

Understanding the Digital Shift: Nurses' Competency, Engagement, Utilization and Satisfaction with Digital Health Technology

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Abstract

The integration of digital health technology has become increasingly essential in modern nursing practice, transforming the way care is delivered and managed. Hence, this study aims to investigate nurses' competency, engagement, utilization, satisfaction, and experiences with digital health technology. This study employed a concurrent triangulation mixed-method design, incorporating a descriptive-correlational research design and a phenomenological approach. One hundred forty-seven (147) respondents who met the inclusion criteria were chosen through simple random sampling and convenient sampling for the quantitative study, and fourteen (14) participants were drawn from these for actual participation in the qualitative study through purposive sampling. Findings reveal that most respondents were middle-aged female staff nurses with bachelor's degrees, showing they were experienced professionals. The overall weighted means were very high for competency (4.28), engagement (4.32), utilization (4.30), and satisfaction (4.28). Significant relationships were found between age and both competency and satisfaction, and between years of digital technology experience and all four variables. Position was significantly related to competency. Sex and education level showed no significant relationships. Significant differences in competency, engagement, utilization, and satisfaction were also found across different demographic groups. Post Hoc Analysis using Tukey HSD test highlights significant differences in nurses' competency, engagement, utilization, and satisfaction between and among the variables. Thematic analysis identified experiences, including leveraging data for improved outcomes, integrating solutions for optimized healthcare delivery, and maximizing resource efficiency. The study led to the development of a research simulacrum and proposed sustainability program to guide and empower nurses in optimizing the use of digital health technology.

Keywords: *competency, digital health technology, experiences, engagement, satisfaction, utilization*

1. Introduction

As Heraclitus, a Greek philosopher, said some 2,500 years ago, "There is nothing permanent except change". Though the quote was said hundreds of centuries ago, the truth is applicable today and will be relevant forever. This famous adage is equated to the saying "From Bedside to Bytes," which encapsulates the critical transition nurses experience as healthcare increasingly integrated digital solutions in the hospital setting. Globally, the rapid advancement of digital health technology has significantly impacted human efforts in recent decades and led to significant advancements in population-wide health policies, individual health and medical treatment, and the integration of real-time knowledge and insights.

Globally, the use of digital health and technology to address health issues has emerged as a prominent field of practice using conventional and innovative approaches. The World Health Organization (WHO) has been charged with establishing normative guidelines in the field of digital health, particularly promoting evidence-based digital health interventions. The benefits and drawbacks of these developments on human health remain a subject of speculation (Labrique, 2020). To date, despite the increased attention, the World Health Organization (2021) reports that digital health has been widely implemented without a thorough analysis of evidence based on benefits and hazards. The proliferation of short-lived implementations and an overwhelming variety of digital tools has led to a lack of knowledge on how these tools affect health systems and people's well-being. While digital technology can enhance the health system, it is crucial to assess its impact to avoid unnecessarily taking funds away from other non-digital approaches.

In the Philippines, as of March 17, 2023, four Filipino digitalization specialists participated in a conversation on the nation's transition to digital healthcare presented by the Department of Science and Technology-Philippine Council for Health Research and Development. "PCHRD Beyond XL: Transforming Healthcare Through Digitalization" was the central theme of the discussions. Dr. de Guzman claims that there are several levels of research and development for digital health, encompassing services, policies, and treatments. Additionally, he stated that these instruments ought to be incorporated into the standards of care since they will enhance the care's quality, convenience, and responsiveness to each and every Filipino. Central to the discipline indicates that the Electronic Medical Record (EMR) system is the digital counterpart of hospital paper records or charts, usually including the general health information, treatment plan, and management of patients (Ramoo et al., 2023). By reducing medication administration errors, decreasing nurses' workload, slightly improving patient information documentation, and enhancing certain aspects of clinical practice, the EMR system has been shown to improve patient safety, the quality of nursing care, and operational efficiency, although it has been associated with reduced availability of some medical information and increased documentation time (Naamneh & Bodas, 2024). Moreover, by implementing robust privacy measures such as access controls, encryption, and patient consent protocols, EMR systems offer a more secure method of protecting patient data compared to paper-based systems, which are more susceptible to unauthorized access and data breaches (Tertulino et al., 2023).

With the integration of EHRs into nursing practice, Filipino registered nurses have experienced enhanced patient-centered care and improved documentation efficiency. These digital systems have streamlined workflows and reduced administrative burdens, allowing nurses to focus more on direct patient care. However, challenges such as system usability issues and the need for adequate training highlight the importance of continuous support and system refinement to fully realize the benefits of EHRs in the Philippine healthcare setting (Amaba et al.,

2023). By transitioning from paper-based records to EHRs, Philippine rural health workers have encountered both opportunities and challenges. While EHRs have the potential to improve data management and patient care, inconsistent implementation and limited resources have led to partial adoption. This uncertain transition underscores the need for comprehensive strategies and support systems to ensure the effective normalization of EHRs in routine healthcare work (Macabasag et al., 2022). This aids in proactive health management, which may reduce the prevalence of chronic illnesses and enhance population health in general.

On the other hand, digital health technology utilization is also crucial for improving healthcare access, quality and efficiency. A relevant study by Owens et al. (2020) was conducted by implementing Barcode Medication Administration (BCMA) technology in a community hospital emergency department. Healthcare providers have significantly reduced medication administration errors and improved nursing satisfaction. The study observed a 74.2% decrease in medication errors and a statistically significant improvement in nursing scores following the BCMA implementation. The study offers a methodical assessment of various aspects of electronic health records, which is essential for identifying the factors that contribute to success and the obstacles that must be overcome in order to improve it further. These findings underscore the potential of BCMA systems to enhance patient safety and nursing workflow in high-pressure clinical environments.

Similarly, pertinent research regarding nurses' challenges in utilizing digital health tools was also discovered, according to the World Bank. Challenges include market limitations, cost and educational obstacles, and security and privacy concerns due to sensitive patient data. The Republic Act No. 10173, also known as the "Data Privacy Act of 2012", is a Data Privacy Guidelines on the Processing of Health Information. It ensures individuals' rights to access and modify personal information, prohibiting illegal collection, use, or sharing. The DOH oversees healthcare providers utilizing EHR systems and is developing the National Health Information System (NHIS) to facilitate nationwide implementation. The DOH advocates for health providers to establish a solid foundation to enhance the usability and interoperability of EHR systems (World Bank, 2022). Finally, the swift adoption of emerging technology, increasing patient expectations, and workforce shortages are merely a few of the many challenges confronting the healthcare sector.

On the other hand, having been assigned to private hospitals of La Union, such as Lorma Medical Center, the researchers saw that digital technology was fully and effectively implemented and used in the emergency room, as well as in various wards and departments. Modern, upscale facilities in every unit of the hospital guarantee that interventions are carried out quickly and easily. As the hospital adopts a paperless facility strategy, the unit is prepared for a more sophisticated record-keeping system. The nurses whom the researchers worked with also mentioned their experiences in digital technology, sensors, and electronic records management. This is not just about complying with regulations; it is also about laying the groundwork for data integrity and operational excellence.

MEDSYS software at Lorma Medical Center utilizes modules for nurses which provide features that support patient data management, medication management, order management, communication, collaboration, reporting, analytics, system integration, interoperability, security, privacy, hardware, and infrastructure. By integrating these digital processes, MEDSYS streamlines clinical workflows, enhances collaboration, reduces manual errors, and improves the accessibility and quality of healthcare delivery. Ultimately, it strengthens nurses' competency, engagement, utilization, satisfaction and experiences with digital health technology (IT Department of Lorma Medical Center, 2025).

Additionally, the MEDSYS system at Lorma Medical Center includes the Visual Nurse Program, which links multiple departments such as Laboratory, X-ray, Ultrasound, CT scan, Heart Station, Hemodialysis, Pulmonary Laboratory, Pharmacy, Central Supply, Nutrition and Dietetics, Operating Room, Billing, and other connected units. It features data-entry restrictions, updated and reliable reporting, a user-friendly interface, and password protection to ensure accuracy, usability, and data security. Through this integration, nurses at Lorma Medical Center can efficiently manage patient requests, access clinical updates, and streamline workflows across departments.

A considerable amount of literature has been published on digital health technology. However, there has been relatively little literature published on the use of MEDSYS and an apparent gap in research focusing on the distinctive practices, including the competency, engagement, utilization, and satisfaction of nurses with the use of digital health technology. Moreover, the lack of research studies on this topic leaves policymakers and healthcare administrators with limited insights into the effectiveness and user-friendliness of digital healthcare technology, potentially leading to underutilization or improper implementation of these systems. Management of electronic records is critical for regulatory compliance and operational efficiency. As a result, the researchers decided to conduct the study.

Even though the Philippine government demands that the healthcare industry embrace digitalization, most government hospitals do not fully comply with its policies when implementing the program. To comprehend the reason for the discrepancy between the standard mandate for all government and private hospitals to adopt digital technology. Examining the competencies, engagement, utilization, satisfaction and experiences at Lorma Medical Center that utilizes the MEDSYS system is crucial. The study's findings can be utilized as a baseline and benchmarking process, which can help a local implementation succeed by improving patient care outcomes, which requires effective system use.

2. Objectives

This study aims to determine Nurses' Competency, Engagement, Utilization and Satisfaction with Digital Health Technology. Specifically, it sought to determine the socio-demographic profile of the respondents in terms of age, sex, length of experience in digital health technology, education level and position. Further, it also aims to identify the extent of nurses' competency, engagement, utilization and satisfaction with digital health technology, the significant relationship between the profile of the respondents with the extent of nurses' competency, engagement, utilization and satisfaction with digital health technology, the significant difference between the extent of nurses' competency, engagement, utilization, and satisfaction with digital health technology when grouped according to profile variables, the significant difference between the extent of nurses' competence, engagement, utilization, and satisfaction with digital health technology and how do nurses describe their clinical experience with the use of digital health technology. Moreover, it also aims to determine the experiences of nurses with the use of digital technology.

3. Materials and Methods

This study employed a concurrent triangulation mixed-methods approach, combining quantitative and qualitative methods to gain a thorough understanding of nurses' competency, engagement, utilization, satisfaction, and experiences with digital health technology. This approach was chosen because it allows for quantitative and qualitative data to be collected simultaneously and analyzed separately. At the same time, a mixed method is employed for

both numerical data analysis and an in-depth exploration of participants' experiences with digital health technology. The quantitative part of the study utilized a descriptive-correlational research design to examine the relationship between nurses' demographic profiles and their level of competency, engagement, utilization, and satisfaction with digital health technology. According to Creswell (2008). For the qualitative component of the study, the phenomenological method was used to investigate nurses' experiences with digital health technology. This method was chosen to gain a more in-depth understanding of the participants' experiences.

This study was conducted at Lorma Medical Center, a healthcare institution located in San Fernando, La Union. The hospital is known for its integration of digital health technology, such as MEDSYS, with computing platforms, connectivity, software, barcoding and sensors. This technology facilitated healthcare delivery, making it an ideal setting for the study of nurses' competency, utilization, satisfaction, engagement and experiences with digital health tools. The population for this study consisted of nurses employed at Lorma Medical Center who had been actively using digital health technology for at least one year. The inclusion criteria for selecting the participants were as follows: (1) Nurses employed at Lorma Medical Center. (2) Actively utilizing digital health technology for patient care (3) At least one year of experience in using digital health technology in their respective roles. (4) Male or female, and (5) willingness to participate in the study and provide insights on their competency, utilization, engagement, satisfaction and experiences with digital health technology. Nurses who did not meet the criteria set by the researchers are not included in the study. A sample size of 147 was computed using an online Raosoft calculator using a 5% margin of error and 95% confidence level. The researchers determined that 147 respondents were needed to achieve a reliable sample size, given the total population of bedside nurses at Lorma Medical Center. The researchers used the combination of simple random sampling and convenience sampling for the quantitative part of the study, ensuring the representation of all subgroups of nurses in the different departments. The Participants of the study were Fifteen (15) participants based on the point of saturation.

The tool for data collection in this study is composed of a self made questionnaire for the Quantitative and semi-structured interview guide for the qualitative. For the quantitative part of the study, the researchers developed a researcher-made questionnaire with an emphasis on the following components, which were divided into parts. This first section of the research questionnaire is the socio-demographic information of the respondents, which is used to gather basic information about the respondents, including age, gender, position in the hospital, and years of experience using digital health technology. The second section of the research questionnaire assessed the extent of competency, engagement, utilization and satisfaction of the respondents with the use of digital health technology. Researchers used a five-point Likert scale to assess competency, engagement, utilization, and satisfaction with digital health technology at Lorma Medical Center. Respondents were asked to rate their perceptions and indicate their agreement or disagreement with each statement. The research questionnaire was based on the 11 core competencies of nurses and the policy guidelines from the IT department of Lorma Medical Center and the Nursing Information System on the use of digital health technology in the hospital.

In addition, the researchers utilized a semi-structured interview guide as it allows participants to respond to open-ended questions. This tool was designed to gather nurses' experiences with the use of digital health technology. The interview guide was divided into the following sections: One central question or grand tour question was asked about the experiences undergone by the participants with the use of digital health technology. This central question was to encourage nurses to provide recommendations for improving the use of digital

health tools in the hospital setting. Open-ended probing questions were used to explore the experiences. Participants were asked to share their experiences on how the use of digital technology has affected the quality of care they provide to patients and how the experiences they employ navigate the challenges experienced. The study conducted pre-testing with two nurses to ensure the relevance and validity of the questions. Interviews were conducted in person using audio recording devices, recording participants' consent and the interview itself. Each interview lasted between 15 and 20 minutes and was conducted in a comfortable, private setting.

Before the commencement of data collection, the researchers ensured that their proposal was reviewed by the Lorma Colleges Research Ethics Committee (R.E.C.) for ethical approval. Once approved, the researchers provided a copy of the R.E.C. evaluation to the Dean of the College of Nursing and sought permission to carry out the survey and interviews. In addition to administering the research questionnaire and interview guide, the instruments were thoroughly validated by research experts. Following validation, the researchers formally requested permission to conduct a pilot study at Lorma Medical Center in San Fernando City, La Union. The pilot study was conducted with twenty (20) nurses from various departments within the hospital. In conducting the actual study, the researchers administered the questionnaires and the interviews simultaneously. A formal letter was sent to the administration and the Nursing Director of Lorma Medical Center to request permission to distribute the questionnaires and conduct interviews with the nurses. Upon approval, all potential participants received an informed consent form emphasizing that participation was entirely voluntary and free from any coercion. Participants were assured that strict confidentiality and anonymity would be maintained throughout the study. They were also informed of their right to withdraw at any time without any consequences to their current or future relationship with Lorma Medical Center or the researchers. The study adhered to the provisions of the Data Privacy Act of 2012, ensuring that all collected data was used solely for research purposes. The researcher-made questionnaire was distributed to all participants during their regular shifts, either through face-to-face distribution or via digital means, depending on their availability. At the same time, while waiting for the respondents to answer the questionnaire, the qualitative data collection began. . Each interview lasted approximately 15 to 20 minutes, and participants were interviewed individually. The interview ended with the researcher expressing gratitude to the respondents.

An allocated code was used for each participant in their prospective words during the data collection to ensure the anonymity and confidentiality of each participant. Interview transcriptions were immediately processed, encoded in Google Docs, and later reviewed for accuracy. The researchers returned to the participants four times to validate that the experiences were indeed lived through by the participants at Lorma Medical Center. Additionally, this process allowed participants to confirm the accuracy of the transcribed narratives, ensuring that their experiences and insights were correctly represented. The researchers ensured that honesty, integrity, secrecy, and legality were upheld. To protect the researchers' intellectual integrity, the data was only disclosed in the results and discussion sections. The study completely followed Lorma Colleges' research ethics policy and procedures. The research was self-funded, with no support from any organizations. Access to the gathered data was limited to the researchers and panelists. The data was securely stored on Google Drive for safekeeping until the paper was published.

Furthermore, the researchers utilized frequency count and percentage distribution. These were used to describe the demographic profile of the respondents. To analyze the level of competency, the researchers employed a five-point Likert scale to determine the extent of the

nurses' competency in the use of digital health technology. To determine and evaluate the significant difference in nurses' competency, engagement, utilization, and satisfaction with digital health technology when grouped according to profile variables when grouped according to profile, Analysis of Variance (ANOVA) was utilized. To determine and evaluate the significant difference in nurses' competency, engagement, utilization, and satisfaction with digital health technology, Analysis of Variance (ANOVA) and post hoc analysis using Tukey were utilized. To analyze the experiences of the nurses, thematic analysis utilizing the Collaizi method was utilized. This method consisted of seven steps: familiarization, identification of significant statements, formulation of meanings, clustering of themes, development of exhaustive descriptions, production of a fundamental structure, and verification of the fundamental structure (Morrow, Rodriguez, & King, 2015).

The researcher recognizes the importance of conducting high-quality research. Key strategies were employed to ensure trustworthiness of the research including credibility, triangulation, dependability, confirmability, peer debriefing, transferability. To guarantee a thorough grasp of the phenomena under study, the researchers employed persistent observation, in which they carefully examined the data in search of recurring patterns or discrepancies. When combined, these approaches build credibility and guarantee that the research findings are valid, credible, and dependable. To ensure the reliability of the data gathered during the interview with the participants, the researcher followed up with the participants to ask for validation of the narrative transcripts that the researcher had transcribed.

The privacy and confidentiality of participants were protected by limiting data collection to what was necessary and anonymizing all personal information. . Furthermore, veracity and honesty were prioritized by providing accurate and truthful information about the study's purpose and outcomes. The principles of non-maleficence and beneficence guided the study in ensuring no harm came to the participants while aiming to provide benefits through an improved understanding of digital health technology. Justice was maintained by treating all participants fairly and equitably, selecting them based on relevance to the study rather than demographic factors. Finally, fidelity was maintained by protecting participants' rights and maintaining transparency throughout the research process.

4. Results

4.1 Demographic Profile of the Respondents

The data presented in Table 1 shows the demographic profile of the respondents. Based on the age distribution of the respondents, 63.3% were middle-aged. In terms of sex, 72.8% of the respondents were female. Regarding education level, 98% of the respondents hold a bachelor's degree. Lastly, 83% of the respondents were staff nurses in terms of job positions.

Table 1. Socio-demographic Profile of the Respondents

Profile		Frequency (f)	Percentage (%)
Age	Early Adulthood (19-29)	54	36.7%
	Middle Age (30-64)	93	63.3%

Sex	Male	40	27.2%
	Female	107	72.8%
Length of Experience in Digital Health Technology	1-3 years	65	44.2%
	4-7 years	44	29.9%
	8-10 years	26	17.7%
	More than 10 years	12	8.2%
Education level	Doctor's degree	0	0%
	Master's degree	2	1.4%
	Bachelor's degree	145	98.6%
Position	Head Nurse	7	4.77%
	Senior Nurse	18	12.2%
	Staff Nurse	122	83%
Total		N = 147	100%

4.2 Summary Table on the Extent of Nurses' Competency, Engagement, Utilization and Satisfaction with Digital Health Technology

The table presents the extent of nurses' competency, engagement, utilization, and satisfaction with digital health technology yielded an overall weighted mean of 4.29, indicating a very high level along nurses' competency, engagement, utilization and satisfaction with digital health technology.

Table 2. Summary Table on the Extent of Nurses' Competency, Engagement, Utilization and Satisfaction with Digital Health Technology

VARIABLES	OVERALL WEIGHTED MEAN	DESCRIPTIVE EQUIVALENT RATING
Competency	4.28	Very Highly Competent (VHC)
Engagement	4.32	Very Highly Engaged (VHE)
Utilization	4.30	Very Highly Utilized (VHU)
Satisfaction	4.28	Very Highly Satisfied (VHS)

Legend: VHC-Very Highly Competent, VHE- Very Highly Engaged, VHU- Very Highly Utilized, VHS- Very Highly Satisfied

4.3 Significant Relationship Between the Profile of the Respondents with the Extent of Nurse's Competency, Engagement, Utilization, and Satisfaction with Digital Health Technology

The data presented the significant relationship exists between age and both competency and satisfaction with digital health technology. Furthermore, length of experience in digital health technology was significantly related to competency, engagement, utilization, and satisfaction. Moreover, position showed a significant relationship with competency. In contrast, no significant relationship was found between sex or education level and any of the variables.

Table 3. Significant Relationship Between the Profile of the Respondents with the Extent of Nurse's Competency, Engagement, Utilization, and Satisfaction with Digital Health Technology

Variables	Components	r value	Test significance (p < .05)	of Interpretation	Decision
Age	Competency	0.2744	0.0007707	significant positive	small Reject Hypothesis
	Engagement	-0.1199	0.1479	non small negative	significant Accept Hypothesis
	Utilization	-0.1436	0.08271	non small negative	significant Accept Hypothesis
	Satisfaction	-0.1764	0.03254	significant negative	small Reject Hypothesis
Sex	Competency	-0.1417	0.08679	non small negative	significant Accept Hypothesis
	Engagement	-0.1236	0.1357	non small negative	significant Accept Hypothesis
	Utilization	-0.03401	0.6825	non very negative	significant small Accept Hypothesis
	Satisfaction	-0.001897	0.9818	non very negative	significant small Accept Hypothesis
Length of experience in digital health technolog y	Competency	0.1969	0.01685	significant positive	small Reject Hypothesis
	Engagement	0.267	0.001077	significant small positive	very Reject Hypothesis
	Utilization	0.2472	0.002541	significant	very Reject

				small positive	Hypothesis
	Satisfaction	0.3113	0.0001241	significant medium positive	Reject Hypothesis
Education level	Competency	-0.01438	0.8627	non very negative	significant small Accept Hypothesis
	Engagement	0.08913	0.283	non very positive	significant small Accept Hypothesis
	Utilization	0.05846	0.4819	non very positive	significant small Accept Hypothesis
	Satisfaction	0.05113	0.5385	non very positive	significant small Accept Hypothesis
Position	Competency	0.1672	0.04292	significant positive	small Reject Hypothesis
	Engagement	-0.07087	0.3937	non very negative	significant small Accept Hypothesis
	Utilization	-0.04846	0.56	non very negative	significant small Accept Hypothesis
	Satisfaction	-0.02209	0.7906	non very negative	significant small Accept Hypothesis

**Correlation is significant at the 0.05 level*

4.4 Significant Difference between the Extent of Nurses' Competency, Engagement, Utilization, and Satisfaction with Digital Health technology when grouped According to Profile Variables

The table shows the ANOVA result demonstrated statistically significant differences in nurses' competency, engagement, utilization, and satisfaction with digital health technology when grouped according to profile variables, leading to the rejection of the null hypothesis.

Table 4. Significant Difference between the Extent of Nurses' Competency, Engagement, Utilization, and Satisfaction with Digital Health technology when grouped According to Profile Variables

Source	F Statistic	P- value	Interpretation	Decision
Between groups				
Within groups	1033.8707	0.000000005914	Significant	Rejected Hypothesis
Total				

Legend: P-value - any value<0.05=Significant; any value>0.05= Not significant. Since P-value< α , H_0 is rejected.

4.5 Significant difference between the extent of Nurses' Competency, Engagement, Utilization, and Satisfaction with Digital Health technology

The table shows the extent of competency, engagement, utilization and satisfaction with digital health technology among nurses shows significant differences observed in factor A between subjects and factor B between treatments, which lead to the rejection of the null hypothesis. The results of the qualitative analysis of the selected participants provided insights into nurses' experiences while using digital health technology in healthcare delivery. The data revealed shared patterns in how nurses adapt to and manage digital tools in their practice, resulting in the emergence of three major themes.

Table 5. Significant difference between the extent of Nurses' Competency, Engagement, Utilization, and Satisfaction with Digital Health technology

Source	F Statistic (df1,df2)	P-value	Interpretation	Decision
Factor A: Between Subjects (rows)	4.3582	<.00001		
Factor B: Between Treatments (columns)	14.385	5.914e-9	Significant	Rejected Hypothesis
Total				

Legend: P-value - any value<0.05=Significant; any value>0.05= Not significant. Since p-value< α , H_0 is rejected.

4.6 Post Hoc Analysis Using Tukey

Table 6 presents the results of the Tukey HSD test, which highlights significant differences in nurses' competency, engagement, utilization, and satisfaction. Based on the ANOVA findings, a significant difference was observed between groups, prompting the conduct of a post-hoc analysis using the Tukey test to determine the significant differences between and among the variables

Table 6. Post Hoc Analysis Using Tukey Test in Determining the Significant Difference between and Among the Variables

Treatments pair	Tukey HSD Q statistic	Tukey HSD p-value	Tukey HSD inference
A vs C	13.0471	0.0010053	** p<0.01
A vs D	13.1921	0.0010053	** p<0.01
A vs E	8.6981	0.0010053	** p<0.01
A vs F	53.9425	0.0010053	** p<0.01
A vs G	59.0367	0.0010053	** p<0.01
A vs H	59.6151	0.0010053	** p<0.01
A vs I	59.4513	0.0010053	** p<0.01
B vs C	11.0176	0.0010053	** p<0.01
B vs D	15.2216	0.0010053	** p<0.01
B vs E	10.7276	0.0010053	** p<0.01
B vs F	51.9130	0.0010053	** p<0.01
B vs G	57.0071	0.0010053	** p<0.01
B vs H	57.5856	0.0010053	** p<0.01
B vs I	57.4217	0.0010053	** p<0.01
C vs D	26.2392	0.0010053	** p<0.01
C vs E	21.7452	0.0010053	** p<0.01
C vs F	40.8954	0.0010053	** p<0.01
C vs G	45.9896	0.0010053	** p<0.01
C vs H	46.5680	0.0010053	** p<0.01
C vs I	46.4042	0.0010053	** p<0.01
D vs E	4.4940	0.0404828	** p<0.05
D vs F	67.1346	0.0010053	** p<0.01

D vs G	72.2288	0.0010053	** p<0.01
D vs H	72.8072	0.0010053	** p<0.01
D vs I	72.6434	0.0010053	** p<0.01
E vs F	62. 6406	0.0010053	** p<0.01
E vs G	67.7348	0.0010053	** p<0.01
E vs H	68.3132	0.0010053	** p<0.01
E vs I	68.1494	0.0010053	** p<0.01
F vs G	5.0942	0.0098868	** p<0.01
F vs H	5.6726	0.0020799	** p<0.01
F vs I	5.5088	0.0032968	** p<0.01

Legend: A- Age, B- Sex, C-Length of experience, D-Education level, E-position, F- Competency, G- Engagement, H- Utilization, I-Satisfaction

4.7 Research Simulacrum

Figure 1 illustrates the research simulacrum, which encapsulates nurses' lived experiences with digital health technology. These experiences were synthesized into three (3) major themes, each comprising three (3) subthemes. The first theme, "Leveraging Data for Better Outcomes," highlights the proactive and strategic utilization of patient data to enhance care delivery. The second theme, "Optimizing Healthcare Delivery and Decision-Making through Integrated Digital Solutions," emphasizes the importance of system integration and the streamlining of clinical processes to support informed decision-making. Lastly, "Resource Optimization and Efficient Resource Allocation" centers on workforce training, adaptability, and the sustainable use of available resources to maximize healthcare efficiency.

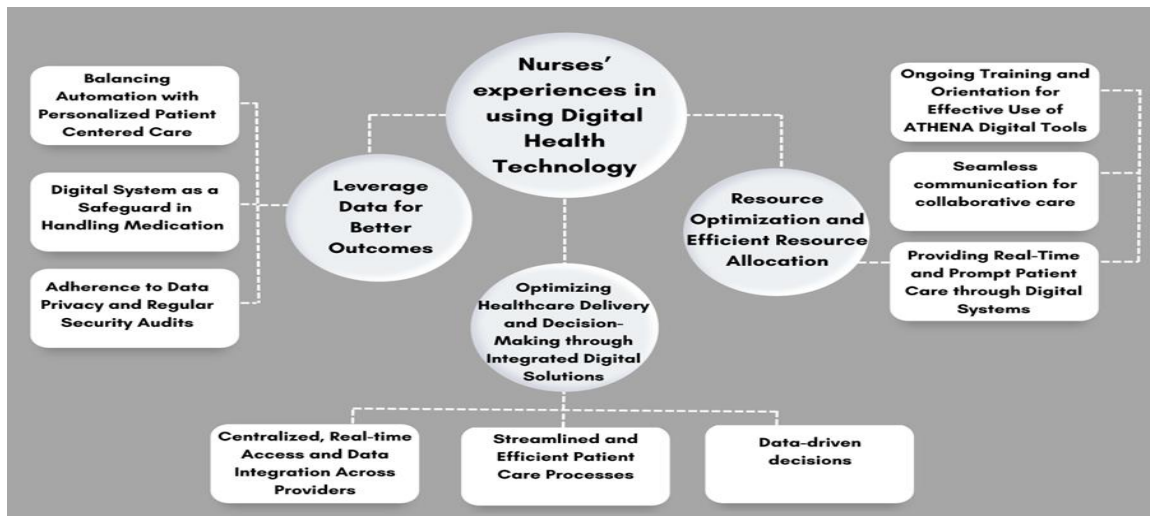


Figure 1: Research Simulacrum

5. Discussion

5.1. The socio-demographic profile of the respondents

The data reveals that the majority of respondents are middle-aged (30-64), with 63.3% being female. The majority of respondents are female (72.8%), reflecting a global trend where women dominate the nursing profession. However, the number of male nurses is gradually increasing due to the profession's stability and broad career opportunities. Most respondents have 1-3 years of experience in digital health technology (44.2%), suggesting that digital health technology is still in its early stages of adoption. Almost all respondents (98.6%) hold a bachelor's degree, making it the standard educational requirement for nurses. Those with a master's degree show more positive attitudes towards electronic health records (EHRs), likely due to enhanced critical thinking and leadership skills. Despite limited formal training in digital health, many bachelor's degree holders gain practical experience through their roles, indicating that hands-on exposure plays a key role in developing digital health competencies. Staff nurses (83%) are the primary users of digital health technology, supporting tasks such as monitoring, documentation, and communication.

5.2. The extent of nurses' competency, engagement, utilization and satisfaction with digital health technology

The extent of nurses' competency, engagement, utilization, and satisfaction with digital health technology yielded an overall weighted mean of 4.29, indicating a very high level in all four aspects.

The extent of nurses' competency with digital health technology is high, interpreted as 'very highly competent' with an overall weighted mean of 4.28. Among the competencies, 'collaboration and teamwork' was observed to be the highest, with a weighted mean of 4.35. However, 'legal responsibility' had the lowest weighted mean of 4.11, still interpreted as high competency. The extent of nurses' engagement with digital health technology was described as "very highly engaged," with an overall weighted mean of 4.32. Among all the engagements, 'legal responsibility' recorded the highest weighted mean of 4.40, indicated as 'very highly engaged'. In contrast, among the engagement, the management of resources received the lowest weighted mean of 4.23, though still interpreted as 'very highly engaged'.

The extent of nurses' utilization of digital health technology yielded an overall weighted mean of 4.30, indicating a descriptive rating of "very highly utilized." Among utilization, 'legal responsibility' interpreted as 'very highly utilized' has the highest mean of 4.40. On the other hand, 'management of resources' has the lowest mean of 4.23, still interpreted as 'very highly utilized.' The extent of nurses' satisfaction with digital health technology is high, as indicated by a rating of 'very highly satisfied' with an overall weighted mean of 4.28. Among Satisfaction, 'management of resources' was observed to be the highest with a weighted mean of 4.50, interpreted as 'very highly satisfied'. However, 'communication' had the lowest mean of 3.64, still interpreted as 'Highly satisfied'.

5.3. The significant relationship between the profile of the respondents with the extent of nurses' competency, engagement, utilization and satisfaction with digital health technology

In terms of a significant relationship between the profile of the respondents and the extent of nurses' competency, engagement, utilization, and satisfaction with digital health technology. In terms of age, competency and satisfaction of nurses with digital health technology have been found to have a significant relationship. There is a significant small

positive relationship between age and competency. Similarly, there is a significant small negative relationship between age and satisfaction, leading to the rejection of the null hypothesis. On the contrary, no significant relationship was found between engagement and utilization. Hence, the hypothesis was accepted. In terms of sex, no significant relationships were found between sex and competency, engagement, utilization, and satisfaction with digital health technology, leading to the acceptance of the null hypothesis.

In terms of the length of experience in digital health technology, a significant positive relationship was found between experience and competency, engagement, utilization, and satisfaction, leading to the rejection of the null hypothesis. In terms of education level, no significant relationships were found between education and competency, engagement, utilization, and satisfaction with digital health technology, leading to the acceptance of the null hypothesis. In terms of position, there is a significant small positive relationship between position and competency, leading to the rejection of the null hypothesis. However, no significant relationship was found between position and engagement, utilization, and satisfaction, leading to the acceptance of the null hypothesis.

5.4. The significant difference between the extent of nurses' competency, engagement, utilization, and satisfaction with digital health technology when grouped according to profile variables

The results of the analysis confirm a significant difference in the extent of nurses' competency, engagement, utilization, and satisfaction with digital health technology when grouped according to their profile variables. The F-statistic of 1033.8707, with a corresponding p-value of 0.000000005914, suggests that the observed variation in digital health technology use across different profile groups is statistically significant and unlikely to have occurred by chance.

The difference lies in how nurses with varying demographic and professional profiles, such as age, sex, years of experience, education attainment, and position, engage with digital health technology. This reveals that these profile variables influence competency, engagement, and utilization of digital tools. Moreover, nurses with higher levels of competency and engagement tend to utilize digital health technology more effectively. The data also show that satisfaction with digital health tools varies significantly across different demographic profiles, with more experienced nurses and those in higher positions reporting higher competency and engagement levels. This corroborates the findings with the study of Kinnunen et al. (2023), which describes nurses' perception of their informatics competencies regarding health information system usage, bringing to light the importance of continuous evaluation to identify progress and new development areas. Therefore, the null hypothesis (H₀) is rejected, which assumes that there is no significant difference in digital health technology use across different profile groups. This implies that demographic and professional factors do impact nurses' digital competency, engagement, utilization, and satisfaction in healthcare settings.

5.5. The significant difference between the extent of nurses' competence, engagement, utilization, and satisfaction with digital health technology

The table demonstrates significant differences in nurses' competency, engagement, utilization, and satisfaction with digital health technology. Factor A: Between subjects (row) refers to the individual differences among the nurses. Factor B: Between treatments (columns) refers to the different variables measured, which are competency, engagement, utilization, and satisfaction.

The F-statistic for Factor A, Between Subjects (rows) is 4.3582 with a p-value of <.00001, and the F-statistic for Factor B, Between Treatments (columns) is 14.385 with a p-value of 5.914e-9. As both p-values are well below the 0.05 threshold, the results infer statistically significant differences across these factors. This implies that nurses experience digital health technology in notably different ways, and these differences are not due to random variation. Instead, they likely stem from real connections in such a way that nurses who score higher in competency are linked to higher satisfaction with digital technology due to sufficient support and adequate training. The outcomes are consistent with the research conducted by Alshammari and Alenezi (2023), which revealed that nurses who underwent comprehensive training and technology integration possessed greater self-efficacy and support, demonstrated enhanced competence, and reported higher levels of job satisfaction. Nevertheless, nurses without adequate training or backing were found to be less satisfied. As a result, the null hypothesis (H0), which posits that there is no significant difference in nurses' competence, engagement, utilization, and satisfaction with digital health technology, was rejected. This confirms that the observed differences are statistically significant and not attributable to random variation; hence, post hoc analysis using Tukey was utilized to determine where the difference lies between and among the different variables.

5.6 Post Hoc Analysis Using Tukey

The Tukey HSD post hoc test revealed that most demographic and professional characteristics (such as age, sex, experience, education, and position) differed significantly from digital health-related variables (competency, engagement, utilization, and satisfaction). Notably, age and sex did not significantly differ from each other but showed significant differences when compared to all digital health variables. Similarly, competency consistently showed significant differences from engagement, utilization, and satisfaction, while these three (G, H, I) were not significantly different from one another. This suggests that while digital health outcomes are interrelated, they are strongly influenced by individual background characteristics.

5.7. Nurses clinical experience with the use of digital health technology

The research simulacrum entitled "Nurses' experiences in using digital health technology" presents a structured framework highlighting the essential strategies and experiences nurses adopt to integrate digital tools into healthcare delivery effectively. It is divided into three major themes: (1) Leveraging data for better outcomes, (2) Optimizing healthcare delivery and decision-making through integrated digital solutions, and (3) Resources optimization and efficient resources allocation. These pillars reflect the evolving role of nurses in a technologically advanced clinical setting. The first major theme emphasizes data-driven care, personalized automation, and secure information handling, which are vital components in ensuring safe and efficient patient outcomes. The second framework emphasizes centralization, real-time access, and data integration across providers, streamlining efficient patient care processes and data-driven decisions.

Furthermore, the simulacrum underscores the importance of providing real-time and prompt patient care through digital systems, seamless communication for collaborative care, and ongoing training and orientation for the effective use of ATHENA digital tools. It illustrates how nurses can use centralized digital systems to streamline patient care, communicate seamlessly with interdisciplinary teams, and make well-informed decisions based on integrated data. Ongoing training and orientation, such as the effective use of platforms like ATHENA, are also emphasized to keep nurses competent and confident in navigating emerging technology.

Altogether, the model highlights that the successful adoption of digital health technology in nursing is not just about access to tools but hinges on cultivating a culture of innovation, continual learning, and strategic resource management.

5.8. The validated measures proposed based on the salient findings of the study

Proposed Sustainability Program on Digital Health Care for Nurses: Basis for Strengthening Digital Systems

Rationale

Digital health technology has transformed healthcare delivery, offering scalable, efficient, and accessible solutions. While it is true that the overall weighted mean across all aspects was 4.29, indicating very high levels of competency, engagement, utilization, and satisfaction, there remains room for improvement. Based on the findings of the study, this sustainability program will help sustain nurses' competency, engagement, utilization, and satisfaction by addressing gaps identified in system use and performance. This underscores the urgent need for a sustainable program that not only enhances nurses' digital competencies but also fosters continuous engagement, satisfaction, and utilization of digital tools. By empowering nurses with the necessary knowledge and skills, healthcare institutions can ensure smoother transitions toward digital systems, ultimately leading to improved patient care and operational efficiency.

Objectives

To develop and implement a sustainable program that enhances nurses' competency, engagement, and satisfaction in using digital health technologies, serving as a foundation for strengthening institutional digital health systems. With this, the sustainability program focused on the following key areas, which received the lowest weighted mean scores in terms of nurses' competency, engagement, utilization, and satisfaction.

Proposed Sustainability Program on Digital Health Care for Nurses: Basis for Strengthening Digital Systems

Program Component	Implementation Strategy	Time Frame	Persons Involved	Expected Outcome
Annual continuing professional development program	Offer online courses that incorporate MEDSYS alongside regular in-person workshops and establish peer support systems for consistent skill development	Annually	Nurse Educators, All Nursing Staff	Effective utilization and proper use of MEDSYS and enhanced nurses' confidence with digital technology

Targeted training for newly hired nurses	Implement hands-on practical simulations and structured onboarding programs that focus on digital health tools to build familiarity among digital health tools	First 3 months of employment	HR Training Department, New Nurses	Well-equipped and trained, newly hired nurses and a smooth transition of digital
Synergistic and teamwork-oriented approach	Designate MEDSYS experts to lead discussions and digital tool diagnostics and encourage cross-departmental collaborations and digital health forums to initiate collaborative work	Quarterly workshops	All Nursing Units, Team Leaders	Improved collaboration of the healthcare team and enhanced problem-solving skills with the use of MEDSYS
Legal and ethical conduct training	Conduct seminars about compliance to the standards and regulations and provide discussions based on ethical cases with refresher courses that tackles ethical and legal conducts	Semi-annually	All Nursing Staff	Nurses are compliant with the dynamic ethical and legal standards of digital health technology
Training on managing digital resources	Provide sessions led by IT to discuss electronic health records, inventory tracking, and digital scheduling tools.	Bi-annually	Nursing Staff	The workflow was streamlined, resource handling was improved, and operational waste was reduced

Information dissemination	Develop printed instructions and training materials, and then turn them into onboarding and training kits that can be easily accessed by nurses in their work areas	Nursing Staff	Admin Team, Unit Managers, Communication Officers	Improved staff knowledge of different features of MEDSYS
Assistance and professional development	Create clear career paths in digital health jobs and set up mentorship initiatives	Ongoing	Mentors, Supervisors	Continuous development in digital health skills retention and professional advancement
Recognition and performance rewards	Create a Digital Excellence Recognition Program. Define measurable metrics for proficiency, creativity and efficiency. Offer tangible rewards.	Quarterly	HR Department, Nurse Managers,	Increase staff confidence, satisfaction and engagement with digital health tools

6. Conclusion

Nurses at Lorma Medical Center are middle-aged females, most of whom hold a bachelor's degree, and a significant number are newly hired staff nurses with 1-3 years of experience with digital health technology; this suggests that the nursing staff is comparatively young, highly educated, and well equipped to adjust and to utilize further the adoption of digital health technology in the clinical setting.

Nurses demonstrated a very high level of competency, engagement, utilization, and satisfaction with digital health technology. A significant relationship exists between age and both competency and satisfaction with digital health technology. Furthermore, length of experience in digital health technology was significantly related to competency, engagement, utilization, and satisfaction. Moreover, position showed a significant relationship with competency. In contrast, no significant relationship was found between sex or education level and any of the variables. Hence, older individuals with longer experience in digital technology and those in higher positions tend to demonstrate greater competency, engagement, utilization, and satisfaction. At the same time, neither sex nor education level appear to influence these variables. There is a significant difference between the extent of nurses' competency, engagement, utilization, and satisfaction with digital health technology when grouped according to profile variables. It can conclude that specific demographic factors, including age, years of experience, educational level, and job position, influence nurses' varying levels of competency and satisfaction. The data reveals statistically significant variations in nurses' levels of

engagement, competence, satisfaction, and utilization across distinct groups and treatments, suggesting that specific factors are at play.

In light of these findings, it is concluded that nurses use digital health tools to improve patient care. They manage data carefully to help patients heal better and feel more comfortable. Nurses blend technology with personal attention, making sure that all information is safe and secure. They continue to learn how to use these tools effectively and maximize the use of available resources. By doing this, nurses become more skilled in their work, ensuring that all care remains focused on each patient's needs. A sustainability program and research simulacrum was developed to enhance and strengthen digital health systems use.

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9. Appendices

APPENDIX A

Approval Sheet from the Research Ethics Committee



LC-REC Form REC-01
APPROVAL LETTER
REC Reference #: 2025-025

February 03, 2025

To: Precy Joyce Barbado, Rhizyl Catawe, Chynericka Darla, Solomon Ekoh, Romy Moises Jr, Ralph Aeron Pagulayan, Joseph Ubah and Annie Joyce Ticuala
LORMA Colleges, College of Nursing

Subject: Approval of the Research Study "UNDERSTANDING THE DIGITAL SHIFT: NURSES' BEST PRACTICES, COMPETENCY, ENGAGEMENT, UTILIZATION, AND SATISFACTION WITH DIGITAL HEALTH TECHNOLOGY" by the Research Ethics Committee (REC).

Dear Researchers,

The Research Ethics Committee (REC) has reviewed your application to conduct the above-mentioned research study in the LOCALE OF STUDY with you as the Principal Investigators within the duration of February 03, 2025 to February 03, 2026.

The following documents have been reviewed and approved:

1. Letter of Intent to Conduct the Study
2. Endorsement of the Research Technical Panel
3. Title and Statement of the Problem/ Objective
4. Literature Review
5. Methods and Procedures
6. Population and Locale
7. Exclusion/Inclusion Criteria
8. Data Analysis
9. Ethical Considerations

We approve the study to be conducted in the presented form provided the following are integrated in the final research protocol:

1. The researchers should ask for consent or permission before recording the interview.
2. Use sentences in paragraph form instead of bullets in filling up the informed consent form.

None of the Investigators participating in this study took part in the decision making and voting procedure for this study.

The Institutional REC expects to be informed about the progress of the study, any revision in the protocol before implementation and participants'/respondents' information/informed consent. Likewise, you are required to provide the Board a copy of the final report.

Yours Sincerely,


RYAN B. BOSTOCK, MASE, RMT
 Interim Chair, LORMA Colleges Research Ethics Committee

10. Author(s) Biodata

Ms. Annie Joyce D. Ticuala, a recent third-year Bachelor of Science in Nursing student from Lorma Colleges, leads a team of passionate peers, alongside their research adviser, Dr.

Gemma L. Pagulayan, in investigating nurses' competency, engagement, utilization, satisfaction, and experiences with digital health technology. Together, they bring energy and commitment to their research endeavors, providing in-depth learning in navigating and improving the integration of digital health technologies within clinical practice.