Clinical and Experimental Health Sciences

An Examination of Nurses' Acceptance of Mobile Health Applications

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ABSTRACT

Objectives: This study aims to examine nurses' acceptance of Mobile Health Applications.

Methods: This cross-sectional study was conducted with 321 nurses in a health practices and research center between March-July of 2020. Data collection instruments were Personal Data Form and Mobile Applications Acceptance Model.

Results: In this study, 97.2% of the nurses believed that mobile health applications should be used more in hospitals. The total mean score of the nurses on the Mobile Applications Acceptance Model (MAAM) was 124.69±15.98. Nurses under the age of 30, those who worked in intensive care units, and those who owned a mobile device exhibited higher total mean scores on the MAAM ($p<0.05$). The MAAM total mean scores were higher among those who thought Mobile Health Applications should be made more widespread ($p<0.04$), who felt that Mobile Health Applications were effective in accessing individual health data ($p<0.001$), who felt that using Mobile Health Applications were easy ($p=0.02$), who believed that using Mobile Health Applications helped patients access health services without having to go to the hospital ($p<0.001$), and who wanted to help patients obtain health services without going to the hospital ($p<0.001$).

Conclusion: Nurses' level of mobile health applications acceptance in terms of using mobile applications was high in our study. Most of the nurses expressed positive views on the use of mobile applications in the hospital setting.

Keywords: Mobile health, mobile applications, nurse, health services.

1. INTRODUCTION

With many advances in technology, mobile devices have become an inevitable part of our daily lives. According to the 2018 Global Digital Report, the number of people in the world owning cellphones has reached 5.1 billion (1). The widespread use of cellphones has accelerated the utilization of Mobile Health Applications (MHA) (2–4). MHAs include portable medical devices, wearable technology, short health messages, smartphone health applications and gamification apps (5).

Mobile Health Applications are both easy to use and readily accessible. They save on time and energy, provide both voice and visual communication between patients and healthcare professionals (6–8), and make it convenient to send health data to patients and their close relatives (9). Additionally, MHAs make it possible to store a great quantity of data, are useful in determining individual health profiles, and developing strategies for regional and national healthcare investments (6, 10).

It is reported that 46% of patients with mental health problems have one or two MHAs installed on their smartphones and 64% use MHAs to access personal health data (9). In a study conducted with oncology patients, the authors indicate that 69.6% of the participants owned smartphones and 86.8% wished to use MHAs regularly to communicate with their healthcare professionals (11). For this reason, it is important that nurses follow up and learn how to use the latest technologies to improve patient care and advance their own professional development. MHAs are a means of providing speedier nursing care that is available to everyone (2–4, 7). However, in order to serve with the MHAs, the nurse must first accept the MSU and be willing to use it (12, 13). This study aims to examine nurses' mobile health applications acceptance. The research questions in this study are as follows:

What is the total mean score of nurses' Mobile Applications Acceptance Model (MAAM)?

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Are there differences in the MAAM scores according to the nurses' demographic characteristics (gender, age, education, working environment, years of work, and owning a mobile device)?

Are there differences in the MAAM scores according to the nurses' thoughts about mobile health applications?

2. METHODS

2.1. Design and Setting

This cross-sectional study was conducted in the Western Black Sea Region of Turkey, in a health practices and research center from March-July 2020. The universe of the research consisted of all nurses (N=432) in the hospital where the research was conducted, no sample selection was made. Those who were not willing to participate in the study, those who provided incomplete data, or could not be reached were excluded. A total of 321 nurses (participation rate: 74.3%) participated in the study.

2.2. Data Collection

Data was collected from the nurses by e-mail. The data collection instruments were "Personal Data Form" and "Mobile Applications Acceptance Model".

Personal Data Form

This form is made up of two parts. The first part queries sociodemographic data such as the nurse's age, education, working year and environment. The researchers prepared the second part on the basis of a literature scan (3, 16, 17). This part contains six statements about the thoughts of the nurses regarding MHAs. The nurses marked the statements that were appropriate for them.

The Mobile Applications Acceptance Model (MAAM)

This scale was developed by Uğur and Turan in 2016 to determine the factors affecting the adoption of mobile applications. Consisting of a total of 32 items (Cronbach's alpha=0.82), the instrument is a 5-point Likert-type scale. As the total score of the scale increases, the level of acceptance of the mobile application also increases. Needs, (items 1-7), Behavioral Intentions (items 8-13), Attitudes about Usage (items 14-19), Perceived Benefits (items 20-24), Subjective Norms (items 25-29) and Performance Expectations (items 30-32) make up the six sub-scales. Cronbach's alpha coefficients for the subscales are: Needs subscale, 0.861; Subjective norms subscale, 0.810, Attitudes about usage subscale, 0.816; Behavioral intentions subscale, 0.899, Perceived benefits subscale, 0.851, Performance expectations subscale, 0.788 (15). The Cronbach's alpha coefficients in this study were found to be 0.96 for total, 0.89 for "Needs subscale", 0.91 for "Subjective norms subscale", 0.92 for "Attitudes about usage subscale", 0.92 for "Behavioral intentions subscale", 0.91 for "Perceived Benefits subscale", 0.79 for "Performance Expectations subscale".

2.3. Data Analysis

The SPSS 22.0 package program was used to analyze the data. Descriptive data is indicated by numbers, percentages, means, and standard deviation. The data was checked for normal distribution with skewness and kurtosis, and parametric tests (one-way analysis of variance and student's t test) were used. The Bonferroni post hoc test was used to determine where the significant differences originated. Analysis results were analyzed at a significant level accepted at $p<0.05$.

2.4. Ethical Considerations

Written permission was obtained for the conduct of the study from an ethics committee of a university (Decision No. 2020/05) and a health practices and research center where the study was conducted. The researchers informed the nurses about the purpose of the research and the confidentiality of the data to be obtained, after which their verbal and written consent was obtained.

3. RESULTS

Of the nurses in the study, 88.2% were women, 53.3% were under the age of 30, 64.2% had a bachelor's degree, 49.8% worked at clinics outside of intensive care, 68.2% had worked for less than 10 years, and 96.9% used smartphones (Table 1).

A comparison of the nurses' personal characteristics in terms of the MAAM total score is given in Table 1. There was a statistically significant difference in terms of the total mean score of the MAAM according to age, working environment, and having a mobile device ($p<0.05$). The total mean score of the MAAM of nurses under the age of 30 is statistically and significantly higher compared to the nurses age 30-40 ($p=0.008$). The total mean score of the MAAM of the nurses who worked in intensive care units was higher compared to the nurses working in other clinical units ($p=0.02$). The total mean score of the MAAM of nurses who have a smartphone was higher compared to the nurses who did not have a smartphone ($p<0.001$). There was a statistically significant difference in terms of the total mean score of the MAAM according to gender, education, and working years ($p>0.05$) (Table 1).

The total mean score of MAAM of the nurses was 124.69±15.98, and the total mean score of the "Needs subscale" was the highest total mean score of the MAAM subscales (28.78±3.23) (Table 2).

Of the nurses, 97.2% thought that the use of MHAs should be made more widespread, 86.3% felt that MHAs were effective in accessing individual health data, 95.0% believed that using MHAs was easy and 83.2% thought that MHAs helped patients access health services without having to go to the hospital. Of the nurses, 89.42% wanted to help patients obtain health services without going to the hospital via their mobile health apps (Table 3).

The MAAM total mean scores were higher among those who thought MHAs should be made more widespread (p=0.04), who felt that MHAs were effective in accessing individual health data (p<0.001), who felt that using MHAs was easy (p=0.02), who believed that using MHAs helped patients access health services without having to go to the hospital (p<0.001) and who wanted to help patients obtain health services without going to the hospital (p<0.001) (Table 3).

Table 1. *Comparison of Nurses' Personal Characteristics and MAAM Total Scores (n=321)*

Characteristics			Mobile Application Acceptance Model total score	Statistical analysis	Significant difference (post hoc) †
	n	%	$\bar{X}$ ± SD		
Gender					
Females	283	88.2	124.23 ± 16.18	p=0.161 t=-1.404	-
Males	38	11.8	128.10 ± 14.19		
Age					
<30	171	53.3	126.95 ± 1.22	**p=0.01* F=4.591**	**1-2 (*p* = .008)***
30-40	116	36.1	125.17 ± 3.20		
>40	34	10.6	121.20 ± 1.34		
Education					
High school	14	4.4	114.92 ± 3.43	p=0.09 t=2.151	-
Associate Degree	34	10.6	121.20 ± 2.64		
Bachelor's degree	206	64.2	125.39 ± 1.08		
Graduate degree	67	20.9	123.61 ± 2.16		
Working environment					
Intensive care	121	37.7	126.53 ± 1.37	**p=0.02* F=3.853**	**1-2 (p=0.02)***
Other departments	160	49.8	118.62 ± 2.31		
Administrative departments	40	12.5	124.81 ± 1.31		
Using a smartphone					
Yes	311	96.9	126.50 ± 0.52	**p<0.001** t=17.032**	-
No	10	3.1	124.63 ± 16.24		
Working year					
<10	219	68.2	125.66 ± 1.05	*p* = 0.26 *F*= 1.130	-
10-20	81	25.2	122.33 ± 1.96		
>20	21	6.5	123.66 ± 2.48		
Total	321	100.0	124.69 ± 15.98		

*Note. t, Student t test; F, one-way analysis of variance (ANOVA), †Significant difference: Bonferroni test, *p < .05, **p < .01*

Table 2. *Nurses' Mobile Application Acceptance Model Total Mean Scores (n=321)*

Mobile Applications Acceptance Model		$\bar{X}$ ± SD	Min-Max
Subscales	Needs	28.78 ± 3.23	21-35
	Subjective norms	18.34 ± 3.34	7-15
	Attitudes about usage	20.52 ± 5.34	8 – 30
	Behavioral intentions	25.38 ± 3.42	15-30
	Perceived benefits	19. 62 ± 3.17	12-25
	Performance expectations	12.03 ± 2.07	7-15
Total score		124.69 ± 15.98	88-160

Table 3. *Differences in MAAM Scores According to The Nurses' Thoughts on Mobile Health Applications (n=321)*

The nurses' thoughts on mobile health applications		n	%	Mobile Application Acceptance Model Total score	Statistical analysis
Do you think the use of mobile health applications should be made more widespread?	Yes	312	97.2	125.00 ± 15.95	***p* = 0.04***
	No	9	2.8	113.88 ± 14.04	***t* = 2.066**
Do you think mobile devices are effective in reaching personal health data?	Yes	277	86.3	126.00 ± 16.47	***p* < .001****
	No	44	13.7	116.43 ± 8.94	***t* = 3.764**
Do you think using mobile health applications is easy?	Yes	305	95.0	125.16 ± 15.91	***p* = 0.02***
	No	16	5.0	115.75 ± 15.08	***t* = 2.310**
Do you think mobile health applications help patients receive healthcare services without having to go to the hospital?	Yes	267	83.2	126.94 ± 15.43	***p* < 0.001****
	No	54	16.8	113.55 ± 14.01	***t* = 5.901**
Would you want to help patients obtain health services without coming to the hospital via their mobile health apps?	Yes	287	89.4	126.27 ± 15.77	***p* < 0.001****
	No	34	10.6	111.32 ± 10.74	***t* = 5.376**

*Note. t, Student t test, *p < 0.05, **p < 0.01*

4. DISCUSSION

This study aimed to examine the acceptance of nurses regarding MHAs. The acceptance level of the nurses in the study regarding mobile health applications was high. Most of the nurses believed that MHAs should be made more widespread and MHAs helped patients to obtain medical services without having to go to a hospital. Most of the nurses wanted to help patients obtain health services via their mobile health apps without having to go to a hospital.

The total mean score of the nurses on MAAM was considerably high. Using a smartphone increases the usage of mobile apps and using smartphones regularly, continuously, and intensively can encourage the discovery of new mobile applications (11, 16). It is thought that the high level of nurses' acceptance of mobile health apps was related to the high rate (96.9%) of smartphone usage among the nurses in this study.

The total mean score of the "Needs subscale" is the highest total mean score of the nurses on the MAAM subscales. "Needs subscale" refers to the needs that drive an individual to use and satisfy the necessity of resorting to a mobile app (13, 14, 19). Another study conducted with nurses reported that 42% of nurses use mobile apps to meet their needs (the most frequent work-related smartphone activity was searching for work-related drug references) – and found that smartphones also helped nurses reduce work-related stress and improve unit cohesion and teamwork (12). In the same study, nurses emphasized that if smartphones are used properly, they are certainly helpful tools for improving patient safety. Nurses make use of mobile apps to evaluate and relieve pain (18, 19), apply therapy (20), provide postpartum care (21), deliver post-surgery care (22), promote healthy life behaviors (23, 24) and reduce aggressive behaviors in children with special needs (25). All of these factors (reducing work-related stress, improving unit cohesion and teamwork, evaluating and relieving pain, applying therapy, providing postpartum care, delivering post-surgery care, etc.) apply to the needs of nurses and patients. The fact that the nurses' "Needs subscale" total mean score was the highest emerged as a natural consequence of using Mobile Health Applications in this study.

In this study, the total mean score of the nurses on MAAM was higher for nurses under the age of 30 compared to those between the ages of 30-40. Clinical nurses below the age of 30 tend to use a smartphone more in their nursing practices for the purposes of efficient planning, team coordination, and checking up on medications. Nurses under 30 were statistically more likely to believe in the positive results that can be derived from the use of mobile apps in the clinical setting compared to their older colleagues (12). This finding can be a result of the high rate of mobile device usage among young people. Young nurses are more inclined to use smartphones and discover and use mobile applications faster, which can increase the acceptance level of mobile applications by young nurses.

This study showed that nurses working in the intensive care units had higher MAAM total mean scores compared to nurses working in other departments. Intensive care units are settings that restrict active communication between patients and their loved ones (26, 27). Relatives of patients under intensive care frequently need to obtain information about developments from health professionals (27). There is subsequently a need to communicate with healthcare personnel in order to continue with treatment and care after discharge from the hospital (28). In this case, MHAs can be an effective alternative method that nurses can use remotely to respond to the needs of patients and their relatives in intensive care units. Thus, it is thought that the mobile application acceptance scores of the nurses working in the intensive care units were higher in this study.

The study demonstrated that MAAM total mean scores were higher among nurses who believed that the use of MHAs should be made more widespread, that the apps

were effective in reaching personal medical data, and that the nurses felt they were helping patients to access health services without having to go to the hospital. Additionally, the MAAM total mean scores of nurses who wanted to help patients seek medical services without having to go to the hospital were higher. Using mobile applications will provide a different perspective to nursing care (8, 29). Remote nursing care can reduce the number of repeated hospital admittances as well as morbidity and mortality rates. This may be a result of the higher number of nurses who thought that MHAs were useful and effective.

4.1. Limitations

Limitations of the study are that the sample consists of the nurses at only one hospital, the results may not be open to generalization, and there may be different applications in other hospitals. The study can be repeated with a larger sample and with multicenter studies.

5. CONCLUSION

In this study, nurses' level of acceptance in terms of using mobile applications was high. The nurses working in the intensive care units who were younger and used smartphones had a higher level of acceptance regarding the use of mobile applications. Most of the nurses expressed positive views on the use of mobile applications in the hospital setting. It was determined that the nurses thought that the use of MHAs should be made more widespread, that the apps were effective in reaching personal medical data, and that they helped patients access health services without going to the hospital.

The acceptance of nurses in using such applications should be seen as an opportunity and nurses should be provided with training in this respect. Also, the areas of usage of mobile health applications should be expanded at the hospitals. We also believed that nursing services will be facilitated and made more accessible through the use of mobile health applications in hospitals and home medical services.

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