Journal of Experimental and Clinical Medicine
https://dergipark.org.tr/omujecm

Research Article

J Exp Clin Med
2022; 39(2): 383-387
doi: 10.52142/omujecm.39.2.14

The place of smartphone applications ın emergency medicine

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Received: 18.08.2021 • **Accepted/Published Online:** 15.11.2021 • **Final Version:** 18.03.2022

Abstract

Medical mobile applications help improve patient care quality, reduce medical errors, and help physicians make faster, evidence-based decisions in patient care, follow-up and rehabilitation. In this study, it was aimed to determine the usage level of smart phone applications among emergency physicians, to investigate the effects of these applications on diagnosis and treatment, to examine their benefits, to determine the expectations regarding these applications, and to raise awareness on ethical issues. Between 02/25/2018 and 03/25/2018 emergency medicine residents in many provinces of Turkey, emergency medicine specialists, were investigated smartphone app to be used in practice with academics. A statistically significant difference was found between emergency medicine experience and mobile application use (p: 0.020). Most of the physicians surveyed had started using their first mobile apps 4 years ago. It was determined that most of the participants using mobile applications in the medical field were using them as a clinical decision tool. It was observed that those with visual expressions were mostly preferred in the use of mobile applications in the medical field (63.1%). It was determined that 75% of the participants found instant messaging applications useful in the professional field. The biggest problem identified in terms of medical ethics of mobile medical applications; was the thought of a violation of patient privacy. Although technological devices make our lives easier in many ways, examination is of great importance in the patient-physician relationship. Medical mobile applications should be prepared professionally and the content quality should be checked by experts. Due to the nature of current research, it is inevitable that technologies become outdated. There is a need for more comprehensive and up-to-date studies on this subject that appeal to large audiences.

Keywords: emergency medicine, mobile phones, mobile apps, technology

1. Introduction

Smartphones and tablet PCs are popular devices that have been integrated into the daily life of many people (1). Smartphones have become increasingly valuable in the healthcare industry and medical research due to the increasing number of smartphone users and functionality. Mobile technologies provide essential advantages for doctors in easy communication, data downloading, and accessing evidence (2). Clinicians, healthcare companies, and patients are closely interested in smartphone technologies. Smartphone technologies developed in the medicine category offer an opportunity in improving patient care and decreasing medical malpractice by promoting rapid access to evidence-based medical knowledge (3, 4). “ Mobile Health Applications User Trends Research in Turkey” was announced for the first time in Digital Health Summit Turkey 2013. It was reported by Georgetown Medical School that medical students have augmented their diagnostic capabilities by using smartphones and that mobile technologies contribute to the education of the students (5). Despite all advantages, there are many problems in this regard. Smartphones may have small display screens and hardware limitations, causing connection problems. The reliability of medical applications is controversial (6).

The present study evaluates the most widely used mobile applications developed for healthcare professionals by emergency physicians. The study aims to determine the scope of smartphone applications in the emergency medicine field, investigate their effects on diagnosis and treatment, and raise awareness about medical ethics.

2. Material and Method

A survey was conducted on the use of smartphone applications in emergency medicine practice among emergency medicine residents, emergency medicine physicians, and faculty members working in different provinces of Turkey between February 25, 2018, and March 25, 2018. The participation of volunteers was enabled by face-to-face communications or phone and e-mail contact. Before starting the data collection phase of the study, approval was granted by the Yüzüncü Yıl University Faculty

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of Medicine Clinical Trials Ethics Committee with a decision number of 16 dated February 16, 2018. Three hundred and twenty respondents were taken into consideration. General practitioners working in the emergency departments and physicians who do not use smartphones were not included in the survey.

Descriptive statistics for the studied variables included mean, standard deviation, minimum and maximum values, and categorical variables were expressed as number and percentage. The mean values for continuous variables were compared between the groups using a one-way analysis of variance. Following the analysis of variance, Duncan's multiple range test was used to determine significantly different values. A chi-square test was used to compare categorical variables between the groups. The level of statistical significance was set at an alpha of 5% in the calculations, and the SPSS version 21 software package was used in the analysis.

3. Results

Of the respondents, 70% were aged 26–35 years, 60.3% were males, 61.6% had an experience of more than six years, and 40% worked in the emergency department for more than six years (Table 1).

A statistically significant relationship was found between emergency medicine experience and the intended purpose of using mobile applications (P=0.020). When comparing age and intended purpose of use, the most common purpose of using smartphones was communication among respondents aged less than 45 years. In comparison, 58.3% of the respondents aged more than 45 years (n=7) used smartphones for academic-professional purposes, and 25% (n=5) use them for communication purposes (Fig. 1).

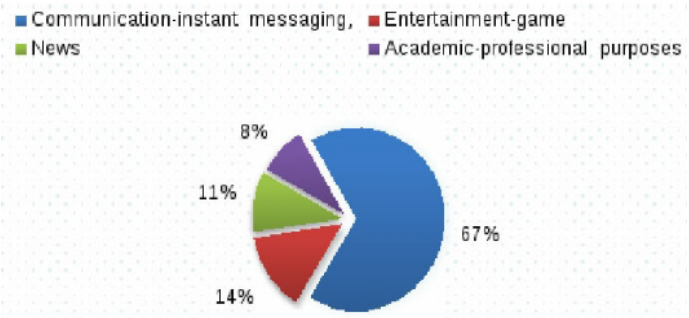

Fig 1. Mobile health applications user trends of the participant

Of the respondents, 45% (n=144) started using mobile applications four years ago while 61.5% of the specialists (n=88) and 52.9% of the faculty members (n=18) started using mobile applications four years ago (P=0.00).

It was found that the majority of participants using mobile applications in the field of medicine used these applications as a clinical decision-making tool during patient care (Fig. 2). Faculty members (70.6, n=24) were ahead of residents (39%, n=55) and specialists (38.2%, n=55) in terms of using the applications for literature search purposes (P=0.02).

Table 1. Sociodemographic data of the respondents participating in the survey titled "The place of smartphone applications in emergency medicine

Variable	n	%
Age		
Less than 25 years	4	1.3%
26-35 years	224	70%
36-45 years	80	25%
More than 45 years	12	3.8%
Gender		
Male	193	60.3%
Female	127	39.7%
Profession		
Specialist	145	45.3%
Research Associate	141	44.1%
Faculty Member	34	10.6%
Geographic Region		
Central Anatolia	76	23.8%
Marmara	68	21.3%
Eastern Anatolia	47	14.7%
Southeastern Anatolia	37	11.6%
Mediterranean	42	13.1%
Aegean	32	10%
Black Sea	18	5.6%
Years in Medicine		
1-3 years	53	16.6%
4-6 years	70	21.9%
7-10 years	101	31.6%
More than 10 years	96	30%
Years in Emergency		
1-3 years	94	29.4%
4-6 years	98	30.6%
7-10 years	74	23.1%
More than 10 years	54	16.9%

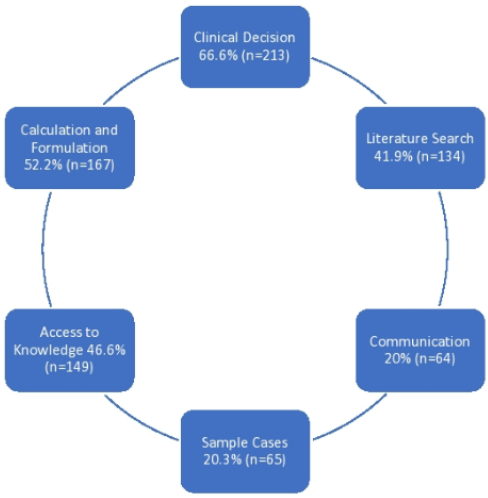

Fig 2. Professional uses of mobile health applications

Concerning the effect of mobile applications 'style of presenting the knowledge on the preference, applications with the visual presentation were the most liked and preferred among mobile applications in medicine (63.1%).

The applications teaching the content with a clinical basis,

such as differential diagnosis for a symptom, were rated as beneficial by 52.9% (n=18) of the faculty members, 49.6% (n=70) of the research associates, and 35% (n=51) of the specialists (P= 0.024). No significant difference was found among the occupational groups and the experience groups in emergency medicine regarding the use of calculation applications (P=0.876, P=0.993).

The most common expectations of the participants from mobile applications were being free of charge or cheap (Fig. 3) whereas 66.9% (n=97) of the specialists and 64.7% (n=22) of the faculty members attached importance to mobile applications being ad-free (P=0.007).

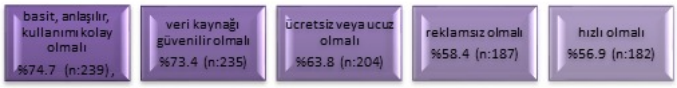

Fig 3. Expectations of the participants from mobile health applications

The most commonly used applications by the participants were Medscape, UpToDate, Calculate by Qx MD, TATD, PubMed mobile, MDCalc, and CepİlaÇ (Table 2). The UpToDate application was more commonly preferred by the faculty members than the specialists and residents (p=0.02).

Table 2. Variety of mobile health applications commonly used by the participants

	Very good (n)	Good (n)	Moderate (n)	Poor (n)	Total (n)	Rate (%)
Medscape	**92**	**107**	**22**	**.**	**221**	**70%**
UpToDate	82	81	29	1	193	61%
Calculate by QxMD	70	63	29	.	162	51%
TATD	48	71	33	7	159	50%
PubMed	40	69	23	.	132	42%
MDCalc Medical Calculator	41	40	27	.	108	34%
Cep İlaç	16	45	36	11	108	34%
WikEm	24	37	23	5	89	28%
ACLS	20	34	19	5	78	24%
5-Minute Emergency Consult	18	26	22	6	72	23%
Read by QxMD	23	28	17	2	70	22%
Annals of Emergency Medicine	15	29	20	2	66	21%
Micromedex Drug Reference	12	28	19	3	62	20%
Resuscitation	12	33	12	3	60	19%
EM Reference	9	24	13	3	59	18%
QuickEM	13	21	16	3	53	17%
SonoSchool	8	26	16	3	53	17%

The use of Pubmed applications was related to the occupational group and emergency experience (P=0.013). This application was rated as very good (29.4, n=10) and good (26.5%, n=9) by the faculty members and as good by the specialists (25%, n=36) and the residents (17.1%, n=24) (P=0.018) (Table 2).

The MDCalc use rate increased with increasing years worked in the emergency department, and faculty members participating in the survey reported more frequent use than the emergency medicine residents and specialists (P=0.00).

The most common problems that the participants face while using mobile health applications were over-detailed application content and the difficulty of reading the content on the smartphone (Fig. 4).

Emergency physicians used instant messaging applications, most commonly with cardiologists and orthopedists (Fig. 5).

ECG recordings and radiographic images were most commonly shared materials by the users of instant messaging applications (Fig. 6).

Fig 4. Problems encountered by the participants while using mobile health applications

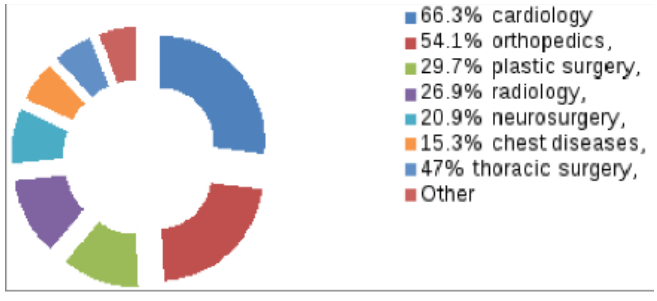

Fig 5. Departments with which emergency physicians use instant messaging the most

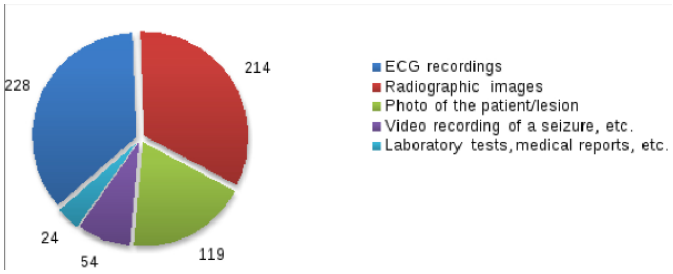

Fig 6. The most commonly shared materials by the participants in instant messaging applications

There was a significant difference in the use of paid applications among emergency physicians, faculty members, and residents (P=0.004). Of the respondents, 30.3% (n=97) reported institutional funding support for the use of these applications.

It was found that 11.3% of the participating physicians have taken part in the mobile application development process. Of physicians participating in the medical application development process, 52.8% were specialists, 36.1% were research associates, and 11.1% were faculty members. There was no significant difference among the occupation groups concerning participation in the mobile application development process (P=0.543). Of the participants, 28.8% have considered developing a mobile health application, and faculty members were more willing to develop a mobile health application than the other groups (P=0.013).

Of the participants, 75% found instant messaging applications helpful in their profession.

Privacy violations and a lack of control were regarded as the most significant problems of mobile health applications in terms of medical ethics. Also, incomplete or incorrect information and misguidance due to commercial purposes were the prominent concerns among the participants.

4. Discussion

There has been an increase in the volume of patients presenting to the emergency departments in recent years. The increase in emergency admissions causes delays in the examination and treatment of emergency patients, affecting patient satisfaction and healthcare quality unfavorably (7).

The role of smartphones in medicine and education appears promising and exciting, and a study reviewing all uses of smartphones in medicine and medical education has reported many uses of smartphones in medicine (8). The present study found that mobile phones are used for professional purposes at a rate of 92.8%.

A study examining the use of smartphones and mobile applications among emergency physicians and medical students has found that most participants possessed applications related to medicine and often preferred applications related to disease diagnosis and management, drug reference applications, and clinical scoring systems and calculators (9). Similar to their study, the present study found that emergency physicians used mobile applications for clinical decision making, calculation and formulation, accessing the knowledge, literature search, sample cases, and consultation purposes.

In Heidelberg University Hospital, the physicians designed a smartphone application to simplify procedures and existing paper-based guidelines for use by the physicians and nurses in the pediatric emergency clinic (10). The present study also found that 11.3% of the participants were actively involved in the development phase of any medical application, and 28.8% made designs to improve a medical application.

In 2011, Mohan et al. evaluated mobile health applications on PubMed, Google, and Apple Store platforms and reported more than 10,000 downloads related to medicine and healthcare, one-third of which were free of charge (11). The present study found that most participants preferred free-of-charge applications and paid and unpaid applications did not differ in quality and efficiency. It was also found that approximately one-third of the participants received institutional support for access to paid applications.

The studies evaluating teleconsultation and teleconference systems suggest that burn lesions can be examined for their sizes and depths as in bedside examination and that image quality of portable devices allows such examination. The studies in the literature have demonstrated the applicability of smartphone-based consultation systems in evaluating burn injuries (12). Similarly, 75% of the participants in the present study reported professional benefits of instant messaging applications. Emergency physicians often preferred these applications to communicate with cardiologists and orthopedists, and the most commonly shared materials were ECG recordings, radiographic images, and photos of skin lesions.

In a study by Xu and Zang, the main problems of mobile health applications are listed as the following: the complexity of classification, low accessibility, lack of control mechanisms, privacy concerns and user confidence (most mobile health applications do not warrant user privacy) (13). The present study also observed that privacy violation and lack of control mechanisms were the most significant problems for mobile applications in terms of medical ethics. At the same time, incomplete and incorrect knowledge and misguidance due to commercial purposes are prominent ethical concerns.

Recent mobile device-based observational studies are regarded as promising sources of information for researchers. In light of the present research, mobile applications published in the medicine category are considerably popular among emergency physicians and provide professional convenience.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgments

Before starting the data collection phase of the study, approval was granted by the Yüzüncü Yıl University Faculty of Medicine Clinical Trials Ethics Committee with a decision number of 16 dated February 16, 2018.

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