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PERCEPTIONS OF DIGITALIZATION AND DIGITAL LITERACY AMONG HEALTHCARE EMPLOYEES: A CROSS-SECTIONAL STUDY

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This study aimed to assess employees' self-perception of digital literacy levels, participation in digital skills training, and satisfaction with the current state of digitalization within the healthcare institution. A cross-sectional study was conducted among employees in the Institute of Public Health of Vojvodina (IPHV) from December 2024 to February 2025, using an anonymous, self-administered questionnaire. The analysis included demographic characteristics, self-perceived levels of digital literacy, and perceived impact of digitalization on daily work activities. The response rate was 62%, and the research involved 156 respondents. Our findings showed that 24.4% of respondents had attended some digital skills training. Women were less likely to have attended digital courses compared to men (19.7% vs. 41.2%), while the youngest respondents (under 25 years old) were more likely to have participated in training programs. Participants with a master's degree, doctoral degree, or specialist studies were strongly associated with higher digital training attendance compared to those with a high school education ($p = 0.0001$, $p = 0.0001$, and $p = 0.0082$, respectively). A statistically significant difference ($p < 0.05$) was found in satisfaction with the current level of digitalization in the institution, with physicians reporting the highest satisfaction. The results of our study underscore the need for additional education and support in digitalization, particularly for older employees and administrative staff, to improve their job satisfaction.

Keywords: digitalization, digital literacy, healthcare institutions, job satisfaction

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INTRODUCTION

The successful implementation of digitalization in healthcare institutions largely depends on the digital literacy and adaptability of healthcare professionals (1-3).
Despite the recognized benefits of digitalization, including improved efficiency, accessibility, and workflow optimization, healthcare professionals face numerous challenges in adapting to these changes (4, 5).
Previous research has highlighted disparities in digital competencies among healthcare workers, influenced by factors such as age, education level, professional role, and work experience (6). Moreover, the perception of digital tools' usefulness varies across different professional groups, which may impact the overall effectiveness of digital transformation in healthcare settings. Some professionals view digitalization as a means to optimize workflow and reduce administrative burden, while others experience difficulties in adapting to new technologies due to inadequate training or resistance to change (7, 8).
Given the increasing reliance on digital tools in public health institutions, it is essential to assess how employees perceive digitalization and whether they have adequate training to utilize these technologies effectively (4-8).
The aim of this study was to assess, based on employees' self-perception (both medical and non-medical staff), the level of digital literacy in a healthcare institution, participation in digital skills training, as well as satisfaction with the current level of digitalization within the institution. Understanding these aspects will be crucial for optimizing workflows and enhancing overall institutional efficiency (9).

METHODS

An institution-based cross-sectional study was conducted among employees of the Institute of Public Health of Vojvodina (IPHV), from December 2024 to February 2025.
The IPHV is located in Novi Sad, the administrative center of Vojvodina, the northern province of Serbia. It is one of the largest institutions in the region dedicated to preventive healthcare, playing a key role in public health.
The research instrument was a structured questionnaire designed to assess the level of digitalization across various participant characteristics. The questionnaire was carefully developed based on a comprehensive review of the relevant literature (7-14).
The questionnaire consisted of several sections: the first assessed socio-demographic characteristics (gender, age, education, job position, and work experience); the second focused on digital literacy; the third evaluated the impact of digitalization on daily tasks; the fourth examined satisfaction with current digitalization and suggestions for future improvements. The questionnaire was distributed in paper form by a researcher during participants' working hours. A pilot version was tested on 25 employees to ensure clarity and accuracy of responses.
The study protocol was approved by the Ethics Committee of the Institute of Public Health of Vojvodina (number: 01-934/2, issued on June 13, 2024). Participation was voluntary, anonymous, and uncompensated. Participants were informed about the study's purpose and provided written consent before completing the questionnaire. Each respondent was assigned a unique code, and data were entered into a secure, password-protected database accessible only to the research team.

Statistical methods

Descriptive statistics were used to present categorical variables as frequencies and percentages, while continuous data were shown as means with standard deviation (±SD). The Chi-square test or Fisher's exact test was used to analyze categorical data. The odds ratio (OR) with confidence intervals (CI) was used to assess the strength of associations between categorical variables, with the lowest 'Yes' response category as the reference. Pareto analysis, based on the 80/20 principle, identified key digital tools and challenges in daily work. Statistical analyses were performed using SPSS version 21, with significance set at $p < 0.05$.

RESULTS

During the study period, approximately 250 questionnaires were distributed, and following multiple reminders, the response rate reached 62% (n = 156). The majority of participants were female (78.2%). The mean age of participants was 43 ± 5.2 years.
Regarding participants' digital literacy, only 24.4% reported having participated in any form of digital skills training, while approximately 30% self-reported intermediate digital skills (Table 1).
Figure 1 illustrates the utilization rates of different digital tools among respondents, along with patterns of platform usage. Viber and YouTube were the most frequently used digital tools, reported by the largest number of users (55/156; 35.3%). The cumulative curve in the graph indicates that the first few categories account for the largest share of the overall distribution, with over 80% of respondents using

Table 1. *Digital literacy of the participants*

Variables		N = 156	Percentage
Have you attended any courses or training related to digital skills?	Yes	38	24.4
	No	118	75.6
How would you rate your level of digital literacy?	Beginner	21	13.5
	Intermediate	46	29.5
	Advanced	65	41.7
	Expert	24	15.3

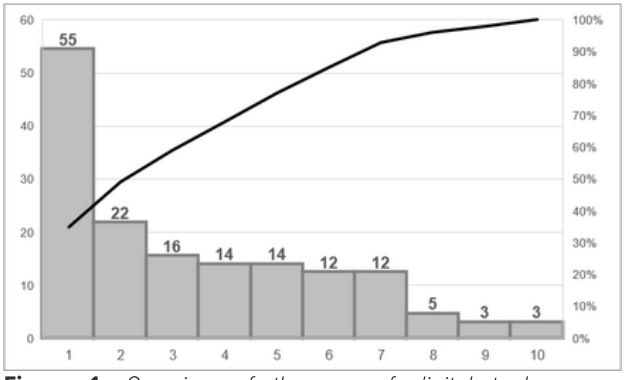

Figure 1. *Overview of the use of digital tools among participants*

Legend: 1 - Viber and YouTube; 2 - Viber and Zoom; 3 - Viber; 4 - Zoom; 5 - Viber and Skype; 6 - YouTube; 7 - Viber and YouTube and Zoom; 8 - Viber and YouTube and Zoom and Skype; 9 - Skype; 10 - Other (WeTransfer, Pinterest)

tool combinations, with Viber as the most prevalent platform.

In addition, the most frequently reported challenges included loss of personal contact and reduced quality of patient interactions (33/156; 21.2%), followed by increased administrative workload (27/156; 17.3%). Other concerns included challenges in integrating new digital solutions with existing systems, along with resistance to change and innovation (each accounting for 19%). These factors collectively account for over 70% of all reported challenges, highlighting them as key concerns in the digitalization process (Figure 2).

Females were significantly less likely to attend training than males (24/122, 19.7% vs. 14/34, 41.2%; p = 0.0116). Compared to participants aged ≥55 years, the two youngest age groups (<25 years and 25–34 years) were significantly more likely to attend training (p = 0.0001 and p = 0.0080, respectively).

Participants with a master's degree, doctoral degree, or specialist studies were strongly associated with higher training attendance compared to those with a high school education (p = 0.0001, p = 0.0001, and p = 0.0082, respectively).

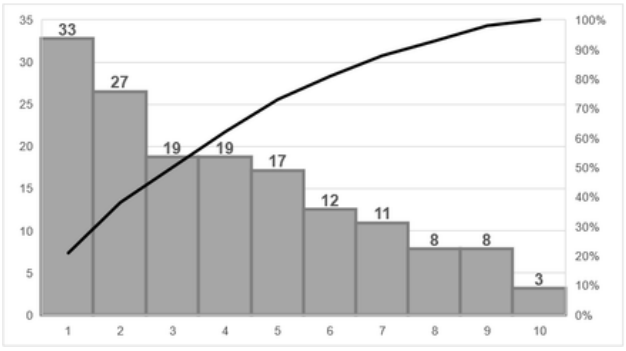

Figure 2. *Overview of the main challenges related to digitalization in the work of the participants*

Legend: 1 - Loss of personal contact – reduced quality of communication and relationships within the team; 2 - Increased administrative workload; 3 - Issues with integrating new digital solutions with existing systems or software; 4 - Resistance to changes and innovations; 5 - Lack of digital skills and training; 6 - Outdated equipment, insufficient internet connectivity, or inadequate software tools; 7 - Data security and protection; 8 - Costs of procurement, implementation, and maintenance of digital tools; 9 - Limitations in digitization due to legal regulations; 10 - System reliability – issues with frequent breakdowns, system crashes, or technical support that is not fast or efficient enough

There were no statistically significant differences in training attendance based on participants' profession (p > 0.05).

Compared to participants with ≥16 years of experience, respondents with <1 year of experience had a significantly higher probability of attendance (p = 0.0011). Similarly, participants with 1–5 years of experience (p < 0.0001) and those with 6–10 years of experience (p = 0.0077) also had a significantly higher probability of attending training (Table 2).

Table 3 presents the characteristics of participants based on their self-assessed level of digital literacy ("Beginner" or "Intermediate" or "Advanced" or "Expert").

Males comprised a higher percentage of beginners (57.1%) compared to females (42.9%), while females predominated in the expert level (91.7%) (p = 0.0002).

Age distribution was also significantly associated with self-assessed digital literacy levels (p = 0.0162). The proportion of participants aged < 25 and 25–34 years increased steadily from the beginner to expert levels (25.0% for those aged <25 years, and 33.3% for those aged 25–34). Conversely, participants aged ≥ 55 were predominantly represented among beginners (52.4%).

Education level was a strong predictor of self-assessed digital literacy (p < 0.0001). Participants with a high school education were predominantly beginners (66.7%). Advanced and expert levels were most common among

Table 2. *Characteristics of the participants in relation to whether they have attended any courses or training related to digital skills*

Characteristics		Yes (n = 38)	%	No (n = 118)	%	OR	95% CI	p-value[a]
Gender	Male	14	36.8	20	16.9	ref.		
	Female	24	63.2	98	83.1	0.35	0.15-0.79	**0.0116**
Age group (in years)	< 25	17	44.7	10	8.5	28.9	5.69-146.92	**0.0001**
	25-34	10	26.3	19	16.1	8.95	1.77-45.15	**0.008**
	35-44	5	13.2	33	28	2.58	0.47-14.22	0.2777
	45-54	4	10.5	22	18.6	3.09	0.52-18.33	0.2141
	≥ 55	2	5.3	34	28.8	ref.		
Level of education	High school	1	2.6	55	46.6	ref.		
	Higher/Vocational school	2	5.3	23	19.5	4.78	0.41-55.39	0.2105
	Specialist studies	7	18.4	21	17.8	18.33	2.13-158.15	**0.0082**
	Master's studies	8	21.1	4	3.4	110	10.88-1112.02	**0.0001**
	Doctoral studies	20	52.6	15	12.7	73.33	9.09-591.69	**0.0001**
Profession	Nurse	8	21.1	83	70.3	0.58	0.06-5.42	0.6315
	Administrative staff	14	36.8	19	16.1	4.42	0.48-40.98	0.1908
	Doctor	15	39.5	10	8.5	9	0.94-86.53	0.0571
	Other	1	2.6	6	5.1	ref.		
Years of work experience	< 1	5	13.2	4	3.4	52.5	4.86-566.95	**0.0011**
	1-5	18	47.4	9	7.6	84	9.90-712.91	**< 0.0001**
	6-10	13	34.2	32	27.1	17.06	2.12-137.31	**0.0077**
	11-15	1	2.6	31	26.3	1.35	0.08-22.51	0.8323
	≥ 16	1	2.6	42	35.6	ref.		

[a]Values that differ significantly ($p < 0.05$) are marked in bold.

Table 3. *Characteristics of the participants in relation to their self-assessment of digital literacy level*

Characteristics		Level of digital literacy								p-value[a]
		Beginner (n = 21)	%	Intermediate (n = 46)	%	Advanced (n = 65)	%	Expert (n = 24)	%	
Gender	Male	12	57.1	10	21.7	10	15.4	2	8.3	**0.0002**
	Female	9	42.9	36	78.3	55	84.6	22	91.7	
Age group (in years)	< 25	1	4.8	7	15.2	13	20	6	25	**0.0162**
	25-34	1	4.8	8	17.4	12	18.5	8	33.3	
	35-44	3	14.3	9	19.6	21	32.3	5	20.8	
	45-54	5	23.8	10	21.7	9	13.8	2	8.3	
	≥ 55	11	52.4	12	26.1	10	15.4	3	12.5	
Level of education	High school	14	66.7	27	58.7	12	18.5	3	12.5	**<0.0001**
	Higher/Vocational school	3	14.3	16	34.8	4	6.2	2	8.3	
	Specialist studies	2	9.5	2	4.3	17	26.2	7	29.2	
	Master's studies	1	4.8	1	2.2	9	13.8	1	4.2	
	Doctoral studies	1	4.8	0	0	23	35.4	11	45.8	
Profession	Nurse	15	71.4	32	69.6	41	63.1	3	12.5	**<0.0001**
	Administrative staff	3	14.3	12	26.1	14	21.5	4	16.7	
	Doctor	1	4.8	1	2.2	8	12.3	15	62.5	
	Other	2	9.5	1	2.2	2	3.1	2	8.3	
Years of work experience	< 1	1	4.8	3	6.5	3	4.6	2	8.3	**0.0002**
	1-5	4	19	13	28.3	5	7.7	5	20.8	
	6-10	8	38.1	20	43.5	8	12.3	9	37.5	
	11-15	3	14.3	5	10.9	20	30.8	4	16.7	
	≥ 16	5	23.8	5	10.9	29	44.6	4	16.7	

[a]Values that differ significantly ($p < 0.05$) are marked in bold.

participants with doctoral degrees (35.4% and 45.8%, respectively).

Professional roles were also significantly associated with digital literacy levels ($p < 0.0001$). Nurses represented the majority at the beginner (71.4%) and intermediate (69.6%) levels, while doctors made up the majority of experts (62.5%). Administrative staff were more evenly distributed across the intermediate level (26.1%).

Years of work experience were significantly associated with digital literacy levels ($p = 0.0002$). Participants with ≥16 years of experience were predominantly at the advanced level (44.6%), those with 6–10 years of experience formed the largest group at the intermediate level (43.5%), while those with 1–5 years of experience were more likely to self-assess as experts (20.8%).

Satisfaction with the current level of digitalization in the institution varied significantly between professions ($p < 0.0001$). Among nurses, 53.8% expressed partial satisfaction, 48.5% of administrative staff were satisfied, while doctors had the highest level of satisfaction (56.0%).

In contrast, the 'Other' category had the highest dissatisfaction rate (42.8%) (Table 4).

There was a significant variation across different years of work experience and various aspects of digitalization ($p = 0.0378$). Respondents with less than one year of work experience reported a higher percentage of positive responses (66.7%), while participants with more than 16 years of experience had the highest proportion of neutral responses (74.4%).

A strong association was observed ($p < 0.0001$), with respondents in the 6-10, 11-15, and ≥ 16 years of experience groups largely agreeing that further digitalization would enhance their productivity, showing higher proportions of positive responses (73.3%, 75.0%, and 76.7%, respectively). In contrast, those with less than one year of experience exhibited a lower proportion of positive responses (44.4%).

There were no significant differences regarding satisfaction with the current level of digitalization across the years of work experience ($p = 0.8007$) (Table 5).

DISCUSSION

To our knowledge, this is the first insight into the key factors influencing digital competency and adoption in public health institutions in our country, offering valuable guidance for developing targeted training programs and optimizing digital transformation strategies. The findings highlight significant differences in digital skills training participation and digital literacy levels based on gender, age, education, job position, and work experience.

Approximately 80% of participants were women, reflecting the gender distribution in the institution. Although men attended digital training more frequently, most had only beginner-level digital skills. The majority of participants (36%) had a high school education, and nurses represented 58% of the study group. Participants with 6–10 and ≥ 16 years of work experience made up 29% and 28%, respectively.

Medical personnel with access to digital devices, such as computers, smartphones, and digital medical equipment, generally exhibit high digital literacy (10, 11). This study highlights the significant impact of digital literacy and training on healthcare employees' engagement with digital tools. Despite the widespread use of platforms, only 24.4%

Table 4. *The impact of digitalization on productivity, the perception of further digitalization development, and satisfaction with the current level of digitalization according to the participants' occupation*

Variables		Profession								p-value[a]
		Nurse (n = 91)	%	Administrative staff (n = 33)	%	Doctor (n = 25)	%	Other (n = 7)	%	
How does digitalization affect your productivity?	Negative	1	1.1	4	12.1	1	4	2	28.6	**0.0013**
	Neutral	50	54.9	27	81.8	11	44	4	57.1	
	Positive	40	44	2	6.1	13	52	1	14.3	
Do you believe that further digitalization would improve your productivity?	Yes	54	59.3	19	57.6	20	80	4	57.1	0.1432
	No	12	13.2	9	27.3	2	8	2	28.6	
	Not sure	25	27.5	5	15.1	3	12	1	14.3	
Are you satisfied with the current level of digitalization in your institution?	Yes	40	44	16	48.5	14	56	2	28.6	**<0.0001**
	No	2	2.2	9	27.3	1	4	3	42.8	
	Partially	49	53.8	8	24.2	10	40	2	28.6	

[a]Values that differ significantly ($p < 0.05$) are marked in bold.

Table 5. *The impact of digitalization on productivity, the perception of further digitalization development, and satisfaction with the current level of digitalization, according to the years of work experience of the participants*

Variables		Years of work experience										p-value[a]
		< 1 (n = 9)	%	1-5 (n = 27)	%	6-10 (n = 45)	%	11-15 (n = 32)	%	≥ 16 (n = 43)	%	
How does digitalization affect your productivity?	Negative	1	11.1	1	3.7	1	2.2	2	6.3	3	7	**0.0378**
	Neutral	2	22.2	11	40.7	27	60	20	62.5	32	74.4	
	Positive	6	66.7	15	55.6	17	37.8	10	31.3	8	18.6	
Do you believe that further digitalization would improve your productivity?	Yes	4	44.4	3	11.1	33	73.3	24	75	33	76.7	**<0.0001**
	No	2	22.2	2	7.4	8	17.8	5	15.6	8	18.6	
	Not sure	3	33.3	22	81.5	4	8.9	3	9.4	2	4.7	
Are you satisfied with the current level of digitalization in your institution?	Yes	3	33.3	15	55.6	18	40	15	46.9	21	48.8	0.8007
	No	1	11.1	2	7.4	3	6.7	3	9.4	6	14	
	Partially	5	55.6	10	37	24	53.3	14	43.8	16	37.2	

[a]Values that differ significantly ($p < 0.05$) are marked in bold.

of participants reported attending formal digital skills training. This gap suggests that insufficient training may hinder the effective implementation of digitalization in healthcare institutions, limiting the optimal use of digital resources (12).

Key barriers to digitalization identified in this study include the loss of personal contact, increased administrative workload, and resistance to new technologies. These challenges, representing over 70% of reported difficulties, emphasize the need for structured integration strategies to enhance user acceptance and reduce workflow disruptions. A 2020 study among healthcare professionals in Finland found that while digitalization reduced some workloads and streamlined tasks, it also increased workload and slowed processes due to poor system usability and the continuous learning required for new digital services (13).

A study examining barriers healthcare providers perceive regarding e-health innovations identified two key psychological barriers: tradition and image. Tradition barriers refer to conflicts between the innovation and end-users' existing behaviors, norms, and experiences, while image barriers reflect negative assessments of the innovation's image, efficacy, and consequences of its use (14). Similar findings have been reported in other studies conducted in different regions (15–18).

Our findings indicate that most participants lacked formal digital literacy training, likely relying on self-directed learning or work experience. This low percentage may be due to the lack of available training programs, limited awareness of their importance, or a general perception that digital skills are not a priority in professional development. Additionally, older participants with more work experience may not have seen the need for formal training.

A study in the Portuguese public sector found that employees with higher education and professional skills were more likely to participate in digital training. Most participants also expressed interest in future training, particularly in data management, cybersecurity, and communication systems (19). Similarly, a study among hospital healthcare professionals found that those with master's degrees were 2.13 times more likely to have adequate digital literacy than those with a bachelor's degree or lower (11). This may be due to the greater use of digital technology for education and research among higher-educated health professionals (11, 19).

We found that doctors reported the highest satisfaction and confidence in digitalization improving productivity, while administrative staff showed the highest proportion of neutral or negative responses. Nurses expressed mixed perceptions, reflecting the complexity of digital adoption across different healthcare roles. These variations suggest the need for tailored digital solutions for each professional group. Another study found a significant association between digital literacy levels and attitudes toward digital health technology, concluding that a positive attitude is linked to higher digital competence (11).

Digitalization reshapes healthcare work, but managers and healthcare professionals perceive its effects differently. In developing countries, low digital literacy among healthcare workers hinders the implementation of information systems (20).

A large-scale study in Israel identified training and a positive attitude as key factors in digital adoption, while high costs remain a major barrier. Early adopters and professionals who value their impact perceive digitalization as enhancing their influence (21).

The strength of this study lies in its valuable insights into employee satisfaction with digitalization, its identification of key factors influencing digital literacy, and its emphasis on the need for targeted training initiatives. These findings provide a foundation for future research and offer practical recommendations aimed at improving digital competencies and enhancing efficiency within the healthcare sector.

Our study had some limitations. As a single-center study, its findings may not be fully generalizable. The cross-sectional design limits causal inferences, and self-reported digital skills may introduce response bias. Selection bias is also possible, as participants may have had a greater interest in digitalization. Additionally, the study does not assess the long-term impact of digitalization or the effectiveness of training programs. Small sample sizes in some subgroups may have affected the estimated precision. Despite these limitations, we believe that the main findings remain relevant, highlighting the need for further large-scale and longitudinal research.

Findings of our study indicate that younger, highly educated, and less experienced employees are more inclined toward digital skills training, while certain professional groups and older employees may require targeted interventions to bridge the digital divide.

Despite widespread digital tool usage, key barriers such as increased administrative workload, resistance to change, and insufficient formal training persist. Addressing these issues through structured training programs, institutional support, and user-friendly digital solutions could enhance the efficiency and effectiveness of digitalization efforts in healthcare settings.

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Author Contributions

Conceptualization, methodology, & investigation, formal analysis, and writing—original draft preparation: M. L.; Data curation, formal analysis, and validation: I.M.; Investigation, data curation, and visualization: K.S.; Methodology, writing—review, editing, and supervision: M.R.

Statement of Ethics

This study was approved by the Ethics Committee of the Institute of Public Health of Vojvodina (No. 01-934/2, issued on June 13, 2024). Participation was voluntary, anonymous, and uncompensated. All participants provided written informed consent prior to completing the questionnaire. Data were coded and stored in a secure, password-protected database.

Statement of Competing Interest

The authors declare no relevant conflicts of interest.

Statement of Data Availability

Not applicable.

Statement of Generative AI Use

No generative AI was used.

REFERENCES

1. Reid L, Button D, Brommeyer M. Challenging the Myth of the Digital Native: A Narrative Review. Nurs Rep. 2023;13(2):573-600. [CrossRef]

2. Ban S, Kim Y, Seomun G. Digital health literacy: A concept analysis. Digit Health. 2024;10:20552076241287894. [CrossRef]

3. Stoumpos AI, Kitsios F, Talias MA. Digital Transformation in Healthcare: Technology Acceptance and Its Applications. Int J Environ Res Public Health. 2023;20(4):3407. [CrossRef]

4. Mumtaz H, Riaz MH, Wajid H, Saqib M, Zeeshan MH, Khan SE, et al. Current challenges and potential solutions to the use of digital health technologies in evidence generation: a narrative review. Front Digit Health. 2023;5:1203945. [CrossRef]

5. Poot CC, Meijer E, Fokkema M, Chavannes NH, Osborne RH, Kayser L. Translation, cultural adaptation and validity assessment of the Dutch version of the eHealth Literacy Questionnaire: a mixed-method approach. BMC Public Health. 2023;23(1):1006. [CrossRef]

6. Cavanagh R, Gerson SM, Gleason A, Mackey R, Ciulla R. Competencies Needed for Behavioral Health Professionals to Integrate Digital Health Technologies into Clinical Care: a Rapid Review. J Technol Behav Sci. 2022:1-14. [CrossRef]

7. Ramachandran S, Chang HJ, Worthington C, Kushniruk A, Ibáñez-Carrasco F, Davies H, et al. Digital Competencies and Training Approaches to Enhance the Capacity of Practitioners to Support the Digital Transformation of Public Health: Rapid Review of Current Recommendations. JMIR Public Health Surveill. 2024;10:e52798. [CrossRef]

8. Nazeha N, Pavagadhi D, Kyaw BM, Car J, Jimenez G, Tudor Car L. A Digitally Competent Health Workforce: Scoping Review of Educational Frameworks. J Med Internet Res. 2020;22(11):e22706. [CrossRef]

9. Ferreira JC, Elvas LB, Correia R, Mascarenhas M. Empowering Health Professionals with Digital Skills to Improve Patient Care and Daily Workflows. Healthcare (Basel). 2025;13(3):329. [CrossRef]

10. Alwan K, Awoke T, Tilahun B. Knowledge and Utilization of Computers Among Health Professionals in a Developing Country: A Cross-Sectional Study. JMIR Hum Factors. 2015;2(1):e4. [CrossRef]

11. Tegegne MD, Tilahun B, Mamuye A, Kerie H, Nurhussien F, Zemen E, et al. Digital literacy level and associated factors among health professionals in a referral and teaching hospital: An implication for future digital health systems implementation. Front Public Health. 2023;11:1130894. [CrossRef]

12. Borges do Nascimento IJ, Abdulazeem H, Vasanthan LT, Martinez EZ, Zucoloto ML, Østengaard L, et al. Barriers and facilitators to utilizing digital health technologies by healthcare professionals. NPJ Digit Med. 2023;6(1):161. [CrossRef]

13. Kaihlanen AM, Laukka E, Nadav J, Närvänen J, Saukkonen P, Koivisto J, et al. The effects of digitalisation on health and social care work: a qualitative descriptive study of the perceptions of professionals and managers. BMC Health Serv Res. 2023;23(1):714. [CrossRef]

14. Iyanna S, Kaur P, Ractham P, Talwar S, K.M. Islam N. . Digital transformation of healthcare sector. What is impeding adoption and continued usage of technology-driven innovations by end-users? Journal of Business Research. 2022;153:150-61. [CrossRef]

15. Almalawi A, Khan AI, Alsolami F, Abushark YB, Alfakeeh AS. Managing Security of Healthcare Data for a Modern Healthcare System. Sensors (Basel). 2023;23(7):3612. [CrossRef]

16. van Kessel R, Haig M, Mossialos E. Strengthening Cybersecurity for Patient Data Protection in Europe. J Med Internet Res. 2023;25:e48824. [CrossRef]

17. Karaferis D, Aletras V, Raikou M, Niakas D. Factors Influencing Motivation and Work Engagement of Healthcare Professionals. Mater Sociomed. 2022;34(3):216-24. [CrossRef]

18. Memon AH, Khahro SH, Memon NA, Memon ZA, Mustafa A. Relationship between Job Satisfaction and Employee Performance in the Construction Industry of Pakistan. Sustainability. 2023;15(11):8699. [CrossRef]

19. Lopes AS, Sargento A, Farto J. Training in Digital Skills-The Perspective of Workers in Public Sector. Sustainability. 2023;15(13):10577. [CrossRef]

20. Shiferaw KB, Tilahun BC, Endehabtu BF. Healthcare providers' digital competency: a cross-sectional survey in a low-income country setting. BMC Health Serv Res. 2020; 20(1):1021. [CrossRef]

21. Naamati-Schneider L. The effect of digitalization on service orientation and service perception among Israeli healthcare professionals: A qualitative study. Digit Health. 2023;9:20552076231191892. [CrossRef]