Experiences of electronic health records' and client information systems' use on a mobile device and factors associated with work time savings among practical nurses: A cross-sectional study

Satu Paatela, Maiju Kyytsönen, Kaija Saranto, Ulla-Mari Kinnunen, Tuulikki Vehko

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Abstract

Background: Clinical information in nursing is mainly nowadays transmitted using digital solutions such as computers and mobile devices. Different technological systems including electronic health records (EHR) and client information systems (CIS) can be integrated with mobile devices. Mobile device use is expected to increase because long-term care is more often provided in environments, such as at clients' homes, where computers are rarely available. More user-centred data is needed to ensure mobile devices are effective tools in practical nurses' daily activities.

Objective: To analyze practical nurses' experiences of EHR/CIS use on a mobile device in their daily practice, as well as to examine the factors associated with work time savings when using EHR/CIS on a mobile device.

Methods: A cross-sectional study based on an electronic survey was conducted during the spring 2022. A total of 3,866 practical nurses responded to the survey. The sample was restricted to practical nurses who used EHR/CIS on a mobile device and who worked in home care or service housing (n=1,014). A logistic regression analysis was used to examine the factors associated with work time savings.

Results: More experienced EHR/CIS users were more likely to perceive work time savings compared to those with less experience (OR=1.59, 95% CI=1.30–1.94). Participants with work experience of 0–5 years were more likely to have work time savings compared to those who had worked 21 years or more (OR=2.41, 95% CI=1.43–4.07). Practical nurses in home care were more likely to experience work time savings compared to those who worked in service housing (OR=1.95, 95% CI=1.23–3.07). A lower grade given for EHR/CIS was associated with a lower likelihood of experiencing work time savings (OR=0.76, 95% CI=0.66–0.89). Participants who documented client data in a public area were more likely to experience work time savings compared to those who did so in the (nurses') office (OR=2.33, 95% CI=1.27–4.25). Practical nurses who reported that documentation of client data on a mobile device was easy (OR=3.05, 95% CI=2.14–4.34) and that documentation of client data on a mobile device reduced the need to memorize things (OR=4.10, 95% CI=2.80–6.00) were more likely to experience work time savings compared to others.

Conclusions: To increase the proportion of those practical nurses who experience work time savings, we suggest that organizations should provide comprehensive orientation and regular education for those mobile device users who are less experienced of using EHR/CIS and do not find mobile devices as easy to use. User satisfaction is another issue that should be considered and therefore we recommend that end users should be involved more commonly in the development of EHR/CIS.

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Results: More experienced EHR/CIS users were more likely to perceive work time savings compared to those with less experience (OR=1.59, 95% CI=1.30–1.94). Participants with work experience of 0–5 years were more likely to have work time savings compared to those who had worked 21 years or more (OR=2.41, 95% CI=1.43–4.07). Practical nurses in home care were more likely to experience work time savings compared to those who worked in service housing (OR=1.95, 95% CI=1.23–3.07). A lower grade given for EHR/CIS was associated with a lower likelihood of experiencing work time savings (OR=0.76, 95% CI=0.66–0.89). Participants who documented client data in a public area were more likely to experience work time savings compared to those who did so in the (nurses') office (OR=2.33, 95% CI=1.27–4.25). Practical nurses who reported that documentation of client data on a mobile device was easy (OR=3.05, 95% CI=2.14–4.34) were more likely to experience work time savings compared to those who experienced documentation as not easy. Participants who perceived that documentation of client data on a mobile device reduced the need to memorize things (OR=4.10, 95% CI=2.80–6.00) were more likely to experience work time savings compared to those who did not.

Conclusion: To increase the proportion of those practical nurses who experience work time savings, we suggest that organizations should provide, for example, comprehensive orientation and regular education for those mobile device users who are less experienced of using EHR/CIS and do not find mobile devices as easy to use.

Introduction

Information and Communication Technology (ICT) including electronic health records (EHRs) and client information systems (CISs) have become an increasingly important part of healthcare and social services in Finland [1-4]. In fact, EHR has been a common tool in Finnish healthcare for a long time, and from 2010 onwards EHR availability has been 100% in public and private facilities [5]. EHR includes a comprehensive collection of patient health information (e.g., narrative texts and laboratory data), and the collected data can be used in the care processes of the patient [6]. Instead, CISs are more commonly used in public social welfare sector for accessing, storing and using client information and documents [3,4]. Over the decades, the Finnish Ministry of Social Affairs and Health has guided the construction of technological infrastructure and related legislative work nationally with the eHealth and eWelfare strategy aiming to strengthen the effective use of data to support service renewal and the well-being of citizens [7].

With the development of the ICT infrastructure, the clinical information in nursing is nowadays mainly transmitted via digital solutions such as computers and mobile devices [8]. Particularly, mobile devices such as smartphones and tablets are commonly used in the healthcare sector [9,10], and nurses are known to use EHR on mobile devices three times more often compared to doctors in a hospital environment [11]. Different technological systems such as EHRs can be integrated with mobile devices [9,11-13], and this allows social and healthcare professionals to document client data and exchange information related to the clients and service assignments in the system regardless of the time and location [11,13]. Thus, the ability to receive nursing information via a mobile device can promote the mobility and portability of care and enhance service flexibility [9,12].

In previous studies, nurses have been reported to perceive mobile devices as beneficial in their daily practice [14, 15]. Mobile device use has been found to support nurses' workflow processes [11,16-18] as nurses need to spend less time on clinical documentation [17]. In fact, it is important to recognize that the use of different technological systems such as EHRs itself has been shown to provide nurses with more time for direct patient care and inter-professional communication [19]. Moreover, mobile devices have been reported to be useful for planning work, handling notes [14] and saving time for nurses [14,20,21]. Mobile devices may also reduce duplicate documentation [13] and potential documentation errors [17,20] because client data can be documented at the time of its occurrence. Additionally, improved decision-making is one of the main advantages [9,20]. Mobile devices continuously provide the latest information on the situation of the clients, which can improve safety and the quality of care [14,18]. For instance, in home care settings workers can review and plan real-time nursing interventions and tasks in the clients' home environment [13,16] because the daily assignments can be seen directly on the mobile device. The use of mobile devices can also contribute to client empowerment as nurses have easier access to clinical information and they can reply to clients' questions more readily [17].

On the other hand, some challenges have emerged related to the use of EHR/CIS on a mobile device. According to a recent study, the use of EHR on a mobile device can negatively affect nurses' well-being since the use of mobile devices may increase time pressure and stress at work due to functional problems and changing information systems [10]. Particularly in home care settings, challenges have been reported to be technical issues, including usability problems, because information systems that are used on a mobile device are not always developed to meet the specific needs of different working environments [22]. This in turn may lead to reduced workflows [22]. Additionally, poor signal connectivity [18] and increased data

security threats are involved [17,18,23] when using mobile devices. Also, some of the recent studies have observed that the use of EHR itself may negatively impact the quality of communication between nurses and patients because nurses' attention is more focused on the documentation tool such as computers rather than on the patient [24,25]. More generally, lack of digital competence can affect how different digital tools are adopted in practice [26,27].

The European Union has promoted digitalization in society, including public services, with political consensus through the Digital Decade policy programme [28]. The change in the demographic structure especially forces social and healthcare services to invest even more in technological solutions [29] such as mobile documentation [22]. An aging population increases the need to provide long-term care in home environments [30] and therefore, using EHR and CIS on a mobile device is expected to grow as computers for professionals are rarely available at the patients' bedside in the home environment [14]. In the Finnish context, practical nurses often take care of needs related to the activities of daily living, for instance in home care and service housing. Practical nurses in the social and healthcare profession are strictly regulated by law in Finland [31,32]. Practical nurses must have completed the Vocational Qualification in Social and Healthcare with 180 awarded competence points [33]. Qualified practical nurses are registered in the National Supervisory Authority for Welfare and Health, and they work in a broad range of careers in the social welfare and healthcare sector, early childhood education or schools [34]. Practical nurses are the second largest occupational group in Finland and the largest group in the social welfare and healthcare sector in Finland, with 79,800 people working as practical nurses at the end of 2020 [35].

As practical nurses form an important group of professionals, it is justified to study their ways of working and increase our knowledge of practical nurses' experiences of EHR and CIS use on mobile devices. Some of the previous studies have investigated the use of mobile devices from the perspectives of registered nurses, nursing students and doctors [10, 11,14,15], but there is still limited understanding of the experiences of practical nurses. More user-centred data is needed to ensure that mobile devices fit into the changing clinical practice [18] and to improve health professionals' workflows in those work environments where mobile devices are commonly used. As patient care becomes increasingly complex [8] and health professionals are constantly required to work more efficiently [36], it is important to study whether mobile devices are as effective tools as they are expected to be in the daily activities of practical nurses [9,11,13,14,16,17].

Consequently, the aim of this study was to analyze practical nurses' experiences regarding their use of EHR/CIS on a mobile device in their daily practice in home care and service housing settings in social welfare and healthcare sector. Furthermore, we examined the potential factors associated with work time savings when practical nurses were using EHR/CIS on a mobile device.

Methods

Study context

Finland is a Nordic welfare state where all citizens have universal access to healthcare and social welfare services. In the 2000s, long-term care for the elderly and persons with

disabilities in Finland has changed from institutional care towards more individualized services [37]. In Finland, long-term care is increasingly provided in service housing or in the home environment under social services. Service housing is available for those citizens who need support living independently, and it may contain services such as a meal service, assistance with personal hygiene or different healthcare services [38]. However, most of the elderly are still living at home and if necessary, they can receive home care. Home care forms a service entity that covers health-centre-based home nursing and home help services [37,38]. A wide variation of different EHRs and CISs are used in Finland, and the same systems can be used in both healthcare and social welfare sectors [6].

Study design and Sample

This study was a cross-sectional study based on an electronic survey. The data was collected in spring 2022 during a three-week time period using a convenience sampling method. At the end of 2020, there were 79,800 employed practical nurses in Finland [35] who worked in social welfare and healthcare sector or in a school or in early childhood education and care. Potential respondents were invited to take part in the survey via an e-mail from two trade unions (The Finnish Union of Practical Nurses and The Union of Public and Welfare Sectors). The electronic survey was delivered to 54,030 members of the trade unions aged 18–65. Use of EHR/CIS was stated as the study theme in the cover letter. However, according to the previous studies, all members of the trade unions do not use EHR/CIS in their daily practice, because practical nurses in the social services may still use alternative solutions to support documentation [6]. Two reminders were sent to the potential participants and a total of 3,866 practical nurses responded to the survey, resulting in a response rate of 7.2%.

In this study, the inclusion criteria for participation were that 1) the respondents should work as practical nurses and use an EHR or CIS and 2) not work in a school or in early childhood education and care. These inclusion criteria were presented in the first two questions of the survey and the survey closed for those potential respondents who did not meet the criteria. The analysis was further restricted to practical nurses who answered that they use EHR or CIS on a mobile device and work in home care or service housing (n=1,014). Respondents working in other places of employment were excluded as the number of mobile device users was limited.

Instrument

Experiences of electronic health record systems among physicians were measured for the first time in Finland in a national survey in 2010 [39,40]. Since then, the survey has been developed further and repeated in 2014, 2017, 2021 for physicians and tailored for registered nurses in 2017 [41-43] and for social care professionals (educated at university or university of applied sciences) in 2020 [44,45]. From 2014 these national surveys have been conducted as part of 'Monitoring and assessment of social welfare and healthcare information system services' (STePS) -projects [6]. For the first time in 2022, the survey was tailored and conducted for practical nurses as well. The survey was pre-tested with 20 practical nurses before the data collection. The questions related to EHR/CIS use on a mobile device were of special interest because it is an elementary part of the of many practical nurses. Consequently, this study focused specifically on the use of a mobile device for the purpose of documenting client data.

A total of 11 variables from the survey were covered in this study. The *'Documentation of client data on a mobile device saves working time'* variable was used as an outcome measure. In order to understand what kind of factors are connected to work time savings, the following variables were used: *'Age'*, *'Work experience'*, *'Workplace'*, *'Experience in using EHR/CIS'*, *'Grade for EHR/CIS'*, *'Most common place to document client data on a mobile device'*, *'Received sufficient training to document client data on a mobile device'*, *'Documentation of client data on a mobile device is easy'*, *'Documentation of client data on a mobile device reduces the need to memorize'*, *'I can document everything I need on a mobile device'*. Nine variables were re-coded in the analysis and two variables were included as a continuous variable. The 5-point Likert scale was specified in five different variables as: 1= fully agree, 2= agree, 3= neither agree nor disagree, 4= disagree, 5= fully disagree. The response options were re-coded as: 1,2= yes and 3,4,5=no to focus the attention to the phenomena we were interested in and to secure enough respondents in all categories. The included variables are presented in Table 1.

Table 1. The included variables in the analysis. [a]

Variable	Item in the survey	Response options	Coded in the analysis
Age	Year of birth	1957–2003	18–34 years 35–54 years 55–65 years

Work experience	How long have you worked as a practical nurse (or equivalent)?	1= under 1 year 2= 1–2 years 3= 3–5 years 4= 6–10 years 5= 11–15 years 6= 16–20 years 7= over 20 years	1,2,3=0–5 years 4=6–10 years 5=11–15 years 6=16–20 years 7= 21 years or more
Workplace	The place of the main employment.	The three largest places of the main employment were included in the study: 1= hospital-based home care, 2= residential care home 3= home care	1,2=service housing 3=home care
Experience in using EHR/CIS	How experienced do you consider yourself to be as a EHR/CIS user?	The answer options were rated from 1 (beginner) to 5 (highly experienced).	Included as a continuous variable.
Grade for EHR/CIS	How would you rate the electronic health record/client information system you use on a mobile device?	On a scale of 4 to 10 (with 4 being the lowest score and 10 being the highest score)	Included as a continuous variable.
Most common place to document client data on a mobile device	What is the most common place to document client data on a mobile device?	1= next to the patient, 2= in a public area (e.g. corridor) 3= on the streets, 4= at the office/nurses' office 5= in one's car 6= in the public transport 7= other	1= next to the patient 2= in a public area 4= at the (nurses') office 5= in one´s car 3,6,7= other
Received sufficient training to document client data on a mobile device	I have received sufficient training to document client data on a mobile device.	5-point Likert scale	Binary variables: 1,2= yes 3,4,5= no
Documentation of client data on a mobile device is easy	Documentation of client data on a mobile device is easy.	5-point Likert scale	Binary variables: 1,2= yes 3,4,5= no
Documentation of client data on a	Documentation of client data on a mobile device	5-point Likert scale	Binary variables: 1,2= yes

mobile device saves working time	saves working time.		3,4,5= no
Documentation of client data on a mobile device reduces the need to memorize things	Documentation of client data on a mobile device reduces the need to memorize things.	5-point Likert scale	Binary variables: 1,2= yes 3,4,5= no
I can document everything I need on a mobile device	I can document everything I need on a mobile device.	5-point Likert scale	Binary variables: 1,2= yes 3,4,5= no

[a] The 5-point Likert scale is specified as: 1= fully agree, 2= agree, 3= neither agree nor disagree, 4= disagree, 5= fully disagree.

Data analysis

The data were analysed using the statistical software IBM SPSS Statistics Version 29.0.0.0 (241). The characteristics of the study participants were described using percentages (%). A binary logistic regression analysis was conducted to examine the association between independent and dependent variables. The '*Documentation of client data on a mobile device saves working time*' item was used as a dependent variable and 10 items were used as independent variables in the analysis. In establishing a model for the relationship between independent and dependent variables, we first tested the significance of each independent variable individually according to Wald´s F test. Based on the P-values ($P<.05$) of Wald´s F test, the items '*Age*' and '*I can document everything I need on a mobile device*' were excluded from the regression analysis model. We included eight other independent variables one by one in the model using a forward stepwise selection method. At each step, variables were chosen for the final model according to their effect on the model's goodness-of-fit measure, Nagelkerke R Square (R^2_N), and based on the P-values of Wald's F test. The fully adjusted model included seven independent variables: '*Experience in using EHR/CIS*', '*Work experience*', '*Workplace*', '*Grade for EHR/CIS*', '*Most common place to document client data on a mobile device*', '*Documentation of client data on a mobile device is easy*' and '*Documentation of client data on a mobile device reduces the need to memorize*'. The '*Received sufficient training to document client data on a mobile device*' item was omitted from the final model, because it was no longer statistically significant ($P=.08$) after adjusting the final variable to the model. The fully adjusted model's R^2_N was 0.372. Variance inflation factor (VIF) was used to secure a model without multicollinearity: the values indicated low correlation, which is acceptable in a regression model. The results of the fully adjusted regression analysis model are presented with P-values, VIF, odds ratios (ORs) and their 95 % confidence intervals (CI) in Table 4.

Ethical considerations

We considered ethical issues related to different phases of this study. Ethical approval for the study was provided by the Finnish Institute for Health and Welfare THL/1206/6.02.01/2022. Study participants were offered written information on the research and data processing in a covering letter and Privacy Notice [46]. Participants did not receive any compensation for their

participation in the study. The research group has been committed to protecting the anonymity of the participants throughout the study process.

Results

Characteristics of the mobile device users

A total of 1,014 practical nurses used EHR/CIS on mobile device. Almost half of the mobile device users (471/1,014, 46.4%) were 35–54 years old, but also the proportion of the participants that were at least 55-year-old was relatively high. The work experience of the participants varied and was quite evenly distributed. For instance, some of the practical nurses (195/1,014, 19.2%) had 0–5 years of work experience as a practical nurse or equivalent, while some had worked for 21 years or more (238/1,014, 23.5%). Most of the mobile device users (706/1,014, 69.6%) were working in home care and the rest were working in service housing. Almost half of the mobile device users (458/1,014, 45.2%) rated their experience of using EHR/CIS at level 4 (1=beginner, 5=highly experienced). Only four practical nurses rated themselves as beginners in using EHR/CIS. Furthermore, most of the practical nurses evaluated the EHR/CIS system used via a mobile device as good (364/1,014, 35.9%) or satisfactory (271/1,014, 26.7%) (Table 2).

Table 2. Characteristics of the study participants (n=1,014).

Characteristics		Value, n (%)
Age (years)		
	18–34	156 (15.4)
	35–54	471 (46.4)
	55–65	387 (38.2)
	Missing data	-
Work experience (years)		
	0–5	195 (19.2)
	6–10	232 (22.9)
	11–15	220 (21.7)
	16–20	129 (12.7)
	21 or more	238 (23.5)
	Missing data	-
Workplace		
	Service housing	308 (30.4)
	Home care	706 (69.6)
	Missing data	-
Experience using EHR/CIS		
	1 (beginner)	4 (0.4)
	2	47 (4.6)
	3	287 (28.3)
	4	458 (45.2)
	5 (highly experienced)	218 (21.5)
	Missing data	-
Grade for EHR/CIS		

	10 (Excellent)	21 (2.1)
	9 (Very Good)	110 (10.8)
	8 (Good)	364 (35.9)
	7 (Satisfactory)	271 (26.7)
	6 (Moderate)	140 (13.8)
	5 (Adequate)	90 (8.9)
	4 (Fail)	14 (1.4)
	Missing data	4 (0.4)

Practical nurses' experiences of documenting client data on a mobile device

The most common place to document client data on a mobile device was next to the client (537/1,014, 53%). Some of the practical nurses documented client data in the car, at the (nurses') office or in a public area. Mobile device users were relatively pleased with the training they had received to document client data on a mobile device (661/1,014, 65.2%). Most of the mobile device users (648/1,014, 63.9%) perceived it was easy to document client data on a mobile device. Two thirds of the practical nurses (667/1,014, 65.8%) evaluated that the documentation of client data on a mobile device saved their working time. Moreover, a vast majority of the mobile device users (785/1,014, 77.4%) agreed that the documentation of client data on a mobile device reduced the need to memorize things. Less than half (418/1,014, 41.2 %) of the participants agreed they could document everything they need on a mobile device. (Table 3.)

Table 3. Practical nurses' experiences of documenting client data on a mobile device (n=1,014).

Variable		Value, n (%)
Most common place to document client data on a mobile device		
	Next to the client	537 (53.0)
	In a public area (e.g. corridor)	135 (13.3)
	At the (nurses') office	133 (13.1)
	In one's car	175 (17.3)
	Other	31 (3.1)
	Missing data	3 (0.3)
Received sufficient training to document client data on a mobile device		
	No	350 (34.5)
	Yes	661 (65.2)
	Missing data	3 (0.3)
Documentation of client data on a mobile device is easy		
	No	361(35.6)
	Yes	648 (63.9)
	Missing data	5 (0.5)
Documentation of client data on a mobile device saves working time		

	No	343 (33.8)
	Yes	667 (65.8)
	Missing data	4 (0.4)
Documentation of client data on a mobile device reduces the need to memorize things		
	No	222 (21.9)
	Yes	785 (77.4)
	Missing data	7 (0.7)
I can document everything I need on a mobile device		
	No	594 (58.6)
	Yes	418 (41.2)
	Missing data	2 (0.2)

Factors associated with work time savings when using EHR/CIS on a mobile device

Several factors were associated with work time savings when using EHR/CIS on a mobile device (Table 4). Experience of using EHR/CIS, work experience, the workplace, the grade given for the EHR/CIS, the statements 'documentation of patient data on a mobile device is easy' and 'documentation of patient data on a mobile device reduces the need to memorize things' had statistically significant associations with work time savings.

Practical nurses who considered themselves to be more experienced EHR/CIS users were more likely to perceive work time savings. Participants who had worked 0–5 years as a practical nurse were 2.41 times more likely to experience work time savings compared to those who had worked 21 years or more. Practical nurses who had worked 16–20 years had a lower likelihood of experiencing work time savings than those who had worked for 21 years or more. Furthermore, practical nurses who worked in home care settings were 1.95 times more likely to report work time savings compared to those participants who worked in service housing. Giving a lower grade for EHR/CIS was associated with a lower likelihood of experiencing work time savings. Participants who documented client data in a public area were 2.33 times more likely to experience work time savings compared to those who documented client data at the (nurses') office. Moreover, those practical nurses who reported that the documentation of client data on a mobile device was easy, were 3.05 times more likely to experience work time savings compared to others. Practical nurses who reported that the documentation of client data on a mobile device reduced their need to memorize things were 4.10 times more likely to experience work time savings compared to those who did not find mobile devices helpful in memorizing things.

Table 4. The results of the fully adjusted logistic regression analysis model for the practical nurses' experience of work time savings when using EHR/CIS on a mobile device. [a-b]

Variable		Odds ratio (95 % CI)	p-value	VIF
Experience in using EHR/CIS		1.59 (1.30–1.94)	**<.001**	1.09
Work experience (years)			**<.001**	1.03
	0–5	2.41 (1.43–4.07)	**.001**	
	6–10	1.34 (0.84–2.13)	.23	
	11–15	1.03 (0.64–1.67)	.89	

	16–20	0.52 (0.31–0.87)	**.01**	
	21 or more	1	-	
Workplace				1.18
	Home care	1.95 (1.23–3.07)	**.004**	
	Service housing	1	-	
Grade for EHR/CIS, on a scale of 4–10		0.76 (0.66–0.89)	**<.001**	1.40
The most common place to document client data on a mobile device			.08	1.17
	Next to the client	1.66 (0.96–2.88)	.07	
	In a public area (e.g. corridor)	2.33 (1.27–4.25)	**.006**	
	In one's car	1.84 (0.96–3.53)	.07	
	Other	2.09 (0.73–5.94)	.17	
	At the (nurses') office	1	-	
Documentation of client data on a mobile device is easy				1.44
	Yes	3.05 (2.14–4.34)	**<.001**	
	No	1	-	
Documentation of client data on a mobile device reduces the need to memorize things				1.20
	Yes	4.10 (2.80–6.00)	**<.001**	
	No	1	-	

[a] The level of statistical significance was set at $p< .05$, marked in bold.
[b] VIF: Variance inflation factor.

Discussion

Principal results

The aim of the study was to analyze practical nurses' experiences of using EHR/CIS on a mobile device in their daily practice. Our study findings revealed that practical nurses' experiences of documenting client data on a mobile device were relatively good. Two-thirds of the participants perceived that mobile devices were effective tools in their daily practice, as mobile devices helped them in saving working time. A vast majority of the participants agreed that using EHR/CIS on a mobile device reduced the need to memorize things. On the other hand, the participants least agreed with the statement that they could document everything they needed on a mobile device.

We also examined factors associated with work time savings when practical nurses were using EHR/CIS on a mobile device. Experience with the EHR/CIS, work experience, the workplace, the grade awarded for the EHR/CIS, the statements 'documentation of patient data on a mobile device is easy' and 'documentation of patient data on a mobile device reduces the need to

memorize things' were all associated with practical nurses' experiences of work time savings.

Limitations

This study includes some limitations. First, the response rate (7.2%) remained fairly low, which is typical for web-based and longer surveys [47], as well as surveys targeted at healthcare professionals [48]. Some of the email addresses of the potential respondents may not have been correct because of job changes or other reasons and some did not open the email related to the survey at all, so the actual response rate may have been higher if calculated for only those who actually received the invitation to the survey. Eventually, 85.3% of survey clicks led to responding to the survey. The data was collected during the national industrial action organized by the trade unions, which may have complicated answering the survey, as well as different work-related factors that practical nurses may encounter in their daily work such as rush and interruptions since many union members use their work e-mail as their contact information. Additionally, the used convenience sampling method may limit the generalizability of the results. On the other hand, the age structure of the respondents was equivalent with those who belong to national trade unions [49]. The survey could also be answered in the two official languages of Finland (Finnish and Swedish), which may have encouraged speakers of both languages to answer.

Second, practical nurses form a common occupational group in Finland, but it may be a lesser-known occupational title in other parts of the world. In fact, healthcare professionals with wide variations of occupational titles may provide long-term care internationally. Nevertheless, we suggest that our study results can be utilized in those nursing professions such as registered nurses and healthcare assistants who use mobile devices as a documentation tool in their daily practice. Additionally, it should be noted that Finland has used ICT tools extensively in healthcare for a long time [5] and in general the usage of mobile data in Finland is most extensive when compared globally [50]. Therefore, the study results could be utilized in similar countries where ICT development is at the same stage.

Third, the survey was tailored for the first time for practical nurses in Finland as were the questions related to mobile device use in the survey. We can assume the respondents understood the different items of the instrument relatively well, since the proportion of missing data was low. The instrument was pre-tested with 20 practical nurses before the survey was sent to the participants.

In the future, work time saving should be studied among users of specific EHR/CIS brands, since the grading of the system by the respondents was strongly associated with experiencing work time savings. Research should also be conducted in specific work environments as the care processes and needs of professionals differ, for example, in home care and in service housing. Therefore, a subgroup analysis for practical nurses in home care and service housing separately would be a good add-on for future studies. Another significant research topic would be to examine the barriers practical nurses may experience, when the documentation is done

next to the patient using a mobile device.

Comparison with prior work

As far as we know, this was the first time practical nurses' experiences on their use of EHR/CIS on a mobile device was studied. We were particularly interested in examining whether the use of EHR/CIS on a mobile device saves practical nurses working time and which factors were associated with work time savings. In the healthcare sector, saving work time is an important issue, as nursing professionals need to carry out numerous tasks in their daily practice and they should have more time for immediate patient care and spend less time on indirect patient care such as working with documentation [21].

In this study, we found that two-thirds of the practical nurses who worked in home care or service housing perceived work time savings when they were using EHR/CIS on a mobile device. Similar work time savings have been reported in previous studies of healthcare professionals [14,20,21]. This study showed that documenting client data in a public area, for example in a corridor of a housing service, made work time savings over two times more likely than documenting at the (nurses') office, where computers are typically available. However, it should be noted, that documenting sensitive client data on mobile devices in a public area may involve some increased security threats such as the loss or theft of the mobile device [23] and therefore mobile technology tools should provide critical security functions and organizations should have clear policies on how to manage mobile devices [51].

Based on our study results, work experience was associated with work time savings when using EHR/CIS on a mobile device. In this study participants who had worked 0–5 years as a practical nurse or equivalent were over two times more likely to experience work time savings compared to those who had worked for over 21 years. We assume that practical nurses with less work experience may perceive work time savings more often because they are more used to working with new technologies in their daily practice and they may have received orientation to using mobile devices more recently. It is interesting to notice that in our analysis we did not find age to be significantly associated with work time savings when using EHR/CIS on a mobile device. However, age can affect how the use of mobile devices is perceived, as previous study results have indicated that older nurses are less likely to use smartphones or agree that they bring benefits in acute care settings [52].

We also found that those practical nurses who worked in home care settings were almost two times more likely to report work time savings compared to practical nurses who worked in service housing. This finding is not very surprising, as home care is dependent on mobility and requires the use of ICT tools at patients' homes [22], which encourages integrating mobile technology in the daily practices of the workers. An important prerequisite for the benefits of using mobile technology is that mobile devices should integrate well with the used information systems [18], such as EHR and CIS. It could be assumed that mobile devices bring work time savings for practical nurses particularly in home care settings because mobile devices enable the documentation of client data right after the daily tasks are completed [13], for instance, next to the client. However, while in this study practical nurses frequently documented data next to the client, it was not a statistically significant factor for work time savings. Since mobile devices enable users to document client data immediately after meeting the client, it may reduce the need for healthcare professionals to memorize things. Based on our study results, those practical nurses who experienced that the documentation of client data reduced the need

to memorize things were four times more likely to report work time savings compared to those practical nurses who did not find mobile devices helpful in reduced the need to memorize things.

Our study findings indicated that those practical nurses who reported that the documentation of client data on a mobile device was easy were over three times more likely to experience work time savings compared to those practical nurses who did not find mobile devices as easy to use. Additionally, Zhang et al. [53] found that nursing professionals in home care settings perceived mobile devices to be useful if the tools are easy to use. Overall, the usability problems related to health information systems including EHR are well acknowledged [2,54], but the received data is often based on using these systems on a computer. It should be noted that the use of EHR/CIS specifically on mobile devices may pose additional challenges for social and healthcare professionals. For instance, previous studies have revealed that mobile devices are difficult to use, too small for daily practice [16], do not work properly at all times [13], and may be unstable because of the possible Internet connection problems [18,22].

In this study, the grade given by the respondents for the EHR/CIS on a mobile device seems to be a factor that was also associated with work time savings. More precisely, a lower grade given for the EHR/CIS was associated with a lower likelihood of experiencing work time savings. Since the grade for the EHR/CIS can be thought of as reflecting the user satisfaction to some extent, the finding highlights the importance of investing in user satisfaction concerning the practical nurses' EHR/CIS use on mobile devices. User satisfaction has been an area of special interest in some previous studies [9,15] and its effects are known to be wider than those related to work time savings. According to Hsiao & Chen [9] user satisfaction affects nurses' intention of continuing to use information systems on mobile devices and the perceived usefulness is often related to user satisfaction. Additionally, the quality of the information system and support from managers effectively predict user satisfaction [15], as well as technology adoption in general [18]. It should be noted that those healthcare professionals who are more experienced users of the information systems may have important proposals for improvements [9] and therefore these users should particularly be involved in the development of EHR/CIS to ensure the user satisfaction of the system interfaces.

Practical nurses' experience of using EHR/CIS should also be considered when evaluating the potential work time savings. Based on our study results, those practical nurses who had more experience in using EHR/CIS were more likely to experience work time savings. Similarly, Villalba-Mora et al. [26] found that those healthcare professionals who used health information technologies such as EHR more frequently perceived these tools to be more useful. Additionally, previous experience of digital technologies is important, since it supports healthcare professionals in adopting mobile devices in their daily practices [18].

Conclusions

This study expanded the current knowledge of the existing literature on the use of EHR/CIS on a mobile device by practical nurses in their daily practice and factors associated with work time savings. Our study results revealed that two-thirds of the practical nurses perceived mobile devices as useful in home care and service housing settings, since participants reported that documenting client data on a mobile device saved their working time. Experience in using EHR/CIS, work experience, the workplace, the grade given for the EHR/CIS, the statements 'documentation of patient data on a mobile device is easy' and 'documentation of patient data

on a mobile device reduces the need to memorize things' were all significantly associated with practical nurses' experiences of work time savings. Based on our findings, we recommend that special attention should be paid to those mobile device users who are less experienced in using EHR/CIS or do not find mobile devices as easy to use. Organizations should offer these healthcare professionals comprehensive orientation and regular education on the use of EHR/CIS on mobile devices. User satisfaction is another issue that should be considered if the aim is to achieve work time savings among those healthcare professionals who use EHR/CIS on a mobile device since work time saving were more often experienced by those practical nurses who gave a higher grade for their EHR/CIS. Therefore, we suggest that end users, particularly those with more experience in using EHR/CIS, should be involved in the development of EHR/CIS to ensure better user satisfaction of system interfaces.

Acknowledgments

Data Availability
The data collected and analyzed during the current study are not publicly available due to co-registratorship between the University of Eastern Finland and the Finnish institute for health and welfare, the controllers of the data.

Conflicts of Interest
None declared.

Authors' contribution

Satu Paatela: Conceptualization, Formal analysis, Writing – original draft.
Maiju Kyytsönen: Conceptualization, Formal analysis, Writing – review & editing
Kaija Saranto: Conceptualization, Writing – review & editing
Ulla-Mari Kinnunen: Conceptualization, Writing – review & editing
Tuulikki Vehko: Conceptualization, Supervision, Project administration, Writing – review & editing

Abbreviations

CIS: client information system
EHR: electronic health record
ICT: Information and Communication Technology
VIF: Variance inflation factor

References

1. Kinnunen U-M, Heponiemi T, Rajalahti E, Ahonen O, Korhonen T, Hyppönen H. Factors related to health informatics competencies for nurses—results of a national electronic health record survey. CIN: Computers, Informatics, Nursing. 2019;37(8):420-429. doi: 10.1097/CIN.0000000000000511

2. Kaihlanen A, Gluschkoff K, Hyppönen H, Kaipio J, Puttonen S, Vehko T, Saranto K, Karhe L, Heponiemi T. The associations of electronic health record usability and user age with stress and cognitive failures among Finnish registered nurses: Cross-Sectional Study. JMIR Med Inform. 2020;8(11):e23623. doi: 10.2196/23623 PMID: 33206050

3. Salovaara S, Ylönen K. Client information systems' support for case-based social work: experiences of Finnish social workers. Nordic Social Work Research. 2022;12(3):364-378. doi: 10.1080/2156857X.2021.1999847

4. Ylönen K. The use of electronic information systems in social work. A scoping review of the empirical articles published between 2000 and 2019. European Journal of Social Work. 2022. doi: 10.1080/13691457.2022.2064433

5. Reponen J, Keränen N, Ruotanen R, Tuovinen T, Haverinen J, Kangas, M. Availability and use of e-health in Finland. In: Vehko T, eds. E-health and e-welfare of Finland. Checkpoint 2022. National Institute for Health and Welfare (THL). Report 6/2022. Helsinki, Finland 2022:61-95. https://urn.fi/URN:ISBN:978-952-343-891-0.

6. Vehko T, editor. E-health and e-welfare of Finland. Checkpoint 2022. National Institute for Health and Welfare (THL). Report 6/2022. Helsinki, Finland 2022. https://urn.fi/URN:ISBN:978-952-343-891-0.

7. Jormanainen V, Hämäläinen P, Reponen J. The Finnish healthcare and social care system and ICT-policies. In: Vehko T, editor. E-health and e-welfare of Finland. Checkpoint 2022. National Institute for Health and Welfare (THL). Report 6/2022. Helsinki, Finland 2022:61-95. https://urn.fi/URN:ISBN:978-952-343-891-0.

8. Silva A. M, de A, Mascarenhas V. H. A, Araújo S. N. M, Machado R. da S, Santos A. M. R. dos, Andrade E. M. L. R. Mobile technologies in the Nursing area. Revista Brasileira de Enfermagem. 2018;71(5):2570–2578. doi:10.1590/0034-7167-2017-0513

9. Hsiao J, Chen R. Understanding determinants of healthcare professionals' perspectives on mobile health continuance and performance. JMIR Med Inform. 2019;7(1):e12350. doi: 10.2196/12350

10. Heponiemi T, Kaihlanen A, Gluschkoff K, Saranto K, Nissinen S, Laukka E, Vehko T. The association between using a mobile version of an electronic health record and the well-being of nurses: Cross-sectional Survey Study. JMIR Med Inform. 2021;9(7):e28729, doi: 10.2196/28729 PMID: 34255704

11. Lee, Y., Park, Y.R., Kim, J., Kim, J.H., Kim. W.S. & Lee, J.H. Usage pattern differences and similarities of mobile electronic medical records among health care providers. JMIR Mhealth Uhealth. 2017;5(12):e178. doi: 10.2196/mhealth.8855 PMID: 29237579

12. Lin T-G. Mobile Nursing Information System Utilization: The task-technology fit perspective. CIN: Computers, Informatics, Nursing. 2014;32(3):129-137. doi: 10.1097/CIN.0000000000000039

13. Han S, Juell-Skielse G, Smedberg Å, Aasi P, Nilsson AG. Benefits of mobile reporting systems in social home care: the case of seven Swedish municipalities. Int J Technol Assess Health Care. 2014;30(4):409-15. doi: 10.1017/S026646231400052X PMID:

25425318

14. Johansson P, Petersson G, Saveman B-I, Nilsson G. Using advanced mobile devices in nursing practice – the views of nurses and nursing students. Health Informatics Journal. 2014;20(3):220-231. doi:10.1177/1460458213491512

15. Cheng C, Chan C, Chen L, Guo S. H. Evaluation of the implementation of a mobile nursing information system. Online Journal of Nursing Informatics. 2019;23(3):1.

16. Schachner M, Sommer J, González Z, Luna D, Benítez S. Evaluating the feasibility of using mobile devices for nurse documentation. Nursing Informatics. 2016;225:495–499. doi:10.3233/978-1-61499-658-3-495

17. Ehrler F, Lovis C, Blondon K. A Mobile phone app for bedside nursing care: design and development using an adapted software development life cycle model. JMIR Mhealth Uhealth. 2019;7(4):e12551. doi: 10.2196/12551 PMID: 30973339

18. Jacob C, Sanchez-Vazquez A, Ivory C. Social, organizational, and technological factors impacting clinicians' adoption of mobile health tools: Systematic Literature Review. JMIR Mhealth Uhealth. 2020;8(2):e15935. doi: 10.2196/15935

19. Moore EC, Tolley CL, Bates DW, Slight SP. A systematic review of the impact of health information technology on nurses' time. J Am Med Inform Assoc. 2020;1;27(5):798-807. doi:10.1093/jamia/ocz231.

20. Mickan S, Tilson JK, Atherton H, Roberts NW, Heneghan C. Evidence of effectiveness of health care professionals using handheld Computers: A scoping review of systematic reviews J Med Internet Res. 2013;15(10):e212. doi: 10.2196/jmir.2530 PMID: 24165786

21. Pérez-Martí M. Electronic records with tablets at the point of care in an internal medicine unit: OJNI. On - Line Journal of Nursing Informatics. 2020;24(3).

22. Rydenfält C, Persson J, Erlingsdottir, Johansson G. eHealth Services in the Near and Distant Future in Swedish Home Care Nursing. CIN: Computers, Informatics, Nursing. 2019;37(7): 366-372. doi: 10.1097/CIN.0000000000000536

23. Vossebeld D. M, Puik E. C. N, Jaspers J. E, Schuurmans M. J. Development process of a mobile electronic medical record for nurses: A single case study. BMC Medical Informatics and Decision Making. 2019; 19(1):11.

24. Forde-Johnston C, Butcher D, Aveyard H. An integrative review exploring the impact of Electronic Health Records (EHR) on the quality of nurse–patient interactions and communication. Journal of Advanced Nursing. 2023;79,48–67. doi:10.1111/jan.15484

25. Ali S, Kleib M, Paul P, Petrovskaya O, Kennedy M. Compassionate nursing care and the use of digital health technologies: A scoping review. International Journal of Nursing Studies. 2022;127,104161, doi:10.1016/j.ijnurstu.2021.104161

26. Villalba-Mora E, Casas I, Lupiañez-Villanueva F, Maghiros I. Adoption of health information technologies by physicians for clinical practice: The Andalusian case. Int J Med Inform. 2015;84(7):477-85. doi: 10.1016/j.ijmedinf.2015.03.002.

27. Zhu H, Andersen S.T. Digital competence in social work practice and education: experiences from Norway. Nordic Social Work Research 2022;12(5):823-838. doi: 10.1080/2156857X.2021.1899967

28. European commission. Shaping Europe's digital future 2021. Available from: https://ec.europa.eu/digital-single-market/en/content/european-digital-strategy [accessed Jan 5, 2023].

29. Dequanter S, Steenhout I, Fobelets M, Gagnon MP, Sasseville M, Bourbonnais A, Giguere A, Ndiaye MA, Lambert A, Gorus, E, Buyl L. Technology implementation in care practices for community-dwelling older adults with mild cognitive decline: Perspectives of professional caregivers in Quebec and Brussels. Digital Health. 2022;8.

doi:10.1177/20552076221139693

30. Fritzell J, Agahi N, Jylhä M, Rostgaard, T. Social inequalities in ageing in the Nordic countries. Eur J Ageing. 2022;19:155–159. doi:10.1007/s10433-022-00702-5

31. Finlex. Act on Healthcare Professionals 559/1994. Available from: https://www.finlex.fi/en/laki/kaannokset/1994/en19940559 [accessed Jan 20, 2023].

32. Finlex. Degree on Healthcare Professionals 564/1994. Available from: https://www.finlex.fi/en/laki/kaannokset/1994/en19940564 [accessed Jan 20, 2023].

33. Finnish National Agency for Education. Vocational Qualification in Social and Health Care 2022. Available from: https://eperusteet.opintopolku.fi/#/en/ammatillinen/7854765/tiedot [accessed Dec 20, 2022].

34. The Finnish Union of Practical Nurses. Practical nurse training. Practical nurse´s education, training and registration 2022. Available from: https://www.superliitto.fi/in-english/practical-nurse-training/ [accessed Dec 20, 2022].

35. Statistics Finland. Shop sales assistants, health care assistants and nurses most common occupations in 2020. Available from: https://www.stat.fi/en/publication/cktws35s04dru0b553lzi7aci [accessed Dec 15, 2022].

36. Lee T.Y, Sun G.T, Kou L.T, Yeh M.L. The use of information technology to enhance patient safety and nursing efficiency. Technology Health Care. 2017b;25(5):917-928. doi:10.3233/THC-170848

37. Keskimäki I, Tynkkynen LK, Reissell E, Koivusalo M, Syrjä V, Vuorenkoski L, Rechel B, Karanikolos M. Finland: Health system review. Health systems in transition. 2019;21(2):1–166.

38. Finlex. Social Welfare Act 1301/2014. Available from: https://finlex.fi/fi/laki/ajantasa/2014/20141301#L3P21 [accessed Jan 20, 2023].

39. Vänskä J, Viitanen J, Hyppönen H, Elovainio M, Winblad I, Reponen J, Lääveri T. Lääkärien arviot potilastietojärjestelmistä kriittisiä. Suomen Lääkärilehti. 2010;50-52(65):4177-4183.

40. Viitanen J, Hyppönen H, Lääveri T, Vänskä J, Reponen J, Winblad I. National Questionnaire Study on Clinical ICT Systems Proofs: Physicians Suffer from Poor Usability. International Journal of Medical Informatics. 2011;80(10):708-725. doi:10.1016/j.ijmedinf.2011.06.010

41. Hyppönen H, Lääveri T, Hahtela N, Suutarla A, Sillanpää K, Kinnunen U.-M, Ahonen O, Rajalahti, E, Kaipio J, Heponiemi T, Saranto K. Kyvykkäille käyttäjille fiksut järjestelmät? Sairaanhoitajien arviot potilastietojärjestelmistä 2017 (In English: Smart systems for capable users? Nurses' experiences on patient information systems 2017.) Finnish Journal of EHealth and EWelfare 2018;10(1):30–59. doi: 10.23996/fjhw.65363

42. Saranto K, Kinnunen U.-M, Koponen S, Kyytsönen M, Hyppönen H, Vehko T. Sairaanhoitajien valmiudet tiedonhallintaan sekä kokemukset potilas- ja asiakastietojärjestelmien tuesta työtehtäviin. (In English: Nurses' competences in information management as well as experiences in health and social care information system support for daily practice.) Finnish Journal of EHealth and EWelfare 2020;12(3):212–228. doi:10.23996/fjhw.95711

43. Saranto K, Koponen S, Vehko T, Kivekäs E. Nurse managers opinions of information system support for performance management: A Correlational Study. Methods of Information in Medicine. 2022. doi:10.1055/a-1978-9727.

44. Ylönen, K., Salovaara, S., Kaipio, J., Tyllinen, M., Tynkkynen, E., Hautala, S., & Lääveri, T. Sosiaalialan asiakastietojärjestelmissä paljon parannettavaa: käyttäjäkokemukset 2019.

Finnish Journal of EHealth and EWelfare. 2020;12(1):30–43. doi:10.23996/fjhw.88583

45. Salovaara S, Ylönen K, Silén M, Viitanen J, Lääveri T, Hautala S. Sosiaalialan korkeakoulutettujen ammattilaisten arviot asiakastietojärjestelmistä 2020. (In English: Social welfare professionals' experiences on client information systems in 2020.) Finnish Journal of EHealth and EWelfare. 2022;14(2): 191–207. doi:10.23996/fjhw.113710

46. European Union. General Data Protection Regulation 2016/679. The European Union. Available from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32016R0679 [accessed May 3, 2023].

47. Sammut R, Griscti, O, Norman I. Strategies to improve response rates to web surveys: A literature review. International Journal of Nursing Science. 2021;123:104058. doi:10.1016/j.ijnurstu.2021.104058.

48. Timmins F, Ottonello G, Napolitano F, Musio M.E, Calzolari M, Gammone M, Catania G, Zanini M, Aleo G, Sasso L, Bagnasco A. The state of the science—the impact of declining response rates by nurses in nursing research projects. J Clin Nurs. 2023;32:e9-e11. doi:10.1111/jocn.16597

49. The Finnish Union of Practical Nurses. Tilastot. Available from: https://www.superliitto.fi/super-info/superin-toiminta/tilastot/ [accessed Sep 29, 2023].

50. Tefficient. Mobile data usage got a boost when we were immobile. Available from https://tefficient.com/mobile-data-usage-got-a-boost-when-we-were-immobile/#more-5938 [accessed Feb 21, 2022].

51. Dexheimer JW, Borycki EM. Use of mobile devices in the emergency department: A scoping review. Health Informatics Journal. 2015;21(4):306-315. doi:10.1177/1460458214530137

52. Flynn G, Polivka B, Behr J. Smartphone use by nurses in acute care settings. CIN: Computers, Informatics, Nursing. 2018;36(3):120-126. doi: 10.1097/CIN.0000000000000400

53. Zhang H, Cocosila M, Archer N. Factors of adoption of mobile information technology by homecare nurses: A technology acceptance model 2 approach. CIN: Computers, Informatics, Nursing. 2010;28(1):49-56. doi: 10.1097/NCN.0b013e3181c0474a

54. Hyppönen H, Kaipio J, Heponiemi T, Lääveri T, Aalto A, Vänskä J, Elovainio M. Developing the national usability-focused health information system scale for physicians: Validation Study. J Med Internet Res. 2019;21(5):e12875. doi: 10.2196/12875

Supplementary Files