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Comparison of Nurses' Digital Literacy Levels: A Study in Digital and Non-Digital Hospitals

Hemşirelerin Dijital Okuryazarlık Düzeylerinin Karşılaştırılması: Dijital ve Dijital Olmayan Hastanelerde Bir Çalışma

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ABSTRACT

Objective: The aim of this study is to compare the digital literacy levels of nurses working in digital and non-digital hospitals and to examine the effect of demographic and professional variables on their digital competence.

Methods: This study was designed as a descriptive comparative cross-sectional study and included 219 nurses working in one digital and one non-digital hospital in Türkiye. Data were collected using a structured questionnaire comprising demographic information and a 12-item unidimensional Digital Literacy Scale. The reliability of the scale was confirmed (Cronbach's alpha=0.948). Statistical analyses were performed using SPSS, including descriptive statistics, independent samples t-tests, one-way analysis of variance, Games-Howell post-hoc tests, and chi-square tests.

Results: Nurses working in digital hospitals had significantly higher levels of digital literacy than nurses in non-digital hospitals ($p<0.05$). No significant differences were observed based on age, education level, or years of experience. However, digital literacy scores increased significantly with greater frequency of digital tool use. No significant relationship was found between professional experience and the frequency of digital interaction.

Conclusion: Corporate digital infrastructure and frequency of digital tool usage are key factors affecting nurses' digital literacy. Encouraging daily digital interactions and providing access to technological resources may help strengthen digital competencies in healthcare settings.

Keywords: Digital literacy, hospital, health technology, nurse

ÖZ

Amaç: Bu çalışmanın amacı, dijital ve dijital olmayan hastanelerde çalışan hemşirelerin dijital okuryazarlık düzeylerini karşılaştırmak ve demografik ve mesleki değişkenlerin dijital yeterlilikleri üzerindeki etkisini incelemektir.

Yöntem: Tanımlayıcı ve karşılaştırmalı kesitsel bir çalışma olarak tasarlanan araştırmaya, Türkiye'de bir dijital ve bir dijital olmayan hastanede çalışan 219 hemşire katılmıştır. Veriler, demografik bilgileri ve 12 maddelik, tek boyutlu bir Dijital Okuryazarlık Ölçeği'ni içeren yapılandırılmış bir ölçek aracılığıyla toplanmıştır. Ölçeğin güvenilirliği doğrulanmıştır (Cronbach's alpha=0,948). İstatistiksel analizler, tanımlayıcı istatistikler, bağımsız örneklem t-testleri, tek yönlü ANOVA, Games-Howell post-hoc testleri ve ki-kare testleri içeren SPSS kullanılarak gerçekleştirilmiştir.

Bulgular: Dijital hastanelerde çalışan hemşirelerin, dijital olmayan hastanelerdeki hemşirelere kıyasla anlamlı derecede daha yüksek dijital okuryazarlık düzeyleri olduğu bulunmuştur ($p<0,05$). Yaş, eğitim düzeyi veya deneyim yılına göre anlamlı bir fark gözlenmemiştir. Ancak, dijital okuryazarlık puanları, dijital araç kullanım sıklığının artmasıyla önemli ölçüde artmıştır. Mesleki deneyim ile dijital etkileşim sıklığı arasında anlamlı bir ilişki bulunamamıştır.

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Sonuç: Kurumsal dijital altyapı ve dijital araç kullanım sıklığı, hemşirelerin dijital okuryazarlığını etkileyen temel faktörlerdendir. Günlük dijital etkileşimi teşvik etmek ve teknolojik kaynaklara erişimi sağlamak, sağlık hizmetleri ortamlarında dijital yeterliliklerin güçlendirilmesine yardımcı olabileceği söylenebilir.

Anahtar Kelimeler: Dijital okuryazarlık, hastane, hemşire, sağlık teknolojisi

INTRODUCTION

The impact of digitalization on healthcare services is undeniable and involves comprehensive change processes that require healthcare professionals to develop new competencies.[1-3] Hospitals, which encompass numerous and complex specialties, possess substantial information and communication technology infrastructure.[4] Digitalization extends from electronic documentation to robot-assisted procedures and can improve care quality, patient safety, and patient outcomes.[5] Digitalization is expected to digitalization will alleviate the challenges facing the healthcare system, which is grappling with demographic change and a shortage of qualified professionals.[5]

With developments in the delivery of healthcare services, the role of nursing professionals can no longer be limited to providing care that addresses only patients' physical needs.[6] The digitization of healthcare delivery has created a new relationship for nurses -between nurses and technology. While technology cannot replace compassion today, it has become an important competency that nurses must acquire.[7] Digital literacy is required to acquire these technological competencies. Digital literacy is generally defined as the knowledge, skills, and attitudes necessary to effectively use information and communication technologies.[8] Digital literacy is seen as a competency related to the ability to access, evaluate, produce, and share information, encompassing technical skills and information literacy.[9,10] To implement this, recent studies have developed assessment tools to measure nurses' knowledge, skills, and attitudes toward digital technologies.[11] These tools emphasize that digital literacy in nursing is not only the ability to use devices but also to integrate data into clinical reasoning and patient care.

The importance of digital literacy in healthcare service delivery is increasing, while its absence poses challenges. Nurses with sufficient digital skills can support accurate documentation, clinical decision-making, and patient education, while the lack of these competencies can jeopardize patient safety and quality of care.[12] For example, a lack of digital competence has been associated with increased error rates, compromised safety, and reduced service quality.[13] Conversely, positive outcomes have been demonstrated in healthcare providers with higher digital capacity. Research shows that electronic medical records and related tools provide benefits such as increased documentation accuracy, compliance, and decision support.[14] Hospitals with a high level of digital maturity (HIMSS EMRAM stages 6-7) achieve significantly better safety and quality outcomes than hospitals with lower digital maturity.[15] Hospitals with higher levels of digital maturity have achieved better safety outcomes and lower infection rates, reflecting more effective use of data in patient care. Similarly, more digitally mature hospitals report higher patient experience scores (e.g., communication and care coordination) than less digitally mature hospitals.[15]

Empirical studies directly examining the relationship between an institution's level of digitalization and nurses' digital literacy are limited. Therefore, this research demonstrates that the digital literacy of frontline personnel, such as nurses, given the institution's level of digital infrastructure, is crucial to realizing the security and quality benefits of health information technology.

METHODS

This study was designed as a descriptive, comparative cross-sectional study. The primary objective is to examine the digital literacy levels of nurses working in both digital and non-digital hospitals. A hospital accredited at level 7 by HIMSS EMRAM was selected as the digital hospital. For the non-digital hospital, a hospital with a similar number of beds was selected. The research examines whether the level of hospital digitalization affects nurses' digital competencies and explores the relationship between digital literacy and various demographic and professional factors. Ethics committee approval has been obtained from the Non-Interventional Research Ethics Committee of İzmir Bakırçay University (decision number: 2106, research number: 2096, date: 07.03.2025). Participants gave their voluntary consent after being informed in detail about the purpose, method, possible risks and rights of the research.

Population and Sample

The study population consists of all nurses working at one digital hospital and one non-digital hospital in Türkiye. The total number of nurses in the two hospitals is reported to be 502. The formula for a known population size was used to determine the required sample size: $n=(N \times t^2 \times p \times q) / [(d^2 \times (N - 1)) + (t^2 \times p \times q)]$. According to this calculation, the minimum sample size was set at 218 nurses. The final sample consisted of 219 participants who met the inclusion criteria.

Hypotheses

The following hypotheses were tested in the study:

H1: The digital literacy levels of nurses working in digital hospitals are significantly different from those of nurses in non-digital hospitals.

H2: Nurses' digital literacy levels vary significantly according to their personal information.

- H2a: Nurses' digital literacy levels differ significantly according to age groups.
- H2b: Nurses' digital literacy levels differ significantly by education level.
- H2c: Nurses' digital literacy levels differ significantly according to years of professional experience.
- H2d: Nurses' digital literacy levels differ significantly according to their unit of work.
- H2e: Nurses' digital literacy levels differ significantly according to daily digital tool usage frequency.

Statistical Analysis

The data used in the study were collected through face-to-face interviews. The Digital Literacy Scale, whose validity and reliability were established by other researchers, was administered alongside a form collecting the participants' demographic characteristics. The scale used to assess participants' digital literacy was developed by Nabiyeva et al.[16] in a study conducted among employees of the Psychiatry Clinic at the Akdeniz University Faculty of Medicine. It is a five-point Likert-type self-report scale, consisting of a single dimension and 12 items, that assesses adults' ability to use various digital technologies correctly and to access, produce, and share accurate information. Statistical analysis was performed using SPSS software. Initially, descriptive statistics (mean, standard deviation, skewness, and kurtosis) were used to summarize the distribution of digital literacy scores.

The reliability of the digital literacy scale was assessed using Cronbach's alpha coefficient, where a value above 0.70 is considered acceptable for internal consistency. Independent-samples t-tests were used to compare mean digital literacy scores between two groups (e.g., hospital or department type). For categorical variables with more than two levels (e.g., age group, education level, professional experience, frequency of digital tool use), one-way analysis of variance (ANOVA) was used to test for significant differences in mean scores across groups. Games-Howell post-hoc tests were applied when ANOVA results were statistically significant. This method was preferred because it does not assume homogeneity of variance and is robust to unequal sample sizes.

Additionally, chi-square tests of independence were used to investigate associations between categorical variables such as education level and frequency of digital technology use. All statistical tests were two-tailed, and results were considered significant at $p<0.05$.

RESULTS

This section presents the results of statistical analyses examining the digital literacy levels of nurses in digital and non-digital hospitals. First, descriptive statistics and reliability analyses are presented to summarize the overall digital literacy scores. Subsequently, inferential statistical tests such as independent-samples t-tests, one-way ANOVAs, post-hoc comparisons, and chi-square tests were used to evaluate the study hypotheses regarding the effects of institution type, professional experience, educational background, and digital usage patterns.

A total of 219 participants volunteered to take part in the study as shown in Table 1. By age group, 43.8% of participants were 34 years of age or younger, 24.7% were 35-45 years of age, and 31.5% were 46 years of age or older. In terms of education, 10% had an associate degree or less, 73.5% had a bachelor's degree, and 16.4% had a graduate degree. More than half of the participants (53.4%) worked in non-digital hospitals (46.6% in digital hospitals), and 56.6% worked in administrative roles (43.4% in clinical roles). Approximately 63.0% had 16 years or more of professional experience; 20.5% had 10 years or less, and 16.4% had 11-15 years. Most participants reported using digital tools daily (66.1%); 13.8% used digital tools several times a day, 13.3% used them several times a week, and only 6.9% reported never using digital tools.

As shown in Table 2, the 12-item Digital Literacy Scale demonstrated excellent internal consistency with a Cronbach's alpha value of 0.948. This high alpha value indicates that the items reliably measure a single underlying construct, reflecting high internal consistency of the scale.

The average digital literacy score is around 4.20 (on a scale of 1-5) and the standard deviation is 0.84. Skewness (-0.04) and kurtosis (-1.27) indicate that the distribution is approximately symmetric and slightly flatter than normal (platykurtic).

To examine the relationship between the daily frequency of digital use among study participants and various demographic factors, a chi-square test of independence was performed. As shown in Table 3, only hospital type showed a statistically significant relationship with the frequency of use [χ^2 (3)=11.733, p=0.008]. This indicates that daily digital usage differs between digital and non-digital hospitals. In contrast, no significant relationship was found between usage frequency and education level (p=0.090),

age group (p=0.282), or years of experience (p=0.591). Although education, age, and experience do not show a significant relationship with the frequency with which staff use digital tools, hospital type (digital or non-digital) does.

The one-way ANOVA results presented in Table 4 indicate no statistically significant differences in mean scores among age, education, and professional experience categories. In practical terms, respondents' age, highest

Table 1. Descriptive statistics

Variable	Category	n	%
Age	34 years and under	96	43.8
	35-45	54	24.7
	46 years and over	69	31.5
Educational status	Associate degree	22	10.0
	Undergraduate degree	161	73.5
	Postgraduate degree	36	16.4
Hospital type	Non-digital	117	53.4
	Digital hospital	102	46.6
Service provided	Administrative	124	56.6
	Clinical	95	43.4
Professional experience	10 years and under	45	20.5
	11-15 years	36	16.4
	16 years and over	138	63.0
Daily digital usage frequency	Never use	15	6.9
	A few times a week	29	13.3
	Every day	144	66.1
	Every few hours	30	13.8

Table 2. Reliability and distribution properties of the Digital Literacy Scale

Cronbach's alpha		Number of items		
0.948		12		
n	**Mean**	**SD**	**Skewness**	**Kurtosis**
219	4.20	0.84	-0.04	-1.27

SD: Standard deviation

Table 3. Chi-square test results

Variable (chi-square)	χ^2 (SD)	p
Hospital type	11.733 (3)	0.008
Educational status	10.947 (6)	0.090
Age	7.442 (6)	0.282
Professional experience	4.636 (6)	0.591

SD: Standard deviation

Table 4. One-way ANOVA by age, education, experience and ınternet usage frequency

Factor	F	p
Age	2.224	0.111
Educational status	2.223	0.111
Professional experience	1.902	0.152
Internet usage frequency	3.214	0.001

ANOVA: One-way analysis of variance

level of education, and length of work experience do not appear to significantly affect mean scores.

The one-way ANOVA comparing groups based on daily digital usage frequency reveals a significant difference in mean scores [F (3, 214)=5.920, p=0.001]. This result indicates that there is a difference between usage frequency groups, with at least one group's mean score being significantly different from the others. Given that the overall test was significant, a post-hoc analysis was conducted to determine which usage groups differed.

Games-Howell post-hoc comparisons are used to identify specific groups that differ in mean scoresas shown in Table 5. The analysis indicates that participants who use digital tools "every few hours" scored significantly higher than those who use them "every day", "several times a week", and "never": the average differences are approximately 0.32 (p=0.010), 0.71 (p=0.013), and 0.89 (p=0.018), respectively. No other statistically significant pairwise differences were found between usage frequency groups. In summary, more frequent digital use (multiple times per day) is associated with higher average scores, while other usage groups do not differ significantly from one another.

The independent-samples t-test comparing the average scores of staff working in non-digital and digital hospitals found a statistically significant difference (t=-2.045, p=0.042), as presented in Table 6. Participants working in digital hospitals reported a higher average score ($\bar{x}$=4.3235) than those working in non-digital hospitals ($\bar{x}$=4.0919). The findings show the positive effect of working in digital hospitals on nurses' digital literacy levels.

An independent-samples t-test comparing administrative and clinical service groups found no significant difference in mean scores (t=-0.623, p=0.534). Employees in administrative roles ($\bar{x}$=4.1687) and employees in clinical roles ($\bar{x}$=4.2404) had very similar mean scores. This indicates that there is no significant difference in the mean score on the scale between service types (administrative and clinical).

When the established hypotheses were examined, H1 was accepted because the digital literacy of nurses working in hospitals differed significantly according to the hospitals' digital level. However, H2 was only partially accepted because a significant difference in internet usage frequency (H2e) was observed across demographic groups.

Table 5. Games-Howell post-hoc analysis

(I) Usage frequency	(J) Usage frequency	Mean difference (I-J)	Std. error	p	95 % CI lower	95 % CI upper
I never use it	A few times a week	-0.18429	0.32625	0.942	-1.0694	0.7009
	Every day	-0.57049	0.26343	0.175	-1.3244	0.1835
	Every few hours	-0.89167*	0.26581	0.018	-1.6497	-0.1336
A few times a week	Never use	0.18429	0.32625	0.942	-0.7009	1.0694
	Every day	-0.38619	0.21406	0.289	-0.9642	0.1918
	Every few hours	-0.70738*	0.21699	0.013	-1.2922	-0.1226
Every day	Never use	0.57049	0.26343	0.175	-0.1835	1.3244
	A few times a week	0.38619	0.21406	0.289	-0.1918	0.9642
	Every few hours	-0.32118*	0.10021	0.010	-0.5840	-0.0584
Every few hours	Never use	0.89167*	0.26581	0.018	0.1336	1.6497
	A few times a week	0.70738*	0.21699	0.013	0.1226	1.2922
	Every day	0.32118*	0.10021	0.010	0.0584	0.5840

*The mean difference is significant at the 0.05 level

Table 6. Independent sample t-test results

Groups mean	± SD	t	p
Non-digital hospital	4.0919±0.8382	-2.045	0.042
Digital hospital	4.3235±0.8336		
Administrative service	4.1687±0.8353	-0.623	0.534
Clinical service	4.2404±0.8538		

SD: Standard deviation

DISCUSSION

Digitalization plays a crucial role in healthcare delivery, just as it does in every other aspect of life. This study aims to compare the digital literacy levels of nurses working in digital and non-digital hospitals and to examine the impact of demographic and professional characteristics on digital literacy. The findings reveal that nurses working in digital hospitals have significantly higher levels of digital literacy than their colleagues in non-digital hospitals. This supports the hypothesis that institutional digital infrastructure can positively influence individuals' interactions with, and proficiency in using, digital tools.

The findings of the current study are consistent with those of Erbir[17] and, Şahin and Seçer,[18] but they also reveal significant differences. Consistent with both studies, the current research shows that more frequent digital interaction (such as daily use of digital tools) is associated with higher levels of digital literacy among nurses. This supports the idea that regular exposure to digital environments develops practical digital competencies. However, contrary to the findings of Şahin and Seçer,[18] who reported significant differences in digital literacy based on age and gender, the current study did not observe statistically significant differences between age groups or between male and female participants. Similarly, while Erbir[17] found that younger nurses and those with less experience had higher digital literacy scores, no such difference emerged in this study. The differing findings may stem from contextual factors such as regional differences in institutional infrastructure or educational practices.

The findings of this study align with existing research indicating that nurses in digitally advanced hospitals tend to have higher digital literacy than those in less digitally advanced hospitals. Comparcini et al.[19] found that nurses exposed to a greater number of digital resources scored significantly higher on digital health literacy assessments, thereby supporting the idea that digitalization promotes digital competence. Similarly, Hariyati et al.[20] reported that nurses in managerial roles and with higher education levels, often associated with institutions with greater digital integration, demonstrated better digital information skills, which further emphasized the impact of professional context and organizational support.

Additionally, these studies emphasize that demographic factors such as age, education, and position in the nursing hierarchy influence digital literacy levels through interaction with the digital environment. For example, Hariyati et al.[20] highlighted the relationship between educational level and computer literacy, underscoring the need to tailor digital literacy programs to these characteristics.[20] Furthermore, it has been argued that infrastructure and continuous professional development opportunities are vital for nurses to develop their digital skills and adapt to changing health technologies.[21]

Study Limitations

The study should be evaluated with certain limitations in mind. The study was conducted among nurses at two hospitals; therefore, the sample is not generalizable. In addition, the cross-sectional design of the study is another limitation.

CONCLUSION

This study provides an important overview of how digitalization shapes nurses' professional practices and, in particular, their digital literacy levels. From this perspective, digital hospitals and high digital literacy among healthcare workers are of substantial importance. The results emphasize the positive effect of working in digitally integrated hospital environments on nurses' digital literacy. Furthermore, frequent use of digital tools plays an important role in strengthening digital competence among healthcare workers. This information underscores the importance of continuous digital interactions and infrastructure investments in healthcare settings. Considering the study results and existing literature demonstrating the contribution of digitalization to nurses' care processes, increasing the number of digital hospitals would be beneficial. Furthermore, strengthening the educational curriculum and organizing in-house training programs aimed at developing nurses' digital skills appear to be important requirements. Further research is recommended to investigate longitudinal effects and assess how digital literacy impacts clinical outcomes and patient care efficiency.

Ethics

Ethics Committee Approval: Ethics committee approval was obtained from the Non-Interventional Research Ethics Committee of İzmir Bakırçay University (decision number: 2106, research number: 2096, date: 07.03.2025).

Informed Consent: Participants gave their voluntary consent after being informed in detail about the purpose, method, possible risks and rights of the research.

Footnotes

Authorship Contributions

Concept: M.O., Design: M.O., S.M., Data Collection or Processing: S.M., Analysis or Interpretation: M.O., S.M., Literature Search: M.O., S.M., Writing: M.O., S.M.

Conflict of Interest: No conflict of interest was declared by the authors.

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