



## The Role of Nursing in the Presence of Modern Technology in Helping Patients in Hospitals

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### Abstract

The paper examined nurses' use of modern technology in the healthcare sector, including their use patterns, perceived effects, attitudes, and knowledge state in a hospital environment. The survey involved 180 registered nurses of different departments, including ICUs, surgery, general wards, and emergency wards. Most nurses were females between 20 and 40, and most had a B.Sc. in Nursing. The analysis demonstrated the high level of adoption of such technologies as Electronic Health Records and patient monitoring systems, whereas such tools as telemedicine portals were not used extensively. Nurses commonly viewed technology to enhance patient documentation, communication, and clinical decision making, with an even distribution of opinions on its impact on workload. The attitudinal difference also varied among departments, with the ICU and surgical nurses recording the most favorable attitudes. Correlation analysis showed a moderate positive correlation between knowledge, attitude, and practice scores. There was also a positive correlation between clinical experience and the frequency of the use of technology. The knowledge scores distribution revealed that most nurses possessed moderate knowledge of the infection control technologies. These results indicate the need to improve the technological competence of nurses to streamline healthcare provision and patient outcomes.

**Keywords:** Nursing roles, Healthcare technology, Attitude, Experience, Infection control, Knowledge distribution.

### Introduction

The adoption of modern technology in healthcare has led to tremendous development in the care of patients, not only in terms of treatment but also in terms of efficiency and efficacy of nursing practice. Nurses, the backbone of healthcare systems, are essential in using these technologies to provide greater support, safety, and patient satisfaction. As healthcare is getting more and more complicated, the role of nurses has changed to encompass data interpretation, digital documentation, and interventions supported by technology [1].



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The introduction of technological applications like Electronic Health Records (EHRs), smart infusion pumps, barcode medication administration (BCMA), clinical decision support systems (CDSS), telemedicine, and remote patient monitoring has changed the face of hospitals. These devices aid evidence-based practice, minimize mistakes, and enhance patient monitoring [2]. The World Health Organization (WHO) suggests that patient safety failures account for almost 15 percent of hospital spending in high-income countries, most of which can be prevented by technology intervention [3]. As the main users of these systems, nurses are crucial to successfully adopting and effectively utilizing them.

The immense adoption of EHRs has transformed the environment of patient documentation and interaction. EHRs allow access to the patient records in real-time, simplify the charting process, and coordinate the healthcare teamwork [4]. Wang et al. (2021) discovered that nurses stated that their clinical decision-making and time management improved due to the implementation of EHR systems [5]. In the same way, BCMA systems have been proven to minimize medication administration errors by up to 41.4 percent [6], which is done mainly by the nursing staff.

Technology is also essential in infection control and is especially relevant in post-COVID-19. UV disinfection robots, automated hand hygiene, and wearable sensors have enhanced the work of nurses in ensuring a sterile environment and avoiding healthcare-associated infections (HAIs) [7]. According to the Centers for Disease Control and Prevention (CDC), HAIs are responsible for about 99,000 fatalities in the United States alone each year [8]. Nurses' use of such technologies is the key to reducing these effects and ensuring patient safety.

Wearable health technologies and remote monitoring have made it possible to ensure constant monitoring of patients' vital signs and chronic conditions, and nurses can intervene when there are abnormalities [9]. This has especially revolutionized the treatment of high-risk patients in the ICUs and post-operative units. Studies have indicated that constant monitoring decreases ICU readmissions and alerts personnel about the early signs of worsening patient conditions, improving care outcomes [10]. Nurses are key people in interpreting these data streams; they make clinical judgments based on this.

In addition, telehealth services have been growing at a high rate because of the COVID-19 pandemic, enabling nurses to make virtual consultations, education, and follow-ups. This has expanded access to care, particularly in underserved and rural regions [11]. Nurses' skill to find their way around the telehealth platforms and work with patients using the virtual format has become a critical competency in the new reality of healthcare.

Although these developments are encouraging, there are challenges to adopting technology in nursing practice. The barriers documented in studies include inadequate training, resistance to change, higher documentation burden, and system usability [12]. The results of a cross-sectional survey in various tertiary hospitals showed that only 60 percent of nurses were sure



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of their ability to use hospital technologies effectively, and 45 percent said that they required more detailed training [13]. These barriers need to be addressed to maximize the advantages of technology in patient care.

Moreover, apprehension is rising about the possibility that technology will dehumanize the care of patients. More emphasis on data input and computer time can be placed at the expense of human contact, which is one of the foundations of the nursing profession [14]. Hence, the balance between technological efficiency and compassionate care should be achieved. The nursing leadership should ensure that the technological integration does not replace the human aspects of care.

Training and education are the most critical aspects of empowering nurses in the digital world. The nursing curriculum has been undergoing revisions to incorporate information on health informatics, literacy in electronic systems, and digital communication strategies [15]. Moreover, hospitals are embracing continuous professional development programs to provide the skills required by the existing personnel to cope with the fast-changing technologies. Technologically competent nurses can be in better places to spearhead clinical practice, patient engagement, and interdisciplinary collaboration innovations.

Technology in nursing is also considered significant in policy and global frameworks. As an example, the International Council of Nurses (ICN) has highlighted the efforts of digital health in ensuring Universal Health Coverage (UHC) and global health outcomes [16]. Nurses, the most significant section of the healthcare workforce, are the focus of this mission.

Introduction of modern technology in hospitals has essentially transformed the nursing profession. Technology is one of the most valuable tools experienced nurses can use to improve clinical outcomes, workflow, and patient satisfaction. However, it depends on the proper training, usability of the system, and organizational support. With healthcare going digital, there is a need to comprehend and help the ever-changing role of nursing in utilizing technology to assist patients more efficiently. The purpose of the study is to evaluate the use of modern technologies in hospitals by nurses and what effect they may have on the care of patients, as well as the challenges and areas for improvement.

## **Methodology**

### **Study Design**

This study used a cross-sectional descriptive survey to examine how nursing could contribute to better patient care by incorporating modern technology in hospitals. This type of study design was selected because it could be used to evaluate the existing practices, the perception of nurses, and the issues they encounter when applying technology in their clinical practice. This methodology allowed for a snapshot of the experiences and reactions of nurses, and thus,



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a thorough analysis of the current integration of technology into the nursing practice and its perceived effect on patient outcomes was conducted.

## **Study Setting**

The research was carried out in three multi-specialty hospitals of tertiary care, which have implemented various advanced technologies to provide their regular healthcare services. Such institutions have developed electronic health records (EHRs), telemedicine systems, automatic medication dispensing systems, remote patient monitors, and intelligent infusion pumps. The presence of technologically advanced settings ensured that the participants could experience the interaction with modern digital tools in the delivery of clinical care firsthand.

## **Study Population and Sampling**

The sample population of this study was the Registered Nurses (RNs) who were actively engaged in direct patient care. The participants had to possess more than one year of clinical practice and work in inpatient departments where technological tools became a regular element of care delivery. There was also exclusion of nursing students, interns, or those on an extended leave at the time of data collection to ensure uniformity in the type of participant.

Stratified random sampling was used to provide equitable representation of the key areas in the hospital, such as Intensive Care Units (ICUs), general wards, emergency departments, and surgical wards. This strategy enabled a moderated perception of nursing experience in various clinical practices. The sample size was fixed at 180 nurses who were selected to yield enough statistical power in the analysis and, at the same time, maintain logistical convenience.

## **Data Collection Instrument**

In this research, the data were gathered with a structured, self-administered questionnaire, which was carefully drafted following a thorough search of available literature and revised in the light of consultation with the experts in nursing, hospital management, and healthcare informatics. The tool was developed to comprehensively reflect nurses' experience in using new healthcare technologies and was divided into five parts to be structured and make sense.

Section A was concerned with the collection of demographic data, including age, gender, level of educational attainment, total years of clinical experience, and the department or unit that the participants were working in at the time. This information served as the background to interpret the trends in the answers and allowed us to study the subgroups of various demographics.

Section B measured the knowledge and the frequency of use of various technologies in healthcare, such as Electronic Health Records (EHRs), remote monitoring systems, automated infusion pumps, and telehealth tools. Besides usage trends, this section also asked about the levels and quality of training on how to use these technologies, since training is usually a key determinant in successful adoption.



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Section C aimed to investigate the perceived efficiency of technology in improving different areas of patient care. The participants were requested to assess the impact of various tools on clinical results, patient safety, efficiency, and care delivery. This section was expected to record the first-hand experience of nurses on the advantages and disadvantages of the real-world technology-enabled care.

Section D addressed the effects of technology on primary nursing duties, mainly focusing on domains such as clinical decision-making, interprofessional communication, real-time documentation, and patient monitoring. It aimed to learn how nurses felt about the alterations in their daily operations and whether technology was used to empower or restrain their professional role.

Lastly, Section E discussed the obstacles and resistance that nurses face during the adoption process or the use of modern technologies. The main problems discussed were the system's usability, the time burden, technical failures, and training or institutional support gaps. The goal of this section was to single out the areas that require consideration to facilitate incorporating digital tools into nursing practice.

The rest of the items, other than those under Section A, were measured on a 5-point Likert scale, which used the response categories Strongly Agree to Strongly Disagree or Always to Never, depending on the type of question.

### **Tool Validation and Reliability**

The content validity of the questionnaire was performed with the help of a panel of six subject-matter experts representing the areas of nursing, hospital administration, and health informatics. Their comments made the items relevant, clear, and aligned with the study objectives. Before the implementation, 20 nurses were used in a pilot study, who were later not included in the primary research sample. The instrument reliability was determined based on the pilot results calculated with Cronbach's alpha, and the instrument was accepted as acceptable in the range of 0.75 and above, as far as internal consistency is concerned.

### **Data Collection Procedure**

The ethical standards were observed during the data collection process. All the participants gave informed consent after being told about the purpose and delimitations of the study. Confidentiality and anonymity were guaranteed to the participants, and participation was voluntary. The administration of the questionnaires was done manually in shift handovers, and this reduced interference with the workflow. The nurses were requested to answer the questionnaire within one week in their free time. The overall time of data collection was four weeks, which was enough time to recruit and complete.



## **Data Analysis**

The data were typed in and analyzed using R Studio, a powerful statistical software environment appropriate for complex data analysis. Descriptive statistics with frequencies, percentages, means, and standard deviations were used to describe demographic data about the participants and their answers to different survey questions. Several inferential statistical methods were used to test research hypotheses and explore the relationships. A chi-square test was employed to evaluate the relationship between demographic factors like age, years of experience, and department affiliation and the attitude of nurses towards technology. To identify a significant difference in perceived effectiveness of technology use among various hospital departments, Analysis of Variance (ANOVA) was used. Further, Pearson correlation was used to determine the strength and direction of the relationship among the knowledge levels, frequency of technology use, and perceived effectiveness in enhancing the care of patients. Moreover, the multiple regression analysis was carried out to determine the most critical predictors of effective technology use, and the variables used were professional experience, type of department, and the adequacy of training. All tests were significant with a p-value of less than 0.05, meaning there were significant associations and differences among the variables under study.

## **Results**

### **1. Demographic Profile of Nurses**

The participating nurses' demographic profile (n=180) was analyzed to make sense of the study population's composition in Table 1. Regarding age distribution, 38.9 percent (n=70) of the nurses were aged 20-30, and 33.3 percent (n=60) were aged 31-40. The remaining 27.8 percent (n=50) were over 40 years.

In the area of gender, most participants were women, with 77.8 percent (n=140) of the sample female and 22.2 percent (n=40) male nurses. Concerning the educational background, 55.6 percent (n=100) of the nurses had a Bachelor of Science in Nursing (B.Sc Nursing), 27.8 percent (n=50) had a diploma in nursing, and 16.6 percent (n=30) had a Master of Science in Nursing (M.Sc Nursing) degree. As far as work experience is concerned, 44.4 percent (n=80) of the nurses had 6-10 years experience, 33.3 percent (n=60) had 1-5 years, and 22.3 percent (n=40) had over 10 years clinical experience.

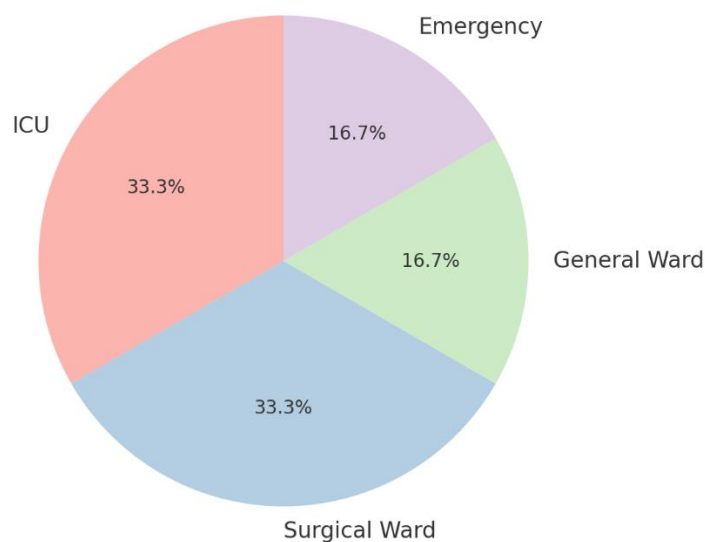
The departmental placement of the nurses was also used, whereby an equal percentage (33.3%, n=60 each) were assigned in intensive care units (ICUs) and surgical wards. Also, 16.7 percent (n=30) had been working in general wards, and the other 16.7 percent (n=30) were employed in emergency departments.



**Table 1: Demographic Profile of Participating Nurses (n=180)**

Variable	Category	Frequency (n)	Percentage (%)
<b>Age Group</b>	20–30 years	70	38.9%
	31–40 years	60	33.3%
	Above 40 years	50	27.8%
<b>Gender</b>	Female	140	77.8%
	Male	40	22.2%
<b>Educational Level</b>	Diploma	50	27.8%
	B.Sc Nursing	100	55.6%
	M.Sc Nursing	30	16.6%
<b>Work Experience</b>	1–5 years	60	33.3%
	6–10 years	80	44.4%
	>10 years	40	22.3%
<b>Department</b>	ICU	60	33.3%
	Surgical Ward	60	33.3%
	General Ward	30	16.7%
	Emergency	30	16.7%

Figure 1 shows how the nurses were divided in the hospitals where the study was conducted. The Intensive Care Unit (ICU) and Surgical Ward were the most significant sections in the entire sample, comprising 33.3 percent of the nurses in the respective areas. This meant a third of the participants were allocated to these high-dependency or special care units.



**Figure 1: Distribution of Nurses by Department**



Conversely, the General Ward and Emergency Department were less represented, and each had 16.7 percent of the total population of nurses. This indicated that fewer members of the nursing personnel worked in less technologically intensive or general care environments. The distribution showed that the research involved a mixed and well-represented sample of nurses in the various units of the hospital. It also stated that nurses may have been exposed to modern technologies in healthcare differently in different departments, which could affect their work and experience in using technological tools in patient care.

## 2. Usage of Modern Healthcare Technologies

The discussion of the pattern of technology utilization among nurses showed that familiarity and adoption of different tools differed in Table 2. The most common ones were the Electronic Health Records (EHRs), with 82 percent of the nurses indicating that they regularly used them, 15 percent used the records occasionally, and only 3 percent had never used them. Sixty-five percent of the participants used an innovative infusion pump regularly, 30 percent mentioned that they used it occasionally, and 5 percent reported using no innovative infusion pump at all.

**Table 2:** Frequency of Use of Various Modern Technologies by Nurses

Technology Type	Regular Use (%)	Occasional Use (%)	Never Used (%)
Electronic Health Records (EHRs)	82	15	3
Smart Infusion Pumps	65	30	5
Telemedicine Portals	40	45	15
Automated Medication Dispensers	60	30	10
Patient Monitoring Systems	75	20	5

Conversely, telemedicine portals had a lesser frequency of regular use, with 40 percent of nurses using it regularly, 45 percent using it occasionally, and 15 percent never using it, which shows a possible gap in uptake. Sixty percent of the nurses frequently used automated medication dispensers, 30 percent occasionally used them, and 10 percent had never touched them. Lastly, patient monitoring systems were reported to be highly utilized in the nursing workflow. 75% reported frequent use of the system, 20% reported occasional use, and only 5% never used the system. These findings in Figure 2 showed high implementation of specific

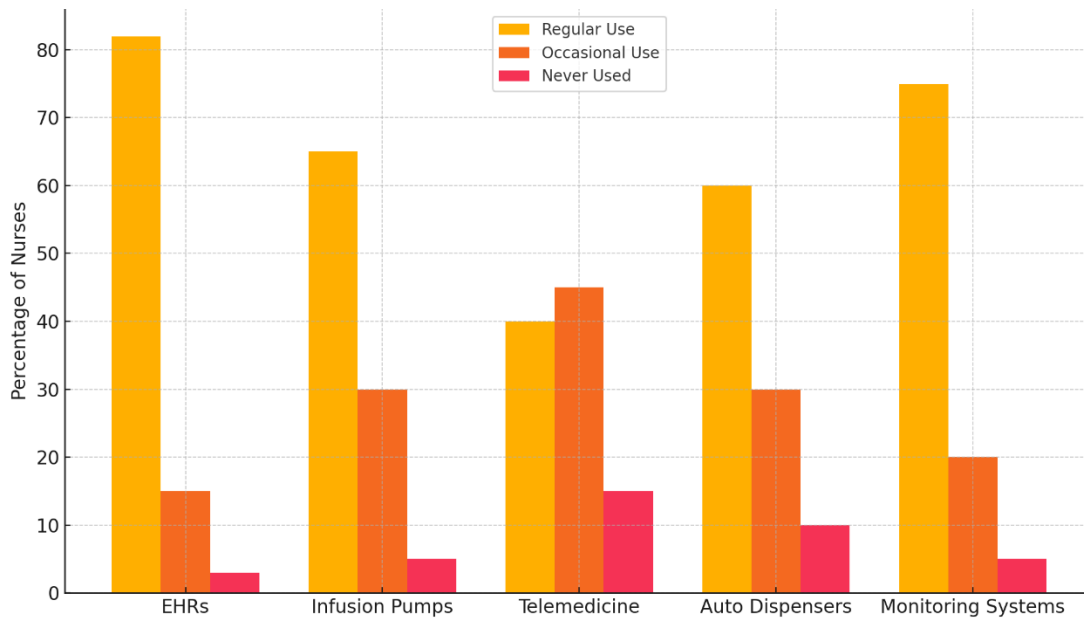


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technologies, including EHRs and monitoring systems, and low implementation of other technologies, including telemedicine portals.



**Figure 2:** Depicting Technology Usage Patterns Among Nurses

### 3. Perceived Impact of Technology on Nursing Roles

Most respondents (50%) strongly agreed and 35% agreed that technology use enhanced patient documentation, meaning that most positively responded to digital record-keeping systems in Table 3. Likewise, improved communication between staff and patients was also well known, with 40 percent of the nurses agreeing strongly and 40 percent agreeing with the statement.

**Table 3:** Nurses' Perceptions of the Impact of Technology on Their Roles

Nursing Role	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
Improved patient documentation	50%	35%	10%	3%	2%
Enhanced communication	40%	40%	10%	7%	3%
Better clinical decision-making	45%	35%	12%	5%	3%
Reduced workload	25%	30%	20%	15%	10%



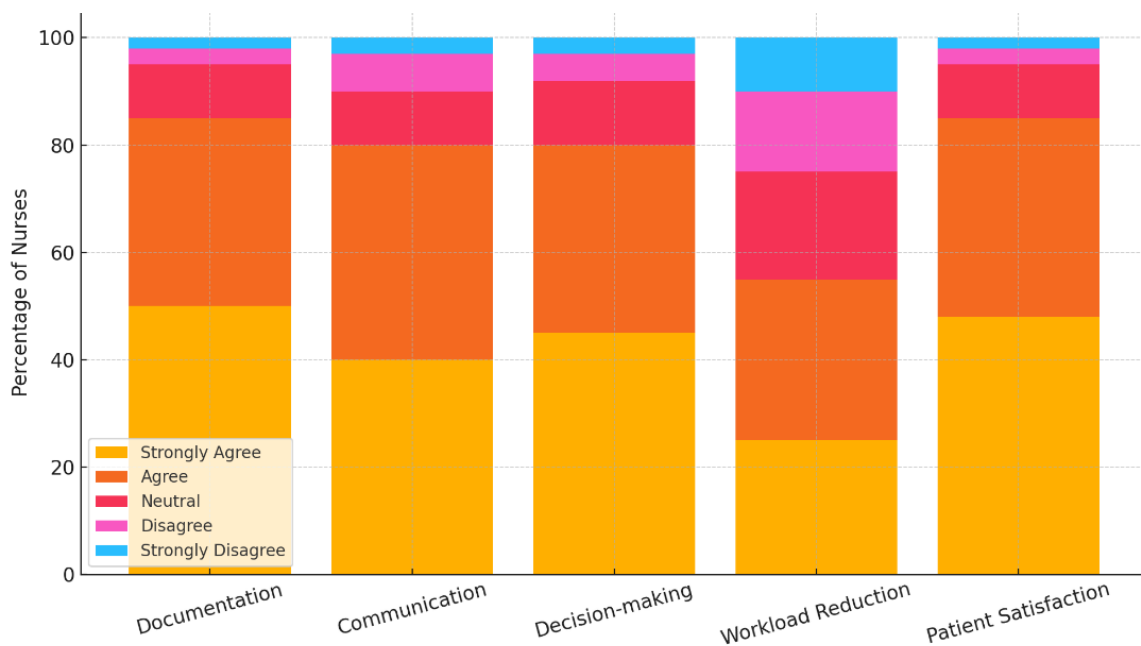
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Increased patient satisfaction	48%	37%	10%	3%	2%
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Regarding clinical decision-making, 45 percent of the nurses strongly agreed and 35 percent agreed that technology had assisted in making improved and quicker clinical decisions. This implies that the availability of electronic health records and decision-support tools positively influenced nursing care delivery. However, the view of a reduction in workload was more mixed. The percentage of people strongly agreeing that technology decreased their workload was 25, 30 agreed, and 20 were neutral. Interestingly, 15 and 10 percent disagreed and strongly disagreed, which shows that some nurses might have felt that some technologies were time-consuming or cumbersome in Figure 3.



**Figure 3:** Perceived Benefits of Technology Use

Finally, a significant percentage of respondents (48 percent strongly agreed and 37 percent agreed) thought that technology had improved patient satisfaction, possibly because of better communication, documentation accuracy, and care delivery at the right time. All these findings showed that there were positive perceptions of technology in most of the roles of the nurses, but there were other areas where this perception was not very positive, like the effect on workload.

#### 4. Attitudes Toward Technology Integration

The attitudes were rated on a scale of 1-5, where a higher score indicated better perceptions of the application of modern technology in nursing practice. Attitude scores of ICU, Surgical, and



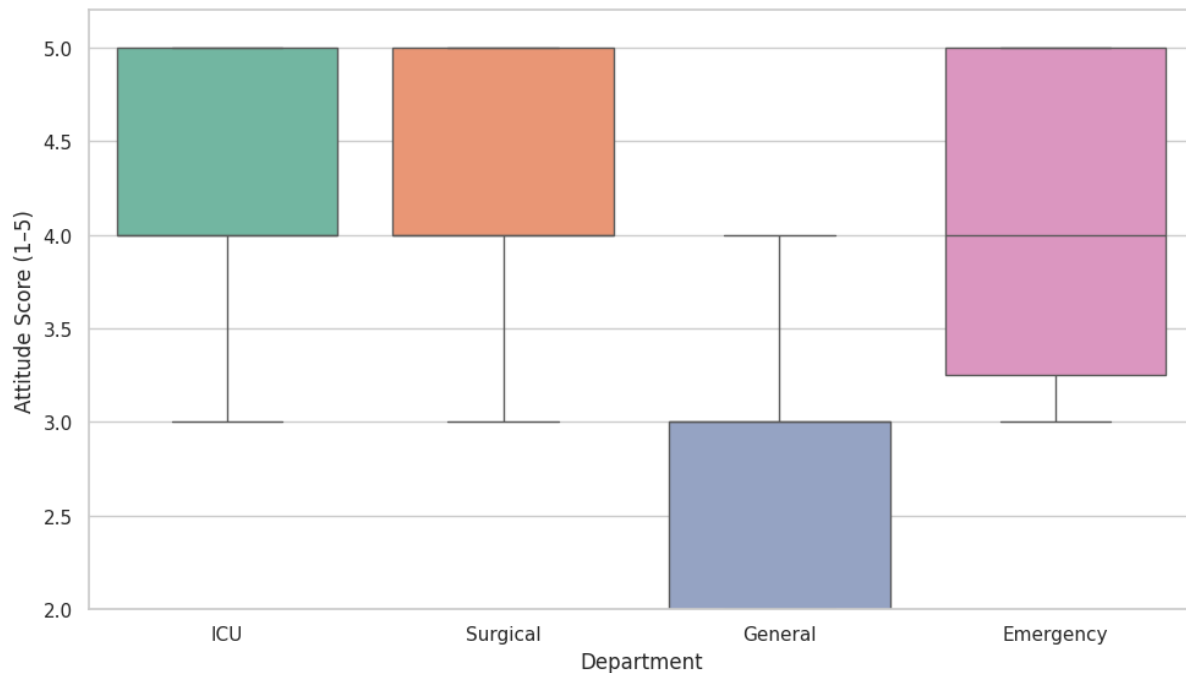
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Emergency nurses were relatively high and stable, with the median of 4.0 and the upper quartile of 5.0. Their answers were not significantly different, meaning the nurses in such settings were somewhat positive about using technology in their operations, as shown in Figure 4.

Comparatively, nurses in the General Ward exhibited a lesser and more spread out distribution of attitude scores, where the median stood at 3.0 and the lower whisker at 2.0. This meant a less desirable or neutral view of them than their counterparts in other departments. Altogether, the box plot demonstrated that nurses who worked at more technologically advanced or high-acuity units (ICUs, surgical wards) had a more positive attitude toward technology than nurses who worked in general care settings.



**Figure 4:** Attitude Scores Across Departments

### 5. Correlation Between Technology Use, Attitude, and Experience

Attitude and practice also had a positive correlation of 0.55, which implies that the more the nurses had a favorable attitude towards technology, the higher the likelihood of practicing effectively. Finally, the correlation between knowledge and attitude was the lowest, with 0.42, which still showed a moderate positive relationship. Knowledge and practice had the highest correlation coefficient of 0.61, indicating that the knowledge level had a moderate correlation with the practice of infection control.

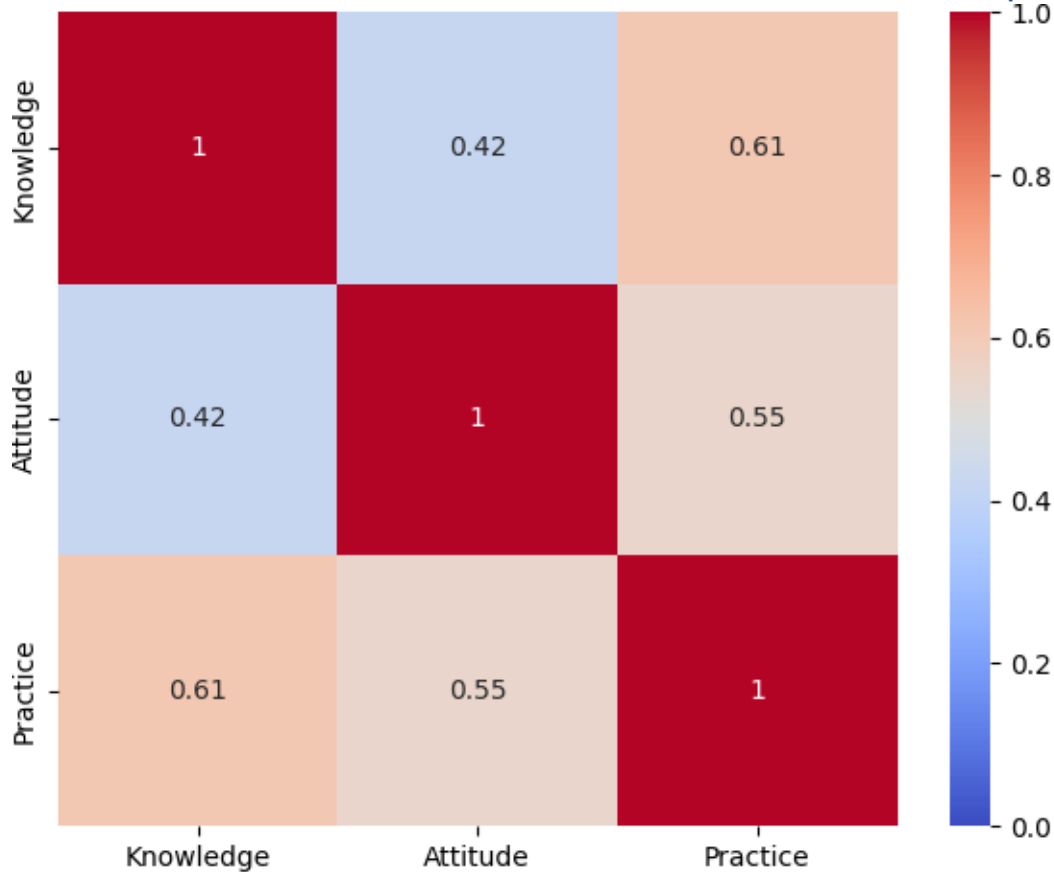
The heatmap plotted in Figure 5 exhibits the intensity of such associations using a red-blue color gradient, and the values on the diagonal were perfect correlations (value = 1), as each variable was perfectly correlated with itself. This number proved that enhancing knowledge and attitudes could positively impact nurses' practices using modern healthcare technology.



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**Figure 5:** Heatmap of Correlations Between Knowledge, Attitude, and Practice Variables

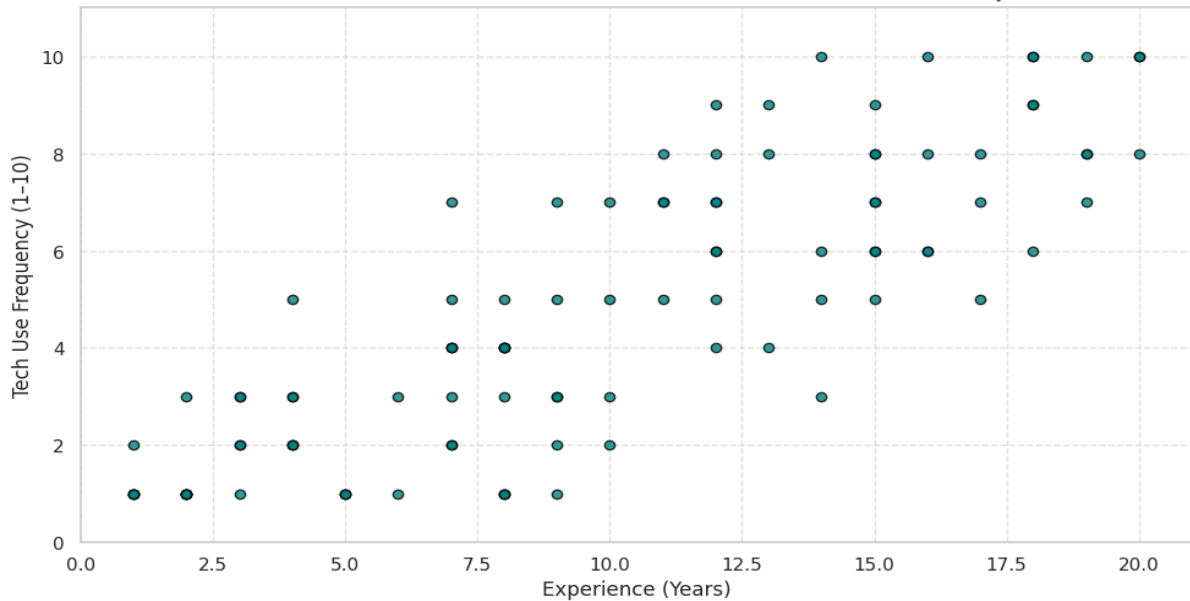
Data points were distributed in a positive trend: the more nursing experience (15-20 years), the higher the frequencies of technology use (scores of 7 to 10). Contrastingly, less experienced nurses (1-5years) were concentrated in lower frequencies of tech use, 1-4. Though the mid-range range experience (6-12 years) was somewhat variable and overlapping, the general trend was that more experienced nurses used the technology more frequently, which could be attributed to their exposure to a broader range of tools, confidence, or the duties within their department that necessitated the use of advanced tools. This scatter plot graphically highlights a moderate positive correlation between experience and technological integration in the nursing practice in Figure 6.



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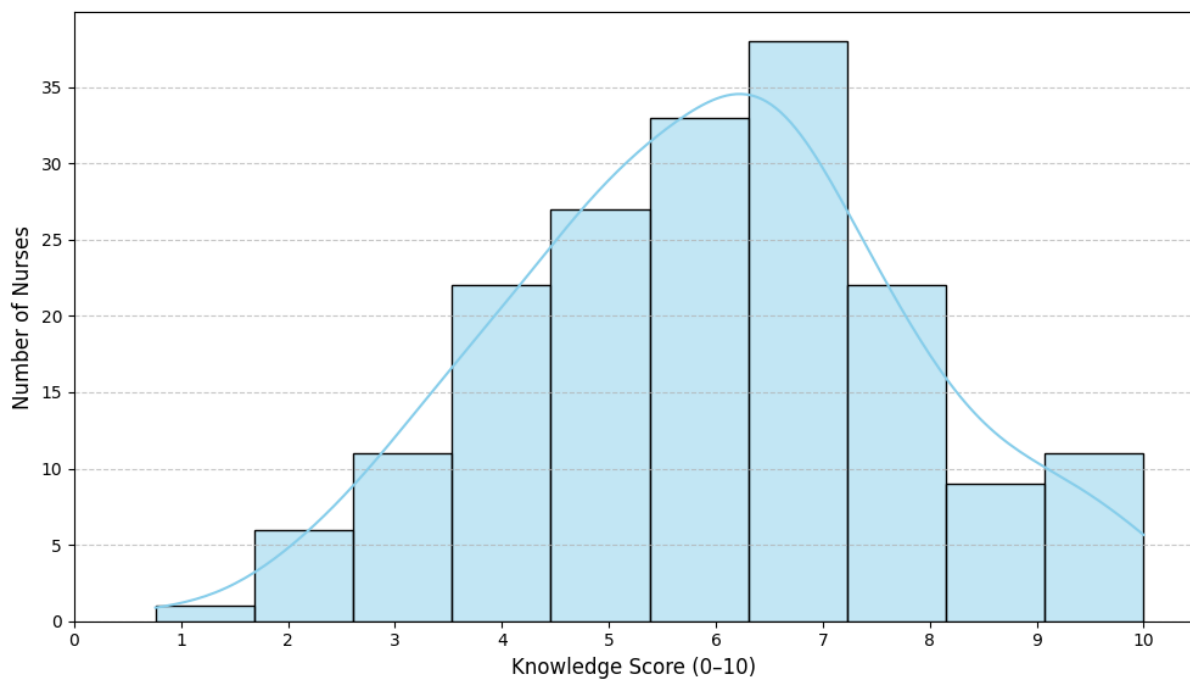
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**Figure 6:** Relation between Experience and Frequency of Technology Use

## 6. Knowledge Levels and Training Sufficiency

Figure 7 contained ten bins and presented a positively skewed bell-shaped curve superimposed as a kernel density estimate (KDE) to bring out the general shape of the data. The scores were mainly concentrated between scores 5 and 7, with the highest frequency being in score 7, where about 38 nurses were under this score.



**Figure 7:** Distribution of Knowledge Scores Among Nurses



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As the scores progressed to the lower and higher ends of the scale (0-3 and 9-10), there was a gradual reduction in the number of nurses. Fewer nurses had very low or very high scores in the knowledge scale. The distribution implied that most nurses showed moderate knowledge, with a tiny proportion getting very low or very high scores.

## **Discussion**

This paper aimed to examine the role of nurses in implementing modern healthcare technologies in a hospital, their knowledge, attitude, and usage patterns, and how they see their role and its impact on patient outcomes. The main findings indicated that most nurses had a moderate level of knowledge, a positive attitude towards technology, and different levels of technology adoption. Electronic Health Records (EHRs) and patient monitoring systems were the most widely used tools, whereas telemedicine portals were not routinely used. The relationships between the domains of knowledge, attitude, and practice were found to be positively correlated. They indicated the interdependence of the mentioned domains in the context of effective technology integration.

These findings align with other literature indicating the importance of technological competence in modern nursing. One of the studies by Wang et al. (2021) stressed that highly digitally literate nurses would be more willing to effectively use technology in treating patients, which would improve the accuracy of documentation and clinical decision-making [17]. The above-average attitude scores of the nurses of the ICU and surgical wards also confirm earlier studies that high-acuity areas are generally the first to adopt technology because patient care in these environments is complex and life-threatening [18].

Besides, the general perspective of enhancing communication and patient satisfaction is consistent with the findings of Skog et al. (2022), who noted that digital technologies, such as EHRs and smart infusion pumps, promote communication and improved safety outcomes [19]. Nevertheless, ambivalent attitudes towards reducing workload also reflected the issues mentioned by Heponiemi et al. (2021), which suggested that efficiency can be increased with the help of technology, but can also strain clinical personnel when implemented incorrectly or when a sufficient amount of training is not provided [20].

The moderate positive correlation of knowledge, attitude, and practice is in tandem with the Technology Acceptance Model (TAM), which assumes that perceived ease of use and usefulness determine the behavioral intentions of technology adoption [21]. The scatter plot provided in this study indicates that the frequency of tech use rises with the increased clinical experience of nurses, which could indicate that clinical experience leads to confidence and familiarity with digital tools, which was also found by Wosny et al. (2023) in hospital-based contexts [22].

Although this study has promising insights, there were some limitations. The data was based on self-reports, which can be subject to response bias. The research was further cross-sectional,



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so there were no causal conclusions. The particular departments selected for the sample cannot be generalized to the entire healthcare environment. In future studies, longitudinal designs can also be applied to determine the long-term effects of training interventions on the use of technology. In addition, qualitative evaluations would be able to further the insight into the contextual barriers and enablers across the various units of the hospital. It is suggested that the use of telemedicine be promoted, digital training be standardized, and interventions be customized to the needs of different departments in order to maximize nursing input in the tech-enhanced healthcare environment.

## **Conclusion**

The research results indicated the considerable importance of healthcare technology in augmenting the practice of nursing and patient outcomes. Most nurses demonstrated a moderate to high level of knowledge, especially in high acuity units, including ICUs and surgery wards, where they had a more positive attitude towards technology. Such technologies as electronic health records (EHRs) and patient monitoring systems have become very popular. However, tools like telemedicine portals were used less, so areas still require more integration. The overall view of nurses towards technology was that it is helpful, especially in enhancing documentation, communication, and clinical decision-making. However, there were divided views on whether it helps to reduce the workload. The correlation analysis showed a moderate positive correlation between knowledge, attitude, and practice, which highlighted that more knowledge and positive perceptions would help in the effective use of technology. Moreover, the more experienced the nurses are, the more they use technology, indicating a higher adaptation level. In general, the findings indicate that specific training, the increased availability of technology, and department-specific interventions can further streamline the use of technology and nursing productivity in a clinical environment.

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