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Original Article

The Most Common Uses of Smartphones among Medical Interns and Residents in Iran: A Cross-Sectional Study at Zahedan University of Medical Sciences

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Abstract

Introduction: Medical students are increasingly using smartphones for personal and professional purposes, making them suitable tools for advancing education in developing countries. To ensure the development of efficient and relevant applications with high user adherence and appropriate content creation, it seems necessary to identify the common uses of smartphones.

Methods: The population of this cross-sectional descriptive study was 416 medical interns and residents at Zahedan University of Medical Sciences, Iran. The sample size was determined from Morgan's table, which includes 203 individuals. Proportional stratified random sampling was used. The data were collected using a researcher-developed questionnaire, the validity and reliability of which were confirmed. The collected data were analyzed using SPSS software. Descriptive statistics (frequency, percentage, mean, and standard deviation) and analytical statistics (independent t-test) were used for data analysis.

Results: The average scores for using smartphones in general affairs, educational and specialized affairs, and clinical affairs were 4.07 ± 0.60, 3.81 ± 0.75, and 3.53 ± 0.84, respectively. The lowest scores in educational affairs were related to participating in conferences and scientific seminars, searching for library resources at the faculty library, and extending the electronic loan period of borrowed books from the university library. In clinical affairs, the lowest scores were related to preparing and sending educational content for hospitalized and discharged patients.

Conclusion: According to the results of this research, organizing educational workshops on introducing the university library website and how to use it using smartphones, encouraging students to participate in scientific conferences and seminars, and creating suitable and high-quality educational content for patients using smartphones and sending them to patients to improve the quality of treatment should be considered.

Introduction

According to various studies, most medical students use smartphones to meet their multiple needs and obtain current information and knowledge (1-3). Making phone calls, browsing the Internet to find and download medical information, sharing educational materials, taking notes, and capturing images are among the most common uses of smartphones by students, as mentioned in various studies (2, 4-7). As multipurpose tools, smartphones have replaced the need for other devices, such as

pagers, cell phones, and personal digital assistants (PDAs) in healthcare (2, 8).

Smartphones have become very popular in both personal and professional fields. Due to their portability and the high processing speed of their operating systems, they have revolutionized medical practice, education, and research. The emergence of web browsing and various applications has revolutionized communication and information seeking. This tool has immense potential to convert the traditional classroom into a mobile classroom, where students and instructors can access educational and distance learning materials anytime and from anywhere (2, 5,6,9-10).

Textbooks have traditionally been the primary source of information for medical students, but with the advancement of information technology, the number of students using electronic resources has increased significantly (4,11). Medical knowledge is rapidly expanding and updating, and quick and timely access of professors and students to information and the latest scientific evidence, such as clinical guidelines, pharmaceutical resources, and clinical calculations without time and place limitations, is crucial, and it seems necessary to use information and communication technology to meet these needs (9, 12-14). Therefore, physician training is complex, and medical students' learning is now more comprehensive than in the classroom. It is different according to their needs and speed. Students must be trained as self-directed and lifelong learners (1).

Learning using a smartphone increases the student's independence, interaction, and communication (3, 15), but it can be helpful for learning when education is carefully designed to make optimal use of technology (1,3). When developing educational programming, design must be done carefully to ensure that the mobile device and educational application create opportunities to enhance student learning rather than complicating or detracting from it (3, 16-17).

Given the increasing ownership of smartphones in developing countries, smartphones are anticipated to impact learning and medicine significantly. To ensure the development of effective and relevant programs with high adherence, as well as the creation of appropriate content, it is essential to identify the most common uses of smartphones. Therefore, this study aimed to investigate clinical students' most common uses of smartphones. The findings of this research will help identify areas that have received less attention from students, which can guide the planning of how this tool can be utilized to improve other areas under investigation.

Methods

This study was a descriptive and analytical cross-sectional study. The studied population was medical students studying in internship and residency courses at Zahedan University of Medical Sciences in the 2022-2023 academic year (416 students), of which 181 (43.5%) were studying in the residency and 235 (56.5%) in the internship courses. The sample size was determined from Morgan's table, which includes 203 individuals. Proportional stratified random sampling was used. As a result, 115 interns and 88 residents participated in this study. If the students selected to participate in the research did not agree to participate, other people from the research community were selected and replaced. Demonstratively, the reason for choosing interns and residents as the research population was that part of the research questionnaire was related to using smartphones in clinical affairs, and students studying in the clinical course could answer this part.

The data for this study were collected using a researcher-made questionnaire, which was adjusted using the results of previous similar studies (2, 4-5, 7, 9, 18-19). The questionnaire related to Kopaei et al.'s study (18) was considered a basic questionnaire, and other studies were used to complete it. The questionnaire included two main parts: 1) demographic information with three items and 2) the main body of the questionnaire with 44 items, including three main parts: general affairs (13 items), educational and specialized affairs (16 items), and clinical affairs (15 items). Each item was measured with a six-point Likert scale (at all, very low, low, medium, high, very high).

To determine the validity of the questionnaire's

face and content, we gave it to ten experts for review. These experts included two general practitioners, four experts in health information management, and four in medical education. Considering that the research subject was interdisciplinary in medical education and information technology, experts from three fields of medicine, medical education, and health information management were selected. The questionnaire was given to experts to confirm the face validity, and the items were modified according to their suggestions. Items on which there was no agreement were modified. Consideration was also given to grammatical adherence, appropriate words, and the placement of items in the appropriate location. Content validity ratio (CVR) and content validity index (CVI) were used to confirm content validity. To calculate the CVR, the experts were asked to rate each item in a 3-part spectrum: Categorize necessary, proper but unnecessary, and unnecessary. Then, the responses were calculated based on the CVR formula. To check the CVI, three criteria of simplicity, relevance, and clarity were scored separately using the 4-part Likert scale for all three criteria. The CVI score was computed by adding the acceptable scores for each item divided by the total number of experts. If each item had a score higher than 0.78, it was approved.

To determine the reliability, the questionnaire was given to 20 students, and it was confirmed by using the test-retest method and by determining Cronbach's alpha coefficient of 0.85. Then, the amount of agreement and Kappa value for each of the items were determined, the questionnaire with 44 items (including the three main sections of general affairs, educational and specialized affairs, and clinical affairs) was designed, and the content validity index was estimated for all items between 0.82 and 0.94.

In October 2023, questionnaires were handed out to students interning at various hospitals. After explaining the research purpose and getting verbal consent, the students were asked to fill them out. Questionnaires were completed through interviews. After completing the questionnaires, the data were saved and analyzed in SPSS 22. Descriptive (frequency, percentage, mean, and standard deviation) and analytical (independent t-test) statistics were used for analysis. The level of statistical significance was considered less than 0.05. Items with an average rating below 2.5 were considered low usage, those with ratings between 2.5 and 3.75 were seen as having moderate usage, and items rated above 3.75 were classified as having high usage.

Results

This study's sample included 203 students. The average age of the research population was 27.62 ± 3.85. Table 1 shows the demographic characteristics of the research sample.

Table 1. Demographic characteristics of the research sample

Row	Demographic Characteristics		Frequency (percent)	Relationship between smartphone uses and demographic characteristics (P-Value)
1	Gender	Male	79 (38.9)	0.528
		Female	124 (61.1)	
2	Age group	21-30	153 (75.4)	0.164
		31 and more	50 (24.6)	
3	Educational level	Internship	115 (56.7)	0.192
		Residency	88 (43.3)	

The relationship between the variables, the amount of smartphone use by the research sample with gender, age group, and educational level, was measured by an independent t-test, and no significant

relationship was observed between the variables (P-value> 0.05) (Table 1).

The research sample's most common operating system (74.4%) was Android (Figure 1).

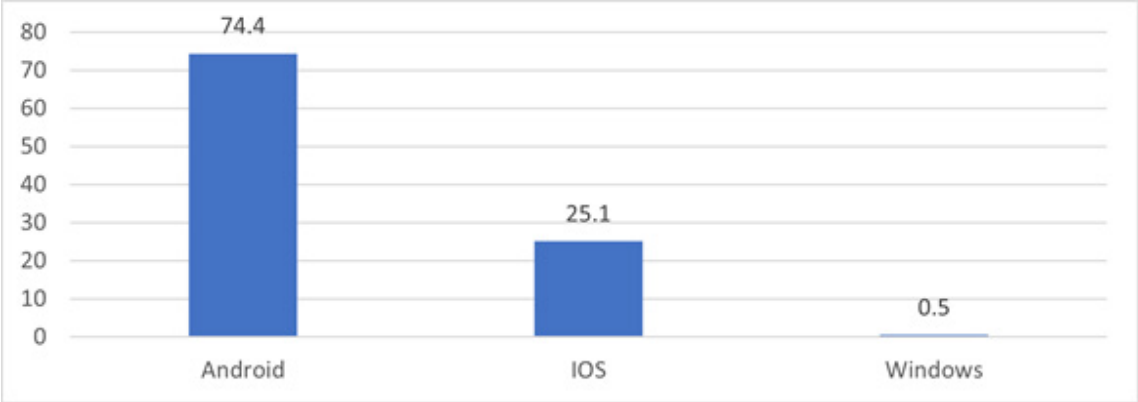

Figure 1. The most common type of operating system used by the research sample

The average score for using smartphones in various affairs was 3.80±0.58. The highest average score obtained by the research sample was related to the use of smartphones for general affairs (4.07 ± 0.60), educational and specialized affairs (3.81 ± 0.75), and clinical affairs (3.53 ± 0.84) (Table 2).

Table 2. The average score obtained by the research sample in using smartphones to perform general affairs

Row	Uses	Mean ± SD
1	Internet access and web browsing	5.31±0.79
2	Connecting to social networks (chatting)	4.92±1.09
3	Make a phone call	4.71±1.22
4	Photo and video production	4.65±1.14
5	Send message	4.62±1.13
6	Personal information management	4.51±1.09
7	Receive news	4.37±1.37
8	Listen to music	4.15±1.30
9	Watching movies	3.68±1.38
10	Perform calculations	3.55±1.14
11	Record daily notes	3.18±1.39
12	Checking Email	2.85±1.29
13	Playing computer games	2.36±1.39
	Total average	**4.07±0.60**

According to Table 2, internet access and web browsing (5.31±0.79), connecting to social networks (chatting) (4.92±1.09), and making a phone call (71±1.22 4/4) were the most common uses of smartphones in general affairs among the research sample, and playing computer games (2.36 ± 1.39) was the least common.

Table 3. The average score obtained by the research sample in using smartphones to perform educational and specialized affairs

Row	Uses	Mean ± SD
1	Access to electronic educational files (text, audio, image, video, and multimedia files)	4.73±0.99
2	Studying electronic educational files (text, audio, image, video, and multimedia files)	4.65±1.03
3	Access to Up ToDate, PubMed, Ovid, Medscape, and other scientific databases.	4.37±1.23
4	Viewing images and medical atlases	4.31±1.18
5	Access to medical images and atlases	4.29±1.05
6	Obtaining information from pharmaceutical reference sources	4.24±1.25
7	Using applications related to medical dictionaries and abbreviations	4.21±1.23
8	Viewing course grades at the end of each semester	4.08±1.71
9	Using educational software	4.06±1.18
10	Doing educational assignments (including preparing text, audio, image, video, and multimedia files)	4.02±1.28
11	Participation in electronic tests	3.71±1.32
12	Setting alerts in scientific databases and informing about the most up-to-date scientific materials	3.41±1.57
13	Select, remove, and add educational units in each semester	3.34±1.58
14	Participation in scientific conferences and seminars electronically	2.74±1.43
15	Searching for university library resources	2.70±1.45
16	Electronic extension of the loan period of books taken from the university library	2.05±1.25
	Total average	**3.81±0.75**

Table 3 shows access to electronic educational files (4.73 ± 0.99), the study of electronic educational files (03 4.65±1/), and access to scientific databases such as Up ToDate, PubMed, Ovid, Medscape, and others. (4.37±1.23) were the most common use of smartphones in educational and specialized affairs among the research community, and electronic extension of the loan period of books taken from the university library (2.05 ± 1.25); searching for university library resources (2.70 ± 1.45); and participation in scientific conferences and seminars electronically (2.74±1.43) were the least common.

Table 4. The average score obtained by the research sample in using smartphones to perform clinical affairs

Row	Uses	Mean ± SD
1	Searching and studying clinical guidelines	4.65±1.07
2	Using applications related to anatomy	4.45±1.38
3	Performing medical calculations	4.41±1.25
4	Using applications related to drug information and features	4.13±1.30
5	Using applications to share radiology images	4±1.57

Table 4. The average score obtained by the research sample in using smartphones to perform clinical affairs

Row	Uses	Mean ± SD
6	Electronic prescribing	3.67±1.70
7	Using the application to diagnose the disease according to the symptoms of the disease	3.64±1.44
8	Application of health information system in the place of treatment through mobile phone	3.58±1.47
9	Conducting remote consultations through social networks	3.50±1.51
10	Using applications to prescribe medical orders based on medical diagnosis	3.49±1.44
11	Using applications related to health measurement (blood group calculator, body mass index, and the like)	3.40±1.48
12	Using applications to interpret laboratory results	3.24±1.40
13	Using applications to conduct remote consultations	3.14±1.57
14	Preparation of educational content for hospitalized and discharged patients	2.37±1.35
15	Sending educational content to hospitalized and discharged patients	2.33±1.42
	Total average	**3.53±0.84**

According to Table 4, searching and studying clinical guidelines (4.65±1.07), using applications related to anatomy (4.45±1.38), and performing medical calculations (4.41±1.25) were the most common uses of smartphones in clinical affairs among the research sample and sending educational content for hospitalized and discharged patients (2.33±1.42) and preparing educational content for hospitalized and discharged patients (2.37± 1.35) were the least common.

Discussion

This study was conducted to determine the common uses of smartphones among medical students. According to the results of this study, most of the students participating in the research were studying during the internship course, and most of them were women in the age group of 21-30 years. The most common operating system used by the research sample was Android, which is consistent with results from similar studies (2, 6, 9, 18, 20). The reason for more use of the Android operating system compared to IOS phones in Iran can be seen as their affordable price, which makes access to it more possible for most people in society.

In the current study, the average score obtained by the research sample in using smartphones for general affairs was optimal and the most common type of use. According to Table 2, accessing the Internet and searching the web, connecting to social networks (chatting), and making phone calls were the most common uses of smartphones in performing general affairs among the research sample, and the least common use was playing computer games. In their study, Kopaei et al. (18) listed chatting, sending emails, listening to music, and taking pictures as the most common uses of smartphones among dentistry students of Tehran University of Medical Sciences, while making animations and commenting on social networks were the least common. In the study by Abedini et al. (21) among students of Isfahan University, the most common uses of smartphones were photography, listening to music, and connecting to the Internet. The least common use was listening to the radio. Making phone calls and sending and receiving text messages were among the most mentioned smartphone uses in Talebi's study (20) among medical Students of Mashhad University of Medical Sciences. In their study, Alfawareh et al. mentioned making phone calls, checking web pages, browsing the Internet, taking photos, and

downloading software as the most common use of smartphones among students of Najran University (5). Therefore, it can be said that the most common uses of smartphones in general affairs are different from each other in different studies, but in most of them, making phone calls, connecting to the Internet and searching for information, chatting, listening to music, and photography and filming are among the most common uses of smartphones in general affairs.

In this study, the research sample achieved an optimal average score in using smartphones for educational and specialized purposes, ranking second after general affairs. According to Table 3, access to electronic educational files (text, audio, image, video, and multimedia files) and study them; access to scientific databases such as Up ToDate, PubMed, Ovid, Medscape, and others were the most common uses of smartphones in educational and specialized affairs among the research sample, and electronic extension of the loan period of books taken from the university library, searching for university library resources. Electronic participation in scientific conferences and seminars was the least common. The reason may be students' lack of knowledge about the facilities of the university library website and technical problems related to the design of websites related to scientific conferences and seminars. To solve the mentioned problems, holding educational workshops for students on the topic "familiarity with the university library website and how to use it correctly by university librarians" and solving the problems of conference and seminar websites should be considered by managers and related officials. In the study of Kopaei et al. (18), notifying the course units, viewing the syllabus of the course units, and sharing educational data were among the most common uses of smartphones in learning and doing educational affairs. Email to classmates, studying PowerPoint, and watching videos of professors' lectures were the least mentioned uses, which are not consistent with the results of the present study, and the reason could be the difference between the research population (medical and dental students), and different questionnaires used to collect data in two studies. In Talebi's study (20), the most widely used medical software among medical assistants and interns was Up ToDate, followed by Medscape, which is consistent with the results of the present study. Browsing the Internet to find medical information and taking notes (2, 6), sharing educational materials (2), and receiving medical news (4) are some of the mentioned uses for smartphones in educational and specialized affairs that have been mentioned in various studies.

In this study, the average score obtained by the research sample for using smartphones to perform clinical tasks was moderate, ranking third after general and educational tasks. According to Table 4, searching and studying clinical guidelines, using applications related to anatomy, and performing medical calculations were the most common uses of smartphones in clinical affairs among the research sample, and preparing and sending educational content for hospitalized and discharged patients were the least common. Considering the significant importance of education in improving patient care, creating suitable electronic educational content for patients with various diseases is essential and can save specialists' time, improve the overall process of treating patients, and prevent unwanted complications of diseases. Therefore, training students to create appropriate and quality educational content for patients using smartphones available to most people and sharing it with patients can be a practical step in improving the quality of health and treatment of patients. In a study conducted in the United States, software related to drug or medical guides and medical calculators were used more often (10). In England, the most popular medical software related to the British national drug list was followed by MD on Call and medical calculators (22). Nemati Anarki et al. mentioned in their study that applying interventions and drug consumption guidelines was the most useful for medical students (19). In their study, Talebi and Gavali mentioned medical calculators as one of the most commonly used tools by medical students (6, 20), which is almost consistent with the results of this study; the reason for this could be the similarity of the data collection tool (questionnaire)

and the research sample (medical students).

One limitation of this study was that the research community was limited to clinical students, so it is suggested that the research community be selected from all fields in future studies. Another limitation of this study was the use of a researcher-made questionnaire, making it difficult to compare the results of different studies.

Conclusion

The discrepancy in smartphone usage among students for educational and professional affairs and clinical affairs compared to general affairs should be a concern for educational managers and policymakers. This issue needs to be addressed with the rise of various applications for educational and clinical tasks. Based on the findings of this research, it is suggested to conduct educational workshops on introducing the university library website and how to use it using smartphones, motivate students to take part in scientific conferences and seminars, and develop suitable and high-quality educational content for patients using smartphones and distribute it to patients to enhance the quality of treatment.

Declaration

Acknowledgment

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Conflicts of Interests

The authors declared no conflict of interest.

Ethical Statement

This study received approval from the Ethics Committee of the Deputy of Research and Technology of Zahedan University of Medical Sciences (Project Number: 10766, Ethics Code: IR.ZAUMS.REC.1401.335); available at: https://ethics.research.ac.ir/IR.ZAUMS.REC.1401.335.

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Authors' contributions

Alipour J and Karimi A. designed this study. Aliabadi A. and Rafiei M. collected and analyzed the data. All authors contributed to the other study's processes and approved the submitted version.

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