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ASSESSMENT OF NURSING STUDENTS' PERCEPTIONS TOWARDS THE USE OF TECHNOLOGY AND MONITORS IN ICU PATIENT CARE

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Abstract

Background: *Advanced technology and physiological monitoring systems are integral to modern Intensive Care Units (ICUs) and play a vital role in ensuring patient safety and high-quality nursing care. Nursing students, as future ICU practitioners, must be adequately prepared to use these technologies; however, their perceptions and readiness remain insufficiently explored.*

Objective: *To assess nursing students' perceptions regarding the usefulness of technology and monitors in providing patient care in the ICU.*

Methods: *A descriptive cross-sectional study was conducted at the College of Nursing, Fatima Jinnah Medical University (FJMU), Lahore. Data were collected from 171 BSN nursing students using a structured questionnaire through convenience sampling. Analysis was performed using SPSS version 26, and findings were presented using descriptive statistics.*

Results: *Most students perceived ICU technology as beneficial for improving patient safety, care efficiency, and professional learning. Nonetheless, many expressed concerns about technology-related errors, psychological stress, reduced psychosocial care, and low self-confidence in managing complex devices.*

Conclusion: *Nursing students recognize the value of ICU technology but report limited confidence in its use, highlighting the need for enhanced hands-on training and supportive educational strategies.*

INTRODUCTION

The modern healthcare system has been profoundly transformed by the rapid integration of advanced technologies, a shift that is most evident in Intensive Care Units (ICUs), where patient care is highly dependent on sophisticated monitoring and life-support systems (Yadav, 2024; Mao et al., 2023). ICUs are equipped with ventilators, infusion pumps, and continuous physiological monitors that provide real-time data on vital parameters such as heart rate, blood pressure, and oxygen saturation, enabling early detection of clinical deterioration and timely life-saving interventions (Verderber et al., 2021; van de Sande et al., 2021). Globally, the expansion of critical care technology has been driven by increasing critical illness burden, aging populations, chronic diseases, and public health emergencies such as the

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COVID-19 pandemic, which underscored the indispensable role of ICU technology in patient survival (Dudas et al., 2023; Jalal et al., 2023; Tronstad et al., 2023).

Despite widespread efforts to modernize hospital infrastructure, including targeted investments in advanced ICUs across both developed and developing countries, disparities persist in the availability and distribution of critical care technology, particularly between urban and rural settings (Ashraf et al., 2025; Crowley et al., 2023; Oliinyk et al., 2024). National health policies increasingly emphasize technological integration to standardize and enhance the quality of critical care services, as reflected in the growing number of accredited hospitals equipped with advanced monitoring systems (Sajjad et al., 2024; Sharieff et al., 2024). Within this complex technological environment, nurses function as the primary interface between patients and machines, responsible for operating devices, interpreting data, and integrating technological information into holistic patient care. This expanded role requires advanced clinical judgment to distinguish true physiological changes from artifacts, directly influencing patient safety and care outcomes (Alshammari & Fayez Alanazi, 2023; Gause et al., 2022; Booth et al., 2021).

Preparing nursing students for this technologically intensive ICU environment is therefore essential. While nursing education aims to bridge theory and practice, students often experience a steep learning curve during ICU clinical placements due to alarm fatigue, device complexity, and high patient acuity, which can affect their confidence and performance (Hakvoort et al., 2022; Labrague et al., 2023). Students' perceptions of ICU technology are shaped by their digital literacy, prior exposure, educational preparation, and the attitudes of clinical preceptors, influencing how they balance technology-driven care with patient-centered, compassionate nursing practice (Gaughan et al., 2022; Kim & Ahn, 2021; Han et al., 2025; Alkhuzaimi et al., 2025). Understanding these perceptions is crucial, as they play a formative role in shaping future nursing practice. Therefore, this descriptive cross-sectional study aims to assess nursing students' perceptions of technology and monitoring systems in ICU settings at the College of Nursing and Midwifery, Fatima Jinnah Medical University, Lahore.

Materials and Methods

This quantitative, descriptive cross-sectional study was conducted at the College of Nursing and Midwifery, Fatima Jinnah Medical University (FJMU), Lahore, over a period of six months following approval of the research synopsis. The study population comprised undergraduate nursing students enrolled in the third and fourth years of the BSN program who had completed at least one clinical rotation in the Intensive Care Unit (ICU). From a total population of 300 students, a sample size of 171 was calculated using Slovin's formula with a 5% margin of error. Participants were recruited using a convenience sampling technique. Students from the first and second years, those without direct ICU patient care experience, postgraduate students, registered nurses, and students absent during the data collection period were excluded.

Data were collected using a structured questionnaire adapted from Elnaggar et al. (2024). The instrument consisted of two sections: demographic characteristics (age, marital status, and academic year) and a 14-item perception scale assessing nursing students' views on the use of technology and monitors in ICU patient care. The perception scale included six items measuring positive perceptions and eight items assessing negative perceptions. Content and construct validity were established through expert review, and reliability analysis demonstrated excellent internal consistency, with a Cronbach's alpha of 0.89 for the overall scale, 0.85 for the positive perception subscale, and 0.82 for the negative perception subscale.

Following ethical approval from the Ethical Review Committee of Fatima Jinnah Medical University and administrative permission from the College of Nursing and Midwifery, informed written consent was obtained from all participants. Participation was voluntary, and confidentiality and anonymity were strictly maintained in accordance with the Helsinki Declaration. Data were analyzed using SPSS version 26, applying descriptive statistics such as frequencies, percentages, means, and standard deviations, with results presented in tables, figures, and graphs.

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Results

Table 1: Distribution of Participants on the basis of their Demographic Variables

Demographic Variables		Frequency (Percentage)
Age	<18 Years	0 (0%)
	18-22 Years	142 (83%)
	>22 Years	29 (17%)
Gender	Male	0 (0%)
	Female	171 (100%)
Year of Study	3rd Year	89 (52%)
	4th Year	82 (48%)
Marital Status	Single	165 (96.5%)
	Married	6 (3.5%)
	Separated/Widowed/Divorced	0 (0%)

The demographic profile reveals a cohort of 171 nursing students who are predominantly young and in the early stages of their professional and personal lives. The vast majority (83.0%) are aged 18-22, positioning them as digital natives whose perceptions of ICU technology are likely shaped by inherent comfort with digital interfaces. Furthermore, the near-even split between 3rd-year (52.0%) and 4th-year (48.0%) students is critical, as it allows for an examination of how advancing clinical exposure influences their understanding of patient monitors. The fact that 96.5% of participants are single further defines this as a sample primarily focused on their academic and clinical training.

Table 2: Frequency and Percentage Distribution Regarding Positive Perception

Perception	Score Range	Frequency (%age)	Mean ± S.D
Low Positive	6-14	26 (15.2%)	12.1±1.8
Moderately Positive	15-22	85 (49.7%)	18.9±2.1
High Positive	23-30	60 (35.1%)	26.3±1.9
Total			21.8±4.5

Table 2 shows that the largest group of respondents (85 respondents, 49.7%) fall into the Moderate Positive Perception category. This indicates that nearly half of the population holds a balanced view, recognizing some benefits of technology but not perceiving them as overwhelmingly strong. A substantial number of respondents (60 respondents, 35.1%) are in the High Positive Perception category. This group holds a strongly favorable belief that technology significantly enhances care effectiveness, patient safety, and nursing efficiency. A smaller segment of the sample (26 respondents, 15.2%) demonstrate Low Positive Perception. This group is relatively skeptical and reports weaker agreement with the proposed benefits of employing technology in the ICU. The total mean score for the positive perceptions scale was M = 21.8 (SD = 4.5), which falls within the "Moderate Positive Perception" range. This indicates that, on average, respondents agree with the benefits of technology.

Table 3: Frequency and Percentage Distribution Regarding Negative Perception

Perception	Score Range	Frequency (%age)	Mean ± S.D
Low Negative	8-18	45 (26.3%)	15.4±2.3
Moderately Negative	19-29	98 (57.3%)	23.7±2.9
High Negative	30-40	28 (16.4%)	33.5±2.5
Total			23.1±5.8

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Table 3 shows that the majority of respondents (98 respondents, 57.3%) fall into the Moderate Negative Perception category. This indicates that most of the sample acknowledges a significant level of concern about the drawbacks of technology, such as patient risks, increased stress, and barriers to patient-centered care. A smaller, but notable, group of respondents (28 respondents, 16.4%) are in the High Negative Perception category. This group holds strong concerns and perceives the risks and negative impacts of technology as being very high.

Just over a quarter of the sample (45 respondents, 26.3%) demonstrate Low Negative Perception. This group is relatively untroubled by the potential drawbacks and reports minimal concerns about the negative aspects of technology in the ICU.

The total mean score for the negative perceptions scale was M = 23.1 (SD = 5.8), which falls within the "Moderate Negative Perception" category, signifying a significant level of concern among the staff.

Discussion

The demographic characteristics of the participants provide an important context for interpreting their perceptions of ICU technology. The study sample was predominantly young, female, and composed of senior nursing students, a profile that is largely consistent with contemporary nursing cohorts. The high proportion of participants aged 18–22 years supports their classification as “digital natives,” a finding comparable to that reported by Han et al. (2025). Despite presumed familiarity with digital tools, this group demonstrated considerable anxiety and low self-confidence in clinical technology use, suggesting that digital exposure alone does not equate to competence or confidence in high-acuity clinical environments. The exclusively female composition of the sample offers a focused insight into the perceptions of the core nursing workforce and avoids gender-based variability observed in other studies, such as that by Habib et al. (2024). Additionally, the nearly equal representation of third- and fourth-year students provides a broader academic perspective than studies limited to final-year cohorts, indicating that challenges related to confidence and clinical pressure persist across advanced stages of training (Abdelaziz, 2023).

With regard to positive perceptions, the findings demonstrate that nursing students largely recognize technology as an essential and beneficial component of ICU patient care. The majority of participants reported moderate to high positive perceptions, reflecting a strong belief in technology’s role in enhancing patient safety, improving care effectiveness, and supporting clinical decision-making. These results align closely with previous research by Labrague, Aguilar-Rosales, Yboa, and Sabio (2023), which similarly reported favorable attitudes toward technology among nursing students and practicing nurses. However, the predominance of moderate rather than high positive perceptions suggests a balanced perspective, where students acknowledge the advantages of technology while remaining aware of its limitations. This measured acceptance indicates that technology is viewed as a supportive tool rather than a substitute for clinical judgment, reinforcing the notion that technological proficiency is a fundamental component of safe and effective critical care practice.

In contrast, negative perceptions were also prominent, highlighting the complexity of students’ experiences with ICU technology. A substantial proportion of participants reported moderate to high negative perceptions, reflecting concerns about device-related errors, increased cognitive workload, psychological pressure, and reduced focus on patient-centered care. These findings differ from those of Gaughan et al. (2022), who reported minimal anxiety in settings with extensive simulation-based preparation, suggesting that real-world clinical exposure presents challenges not fully addressed through current training approaches. The presence of a subgroup with high negative perceptions further emphasizes that technology can be a source of stress and diminished confidence, contrasting with studies such as Wang et al. (2023), which reported empowering effects of technology on nurses. This divergence underscores the influence of contextual factors, including inadequate hands-on training, high patient acuity, and insufficient institutional support. Collectively, these findings highlight the need for enhanced educational strategies, ongoing clinical mentorship, and supportive work environments to

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mitigate negative perceptions and promote confident, competent use of ICU technology.

Conclusion

In conclusion, this study reveals that nursing students possess a nuanced, dualistic perception of ICU technology, strongly acknowledging its benefits for patient care and professional development while simultaneously expressing significant concerns about its potential to induce psychological pressure, erode confidence, and depersonalize patient interactions. These findings underscore a critical "confidence gap" between theoretical appreciation and practical readiness, highlighting an imperative for nursing educators and clinical institutions to collaboratively develop targeted educational strategies, such as enhanced simulation training and robust mentorship programs, to better equip the next generation of nurses with the technical proficiency and psychological resilience required to harness technology effectively without compromising the essential human element of compassionate care.

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