# Digital Nurse' Competencies in Relation to Patient Safety and Teamwork Communication.

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## Abstract

**Background:** The digital era has seen tremendous advancements in healthcare due to the integration of technology, which has changed operational procedures and patient care. Alongside these benefits, there are challenges that must be addressed to ensure patient safety in the digital age. **Aim**: The purpose of this study is to determine digital nurse' competencies and its relation to patient safety and teamwork communication among nursing staff. **Methods:** Utilizing an exploratory descriptive design allowed the current study to accomplish its goal. The study was conducted in National Liver Institute located in the governorate of Menoufia, Egypt. There were 290 staff nurses who worked in all critical care units and inpatient departments. **Results:** A statistical positive correlation among digital nurse' competencies, patient Safety and teamwork communication was found. The highest percent of nurses (84.9%, 82.5%) had a high level of digital skills and digital attitude competence. Also, (86.6%, 86.3%) had a high level of patient safety concerning communicating and clinical safety, (86.6%, 84.6%) had a high level of teamwork communication toward disease and discharge planning. **Conclusion:** A significant positive correlation among digital nurse' competencies, patient safety and teamwork communication were found. **Recommendation**: Healthcare policymakers must determine how health IT can help improve medication safety, patient safety, and adherence to guidelines. To meet regulatory requirements, technical stability, and nursing's most recent best clinical practices, healthcare organizations should prioritize regular technology updates.

**Keywords:** Digital nurse' competencies, Patient Safety and Teamwork Communication

## Introduction:

The global strategy on digital health 2020–2025 delivered by the WHO includes training and education of nurses, and allied workers in digital health competencies as a strategic goal for global digital health transformation. **(Longhini, Rossettini, & Palese, 2024).** Providing high-value care in a health system that is always learning necessitates coordinating ongoing innovation and improvement with the quick changes in evidence and practice. The complexity of innovations aimed at enhancing health care quality and safety is growing; they affect various organizational levels and disciplines and frequently call for a substantial shift in the behavior of those providing care **(Holdsworth, et al, 2020)**.

There are many advantages to the continued digitization and technology-based learning in the nursing field, including enhanced workflows and more effective communication. Nonetheless, to effectively use the new technologies, nurses require digital competencies. Access to health information, better treatment plans, and the organization of patient procedures are the nursing staff areas that would most benefit from digitization. It also lessens the workload of nursing staff and allows for more precise and customized care, which enhances patient care **(Tischendorf, et al. 2024)**.

Improved medication safety, tracking, and reporting; improved communication between healthcare providers; and improved care quality through optimal access to and adhere to guidelines are all examples of health information technology (IT). Data collection for quality management, outcome reporting, public health disease surveillance and reporting is made possible with health IT systems. All health IT requires improvement particularly in areas of platform integration, design, and implementation in the workplace. Safe care requires robust interoperability, but this objective has proven difficult to achieve. Considerable patient safety

issues have already been identified; it is crucial to maintain patient safety and quality as the top priorities **(Carter, Anastasia, & Carter, 2024).**

Advances in technology have created new avenues for enhancing patient safety. Clinical workflows could become more standardized and efficient with the use of technology to digitize healthcare processes, which could also lower costs and errors in all healthcare settings. For example, AI-enabled frontier technologies in the health sector are extending life expectancy, diagnosing illnesses, and saving lives **Fanning (2023)**. Hospital patient safety may be jeopardized by avoidable adverse events (AE), Hospital-acquired infections (HAIs), one of the costliest avoidable adverse events (AEs), not only result in worse patient outcomes but also place a strain on the institution by causing direct financial losses and lengthening patient stays. By automating tasks, introducing medication alerts, clinical reminders, better diagnostic and consultation reports, facilitating information sharing, improving clinical decision-making, preventing potential errors, reducing variation in practice, managing workforce shortages, and making complete patient data available, and technological innovations can improve patient safety **(Fracica, 2021)**.

One of the top priorities in healthcare is ensuring patient safety. Establishing a culture of patient safety that supports healthcare personnel in reducing errors, encourages reporting, learning from mistakes, and fosters engagement with patients is crucial. Patient safety is the absence of preventable harm to a patient and reduction of risk of unnecessary harm associated with health care to an acceptable minimum. Also, it is "a framework of organized activities that creates cultures, processes, procedures, behaviors, technologies, and environments in health care that consistently and sustainably lower risks, reduce the occurrence of avoidable harm, make error less likely, and reduce impact of harm when it does occur," according to the larger context of the health system **(Frederick, 2024).**

Patient safety in the digital age will continue to be a dynamic and ever-evolving topic as long as technology advances. The safe and efficient use of digital healthcare technologies necessitates constant cooperation between healthcare institutions, technology developers, legislators, and patients in order to handle emerging issues and put best practices into place. Patient safety is essential for healthcare settings in the digital age. Standardized language, encryption, multi-factor authentication, and access controls are necessary to guarantee security. Prioritizing user-centered design concepts and feedback is important. Clinical decision support systems should be evaluated and enhanced on a regular basis. Programs for medical staff training are required. Additionally, backup strategies for system disruptions and ethical considerations are important. To address emerging concerns and implement best practices, healthcare organizations, technology developers, lawmakers, and patients must constantly collaborate in the safe and effective use of digital healthcare technologies **(Al-Nami, Awad, & Gadry, 2023).**

Effective communication and teamwork are components of a multifaceted framework that establishes a safety culture and eventually care quality. Mutual respect, problem resolution, and idea sharing are essential components of good teamwork and efficient communication. It is impossible to provide the safe and dependable care without these fundamental components. Many medical professionals, particularly doctors, lack a thorough understanding of effective communication techniques and overlook opportunities to do better when they don't meet expectations. Even while they value effective teamwork, many members of health care teams today will acknowledge that their communication skills are limited and that they are reluctant to call out errors made by their leaders, especially doctors **(Fuchshuber & Greif, 2022).**

Creating an environment that (1) supports interactions between patients, families, and providers in a safe, fulfilling, and rewarding workplace; (2) is free from blame and retaliation; (3) encourages learning from mistakes; and (4) fosters an environment that promotes consistent high-quality care is paramount to effective communication. Handoffs, SBARs, and structured communications are all components of good teamwork and communication techniques that are not innate to healthcare professionals. To achieve the best results in patient care and safety, health care organizations should provide them with the specialized training and practice they need. All members of a care team should participate in specific teamwork training sessions headed by a qualified professional. These training

sessions' realistic scenarios serve as essential teaching tools for team behavior, communication techniques, and safe culture **(Aldawood, eatal.,2020).**

Nonnegotiable mutual respect, inclusiveness of all issues and failure acknowledgment, striving for excellence, conflict resolution, and the use of structured communication tools are all essential components of a successful team. Critical feedback is provided by an evaluation of effective communication, and ongoing development depends on team climate, behavior, and work observation. In the end, cooperation elevates teamwork's efficacy by adding a foundation beyond respect and trust **(Sirimsi, 2023)**.

In a tolerant, nonpunitive setting, open communication is a hallmark of effective teamwork communication through collaboration. Every team member needs to be given clear, well-defined roles and instructions that everyone is aware of. Respect and cooperation are natural outcomes of establishing a just distribution of tasks and shared accountability. The team hierarchy needs to be explained in detail so that everyone can understand it. Regular audits and feedback should be conducted and discussed on a regular basis. Verification and assurance of appropriate access to resources are necessary. From the standpoint of the patient, communication with a team that has integrated through collaboration is considerably more straightforward and efficient. A team that works well together will also be better able to create a personalized care plan for every patient that considers every aspect of optimization and safety **(Alsabri, et al.,2022)**.

It is crucial to improve teamwork, and the quality of care provided to patients by involving frontline staff with leadership skills in safety issues. This approach raises staff awareness and fosters trust and commitment to the decisions made. Critical care patients are a particular area of concern because a failure to publicly address safety concerns and errors could result in a buildup of clinical problems that could have negative effects. Multiple teams in complex settings like the critical care unit necessitate a high degree of interprofessional communication and coordination **(Aldawood, et al.,2020)**.

## Significance of the study:

Digitizing healthcare procedures with technology can improve patient safety, standardize and streamline clinical workflows, foster teamwork and communication among medical professionals, and lower costs and errors in all healthcare settings **(Cohen., et al 2022**). Increased patient safety and fewer adverse events are associated with better teamwork communication in the healthcare setting. Patients, healthcare professionals, and patient safety experts all agree that effective communication, mutual support, and teamwork are critical to improving patient safety and healthcare quality **(Fukami, Uemura, Terai, & Nagao, 2020)**. So, the current study is conducted to determine digital nurse' competencies and its relation to patient safety and teamwork communication among nursing staff.

## Purpose of the study:

Determine the digital nurse' competencies and its relation to patient safety and teamwork communication among nursing staff.

## Research Questions:

1. What is the level of digital nurse' competencies, patient safety and teamwork communication among staff nurses?
2. Is there a relationship between technology-based Learning, patient safety and Teamwork Communication from staff nurses' perspective?

## Method

### Research design:

A descriptive correlational research design was conducted to achieve the purpose of the study.

### Setting:

The study was conducted at National liver Institute (NLI): This study was carried out at 13 critical care units and inpatient departments at National Liver Institute at Shebin El-kom city, Menoufia Governate. It was established in 1985 as a specialist for the treatment of liver diseases in Egypt and the Arab world since 1987. The bed capacity of the Liver Institute is 300 beds. The institute includes Emergency Department, Outpatient Clinics, Intermediate & Intensive Medical Care Unit, Endoscopy, Operating Theaters, Surgical Department, Intermediate & Intensive Surgical Care Unit, Medical Department, Pediatric ICU, Neonatal ICU. The current study was conducted in selected critical care units and inpatient departments.

### Subject:

The current study conducted on staff nurses who working in a previous mentioned setting. The sample size was determined by using Solvin formula to assess the sample size of staff nurses (Yamane, 1976).

**Group one: staff nurses**

n = N/ 1+ N (e)2

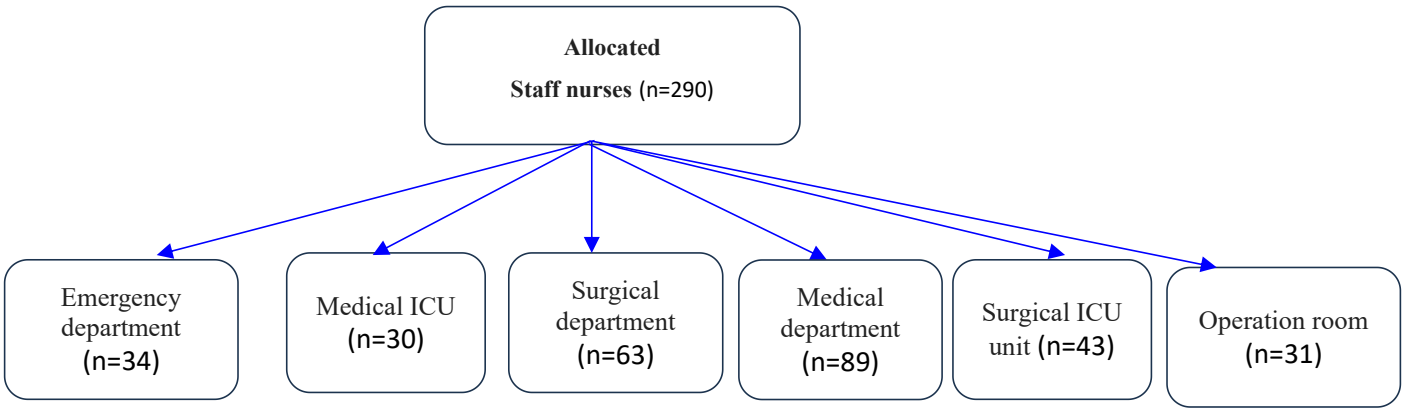
N→ total numbers of staff nurses are (895) nurses

n→ sample size

E → error tolerance (. 05)

1→aconstant value

Sample size of staff nurse at National Liver Institute is 879 / (1+879 × ($0.05^2$)) = 290 staff nurse.




Sampling technique: convenient sample of staff nurses (n=290) who working at above mentioned units and departments.

**Figure** 1. Flowchart of the studied staff nurses.

## Instruments of data collection

To achieve the aim of this study, the data was collected by using three different instruments included the following:

**Instrument one: Digital nurse' competencies Scale** consisted of two parts:

**Part one:** Personal characteristics of staff nurses as age, gender, educational level, work department and years of experience.

**Part two:** Digital nurse' competence Scale was adopted from **Golz,. Et al, (2023)** to assess Digital Competence of Nurses in Clinical Practice. It consists of 25 items classified into three domains: Digital Competence knowledge (4 items), Digital Competence skills (7 items), and Digital Competence attitude (14 items). A five-point Likert scale was employed in the tool, with 1 denoting "strongly disagree," 2 "disagree," 3 "neutral," 4 "agree," and 5 "strongly agree.".

**Scoring system:**

A high score for any subscale reflected the high level of digital nurse's competence. The respondents' total scores were classified into three levels, (25-42) low level, (43-58) moderate level and (59-75) high level of digital nurse' competence.

**Instrument two**: **Patient safety Scale**: It was developed by **Castel, E., & Ginsburg, L. (2008)** to assess level of patient safety from staff nurses' perspective. This tool was a thirty-seven-questionnaire designed to capture the degree in which nurses assessed their patient as safe. It contains nine domains in which this scale is divided: clinical safety (4 items), culture of safety (4 items), working in teams with other health professionals (6 items), communicating effectively (3 items), managing safety risks (3 items), understanding human and environmental factors (3 items), recognizing, responding to, and disclosing adverse events and close calls (4 items), broader Patient safety issues are addressed in health professional education (7 items), and feeling comfortable speaking up about patient safety (3 items). A five-point Likert scale was employed in the tool, with 1 denoting "strongly disagree," 2 "disagree," 3 "neutral," 4 "agree," and 5 "strongly agree.".

**Scoring system:**

A high score representing high perceptions of patient safety scale. The respondents' total scores were classified into three levels, (37-62) low level, (63-86) moderate level and (87-111) high level of patient safety.

- **Instrument three: Teamwork communication Scale: The** researchers adopted the scale after reviewing literature from **Matar, W., & Aldwair, M. (2020)** to assess level of teamwork communication among staff nurses. This tool was a 48 item. Teamwork communication scale measured nine aspects of teamwork communication: Internal communication (5 items), external communication (5 items), communication protocols (6 items), teamwork structure (5 items), Information sharing (4 items), care planning (5 items), information exchange (5 items), discharge planning (4 items), and disease planning (9 items). The tool used a five-point Likert scale ranging from one (1) (strongly disagree) to five (5) (strongly agree),

**Scoring system:**

A high score representing high perceptions of teamwork communication. The respondents' total scores were classified into three levels, (48-80) low level, (81-112) moderate level and (113-144) high level of ethical climate.

**Validity and reliability of the study instruments:**

To verify the completeness, coverage, and clarity of the items, a panel of five nursing experts in the field of nursing administration evaluated the tools' face validity and content. The necessary adjustment was made in accordance with that. To verify that the translated items were consistent and to find any ambiguities or confusion, the researchers also translated the original Arabic tools into Arabic and then, using back translation, translated the Arabic tools into English and compared them to the original English tools. Using Cranach's alpha coefficient method to measure internal consistency, the study tools' dependability was assessed.

**Table 1: Reliability test for student instruments**

| Variable | Number of items | Cronbach's Alpha |
|---|---|---|
| Digital nurse' competences | 25 | 0.89 |
| Patient Safety | 37 | 0.92 |
| Teamwork Communication | 48 | 0.87 |

**Pilot study:**

A Pilot study was conducted to assess the feasibility and applicability of the questionnaires and determine the time needed for data collection. It was conducted on 10% (29) staff nurses from total subjects (290).

Participants in the pilot study were included in the final analysis because no modification occurred.

**Field work:**

The actual data collection took about three months, from the beginning of October to the end of December 2023; oral official permission was obtained from National liver Institute' matron and staff nurses. The staff nurse was informed of the study's purpose and given their consent to take part; the researchers collected data from nursing staff before and between their work hours according to their availability two days per week from 9.0 a.m. To 12.00 p.m. The average number of filled sheets was between 10 to 12. It was estimated that it would take 20 to 25 minutes to finish all the questionnaires. The filling forms were collected on time and revised to check their completeness to avoid any missing data. Finally, the researchers thanked the participants for their cooperation.

**Ethical considerations:**

The study was carried out with careful consideration of research ethics and participant rights: Assuring voluntary participation protected the respondent's rights, and informed consent was obtained by outlining the study's purpose, nature, timing, potential benefits, data collection methods, anticipated results, and respondent's right to withdraw from the study at any time if rights were Violated.

The respondent was assured that the data would be treated as strictly confidential by coding it; furthermore, the respondent anonymity would be maintained as they would not require mentioning their names; and the protocol of the study was revised and accepted by ethical and research committee (No 1029) in the Faculty of Nursing –Menoufia University before starting the study.

**Statistical analysis**

The Statistical Package for Social Sciences (SPSS version 26.0) was used for data analysis and tables. Demographic characteristics were described using frequency and percentages. The arithmetic mean and standard deviation (SD) were employed as central tendency and dispersion measures, respectively, for the variables being examined. The nature of the relationship between the research variables was investigated using the Pearson correlation coefficients (r) analysis, and the mean scores were compared using the one-way analysis of variance (ANOVA) (F) test. The analytical statistics were evaluated using the Tukey test and R linear regression.

**Results**

Table 1. Socio- demographic data of studied staff nurses. Most of our staff nurses were 25-35 years old (n=196, 67.6%), most of them were females (n=183, 63.1%), regarding educational level, 55.9% had Nursing Technical Institute. While 2.8% only had a master's degree. Above one-third of staff nurses, 30.8% worked in medical department, and 21.7% worked at surgical department. Additionally, more than half of them (54.8%) had 5-10 years of experience.

**Table 1. Socio- demographic data of studied staff nurses.**

| Socio- demographic data | | N=290 | % |
|---|---|---|---|
| **Age** | 25 – 35 | 196 | 67.6% |
| | 35 – 45 | 61 | 21% |
| | >45 | 33 | 11.4% |
| **Gender** | Male | 107 | 36.9% |
| | Female | 183 | 63.1% |
| **Educational Level** | Nursing Technical Institute | 162 | 55.9% |
| | Bachelor | 121 | 41.3% |
| | Master's degree | 8 | 2.8% |
| **Work department** | Emergency department | 34 | 11.7% |
| | Medical department | 89 | 30.8% |
| | Surgical department | 63 | 21.7% |
| | Operation room | 31 | 10.7% |
| | Surgical ICU | 43 | 14.8% |
| | Medical ICU | 30 | 10.3% |
| **Years of experience** | 5 – 10 | 159 | 54.8% |
| | 10 – 15 | 83 | 28.6% |
| | 15 – 20 | 48 | 16.6% |

Table (1) represented the mean age of studied nurses was

**Table 2. Levels of Digital competencies among nurses (N = 290).**

| Tool 1 | Low | | Moderate | | High | | Mean ± SD | Chi-square | *P value* |
|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | | | |
| **Digital Competence knowledge** | 0 | 0 | 102 | 34.9 | 188 | 64.4 | 3.73±0.60 | 202.75 | <0.001* |
| **Digital Competence Skills** | 0 | 0 | 42 | 14.4 | 248 | 84.9 | 3.95±0.49 | 110.56 | <0.001* |
| **Digital Competence Attitude** | 0 | 0 | 49 | 16.8 | 241 | 82.5 | 3.97±0.57 | 122.33 | <0.001* |
| **Total mean** | **0** | **0** | **64** | **22.03** | **226** | **77.27** | **3.88±0.55** | **154.12** | **<0.001*** |

**Table (2)** presented that highest percent of studied nurses (84.9%, 82.5%) had a high level of digital Competence skills and digital competence attitude among staff nurses respectively. Also, more than two third (64.4%) of participants had a high level of digital competence knowledge.

**Table 3. Levels of Teamwork communication among nurses (N = 290).**

| Tool 2 | Low | | Moderate | | High | | Mean ± SD | Chi-square | *P value* |
|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | | | |
| **Internal communication** | 0 | 0 | 51 | 17.5 | 239 | 81.8 | 3.91±0.44 | 55.00 | <0.001* |
| **External communication** | 0 | 0 | 57 | 19.5 | 233 | 79.8 | 3.88±0.51 | 137.52 | <0.001* |
| **Communication protocols** | 0 | 0 | 50 | 17.1 | 240 | 82.2 | 3.95±0.54 | 124.01 | <0.001* |
| **Teamwork structure** | 0 | 0 | 49 | 16.8 | 241 | 82.5 | 3.95±0.54 | 121.81 | <0.001* |
| **Information sharing** | 2 | .7 | 56 | 19.2 | 232 | 79.5 | 4.01±0.63 | 132.70 | <0.001* |
| **Care planning** | 20 | 6.8 | 30 | 10.3 | 240 | 82.2 | 3.84±0.66 | 128.72 | <0.001* |
| **Information exchange** | 0 | 0 | 56 | 19.2 | 234 | 80.1 | 3.97±0.60 | 134.31 | <0.001* |
| **Discharge planning** | 0 | 0 | 43 | 14.7 | 247 | 84.6 | 4.06±0.60 | 116.92 | <0.001* |
| **Disease planning** | 7 | 2.4 | 30 | 10.3 | 253 | 86.6 | 3.97±0.56 | 95.91 | <0.001* |
| **Total mean** | **3** | **1.10** | **47** | **16.07** | **240** | **82.14** | **3.95±0.56** | **75.12** | **<0.001*** |

**Table (3)** presented that highest percent of studied nurses (86.6%, 84.6%) had a high level of teamwork communication toward disease planning and discharge planning. Also, (82.5% & 82.2%) of staff nurses reported a high level of teamwork communication regarding teamwork structure, and both Communication protocols and care planning among staff nurses respectively. While, less than one third (19.5%) of participants had a moderate level of external communication from their perspective.

**Table 4. Levels of Patient safety among nurses (N = 290).**

| Tool 2 | Low | | Moderate | | High | | Mean ± SD | Chi-square | *P value* |
|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | | | <0.001* |
| **Clinical safety** | 0 | 0 | 38 | 13.0 | 252 | 86.3 | 4.28±0.68 | 100.94 | <0.001* |
| **Culture of Safety** | 0 | 0 | 68 | 23.3 | 222 | 76.0 | 3.97±0.66 | 151.79 | <0.001* |
| **Working in teams with other health professionals** | 7 | 2.4 | 60 | 20.5 | 223 | 76.4 | 3.93±0.69 | 149.30 | <0.001* |
| **Communicating effectively** | 0 | 0 | 37 | 12.7 | 253 | 86.6 | 3.97±0.48 | 106.27 | <0.001* |
| **Managing safety risks** | 6 | 2.1 | 62 | 21.2 | 222 | 76.0 | 3.87±0.63 | 162.93 | <0.001* |
| **Understanding human and environmental factors** | 6 | 2.1 | 49 | 16.8 | 235 | 80.5 | 3.89±0.59 | 140.58 | <0.001* |
| **Recognize, respond to, and disclose adverse events and close calls** | 13 | 4.5 | 36 | 12.3 | 241 | 82.5 | 4.04±0.74 | 119.94 | <0.001* |
| **How broader patient safety issues are addressed in health professional education** | 7 | 2.4 | 62 | 21.2 | 221 | 75.7 | 3.82±0.60 | 157.51 | <0.001* |
| **Comfort speaking up about patient safety** | 13 | 4.5 | 84 | 28.8 | 193 | 66.1 | 3.79±0.77 | 188.22 | <0.001* |
| **Total mean** | **6** | **2.0** | **55** | **18.87** | **229** | **78.46** | **3.95±0.65** | **216.90** | **<0.001*** |

**Table 4**. Presented that highest percent of studied nurses (86.6%, 86.3%) had a high level of patient safety concerning communicating effectively and clinical safety. Also, (82.5%) of staff nurses reported a high level of patient safety regarding recognize, respond to, and disclose adverse events and close calls. While, about one third (28.8%) of participants had a moderate level of comfort speaking up about patient safety.

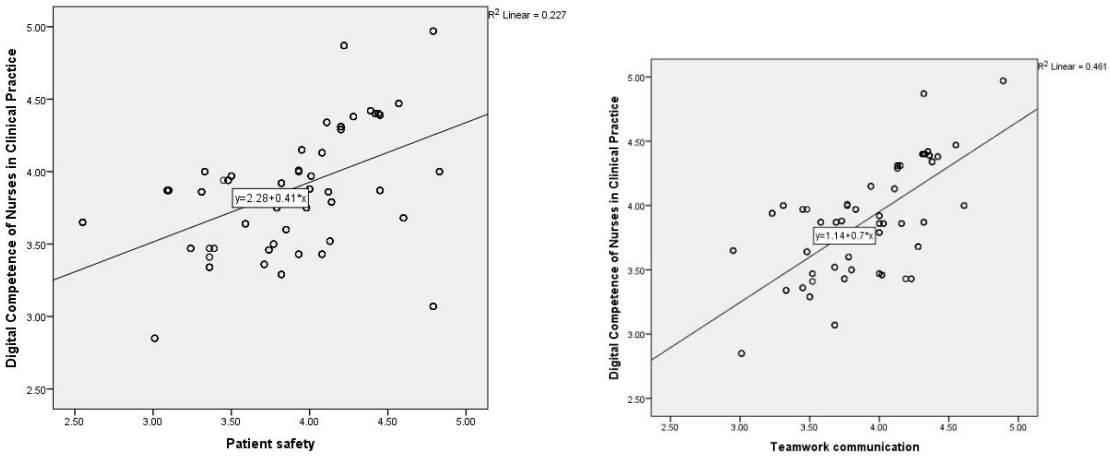
**Table (5): Pearson Correlation Analysis of effect of Digital nurse' competencies on Patient Safety and Teamwork Communication**

| Study variables of studied nurses | Correlation | 1 | 2 | 3 |
|---|---|---|---|---|
| 1. Digital nurse' competencies | Pearson Correlation | 1 | .670** | .476** |
| | Sig. (2-tailed) | | .000 | .000 |
| 2. Teamwork communication | Pearson Correlation | .670** | 1 | .786** |
| | Sig. (2-tailed) | .000 | | .000 |
| 3. Patient safety | Pearson Correlation | .476** | .786** | 1 |
| | Sig. (2-tailed) | .000 | .000 | |

** Correlation is significant at the 0.01 level (2-tailed).

**Table (5):** Showed significant positive correlation among digital nurse' competencies and teamwork communication (r=.670), patient safety (r=. 476). Also, significant positive correlation between patient safety and teamwork communication (r=. 786).

**Figure (3): Scatter Dot Correlation Between of Digital nurse' competencies, Patient Safety and Teamwork Communication among the Studied Nurses (n= 290)**



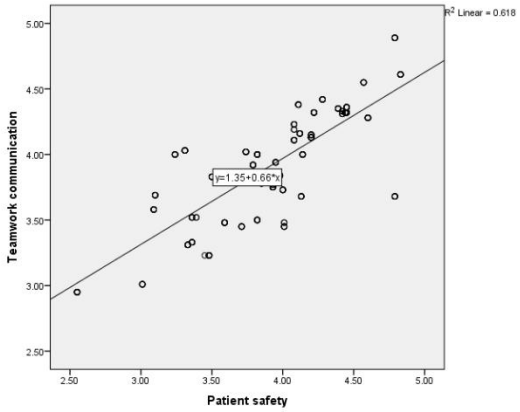



**Figure (2):** This figure illustrated that there was a statistically positive correlation between digital nurse' competencies and patient safety. Also, there was a statistically positive correlation between technology based learning and teamwork communication. Additionally, there was a statistically positive correlation between teamwork, communication and patient safety.

**Discussion:**

"The application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data, and knowledge for communication and decision making" is the definition of healthcare information technology. Through task automation, medication alerts, clinical reminders, better diagnostic and consultation reports, information sharing, clinical decision-making, error prevention, practice variation reduction, workforce shortage management, and full patient data availability, technological advancements can improve patient safety **(WHO, 2020)**. On many levels, good teamwork promotes patient safety, and it influences nursing turnover rates, team satisfaction, and the quality of patient care. In the healthcare system, good communication is essential for reducing mistakes and raising employee satisfaction. **(Anjum, Din, & Ashraf, 2024)**. There are now many opportunities for nurses to use digital technologies in the workplace thanks to the digitization of health care. Digital technologies are also utilized to improve administrative procedures, like the deployment of electronic health records. **(Golz, 2023).**

The current study findings will be discussed considering the previously proposed research questions; accordingly, the first research question was regarding the level of technology-based learning, patient safety and teamwork communication among staff nurses.

Regarding the level of Digital nurse' competencies, the current study findings revealed that staff nurses reported a high level of Digital competencies. The highest percent of studied nurses had a high level of digital competence skills and digital competence attitude. Also, more than two third of participants had a high level of digital competence knowledge.

According to the researchers, higher level of technology-based learning in the current study may be explained by the fact that nurses comply with updated digital educational training courses provided by continuing education and training center in their hospital. Additionally, the hospital administration places a strong focus on health care digitalization standards which are critical of equipping nurses with technology-based knowledge, skills, and attitude.

This result approved by **Zhang, (2024)** who reported that nurses have a critical role in giving information about the content and features of relevant technology, and their performance has a significant influence on the success or failure of health care reform. Also, our result is supported by **Kulju et al (2024)** who stated that using digital solutions in patient care is a crucial part of health care professional digital competency. However, only five studies evaluated this aspect, and four of them found that participants' attitudes or intentions to use improved statistically significantly. It was also discovered that programs designed to increase health care workers' proficiency in eHealth tended to emphasize skill development over motivation.

Furthermore **Virtanen et al. (2021)** stated that training in digital health should concentrate on competencies pertinent to a specific setting, role, seniority level, and group of health professionals to produce statistically significant results regarding participants' skills, performance, or output quality. Building healthcare professional digital competency requires not only their drive and positive attitude toward technology use, but also organizational support, sufficient resources, and peer support and attitude.

In addition, **Java et al (2022)** revealed that participants concurred that a health care professional's overall clinical competency includes digital health competency. It is important to plan ongoing education for digital health competency in a methodical manner, possibly incorporating social media platform resources. In order to be role models for their staff and actually encourage the development of digital health

competencies, managers and supervisors should also take a more active approach to learning about digital health services.

Regarding the level of teamwork communication, nurses reported a high level of teamwork communication toward disease planning, discharge planning, teamwork structure, communication protocols and care planning. While, less than one third of participants had a moderate level of external communication.

From the researchers' point of view, nursing supervisor provides constructive feedback to staff nurses continuously, as well as nurses team structure is clear in roles, responsibilities and work policies which intruns results in effective communication among team members. Therefore, using information technology enables hospitals to adopt new organizational structures, streamline the care process, improve the structure and composition of teamwork.

**Aoyanagi et al (2022)** agreed with current study result and revealed that nurses were aware of the significance of discharge planning, carried out their responsibilities, and had good communication skills. They also mentioned that when it comes to the discharge planning process, communication skills are crucial not only between patients and nurses but also between healthcare providers. Also, **Alshammari & Alenezi, (2023)** agreed with current study result and found that technology integration has a major and positive effect on the competency of the nursing workforce. It has enhanced healthcare professionals' ability to communicate and collaborate with one another, improved access to patient data, given them advanced tools for diagnosis and treatment, and made continuing education and training more accessible.

Also, his result supported by **Mohamed et al., (2022)** stated that information technology makes it easier to obtain patient information, speeds up communication between the medical team from anywhere at any time, and makes it difficult for data stored in the electronic system to be lost.

Also, **Salem (2021)** revealed that the nursing staff' mean score was high, particularly in their documentation and communication skills, which led to time and efficiency savings. They have improved the staffing relationship between others and the documentation process by providing accurate information about patient condition, which may be related to attending the information technology.

Regarding the level of patient safety, nurses reported a high level of patient safety concerning communicating effectively, clinical safety, recognize, respond to, and disclose adverse events and close calls. While, about one third of participants had a moderate level of comfort speaking up about patient safety from their perspective. From the researchers' point of view nurses are aware of clinical aspects of patient safety as well as hospital' system aspects of patient safety were well covered in staff nurses' training program including work environment policies, resources, communication and nursing care processes.

In the same line **Sümen et al (2022)** stated that nurses spend the most time with patients and play a significant role in ensuring patient safety through patient monitoring and supervision. They are also regarded as qualified, trustworthy, and essential health professionals for enhancing the quality of care within the healthcare system. Additionally, nurses should monitor their patients, be mindful of factors that impact patient safety, and take precautions to safeguard and enhance patient safety.

These results supported by **Siokal (2021)** found that about two thirds reported high benefits from using computer-based nursing documentation. Also, consistent with the study performed by **Faustorilla (2020)** detected positive effect of nursing informatics on quality nursing care at most studied nurses. Also, **Salem (2021)** showed that most nursing staff members report higher mean productivity scores than information technology-related performance. This could be explained by the fact that the best use of the information technology resources that were previously available.

**Kamel et al., (2024)** who mentioned that informatics improve quality of patient care, improve nursing care practice and support the appropriate and effective use of resources to improve the patients' safety. **Dinesh et al., (2022)** who mentioned that health information technology can be utilized to promote patients' safety, and the deployment of the appropriate technology leads to increased efficiency, improved quality and safety, and at a reduced cost. Using technology effectively reduces the risk of medical errors, improves medication and medical device safety, facilitates clinician-to-clinician communication, increases access to medical information, and promotes patient safety.

Regarding correlation among digital nurses' competencies and teamwork communication, the current study results showed a significant positive correlation among digital nurse' competencies and Teamwork communication (r=0.670), patient safety (r=0. 476). Also, significant positive correlation between patient safety and teamwork communication (r=0. 786).

In the same line of study results, Kamel., et al (2024) explained that the total knowledge and informatics competency of staff nurses, as well as their overall patient safety level of the post and follow-up program phase, were positively and statistically significantly correlated. Also, **Salem (2021)** reported that all aspects of IT benefits on health and safety, job satisfaction, performance, and work-life balance were found to be statistically significantly positively correlated, according to a reported regression analysis of the effects of IT benefits on various nurses' work outcomes.

**Ansari et al., (2022)** reported that according to the study's findings, nurses' professional competency and their informatics competency were directly correlated.

Since information technology has a big impact on the nursing profession, nurses should use informatics to improve patient outcomes.

In current result there was a statistically positive correlation between digital nurse' competencies and patient safety. Also, there was a statistically positive correlation between digital nurse' competencies and teamwork communication. Additionally, there was a statistically positive correlation between teamwork, communication and patient safety. This result supported by **Febriansyah et al., (2020)** who showed that in-hospital services, the role of teamwork is significant in creating the patient safety culture and hospital management must involve the active role of each team member in improving patient safety culture.

Also, **Salem (2021)** revealed that the dimensions of IT adoption are statistically significantly correlated. Additionally, the work outcomes of nurses who use information technology showed a statistically significant positive correlation between all aspects of IT's benefits for health and safety. Our findings demonstrated a highly significant positive correlation between the benefits of information systems use for the nurses under study and their management support, information systems use, and user involvement. Additionally, there was a strong positive correlation between the data and systems, application of the nursing that was studied, and management support and user involvement.

**Kamel et al., (2024)** indicted that there was a highly statistically significant difference improvement of staff nurses perceived patients' safety level through post and follow up program phases compared with preprogram phase and referred it to current information system that help staff nurses to correctly identify patients, know high alert medication list well and effective communication these makes Them able to overcome problems related to patient safety.

## Conclusion:

In the digital age of healthcare dynamic and evolving field, digital nurse' competencies, patient safety and teamwork communication are crucial for healthcare organizations. From the current study we conclude that; highest percent of studied nurses had a high level of digital nurse' competencies (digital competence skills and digital competence attitude). Also, nurses had high level of patient safety concerning (communicating effectively, clinical safety, and nurses reported high levels of regarding recognize, respond, and disclose adverse events and close calls). In addition, a high level of teamwork communication toward (disease planning and discharge planning, high level of teamwork structure, and both Communication protocols and care planning) were reported by staff nurses. A significant positive correlation among digital nurse' competencies, patient safety and teamwork communication were found.

## Recommendations

For healthcare organizations seeking to enhance patient safety outcomes when utilizing health information technology, the researchers suggest a thorough framework that consists of the following:

1. The hospital needs to set up a system for monitoring health information that involves pertinent stakeholders and leadership.
2. Nurse managers should ensure medication safety and adherence to guidelines by determining how health information technology can help improve patient safety.
3. From planning and execution to ongoing improvement, nursing managers and healthcare stakeholders ought to be involved in every stage of health information projects.
4. Nurse managers of healthcare organizations examine the cost-effectiveness of technologies, make decisions based on evidence, and assess the hardware and software components of the current IT infrastructure.
5. Staff nurses must receive adequate training on how to use the suggested health information technology.
6. Nursing managers make sure that patient safety results are continuously assessed and tracked, particularly when new technology is first being implemented.
7. Technology optimization is required, which entails adjusting the deployed technology in response to user input and patient safety results.
8. To adhere to current nursing best clinical practices, regulatory standards, and technical stability, healthcare organizations should prioritize regular technology updates.
9. Promote nurse-patient interaction: A fundamental aspect of nursing science and excellent nursing care is communication throughout available technologies.
10. Nurse leaders help healthcare organizations foster a culture of trust that promotes reciprocal communication.
11. Designing and implementing training programs emphasizing internet usage techniques will enhance nursing staff members' digital proficiency.

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