

EXPLORING THE IMPACT OF TECHNOLOGY ON NURSING PRACTICE: A CROSS-SECTIONAL STUDY AT SHAIKH ZAYED HOSPITAL, LAHORE

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Abstract

Introduction: Technology integration in nursing has transformed clinical workflows and patient outcomes. This study evaluates how technology influences nursing practices in a tertiary care hospital. Objective: To assess the impact of healthcare technology on nursing practice, including its effects on efficiency, patient safety, communication, and nurse perceptions. Methods: A cross-sectional analytical study was conducted with 240 registered nurses at Shaikh Zayed Hospital Lahore using a Likert-scale questionnaire. Descriptive statistics, chi-square, t-tests, and ANOVA were used for analysis (SPSS v20). Results: Technology positively influenced documentation accuracy, communication, and time management. Nurses with 6–10 years of experience showed higher confidence in EHR use. Gender and age did not significantly impact perception, though education level correlated with perceived improvements in patient safety ($p=0.002$). Conclusion: Technology significantly improves nursing efficiency and safety but also presents challenges such as overload and insufficient training. Continuous professional development and structured implementation are recommended.

INTRODUCTION

Nursing practice has undergone a substantial transformation with the integration of healthcare technology, redefining traditional roles and enhancing patient care outcomes. The advent of electronic health records (EHRs), telemedicine, mobile health applications, and wearable devices has significantly altered how nurses deliver care, communicate with patients, and collaborate with interdisciplinary teams (Crocker & Timmons, 2022). These technological innovations have not only improved the quality and efficiency of nursing care but also expanded access to healthcare, especially in underserved areas (Fagerström et al., 2021).

Healthcare technology has enabled nurses to access real-time patient information, make informed decisions, and provide evidence-based interventions. With the evolution of nursing informatics, education and training of nurses have become more interactive and accessible, equipping them with modern tools like simulations, telehealth, and digital assessments. This shift has empowered nurses to become critical stakeholders in the digital healthcare landscape. Despite its numerous benefits, the integration of technology in nursing practice also poses challenges. These include high implementation costs, data security concerns, and resistance to change among

staff. Nurses often report feelings of stress and confusion when adapting to rapidly evolving digital systems, especially when adequate training is lacking (Fox & Abrahamson, 2022). The need for continuous professional development and institutional support is crucial for ensuring smooth transitions and effective use of digital tools. The cultural image of nursing has also evolved under the influence of media and technological advancements. As digital care models like telehealth become mainstream, the public perception of nursing is shifting toward a more technologically adept and essential profession. However, this shift also requires thoughtful integration of sociocultural considerations and policy development. In Pakistan, where healthcare resources are often strained, technological advancements have presented an opportunity to bridge gaps in patient care. With limited human resources in rural regions, technologies such as EHRs and telemedicine allow nurses to efficiently manage patient loads while maintaining quality care standards. Nonetheless, resource limitations, including insufficient infrastructure and training programs, continue to hinder optimal implementation. Robotic systems and AI-powered diagnostics, though still in early phases, are beginning to influence the nursing workflow by minimizing human error and improving precision in care delivery. Wearable health monitors are also gaining traction as tools for chronic disease management, giving nurses real-time insights into patient behaviors and treatment adherence (Wu et al., 2023).

As the nursing profession continues to evolve in the digital age, integrating new technologies must go hand-in-hand with structured training, ethical safeguards, and equitable access. This comprehensive approach will ensure that technology enhances rather than complicates the delivery of high-quality nursing care.

Methodology

Study Design and setting

This study employed a cross-sectional analytical design conducted at a tertiary care hospital, Shaikh Zayed Medical Complex in Lahore, after obtaining approval from the Institutional Review Board (IRB).

Study Duration: The study was conducted over six months, from July 2024 to December 2024, to ensure adequate time for data collection and analysis.

Study Population: The target population included nurses (MSN, Post RN, BSN, Diploma) working at Shaikh Zayed Hospital, Lahore.

Sampling Method: A non-probability purposive sampling method was utilized to select participants for the study.

Inclusion Criteria

- Registered nurses currently practicing at Shaikh Zayed Hospital, Lahore.
- Nurses with at least six months of experience using healthcare technology in their practice.

Exclusion Criteria

- Nurses with less than 6 months of experience using healthcare technology in their practice.
- Nurses who are not registered.
- Nurses who are currently practicing but have no experience using healthcare technology.
- Nurses who are unable or unwilling to provide informed consent to participate in the study.

Data Collection Instrument: Data was collected using a pre-approved and adopted questionnaire that included Likert scale options. Responses for each statement were rated on a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree."

Data Collection Procedure: The sample size of 240 participants was calculated using Slovin's formula with a 0.05 margin of error and a 95% confidence level. Written informed consent was obtained from all participants, and data collection was carried out using self-administered questionnaires.

The study was divided into two parts:

Demographic Information: Included participants' age, gender, years of nursing experience, level of education, and primary work setting.

Technology Variables: Focused on the usage of technology in nursing practice, its impact on patient

safety and care, challenges in technology use, and overall perceptions of technology in nursing.

Data Analysis: The collected data was analyzed using SPSS software (Version 20). Descriptive statistics, such as frequencies and percentages, were used to summarize demographic data and individual responses. Mean scores and standard deviations were calculated for Likert scale items.

One-Way ANOVA was conducted to compare overall scores among participants categorized by age, experience, and qualifications. Independent Sample t-tests were used to compare scores between genders. Chi-square and Likelihood Ratio Tests were applied to assess associations between individual traits of technology use and variables such as age, gender, experience, and qualification. From this part only significant or near to significant were presented. The results with p-value ≤ 0.05 were considered statistically significant.

Ethical considerations: The study is in accordance to the declaration of World Medical Association (WMA) made at Helsinki year 2023 regarding the ethical principles for medical research involving human.

Sample Size Calculation

Slovene’s Formula

$$\text{Sample Size} = N / (1 + Ne^2) \quad N = \text{population size} \quad e = \text{margin of error}$$

N = 600
E = 0.05

$$\text{Sample Size} = N / (1 + Ne^2)$$

$$\text{SS} = \frac{600}{1 + 600 \times (0.05)^2}$$

$$= \frac{600}{1 + 600 \times (0.0025)}$$

$$= \frac{600}{2.5}$$

Sample Size: 240 (Staff Nurses)

Results:

The findings indicate that technology enhances efficiency in documentation, patient safety, and medication administration accuracy. Nurses with mid-career experience (6–10 years) exhibited greater confidence in using electronic health records (EHRs) compared to early-career professionals. Female nurses were more likely to perceive technology as beneficial

for balancing administrative tasks with patient care. However, a significant proportion of participants expressed concerns about technology being time-consuming and overwhelming. The study also found a strong association between education level and the perceived impact of technology on patient safety, with Post RN nurses demonstrating the highest level of agreement.

Demographics Variables Results:

This section of the results contains demographic characteristics which include Participants Gender, marital status, Education etches and Study variables. Total 240 nursing staff participated in this study of which about 52% were Male and 48% were female. Post RN BSN 26.7%, Generic BSN 25.8%, Diploma in Nursing 22.5%, and Others 25.0%.

Table 1 Age distribution of nursing staff evaluated for role of technology in their professional life

Age (Years)	N	%
18-25	48	20.0
26-35	107	44.6
36-45	15	6.2
46-55	33	13.8
> 55	37	15.4
Total	240	100.0

The age distribution of the sample of the 240-nursing staff assessed about the role of technology in their professional life shows that most respondents were aged 26-35 years, counting 44.6% of the respondents. Second, the sample was represented by the group aged 18-25 years, which accounted for 20.0% of the sample. The proportion was smaller and consisted of participants aged between 46-55 years and those older than 55 years, accounting for 13.8% and 15.4%, respectively. The least represented age group was 36-45 years, at 6.2%. The distribution indicates that most of the participants are in the younger or mid-career stages of their professional lives. See in Table 1

The gender distribution of the evaluated nursing staff shows a close to equal representation of males and females, with a slight edge of females (52.08%) compared to males (47.92%). This balanced distribution ensures both genders are well-represented in the study to provide comprehensive

Total Participants: 240 Nursing Staff
 Gender Distribution: 52% Male, 48% Female

Age Distribution:

- 18-25 years: 20%
- 26-35 years: 44.6%
- 36-45 years: 6.2%
- 46-55 years: 13.8%
- >55 years: 15.4%

Education Levels:

- Post RN BSN: 26.7%
- Generic BSN: 25.8%
- Diploma in Nursing: 22.5%
- Others: 25%

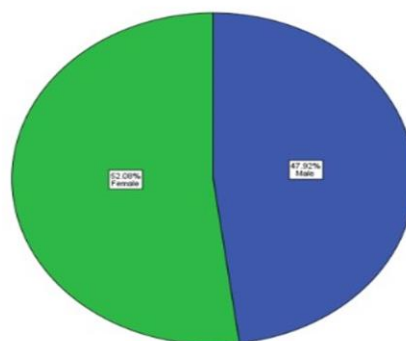


Figure 1 Gender distribution of nursing staff evaluated for impact of technology on their job

Table 2 Working experience of nursing staff evaluated for role of technology in their professional life

Working Experience (Years)	n	%
Less than 1 year	63	26.2
1 - 5 Years	54	22.5
6 -10 Years	63	26.2
More than 10 Years	60	25.0
Total	240	100.0

The experience of the nursing staff surveyed regarding the role of technology in their professional life is spread evenly across the categories. The largest groups are those with less than 1 year of experience and those with 6-10 years of experience, both of which account for 26.2% of the sample. Those with more than 10 years of experience make up 25.0%, and those with 1-5 years account for 22.5%. This distribution would have indicated a sample of heterogeneous representation with both early careerists and experienced nursing staff representation, giving a very panoramic view of the role technology plays in professional practice. (See Table 2.)

Table 3 Education levels of nursing staff evaluated for role of technology in their professional life

Education level	n	%
Diploma in Nursing	54	22.5
BSN Generic	62	25.8
General Nursing (Post RN)	64	26.7
Any other	60	25.0
Total	240	100.0

The education levels of the nursing staff assessed for the role of technology in their professional life are fairly balanced. The largest group consists of those with a General Nursing (Post RN) qualification, at 26.7% of the sample. Those with a BSN Generic degree account for 25.8%, closely followed by participants with other qualifications at 25.0%. Nursing staff with a Diploma in Nursing account for 22.5%. This variation in educational background points to the diversity in professional preparation among participants, which in turn may influence their view about technology in nursing practice. (Table 3)

Table 4 Response of nursing staff to individual questions related to role of technology in their professional life

	Strongly Disagreed		Disagreed		Neutral		Agreed		Strongly Agreed	
	n	%	n	%	n	%	n	%	n	%
Technology improves the quality of care I provide to patients.	46	19.2	45	18.8	45	18.8	60	25.0	44	18.3
I feel confident using electronic health records (EHR) in my daily practice.	42	17.5	46	19.2	49	20.4	56	23.3	47	19.6
The use of technology has reduced the time I spend on patient documentation.	50	20.8	47	19.6	37	15.4	56	23.3	50	20.8
The introduction of new technologies has improved my efficiency as a nurse.	39	16.2	50	20.8	41	17.1	56	23.3	54	22.5
I regularly use technology to communicate with other healthcare professionals.	55	22.9	47	19.6	42	17.5	56	23.3	40	16.7
Technology enhances patient safety in my healthcare setting.	51	21.2	47	19.6	38	15.8	53	22.1	51	21.2
Patient monitoring systems help me provide better care to my patients.	53	22.1	35	14.6	47	19.6	56	23.3	49	20.4
I believe that telehealth services have made healthcare more accessible for patients.	43	17.9	45	18.8	45	18.8	57	23.8	50	20.8
The use of technology has improved the accuracy of medication administration.	60	25.0	52	21.7	34	14.2	48	20.0	46	19.2
Technology helps prevent errors during patient care (e.g., medication errors, treatment delays).	47	19.6	56	23.3	48	20.0	43	17.9	46	19.2
I often encounter technical difficulties while using healthcare technology.	27	11.2	57	23.8	52	21.7	53	22.1	51	21.2
I feel that the training provided for using new technologies is sufficient.	50	20.8	49	20.4	46	19.2	49	20.4	46	19.2
The use of technology can be overwhelming and time-consuming.	47	19.6	51	21.2	43	17.9	59	24.6	40	16.7
There is adequate technical support available when I face challenges with technology.	48	20.0	48	20.0	59	24.6	34	14.2	51	21.2
I feel that healthcare technology sometimes negatively impacts my direct interactions with patients.	42	17.5	50	20.8	42	17.5	60	25.0	46	19.2
Technology has positively transformed nursing practice in the past decade.	48	20.0	46	19.2	49	20.4	43	17.9	54	22.5
I believe technology has made communication between healthcare teams more efficient.	40	16.7	46	19.2	43	17.9	56	23.3	55	22.9
Technology has made it easier for me to balance administrative tasks with patient care.	43	17.9	47	19.6	41	17.1	57	23.8	52	21.7
I believe healthcare would improve with the continuous integration of advanced technologies.	53	22.1	49	20.4	35	14.6	51	21.2	52	21.7
Overall, I am satisfied with the role of technology in my nursing practice.	44	18.3	47	19.6	48	20.0	48	20.0	53	22.1

The comparison of aggregate scores among different demographic and professional categories, such as age, gender, experience, and educational qualifications, does not show any statistically

significant differences across the groups since all the p-values are greater than 0.05. For age ranges, the mean scores ranged from 58.8 (46-55 years) to 61.6 (>55 years). The scores of participants with ages 46-55 years are slightly lower compared to other age groups but not significant ($p = 0.349$) **One Way ANOVA test**. For gender, the mean scores are almost the same, with males scoring 60.6 and females scoring 61.0, meaning no meaningful difference ($p = 0.615$) **independent sample t-test**. For experience in working, scores increased somewhat with experience, but again the highest mean score 61.4 was found at those having 6-10 years of experience. The lowest mean score 59.7 is reported

among those with less than 1 year of experience. However, those differences are not significant with a value of ($p = 0.440$) **one-way ANOVA test**. In terms of educational qualifications, those who hold a General Nursing (Post RN) qualification had the highest mean score at 61.5, while those who hold a BSN Generic degree reported the lowest mean score at 60.3. However, the differences are slight and not statistically significant ($p = 0.696$) **chi-square test**. Overall, these results suggest that perception of technology use in the nursing practice is consistent in all age groups, both genders, work experience, and educational background, hence no significant disparities among categories. (See Table 5.)

Table 5 Comparison of aggregate scores among categories of Age, gender, experience and qualification

		Score				P-value (ANOVA / t-test)
		Mean	SD	Min	Max	
Age	18-25 years	61.5	6.5	47.0	76.0	0.349
	26-35 years	60.8	6.1	44.0	80.0	
	36-45 Years	60.8	7.0	51.0	71.0	
	46-55 Years	58.8	6.2	47.0	78.0	
	> 55. Years	61.6	6.2	47.0	71.0	
Gender	Male	60.6	6.2	44.0	78.0	0.615
	Female	61.0	6.3	47.0	80.0	
Working Experience	Less than 1 year	59.7	6.6	47.0	78.0	0.440
	1 - 5 Years	60.8	5.8	44.0	75.0	
	6 -10 Years	61.4	6.0	47.0	76.0	
	More than 10 Years	61.2	6.7	47.0	80.0	
Education Level	Diploma in Nursing	60.6	6.4	47.0	75.0	0.696
	BSN Generic	60.3	6.1	47.0	80.0	
	General Nursing (Post RN)	61.5	5.5	47.0	76.0	
	Any other	60.7	7.1	44.0	78.0	

There is also a significant association between age and perceptions of technology improving the quality of care delivered to patients, with substantial variation across age groups ($P = 0.015$) **Likelihood ratio**.

For the youngest age group (18-25 years), 47.9% either agreed or strongly agreed that technology improves the quality of care, and this perception decreases in the oldest group (>55 years), with only 40.5% holding the same views. Conversely, the percentage who disagree strongly is highest in the

>55 years group (37.8%) compared to just 6.3% in the 18-25 years group. Neutral responses are most common in the 18-25 years group (31.3%) and drop significantly among older age groups (>55 years: 10.8%). This shows a trend where younger respondents are more positive about the role of technology in healthcare, and as age increases, there is a shift toward skepticism or neutrality. Refer to the table below for detailed proportions. (See Table 6)

Technology Impact Results

Table 6 Association of Age with Technology’s role in improving the quality of care provided to patients

	Age (years)					Total
	18-25	26-35	36-45	46-55	> 55	
Strongly Disagreed	3(6.3)	17(15.9)	4(26.7)	8(24.2)	14(37.8)	46(19.2)
Disagreed	7(14.6)	25(23.4)	1(6.7)	8(24.2)	4(10.8)	45(18.8)
Neutral	15(31.3)	15(14)	5(33.3)	6(18.2)	4(10.8)	45(18.8)
Agreed	12(25)	31(29)	4(26.7)	7(21.2)	6(16.2)	60(25.0)
Strongly Agreed	11(22.9)	19(17.8)	1(6.7)	4(12.1)	9(24.3)	44(18.3)
Total	48(100)	107(100)	15(100)	33(100)	37(100)	240(100)

Likelihood ratio 30.66

P-value = 0.015

The association between age and the belief that telehealth services have made healthcare more accessible for patients varies significantly across age groups (P = 0.038) **Likelihood ratio**. Younger respondents (18-25 years) were more positive, with 41.7% either agreeing or strongly agreeing, compared to just 29.7% in the oldest group (>55 years). Conversely, most disagreement is found among the age group >55, who disagree at 45.9% and strongly

disagree at 8.1%, whereas only 10.4% and 22.9% respectively occur among the 18-25 age group. The age group with the highest number of neutral responses was that 36-45 years of age, at 26.7%. Such results indicate a generational split, where younger age groups more likely than not view telehealth as enhancing access and with increasing age, skepticism arises. (For detailed percentages see Table 7)

Table 7 Association of Age with believe that telehealth services have made healthcare more accessible for patients.

	Age (years)					Total
	18-25	26-35	36-45	46-55	> 55	
Strongly Disagreed	11(22.9)	22(20.6)	2(13.3)	5(15.2)	3(8.1)	43(17.9)
Disagreed	5(10.4)	16(15)	2(13.3)	5(15.2)	17(45.9)	45(18.8)
Neutral	12(25)	20(18.7)	4(26.7)	3(9.1)	6(16.2)	45(18.8)
Agreed	11(22.9)	26(24.3)	2(13.3)	12(36.4)	6(16.2)	57(23.8)
Strongly Agreed	9(18.8)	23(21.5)	5(33.3)	8(24.2)	5(13.5)	50(20.8)
Total	48(100)	107(100)	15(100)	33(100)	37(100)	240(100)

Likelihood ratio = 27.30

P-value = 0.038

The association between age and the belief that the use of technology has improved the accuracy of medication administration shows diverse perspectives across age groups but is not statistically significant, P = 0.105. Among the youngest respondents (18-25 years), 33.4% either agreed or strongly agreed, whereas the proportion increases to 48.6% in the oldest group (>55 years). However,

skepticism is quite remarkable in the younger group with 31.3% strongly disagreeing, and it is the highest in all age groups. Neutral responses were relatively low in all groups, though the highest was at 18.2% for the 46-55 years group. These results depict a mix of acceptance and skepticism across ages without a trend or significant differences. Detailed percentages are available in the table 8.

Table 8 Association of Age with believe that use of technology has improved the accuracy of medication administration.

	Age (years)					Total
	18-25	26-35	36-45	46-55	> 55	
Strongly Disagreed	15(31.3)	25(23.4)	6(40)	6(18.2)	8(21.6)	60(25)
Disagreed	12(25)	19(17.8)	4(26.7)	12(36.4)	5(13.5)	52(21.7)
Neutral	5(10.4)	17(15.9)	0(0)	6(18.2)	6(16.2)	34(14.2)
Agreed	9(18.8)	20(18.7)	1(6.7)	7(21.2)	11(29.7)	48(20)
Strongly Agreed	7(14.6)	26(24.3)	4(26.7)	2(6.1)	7(18.9)	46(19.2)
Total	48(100)	107(100)	15(100)	33(100)	37(100)	240(100)

Likelihood ratio = 23.32

P-value = 0.105

The relationship between gender and the perception that technology has made it easier to balance administrative tasks with patient care is seen but not statistically significant ($P = 0.099$) **Chi-square**. Female respondents agreed in greater numbers: 52.0% either agreed or strongly agreed, whereas males had only 38.2%. In contrast, more males answered neutrally, 20.9%, compared to females,

13.6%. Strong disagreement was also a little more pronounced in males (20.9%) compared to females (15.2%). These findings indicate that females may think that there is a greater utility of technology in balancing the tasks, though the difference is not significant. To see detailed percentages, look at the table 9.

Table 9 Association of gender with believe that Technology has made it easier to balance administrative tasks with patient care.

	Gender		Total
	Male	Female	
Strongly Disagreed	24(20.9)	19(15.2)	43(17.9)
Disagreed	23(20)	24(19.2)	47(19.6)
Neutral	24(20.9)	17(13.6)	41(17.1)
Agreed	19(16.5)	38(30.4)	57(23.8)
Strongly Agreed	25(21.7)	27(21.6)	52(21.7)
Total	115(100)	125(100)	240(100)

Chi-square = 7.81

P-value = 0.099

Differences also emerged in the relationship of gender with the belief that technology has streamlined the administration of the job along with the care for the patients showing notable differences approaching statistical significance ($P = 0.059$) **Chi-square**. Strong agreements were higher among the female respondents at 24.8% compared to male respondents at 18.3%. Strongly, males were more likely to disagree at 29.6% compared to female at

15.2%. Neutrals were marginally higher among females at 17.6% as compared to males at 11.3%. Altogether, 44.8 percent of women agreed or were of the strong opinion, against 40.9 percent for the men. The results reveal that the females may better regard the advantage technology brings with regard to this, even though the difference is slim. For exact percentages, look at the table 10

Table 10 Association of gender with believe that Technology has made it easier to balance administrative tasks with patient care.

	Gender		Total
	Male	Female	
Strongly Disagreed	34(29.6)	19(15.2)	53(22.1)
Disagreed	21(18.3)	28(22.4)	49(20.4)
Neutral	13(11.3)	22(17.6)	35(14.6)
Agreed	26(22.6)	25(20)	51(21.3)
Strongly Agreed	21(18.3)	31(24.8)	52(21.7)
Total	115(100)	125(100)	240(100)

Chi-square = 9.10

P-value = 0.059

EHR in practice is statistically significant (P = 0.013). Notably, respondents who had experience of 6-10 years reported the highest levels of confidence, with 37.5% agreeing and 15.6% strongly agreeing that they feel confident using EHR, adding up to 53.1%. However, less than 1 year of experience reported having lesser confidence since only 25.9% agreed and 14.8% strongly agreed (adding up to 40.7%), whereas a huge percentage of 55.5% either disagreed

or strongly disagreed. What is even more intriguing is that even the ones who had more than 10 years of experience had mixed feelings with 41.7% agreeing and 45% either disagreeing or strongly disagreeing. This implies that mid-career professionals (6-10 years) are more confident when using EHR compared to their less experienced and most seasoned counterparts. For the detailed percentages and counts, please refer to the table 11

Table 11 Association of Work experience with feeling confident using electronic health records (EHR) in daily practice.

	Working Experience (years)				Total
	Less than 1	1 - 5	6 -10	More than 10	
Strongly Disagreed	12(22.2)	9(14.5)	6(9.4)	15(25)	42(17.5)
Disagreed	18(33.3)	8(12.9)	8(12.5)	12(20)	46(19.2)
Neutral	11(20.4)	15(24.2)	15(23.4)	8(13.3)	49(20.4)
Agreed	14(25.9)	8(12.9)	24(37.5)	10(16.7)	56(23.3)
Strongly Agreed	8(14.8)	14(22.6)	10(15.6)	15(25)	47(19.6)
Total	54(100)	62(100)	64(100)	60(100)	240(100)

Likelihood ratio = 25.41

P-value = 0.013

The association between work experience and the opinion that technology has reduced the amount of time spent on documenting patients is statistically significant at P = 0.004. The most optimistic respondents were those with over 10 years of experience, with 31.7% strongly agreeing and an additional 31.7% agreeing, making a total of 63.4% who agreed. Whereas the employees with experience of less than 1 year were negative, only 20.4% agreed and 11.1% strongly agreed (amounting to 31.5%),

while a considerable 59.3% either disagreed or strongly disagreed. The middle career professionals who had experience of 6-10 years had a balanced opinion, as 43.8% agreed or strongly agreed, but 40.6% disagreed or strongly disagreed. This suggests that more experienced individuals believe that the most gains from technology come in streamlining documentation, while lower-experience people are more apprehensive. To see complete percentages and numbers, view the table 12

Table 12 Association of Work experience with use of technology has reduced the time spent on patient documentation

	Working Experience (years)				Total
	Less than 1	1 - 5	6 -10	More than 10	
Strongly Disagreed	17(31.5)	16(25.8)	11(17.2)	6(10)	50(20.8)
Disagreed	15(27.8)	7(11.3)	15(23.4)	10(16.7)	47(19.6)
Neutral	5(9.3)	16(25.8)	10(15.6)	6(10)	37(15.4)
Agreed	11(20.4)	14(22.6)	12(18.8)	19(31.7)	56(23.3)
Strongly Agreed	6(11.1)	9(14.5)	16(25)	19(31.7)	50(20.8)
Total	54(100)	62(100)	64(100)	60(100)	240(100)

Likelihood ratio = 29.18

P-value = 0.004

There is a statistically significant association between the years of work experience and the belief that new technologies introduced have improved efficiency as a nurse (P = 0.018) **Chi-Square**. Those respondents who had 1-5 years of experience were most optimistic; 35.5% agreed and 24.2% strongly agreed, thus agreeing in total to 59.7%. In contrast, those with less than 1 year of experience had 24.1% agreeing and 25.9% strongly agreeing, for a total of 50%, but also a rather large 38.9% either disagreed or strongly disagreed. Respondents with 6-10 years of experience were more divided, at 37.4% agreeing or

strongly agreeing, but 46.9% either disagreeing or strongly disagreeing. Interestingly, those with more than 10 years of experience also exhibited a similar pattern of agreement (36.7%) but had a high proportion of neutral responses (25%). The results therefore indicate that mid-career professionals (1-5 years) are the most optimistic about the efficiency gains from new technologies, whereas skepticism and neutrality are more prevalent among those with greater experience. Detailed percentages and counts can be found in the table 13.

Table 13 Association of Work experience with believe introduction of new technologies has improved efficiency as a nurse

	Working Experience (years)				Total
	Less than 1	1 - 5	6 -10	More than 10	
Strongly Disagreed	12(22.2)	9(14.5)	10(15.6)	8(13.3)	39(16.3)
Disagreed	9(16.7)	6(9.7)	20(31.3)	15(25)	50(20.8)
Neutral	6(11.1)	10(16.1)	10(15.6)	15(25)	41(17.1)
Agreed	13(24.1)	22(35.5)	15(23.4)	6(10)	56(23.3)
Strongly Agreed	14(25.9)	15(24.2)	9(14.1)	16(26.7)	54(22.5)
Total	54(100)	62(100)	64(100)	60(100)	240(100)

Chi-Square = 24.41

P-value = 0.018

The association between education level and the regular use of technology to communicate with other healthcare professionals presents mixed views, though it was not statistically significant (P = 0.069) **Chi-Square**. Respondents with a BSN Generic were the most positive, with 37.1% agreeing and 16.1% strongly agreeing (totaling 53.2%). On the contrary, those who have a Diploma in Nursing and Any Other showed 51.9% and 50% who either strongly

disagreed or disagreed. The responses that were neutral appeared predominantly among General Nursing (Post RN) respondents with a 26.6%. These findings indicate that Generic BSN are likely to use technology more frequently in daily communication, while other categories represent mixed levels of use as well as confidence. For detailed percentages and counts, see the table 14.

Table 14 Association of Education level with regular use of technology to communicate with other healthcare professionals

	Working Experience (years)				Total
	Diploma in Nursing	BSN Generic	General Nursing (Post RN)	Any other	
Strongly Disagreed	15(27.8)	8(12.9)	12(18.8)	20(33.3)	55(22.9)
Disagreed	13(24.1)	13(21)	11(17.2)	10(16.7)	47(19.6)
Neutral	7(13)	8(12.9)	17(26.6)	10(16.7)	42(17.5)
Agreed	10(18.5)	23(37.1)	11(17.2)	12(20)	56(23.3)
Strongly Agreed	9(16.7)	10(16.1)	13(20.3)	8(13.3)	40(16.7)
Total	54(100)	62(100)	64(100)	60(100)	240(100)

Chi-Square = 19.89

P-value = 0.069

Association of level of education and opinion regarding the belief that "Technology improves patient safety at all times" is statically significant ($P = 0.002$) **Chi-Square**. Respondents General Nursing qualifications were the most affirmative in this regard, whereby 29.7 agreed, and 21.9 strongly agreed, therefore adding up to 51.6%. On the contrary, respondents with Any other qualification had the highest refusal with a 38.3 strongly disagreeing and an amount of 50 that disagreed or strongly disagreed. Respondents with a BSN Generic

had mixed responses, in that 43.6% agreed or strongly agreed while 48.4% disagreed or strongly disagreed. Of interest is that Diploma in Nursing respondents had a more balanced view, in that 40.7% agreed or strongly agreed, while 31.5% disagreed or strongly disagreed. These findings indicate that the perception of technology enhancing patient safety varies significantly across educational levels, with the most positive attitudes among Post RN nurses. For detailed percentages and counts, refer to the table 15.

Table 15 Association of Education level with Technology enhances patient safety in my healthcare setting

	Working Experience (years)				Total
	Diploma in Nursing	BSN Generic	General Nursing (Post RN)	Any other	
Strongly Disagreed	4(7.4)	12(19.4)	12(18.8)	23(38.3)	51(21.3)
Disagreed	13(24.1)	18(29)	9(14.1)	7(11.7)	47(19.6)
Neutral	15(27.8)	5(8.1)	10(15.6)	8(13.3)	38(15.8)
Agreed	8(14.8)	15(24.2)	19(29.7)	11(18.3)	53(22.1)
Strongly Agreed	14(25.9)	12(19.4)	14(21.9)	11(18.3)	51(21.3)
Total	54(100)	62(100)	64(100)	60(100)	240(100)

Chi-Square = 31.56

P-value = 0.002

The relationship between education level and the belief that technology has improved the accuracy of medication administration is statistically significant ($P = 0.015$) **Chi-Square**. Respondents with General Nursing (Post RN) qualifications were the most positive, with 18.8% agreeing and 28.1% strongly agreeing (totaling 46.9%). Diploma in Nursing respondents were more skeptical, with 61.1% either disagreeing or strongly disagreeing. Respondents with BSN Generic showed a more balanced opinion

as 38.7% agreed or strongly agreed but 53.2% disagreed or strongly disagreed. Any Other qualifications also reflected mixed perceptions with 39% agreeing or strongly agreeing but 40% either disagreeing or strongly disagreeing. These results suggest that Post RN nurses are the most optimistic about technology improving the accuracy of medication, while the Diploma qualification is the most skeptical. For more information on percentages and counts, please refer to the table 16.

Table 16 Association of Education level with use of technology has improved the accuracy of medication administration

	Working Experience (years)				Total
	Diploma in Nursing	BSN Generic	General Nursing (Post RN)	Any other	
Strongly Disagreed	12(22.2)	17(27.4)	16(25)	15(25)	60(25)
Disagreed	21(38.9)	16(25.8)	6(9.4)	9(15)	52(21.7)
Neutral	3(5.6)	7(11.3)	12(18.8)	12(20)	34(14.2)
Agreed	8(14.8)	14(22.6)	12(18.8)	14(23.3)	48(20)
Strongly Agreed	10(18.5)	8(12.9)	18(28.1)	10(16.7)	46(19.2)
Total	54(100)	62(100)	64(100)	60(100)	240(100)

Chi-Square = 24.94

P-value = 0.015

The association between education level and the perception that use of technology can be overwhelming and time-consuming approaches statistical significance ($P = 0.061$) **Chi-Square**. Respondents with qualifications under Any Other were most likely to strongly disagree, where 30% indicated they are less overwhelmed by technology. Conversely, General Nursing (Post RN) respondents were the most to agree, with 34.4% who agreed and 12.5% who strongly agreed totaling 46.9%, suggesting they find the technology more

overwhelming. Diploma in Nursing and BSN Generic respondents had more balanced responses with 48.1% and 40.3% respectively to either agree or disagree with this statement. Neutral responses seem to be relatively consistent amongst groups, ranging from 12.5% to 24.2%. There is a wide variation in the perception of technological overload with education level, and post RN nurses report the most challenging ones. For more detailed percentages and counts, refer to the table 17.

Table 17 Association of Education level with the use of technology can be overwhelming and time-consuming

	Working Experience (years)				Total
	Diploma in Nursing	BSN Generic	General Nursing (Post RN)	Any other	
Strongly Disagreed	9(16.7)	11(17.7)	9(14.1)	18(30)	47(19.6)
Disagreed	8(14.8)	16(25.8)	17(26.6)	10(16.7)	51(21.3)
Neutral	11(20.4)	15(24.2)	8(12.5)	9(15)	43(17.9)
Agreed	12(22.2)	9(14.5)	22(34.4)	16(26.7)	59(24.6)
Strongly Agreed	14(25.9)	11(17.7)	8(12.5)	7(11.7)	40(16.7)
Total	54(100)	62(100)	64(100)	60(100)	240(100)

Chi-Square = 20.31

P-value = 0.061

The association between the level of education and the opinion that health would improve with the continued implementation of high technologies is not statistically significant ($P = 0.107$) **Chi-Square**. Of the respondents, the majority who were holders of a Diploma in Nursing had a positive response, with 22.2% agreeing and 29.6% strongly agreeing (in total, 51.8%). On the other hand, those with Any Other qualifications were more polarized with 30%

strongly disagreeing but also 28.3% strongly agreeing, showing that opinions were divided in this category. BSN Generic respondents had 41.9% either disagreeing or strongly disagreeing, while only 30.6% agreed. General Nursing (Post RN) respondents also showed mixed views with 42.2% either agreeing or strongly agreeing. These results indicate different levels of optimism across educational groups, with diploma nurses having the

highest positivity toward technology's ability to aid healthcare. For more detailed percentages and

counts, refer to the table 18.

Table 18 Association of Education level with healthcare would improve with the continuous integration of advanced technologies

	Working Experience (years)				Total
	Diploma in Nursing	BSN Generic	General Nursing (Post RN)	Any other	
Strongly Disagreed	6(11.1)	16(25.8)	13(20.3)	18(30)	53(22.1)
Disagreed	13(24.1)	15(24.2)	12(18.8)	9(15)	49(20.4)
Neutral	7(13)	12(19.4)	12(18.8)	4(6.7)	35(14.6)
Agreed	12(22.2)	10(16.1)	17(26.6)	12(20)	51(21.3)
Strongly Agreed	16(29.6)	9(14.5)	10(15.6)	17(28.3)	52(21.7)
Total	54(100)	62(100)	64(100)	60(100)	240(100)

Chi-Square = 18.30

P-value = 0.107

Result Summary:

The findings indicate that technology enhances efficiency in documentation, patient safety, and medication administration accuracy. Nurses with mid-career experience (6–10 years) exhibited greater confidence in using electronic health records (EHRs) compared to early-career professionals. Female nurses were more likely to perceive technology as beneficial for balancing administrative tasks with patient care. However, a significant proportion of participants expressed concerns about technology being time-consuming and overwhelming. The study also found a strong association between education level and the perceived impact of technology on patient safety, with Post RN nurses demonstrating the highest level of agreement. Technology positively influenced documentation accuracy, communication, and time management. Nurses with 6–10 years of experience showed higher confidence in EHR use. Gender and age did not significantly impact perception, though education level correlated with perceived improvements in patient safety (p=0.002).

Discussion:

The integration of technology into nursing practice has become a pivotal factor in improving healthcare delivery. However, as revealed in this study, perceptions regarding the utility and impact of technology are influenced by demographic and professional characteristics such as age, gender, educational background, and work experience. These differences provide valuable insights into the

facilitators and barriers to adopting technology in nursing practice. Overall, the observed age distribution underscores the need for tailored strategies in workforce management. The experience distribution of the nursing staff surveyed presents a heterogeneous mix of early-career and experienced professionals, thereby offering a comprehensive perspective on the role of technology in professional practice. Many nurses realized that technology will help in improving the delivery of healthcare. Advanced tools increased patient safety, improved the reliability of medication administration, and optimized communication among healthcare teams. Among nurses with advanced qualifications and medium work experience, these views were most pronounced. Specifically, telehealth services constituted a transformative element in relation to the improvement of patient access to healthcare. These can help bring maximum benefits out of technology. When such challenges are addressed, health care organizations can support the nursing staff much better by enabling them to use technology to better the patient care and professional satisfaction. The overall impact of technology on the nursing profession is transformative, bringing about great improvements in efficiency, communication, and quality of patient care, but with challenges that differ according to experience, education, and demographic factors. Key insights include, Technology has streamlined nursing workflows by reducing documentation time and improving access to patient information. Mid-career and experienced

nurses are particularly positive about this impact, recognizing its role in balancing administrative tasks with patient care. Technology has improved communication among healthcare professionals. It has fostered inter professional collaboration. Nurses who have advanced qualifications, such as Post RN, are likely to embrace these tools while those with diploma-level education are more skeptical. Accurate and safe drug administration also has been made possible, thanks to technological advancements; for instance, electronic prescription records and computerized automation of medication dispensing that have enhanced accuracy in drugs administered and also improved on patient safety, which end nurses with better education value even more. Younger nurses and especially those who have BSN or more advanced qualifications tend to see technology in a positive perspective. On the other hand, elder and less educated nurses tend to get intimidated by it, meaning comfort with technology lies along with exposure, training, and professional development. Technology has significantly impacted the nursing profession, making it more efficient, accurate, and collaborative. However, its full potential can only be realized through tailored training programs, equitable access to resources, and strategies to address the concerns of less experienced or less educated nurses. This ensures that technology benefits all nurses, regardless of background, and elevates the profession as a whole. It could transform healthcare delivery but may also bring along perceived disparities based on age, gender, education, and experience when the use of technology in practice is considered. Targeted interventions focusing on barriers and maximizing the benefits will be key in these areas.

Conclusion

While technology significantly improves various aspects of nursing practice, challenges such as workload concerns, adaptation barriers, and the need for targeted training remain. Healthcare institutions should implement structured training programs and support systems to optimize technology adoption, ensuring that nursing professionals at all experience levels can maximize its benefits. It could transform healthcare delivery but may also bring along perceived disparities based on

age, gender, education, and experience when the use of technology in practice is considered. Targeted interventions focusing on barriers and maximizing the benefits will be key in these areas. The strategy could be investing in bespoke training, technical support, and curriculum updates in institutions that facilitate fair and effective utilization in all areas of nursing practice by its various cadres. Future research must involve assessing the long-term effects of such interventions both on patients' and professionals' outcomes.

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