ORIGINAL ARTICLE

CONTENTS

A study of nurses' readiness to learn about and use telemedicine

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ABSTRACT

Aim: To determine the sociodemographic characteristics of nurses who participated in a telemedicine network development project, their readiness for training and implementation of telemedicine, as well as their awareness of telemedicine; and to establish or refute an association between demographic and professional characteristics and attitudes towards digital technologies and telemedicine.

Materials and Methods: The study sample comprised 285 nurses. The survey covered demographic and professional characteristics, namely age, gender, total length of service in healthcare, and the level of the healthcare facility where respondents worked. Respondents were asked four questions: 1. Please indicate your affinity for/readiness to use digital technologies. 2. Would you like to learn about telemedicine technologies for use in your practice? 3. Are you sufficiently knowledgeable about telemedicine? 4. What type of training in telemedicine would you choose? (multiple choice).

Results: The results of the study showed that the sociodemographic characteristics of the cohort were represented predominantly by women of working age, indicating a largely experienced workforce, most of whom worked in primary healthcare. A significant association was found between higher digital readiness and the desire to acquire telemedicine competencies.

Conclusions: The study found a significant association between digital readiness and motivation to adopt telemedicine technologies. Nurses preferred online training in telemedicine as part of their continuing professional development. The study also found that awareness of telemedicine among nurses was low.

KEYWORDS: nurses, telemedicine, digitalisation, digital engagement, education

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INTRODUCTION

The education of healthcare workers is an integral part of the ongoing development and reform of the healthcare system in Ukraine during a period of martial law and critical strain on healthcare resources. A shortage of healthcare staff and increasing competency demands are characteristic features of staffing trends in the healthcare sector in Ukraine and other countries [1, 2].

Our previous research, as well as studies by other authors on the educational component of professional pre-higher and higher medical and pharmaceutical education, convincingly demonstrate that improving approaches and methods for training mid-level healthcare professionals is a pressing issue that is receiving increasing attention from educators and healthcare administrators [3, 4].

The WHO places significant emphasis on monitoring and the development of strategic documents on nursing development. According to the report "State of the World's Nursing 2025", despite a gradual increase in the number of nurses worldwide, their uneven distribution is simultaneously increasing, particularly in low- and middle-income countries [5]. The WHO's recommendations for a global strategy to address the shortage and uneven distribution of nurses in health systems were adopted in a resolution identifying four priority areas for development: education, workforce, leadership, and service delivery. Among these, the strategic direction for education aims to ensure that health systems are staffed with personnel possessing the necessary competencies and levels of knowledge, to develop educational programmes based on a competency-based approach, to apply innovative teaching methods, and to ensure that educators are properly trained in best pedagogical practices and technologies, demonstrating expertise in relevant subject areas [6].

The Resolution of the Cabinet of Ministers of Ukraine on the Strategy for the Development of the Healthcare

System for the Period up to 2030 sets out the strategic directions for the development of nursing in Ukraine, in particular the improvement of education and the raising of professional standards for nurses [7].

AIM

To determine the sociodemographic characteristics of nurses who participated in a telemedicine network development project, their readiness for training and implementation of telemedicine, as well as their awareness of telemedicine; and to establish or refute an association between demographic and professional characteristics and attitudes towards digital technologies and telemedicine.

MATERIALS AND METHODS

The study was conducted as part of a telemedicine project aimed at developing telemedicine networks in Ukraine across three regions: Chernihiv, Odesa and Rivne. The study cohort comprised 285 nurses representing 93 healthcare facilities at various levels of care provision. The survey was conducted using Google Forms without the collection or processing of personal data, which encouraged candid responses. The survey ran from August to December 2025 and covered demographic and professional indicators, namely: age, gender, total length of medical service, and the level of the healthcare facility where the respondent works. The level of the healthcare facility where the respondents worked was determined in accordance with the Resolution of the Cabinet of Ministers of Ukraine [8]. Respondents were asked four questions: 1. Indicate your affinity/readiness for digital technologies; 2. Are you interested in learning about telemedicine technologies for use in your practice? 3. Are you sufficiently knowledgeable about telemedicine? 4. What type of training in telemedicine would you choose? (multiple choice). Responses to the first two questions were collected using a Likert scale, where 1 represents the lowest response intensity and 10 the highest. The possible answers to the question "Are you sufficiently familiar with telemedicine?" were as follows: yes, I consider myself sufficiently familiar (a); sufficiently familiar, but I need to improve my knowledge and skills in the use of telemedicine methods and tools (b); I am not sufficiently knowledgeable and need to improve my knowledge and skills in the methods and tools of telemedicine (c); I am not at all knowledgeable, so I need regular training to improve my knowledge and skills in the methods and tools of telemedicine (d). Answers to the question "What type of training in telemedicine would you choose? (multiple choice)": online courses within the continuing professional development system (CPD), practical seminars/training sessions within the continuing professional development system, webinars outside the continuing professional development system, mentoring/individual consultations (outside the CPD system), self-study of materials, thematic training at educational institutions within the CPD system, any educational activities within the CPD system.

Descriptive statistics for ordinal variables are presented as the median (Me) and interquartile range ($IQR = Q_1–Q_3$); the arithmetic mean with standard deviation ($M \pm SD$) is also provided. For categorical variables, absolute (n) and relative (%) frequencies were calculated with 95% confidence intervals (CI) using the Wilson score interval method. The normality of the distribution of quantitative variables was tested using the Shapiro-Wilk test. Based on the test results ($p<0.001$ for both scale variables), non-parametric methods of analysis were selected. To assess the relationship between digital readiness and motivation to learn telemedicine, Spearman's rank correlation coefficient (ρ) was used, with the coefficient of determination (ρ^2) calculated. The strength of the relationship was interpreted using the Chaddock scale.

Comparisons of indicators between independent groups (by age, length of service, and type of healthcare facility where nurses work) were performed using the Kruskal–Wallis test (H-test) with calculation of the effect size (η^2). Analysis of multiple-choice questions was carried out using dummy coding (binary decomposition) followed by a frequency analysis of each response option. Statistical data processing was carried out using the SciPy 1.0, NumPy and pandas libraries.

ETHICS

The study was conducted in accordance with the Declaration of Helsinki and the bioethical standards for sociological research in the medical field. All participants (N=285) provided voluntary informed consent. Participation was anonymous, thereby ensuring the protection of personal data and professional reputation. The results are presented in summary form, making it impossible to identify individuals. The study protocol was approved by the local bioethics committee of the Bogomolets National Medical University.

FRAMEWORK

The study was conducted within the framework of a research project of the Bogomolets National Medical University 2023–2025: «Digitalization and digital transformation in healthcare» (state registration number 0121U107784).

Table 1. Age distribution of the study cohort

Age	n (abs.)	% of the total	95% CI lower limit	95% CI upper limit
up to 30 years old	16	5.6%	3.5%	8.9%
31–40 years old	77	27.0%	22.2%	32.5%
41–50 years old	97	34.0%	28.8%	39.7%
51–60 years old	73	25.6%	20.9%	31.0%
over 60 years old	22	7.7%	5.2%	11.4%

Source: compiled by the authors of this study

Table 2. Distribution of the study group by length of service

Length of service	n (abs.)	% of the total	95% CI lower limit	95% CI upper limit
up to 5 years	10	3.5%	1.9%	6.3%
6–10 years	16	5.6%	3.5%	8.9%
11–20 years	75	26.3%	21.5%	31.7%
21–30 years	86	30.2%	25.1%	35.7%
over 30 years	98	34.4%	29.1%	40.1%

Source: compiled by the authors of this study

Table 3. Breakdown of the study group by type of healthcare facility

Level of healthcare facility	n (abs.)	% of the total	95% CI lower limit	95% CI upper limit
Primary Healthcare Centre	176	61.8%	56.0%	67.2%
General healthcare facility	93	32.6%	27.5%	38.3%
Cluster-based healthcare facility	11	3.9%	2.2%	6.8%
Super-cluster healthcare facility	5	1.8%	0.8%	4.0%

Source: compiled by the authors of this study

AI STATEMENT

The Claude Opus 4.3 artificial intelligence (AI) tool was used in this work for the following tasks: search for literature using keywords under the authors' control; formation and formatting of the bibliography under the authors' control; analysis of statistical data under the authors' control; stylistic processing of the text under the authors' control; language checking and correction under the authors' supervision; multi-level error detection. All sections using AI were reviewed and edited personally by the authors. The scientific statements, conclusions, and results are the authors' own intellectual contribution.

RESULTS

A total of 285 nurses took part in the study. The sample was almost entirely homogeneous in terms of gender: 283 women (99.3%) and 2 men (0.7%), which is entirely consistent with the overall gender composition of nursing staff within the Ukrainian healthcare system.

The age structure of the sample was characterised by a predominance of middle-aged respondents. The results of the age distribution are shown in Table 1.

Table 2 shows the composition of the study group by length of service. In terms of total length of medical service, the largest group was that with over 30 years' experience (n=98; 34.4%), which correlates with the predominance of older age groups.

By type of healthcare facility, the vast majority were staff from primary healthcare centres – 176 people (61.8%). General healthcare facilities were represented by 93 respondents (32.6%). Cluster (n=11; 3.9%) and supercluster (n=5; 1.8%) facilities were represented to a minimal extent, reflecting the staffing structure of primary care as the most numerous in the healthcare system (Table 3).

The sample under study therefore consists predominantly of middle-aged women with considerable professional experience who work in primary healthcare.

Self-assessed readiness for digital technologies on a 10-point scale was: Me=8.0 [IQR: 5.0–9.0], M=7.29±2.44. The distribution deviated from normal (Shapiro-Wilk test W=0.890; $p<0.001$) with left-sided skewness (skewness=-0.86), indicating a bias in responses towards higher values. A score of ≥7 was selected by 69.5% of respondents (n=198), whilst only 8.4% (n=24) indicated low readiness (score 1–3). The data obtained indicate

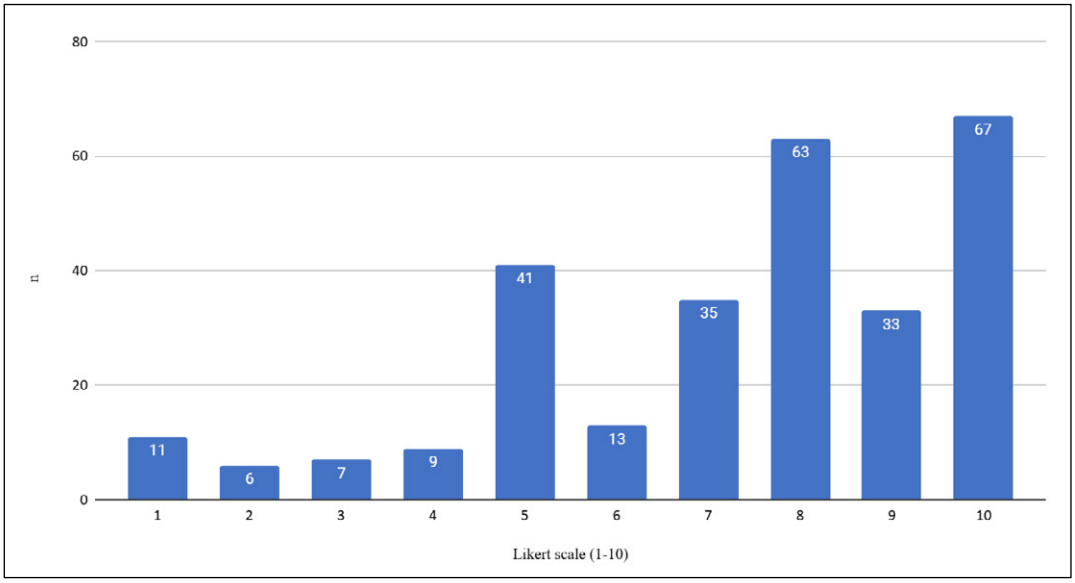


Fig. 1. Nurses' self-assessment of their readiness for digital technologies
Picture taken by the authors

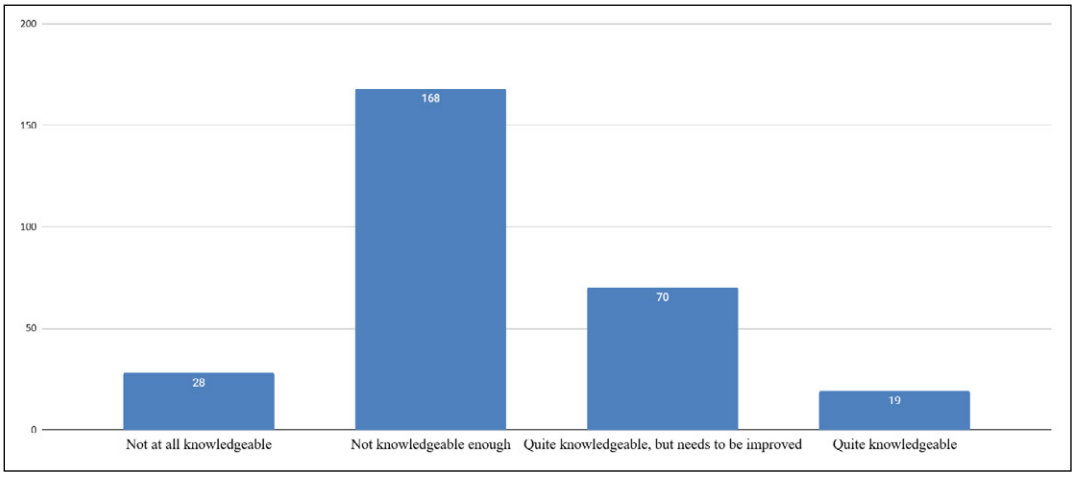


Fig. 2. Nurses' interest in training in telemedicine
Picture taken by the authors

a predominantly high level of subjective readiness among nurses to use digital technologies (Fig. 1).

Fig. 2 shows the distribution of responses regarding the desire to learn about telemedicine. Motivation to learn telemedicine technologies, measured on a 10-point scale, was found to be even higher than the previous level of affinity for digital technologies: Me=9.0 [IQR: 6.0–10.0], M=7.76 ± 2.55. The distribution is non-normal (W=0.821; p<0.001) with marked left-sided skewness (skewness =–1.08). The maximum score (10) was selected by 107 respondents (37.5%), and a score of ≥8 by 189 individuals (66.3%). Only 7.0% (n=20) reported low motivation (score 1–3). Thus, the vast majority of nurses demonstrate a high willingness to acquire new knowledge in the field of telemedicine.

Only 19 respondents (6.7%; 95% CI: 4.3–10.2%) considered their level of knowledge to be sufficient (a). Seventy respondents (24.6%; 95% CI: 19.8–29.9%) acknowledged partial awareness but indicated a need to improve their knowledge and skills in telemedicine methods and tools (b). The majority of respondents — 168 (58.9%; 95% CI: 53.0–64.5%) — reported that they were not sufficiently knowledgeable and needed to improve their knowledge and skills (c). A further 28 respondents (9.8%; 95% CI: 6.9–13.8%) reported a complete lack of awareness and the need for regular training (d). Overall, 93.3% of respondents (n = 266) required additional training in telemedicine, which justifies the implementation of appropriate educational programmes (Fig. 3).

The relationship between digital readiness and motivation to learn. A Spearman's correlation analysis revealed a statistically significant, noticeable positive correlation (Chaddock scale) between digital readiness and the desire to learn telemedicine (ρ=0.669; p<0.001). The coefficient of determination ρ^2=0.447 indicates that digital readiness explains approximately 44.7% of the variation in motivation to learn. This is a significant finding of the study: respondents with higher digital readiness demonstrate a significantly greater desire to master telemedicine technologies.

Preferences regarding the type of training (Fig. 4). A multiple-choice analysis (437 responses with N=285) re-

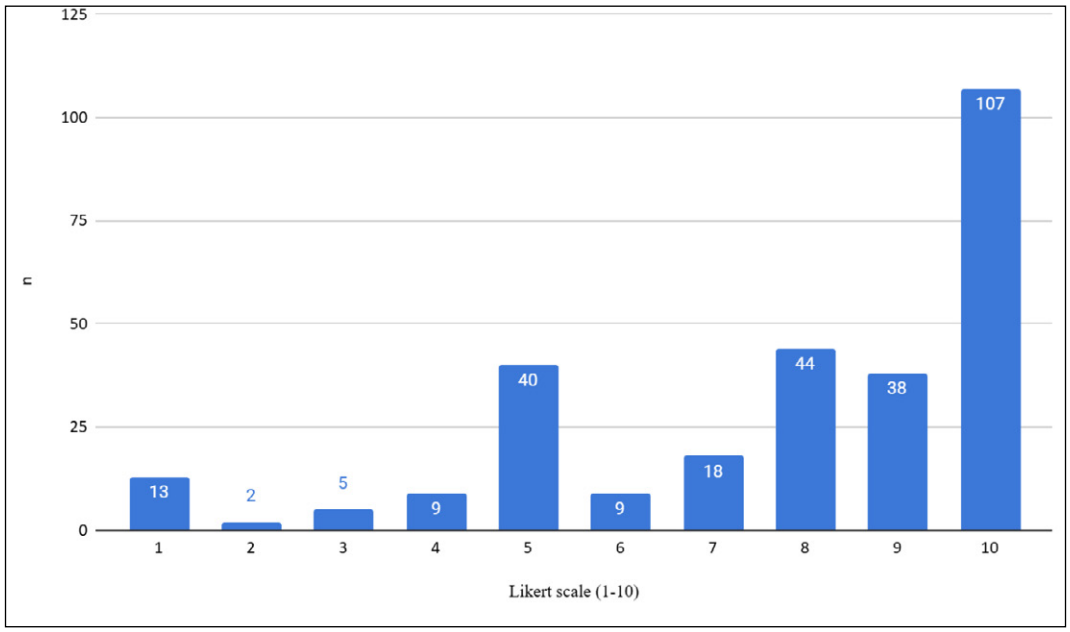


Fig. 3. Respondents' awareness of telemedicine *Picture taken by the authors*

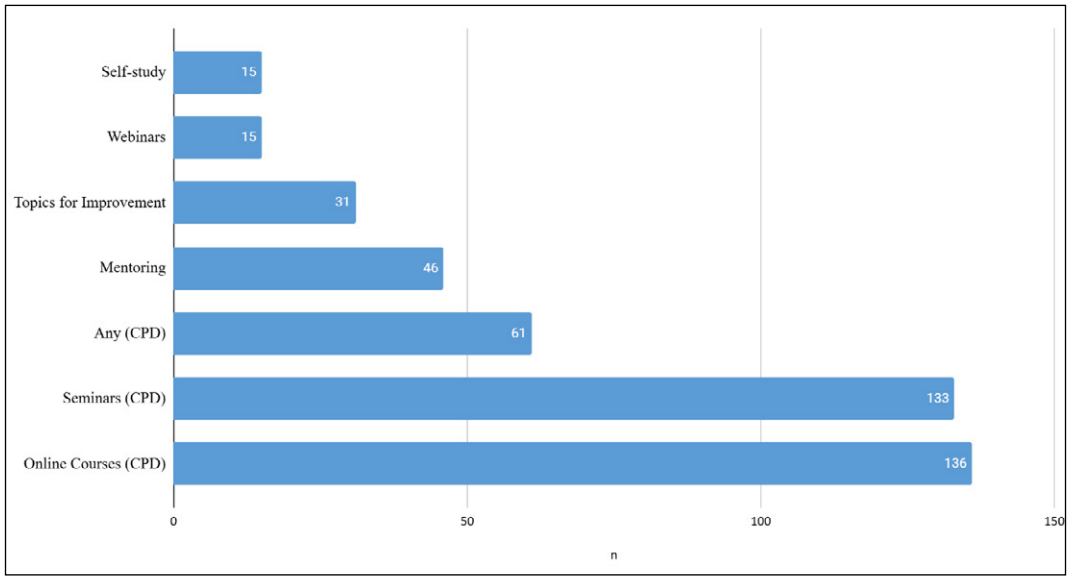


Fig. 4. Choice of telemedicine training programme *Picture taken by the authors*

vealed that the most popular formats are online courses within the continuing professional development system (n=136; 47.7%; 95% CI: 41.9–53.6%) and practical seminars/training sessions within the continuing professional development system (n=133; 46.7%; 95% CI: 40.9–52.5%). Sixty-one respondents (21.4%) chose any form of training within the CPD system, 46 (16.1%) chose mentoring and individual consultations outside the CPD system, and 31 (10.9%) chose subject-specific development at educational institutions. Webinars outside the CPD system (n=15; 5.3%) and self-study of materials (n=15; 5.3%) proved to be less popular.

The preference for these formats within the continuing professional development (CPD) system indicates that respondents have confidence in institutional mechanisms for professional development. Furthermore, future research should explore the potential association between digital affinity and preferences for online learning formats.

Additionally, the results reveal an interesting pattern: within the study cohort, variation in motivation to learn telemedicine is primarily associated with respondents' individual levels of digital readiness, whereas demographic characteristics (age, length of service, type of healthcare facility) do not show a statistically significant association with this indicator (age: H[4] = [value], $p>0.05$, $\eta^2<0.01$; length of service: H[4] = [value], $p>0.05$, $\eta^2<0.01$; type of facility: H[3] = [value], $p>0.05$, $\eta^2<0.01$). This may indicate that nurses' readiness to acquire telemedicine competencies is determined more by personal and professional factors linked to previously acquired digital competence than by age or gender.

However, these observations are descriptive in nature and require confirmation in future studies.

DISCUSSION

The issue of nursing education has attracted the attention of many researchers in various respects. In particular, questions regarding the organisation of different forms and methods of training became particularly relevant during the COVID-19 pandemic, when virtual educational interventions took precedence over other forms of training in cases where clinical training was not required [9]. The introduction of an electronic health system in Ukraine and the development of the e-health ecosystem have led to the establishment of fundamentally new rules and requirements for healthcare professionals regarding work in a digital professional environment [3, 4, 10]. The importance of digital competences and skills among nurses in applying digital technologies in practice, including for communication within the professional environment and with patients, is beyond doubt and is gradually becoming part of professional standards, requiring changes to curricula and programmes for bachelor's and master's level education in medical and pharmaceutical fields [11–13].

Our study closely aligns with the research by Hariyati RTS, Handiyani H et al. (2024) on nurses' digital literacy and its relationship with age and professional characteristics [11]. However, our study is directly linked to the implementation of telemedicine in the practical work of nurses, which makes it more focused on issues relating to the development and implementation of telemedicine in the practical work of healthcare institutions.

An integral and unique feature of the Ukrainian digital landscape is the implementation and development of an electronic healthcare system and eHealth at the national level, where nurses play a specific role as eHealth stakeholders and are a vital component of the healthcare system's resilience in the face of crises and security challenges.

CONCLUSIONS

1. The findings presented here represent the first comprehensive empirical study of nurses' readiness to learn telemedicine technologies in Ukraine.
2. The study employed a three-dimensional approach to assessing digital engagement, readiness to learn telemedicine technologies, and identifying educational preferences among nurses.
3. The study found a strong link between digital readiness and the motivation to adopt telemedicine technologies, as evidenced by a noticeable Spearman correlation ($\rho = 0.669$; $p < 0.001$).
4. Nurses prefer to learn about telemedicine technologies as part of their continuing professional development through online training, which further demonstrates their strong commitment to and readiness for the use of digital technologies.
5. The study found that awareness of telemedicine technologies among nurses is low, which calls for a review of approaches to the development of curricula and programmes at undergraduate and postgraduate levels, with a need to update and develop educational programmes on telemedicine technologies.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest

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A – Work concept and design, B – Data collection and analysis, C – Responsibility for statistical analysis, D – Writing the article, E – Critical review, F – Final approval of the article

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