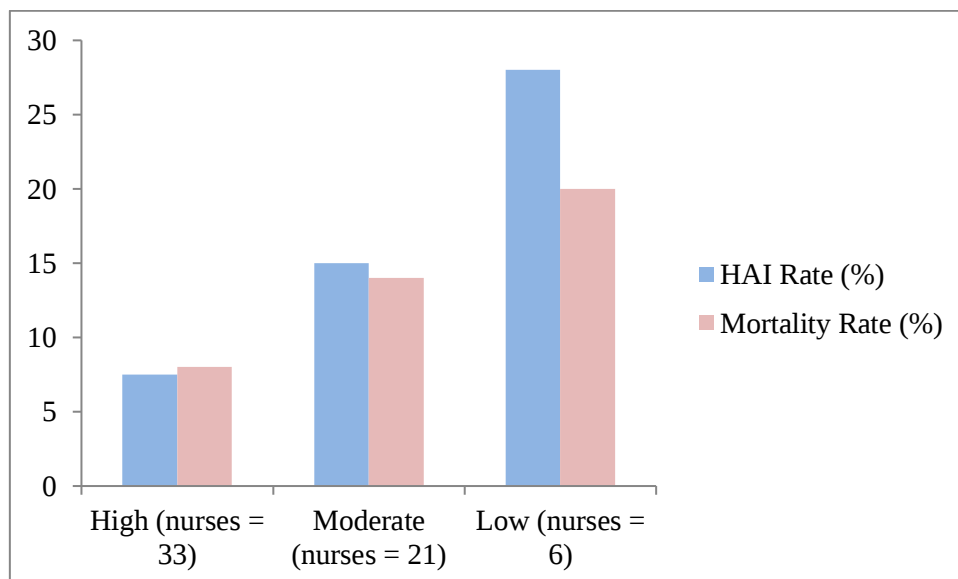


Figure 5: Graphical Presentation of Impact of Nurse Adherence on Patient Outcomes

Statistical Analysis:

Pearson's correlation demonstrated a strong negative correlation between nurse adherence scores and infection rates ($r = -0.68$, $p < 0.001$), indicating that improved adherence was associated with reduced infection incidence and shorter ICU stays.

DISCUSSION

The present study evaluated the adherence of ICU nurses to infection control practices and examined its influence on patient outcomes. The findings revealed that more than half of the nurses demonstrated high adherence to infection control guidelines, particularly in areas such as hand hygiene, use of personal protective equipment (PPE), and aseptic techniques [13]. However, certain domains such as biomedical waste segregation and environmental cleaning showed relatively lower compliance, indicating areas requiring focused improvement.

The predominance of female nurses and a relatively young workforce with moderate ICU experience reflect the current staffing pattern in most tertiary care hospitals. The high level of adherence observed among trained nurses underscores the effectiveness of continuous education and skill-based training in improving infection control compliance. These results are consistent with reports that regular infection control training and supervisory feedback significantly enhance adherence among nursing personnel [14].

Workload, inadequate staffing, and lack of ongoing training emerged as major barriers to compliance. This finding aligns with studies that emphasized that heavy workload and resource constraints negatively influence adherence to infection prevention protocols. Addressing these challenges through optimal nurse-patient ratios, better resource allocation, and institutional support can substantially improve compliance levels [15].

Patient outcome analysis in this study revealed a clear relationship between nurse adherence and patient safety indicators. The patients under the care of the nurses who exhibited high adherence levels had significantly lower rates of hospital-acquired infection (HAI), decreased ICU days, and mortality. The review indicates that the correlation between adherence scores with infection rates is negative ($r = -0.68$, $p < 0.001$), which proves that the strict adherence to infection control measures is a direct factor in enhancing better clinical outcomes [16]. These results corroborate earlier studies which highlighted the pivotal role of infection prevention compliance in reducing HAIs and associated mortality.

The results of the study also highlight that the knowledge aspect on infection control is not merely an issue but a behavioral practice supported by a culture of the organization and leadership. Successful infection control initiatives must be monitored on an ongoing basis, have a feedback mechanism, sufficient PPE resources and a supportive management. Hospitals should implement periodic training workshops, routine audits, and

motivational incentives to sustain high compliance levels among ICU nurses [17].

Overall, the discussion has revealed that a high level of compliance with infection control measures among ICU nurses is the key to minimizing the burden of HAIs and improving the outcomes of patients. The results support the need to continue education, supervision, and interventions at the system level to facilitate a culture of safety and prevention of infections in critical care environments [18].

CONCLUSION

The current research indicates the importance of patient safety and clinical outcome improvement, which is enabled by the ability of ICU nurses to follow the infection control practices. Most of the nurses were very compliant with the major infection control practices especially hand hygiene and the use of personal protective equipment. However, certain areas such as biomedical waste management and environmental cleaning require further attention and reinforcement.

The research has created a high negative correlation between the rate of adherence and hospital-acquired infections, the duration of the ICU, and the mortality rates of the patients. Those nurses who adhered to the infection control guidelines regularly helped to reduce the rates of infection and improve the recovery outcomes.

Regular training, adequate staffing, provision of essential resources, and continuous monitoring are essential strategies to sustain and enhance adherence levels. The commitment of the institutions to the infection prevention policies can result in a significant decrease in both HAIs and quality of healthcare.

Overall, it is important to enhance infection control behaviors with the use of education, supervision, and organizational support to promote patient safety and excellence in critical care nursing.

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