

# Awareness and Using of Medical Students About Mobile Health Technology in Clinical Areas

Asghar Ehteshami<sup>1</sup>, Peyman Rezaei Hachesu<sup>2</sup>, Mahtab Kasayi Esfahani<sup>3</sup>, Esmaeil Rezazadeh<sup>4</sup>

Department of Health Information Technology, School of Health Management and Information sciences, Isfahan University of Medical Sciences, Isfahan, Iran<sup>1</sup>

Tabriz University of Medical Sciences, Tabriz, Iran<sup>2</sup>

School of Advanced Medical Technologies, Isfahan University of Medical Sciences, Isfahan, Iran<sup>3</sup>

Mazandaran University of Medical Sciences, Sari, Iran<sup>4</sup>

Corresponding author: Esmaeil Rezazadeh, Vice-chancellor for treatment affairs. Mazandaran University of medical sciences. Sari, Iran. [esmaealrezazadeh@yahoo.com](mailto:esmaealrezazadeh@yahoo.com)

## Original paper

### ABSTRACT

**Introduction:** Necessity of data transmission and getting contact with specialists is so evident in impassable regions. In order to solve such problems, there are different solutions one of which is mobile health technology. Being small and user-friendly, easy to enter data and having low expense are some of its advantages. This study aims to define the association between awareness of medical students in clinical stage about mobile health technology application and the rate of their using this technology in educational hospital of Isfahan in 2011.

**Method:** The study is a cross-sectional analytical application research. Sixty medical

students were selected as samples from a society of 240 medical students. A researcher-made questionnaire was used. The questionnaire included 21 multiple choice and 15 yes no questions, which were corrected to reach a score. A researcher-made checklist with 5-fold Likert scale was used to define the rate of applying such technology. The reliability of questionnaire was confirmed through a test-retest. The collected data were analyzed with the help of SPSS software in descriptive and deductive statistics level. **Findings:** The highest percentage of awareness about mobile health technology among medical students in the clinical stage of Azzahra educational hospital is 45.6 in nature areas, and their

lowest percentage of awareness is 17.8 in the infrastructure area. In addition, their mean awareness of all areas is 54.4. The highest percentage of using mobile health technology by medical students is 14.6 in the education area, and their lowest percentage of usage is 6.8 in the treatment area. Their mean usage of all areas is 9.4 as well. **Conclusion:** The rate of awareness and application of mobile health technology is not favorable. Except for treatment, there is no significant association between the rate of awareness and application of mobile health technology.

**Keywords:** awareness, application, Technology, mHealth, medical student

## 1. INTRODUCTION

Recent studies have indicated that about 40 to 54 percent of patients in developed countries have access to medical information via internet; a fact that has been highly effective in their selection of treatment method (1). It is necessary to apply of information technology for making the best decision in the health care arena (2). In impassable, villatic and rural regions without or with low possibility for treatment staff to be present at patient bedside, necessity of data transmission and getting contact with specialists is so evident. Currently, the majority of the western country's population are the elderly. This oldness of the population has worried those responsible for health care in such countries; for older pa-

tients require more attention and care, since senility not only cause chronic diseases in such people, but also increases the need for health care which costs a lot (3).

Today, through the development of different sciences and growing new technologies, there are new possibilities, chances, and capacities to be used in obviating such problems in health and treatment field. Mobile communication has also made it possible for clinical cares to exit the monopoly of clinics and hospitals (4). Among such technologies is mobile health technology, which can be used extensively in the health care area. Easy and rapid access, easy learning, and having small volume are features attractive for application of such technology in health and treatment area.

In fact, beside the increase in mobile health technology, such technologies have played a significant role in electronic health growth (5).

There have been provided various mobile tools for physicians and hospitals that are significantly changing health care and can be used in different items such as evaluating disease signs and symptoms, giving required educations to people, and following the rate of treatment improvement (6). Mobile technology is capable of decreasing medical errors through facilitating entry, process, save and retrieval, and flow of information as well as timely informing (3). It can become a solution for mentioned problems in deprived, far, impassable regions through developing telecommunications between special-

ists and patients, and develop facilities for patients, especially the elderly, to communicate with the physician and health surveillance through mobile phone tools (7). For instance, mobile health technology has improved health in elderly patients with type II diabetes (8).

The mobile health technology is capable of playing significant role in supporting health care through presenting facilities for rapid and timely access of specialist staff to patients' profiles and decrease paper files in this way (9). Regarding internet growth and development in recent decades and educating through this, electronic education as an accepted educational method worldwide has been used by many researchers. However, through developing new internet facilities and providing telecommunication possibility, some mobile phones with such technologies were marketed, thereby paved the ground for a modern generation of education named "mobile education" through mobile electronic devices come into existence. Different studies have demonstrated positive effects of telemedicine in decreasing costs, increasing quality and facilitating access (10).

mHealth (mobile health) involves the use of and capitalization of voice and short messaging service as well as a general packet radio service, third- and fourth-generation mobile telecommunications, a global positioning system, and Bluetooth technology (11). One main of which is a short text message service used to encourage patients as a reminder and supporting tool without any time and place limitation (12).

Developing information technology in health and treatment structure of Iran is also important due to following reasons:

- Disease diversity in deprived regions and concentration of facilities in metropolises,
- The tremendous effect of informing in health improvement and disease reduction,
- Necessity of rapid access to patient history by physician,
- Requirement of disease information and statistics in medical studies,

- Requirement of special non-attending consultation,
- Necessity of improving treatment efficiency, patient glorification, giving the best services to the patient together with less worry, and having access to the required tools.

As time passes, electronic health has entered the international system in order to increase treatment quality, rapid access to treatment, and economic treatment, and increase in demands, especially in education and training, has turned electronic treatment to the only solution for such challenges (13). Increasing expense and investment in health issues is not enough to decrease medical negligence and the most important factor in this regard is a precise system of data recording and favorable reporting (14). The best way of implementing such aim is to use electronic systems and new technologies, among which is a mobile health technology. Also, using such technology would decrease sing paper profiles, and therefore reduces their induced costs which is 4-14 \$ per each file (15).

Therefore, studying aforementioned items demonstrates that beside emphasis on information importance and necessity of timely access of health care providers to information anywhere, using mobile health technology is essential in this area. Hence, the present study researchers tried to study the awareness rate of medical students in the clinical stage of educational hospital about mobile health technology, the rate of their using such technology, and finally, the association between the these variables.

## 2. METHOD OF STUDY

This is a descriptive analysis and applicable cross-sectional study with correlative association between variables. The study society includes 240 medical students in clinical stage passing their internship in Azzahra educational hospital of Isfahan. Sampling was performed in cluster-randomized method using a Morgan table with 148 person sample size. However, during the study, a 60 person sample size filled the questionnaire due to execution problems.

A researcher made questionnaire was used in order to collect data of evaluating awareness rate. Different articles and books were used in order to make questions. The duty regulations of medical students of Isfahan University of Medical Sciences were studied, and those duties presentable through mobile technology and mobile softwares were brought as questions in the questionnaire and as items to be studied in the checklist. The questionnaire included one part of 21 multiple choice questions and another part with 15 questions, and a final third part with 36 separate questions for analysis. The questions were designed based on 5 main axes (education, diagnosis, treatment, nature, infrastructure). The validity of the questionnaire and the checklist was confirmed by professors of health information management groups of faculty of management and medical informatics of Isfahan University of Medical Sciences. Reliability of the questionnaire was confirmed through retest; it was executed after 15 days in 20 percent of sample size as pilot, and the correlation coefficient was 95 percent. In order to collect data, face-to-face meeting with medical students in clinical stage were performed in the hospital, and the questionnaires were filled and then being present at the place, the researchers completed the checklist.

After statistical analysis of the data, if the mean awareness score of each parameter was below 50, sample awareness of that parameter was unfavorable. If this rate was between 51 and 80, sample awareness was relatively favorable, and rates higher than 81 were favorable.

The researcher made checklist was the second tool used including 48 items of factors for mobile health technology application in educational and executive (diagnosis/treatment) affairs. The researcher would complete the checklist regarding how many times a day each person uses aforementioned factors (0, 1-3 times, 4-6, 7-9, 10 times or more). After statistical analysis of collected data through the checklist, if the mean score of each parameter was below 50, sample usage of that parameter was unfavorable. If this rate was be-

tween 51 and 80, sample usage was relatively favorable, and rates higher than 81 were favorable. Analysis was performed in descriptive and analytical levels using SPSS16 software. First central and dispersion indices were studied along with associated tables and diagrams. Then it was analyzed using Spearman correlation coefficient, and the association between awareness and application rate was measured.

### 3. FINDINGS

Table 1 indicates that the highest rate of awareness among medical students about mobile health technology in the education field is 94.4 percent related to “informing people of some disease incidence through texting”, and the lowest rate of their awareness is 17.3 percent related to mobile health technology tools in the health informing area.

Parameter	Rate of Awareness
Mobile health technology tools in health informing area	17.3
Improving general health through mobile health technology in the health area	34.8
Different interventions of mobile health technology in health area of disease diagnosis	28
Different interventions of mobile health technology in health area of education	37.5
Informing people of disease incidence through texting	94.4
Total mean	31.3

**Table 1.** Mean awareness scores of medical students in clinical stage of educational hospital about mHealth in the area of education

The highest rate of awareness among medical students about mobile health technology in diagnosis filed is 86.5 percent related to “displaying food calorie through mobile software”, and their lowest awareness was 11.8 percent related to “recording patient state by wristlet and its displaying on the pocket computer in audio format”. Their mean awareness in this area is 37.8 percent.

Also, the highest awareness rate of medical students about mobile health technology in the treatment area is 90.7 percent related to “remembering the time of consuming medication using mobile softwares”, and their lowest percentage of aware-

ness was about “setting appointment between patient and physician by mobile phone softwares capable of developing medical profiles”. Their mean awareness in this area is 40 percent.

The highest awareness rate of respondents about mobile health technology in treatment area was 58.7 percent related to “difference between the objectives of mobile health technology in the health area and electronic health”, and their lowest awareness was 1.8 percent related to different mobile health technology in the health area. Their mean awareness was 17.8 in this area.

According to the study findings, the highest awareness rate of medical students about mobile health technology in nature area was 83.6 percent related to “elimination of place restriction using mobile health technology”, and their lowest awareness was 54.9 percent related to “defining m-health”. Their mean awareness was 45.6 percent in this area. There should be noted that the awareness rate of medical students about mobile health technology in nature area is higher than other areas.

According to table 2, the highest awareness rate of medical students who use mobile health for their daily medical notes about mobile phone in the health area is 48.5 percent in nature areas, and their lowest awareness rate is 17.6 percent in the infrastructure area. Their mean awareness is 57 percent in all areas.

Areas to be studied	Apply	Awareness percentage
Education	31.8	31.3
Diagnosis	38.4	7.8
Treatment	40.1	40
Infrastructure	17.6	17.8
Nature	48.5	45.6
Total mean	57	54.4

**Table 2.** Mean awareness scores of medical students about mHealth who use it for their daily medical notes

The findings of the study indicate that the highest percentage of medical students using mobile health technology in the health area is 14.6 percent in education area, and their lowest application is 6.8 percent in the treatment area. Their mean application in all areas is 9.4 percent.

Areas to be studied	Application percentage
---------------------	------------------------

Education	14.6
Diagnosis	7
Treatment	6.8
Total mean	9.4

**Table 3.** The rate of medical students using mobile health in education, diagnosis, and treatment areas

Statistical tests in the study indicated that there is no association between the awareness rate of medical students about mobile health technology in health education area and their using this technology. The rate of correlation between the two items is also negative and so insignificant ( $\alpha = 0.05$ ,  $p$ -value = 0.959).

According to the table above, there is no association between the awareness rate of medical students about mobile health in health diagnosis area and their using this technology in this area. The rate of correlation between the two items is also positive but so insignificant ( $\alpha = 0.05$ ,  $p$ -value = 0.164). According to the table above, there is a direct association between the awareness rate of medical students about mobile health technology in health treatment area and their using such technology in this area. The correlation rate between the two items is also positive but so insignificant ( $p$ -value = 0.041).

### 4. DISCUSSION

Recognizing capabilities of information technology on one hand, and awareness of needs and interests of final user on the other hand are essential in programming optimized efficiency of information technology and facilitating message transmission. Due to shortage of time for getting information and regarding the increased requirement of information on research and treatment affairs, residents are one of the most important societies requiring information technology. The findings of the study indicate a relatively low awareness of physicians about mobile health technology and its potential and actual advantages so that mean awareness score of medical students about mobile health technology is 31.3 which is unfavorable in this area. David A. Hanauer concluded that texting by mobile phone for controlling blood sugar is highly proper for Tele-education (16). In his study named

“nursing students’ views about using personal digital mobile health as a learning aid” concluded that most students were introduced to scientific softwares based on a personal digital assistant through their friends, and had found it a useful device for learning (17).

Mean awareness scores of students about mobile health technology in diagnosis area is unfavorable. However, according to Anna M. Lindquist et al, pocket computer is an easy device for physicians and students studying in the health care area, and makes it possible to have more rapid access to medical information which in turn improves health care (18). Unfortunately, however, students do not properly use such device.

Mousavifar et al found in their study that follow-up through telephone or short text message service improves glycosylated hemoglobin and adherence to treatment diet in patients, and suggested short text message service to be used in following diabetic patients as a complementary media regarding its ease and simplicity (12). The rate of recognition in the treatment area is unfavorable in our study, and using such technology has not become common.

Mean awareness scores of medical students about most parameters of mobile health technology has not been favorable except in so apparent cases such as:

- Eliminating place restriction by mobile health technology,
- Displaying food calorie using mobile phone softwares,
- Controlling diabetic patient status via short message,
- Controlling vital signs with help of pocket computers in ambulances while accidents happen,
- Informing people about the incidence of diseases via sending messages,
- And remembering medication consumption time.

According to Santosh Krishna, using the short text message service in health care processes has advantages such as saving time for patient and physician. Generally, using mobile health technology would improve health outcomes (19). It seems that having access to learning mo-

bile softwares in treatment and diagnosis areas has increased using mobile health technology in the educational area. Generally, mean awareness score of samples about mobile technology itself is 54.4, which is a moderate awareness. However, their awareness of application rate and type is weak.

## 5. CONCLUSION

Using information technology without requiring educations is not efficient and favorable. This technology can help fill the gap between demanding data and having access to it. However, it requires increased awareness and skill in using electronic informative-communicative resources. Absence of adequate infrastructures of health information technology in the context of electronic exchange of medical and treatment information, weak informing about the potential and actual advantages of this technology, and inadequate consideration of those who are responsible in health areas have a direct effect on treating staff awareness and therefore, the rate of using such technologies. Encouraging mechanisms for users and obligatory academic education of mobile health technology and other modern medical technologies should be considered in health and treatment societies.

### Limitations

*The low number of accessible samples and weak cooperation of medical students in clinical stage despite being justified by researchers were the main problems. The reason was stated to be high workload so that a large number of questionnaires were spoiled or lost.*

## REFERENCES

1. Azizi A, Shajarat M. Mobile health and its situation in health system. First symposium of Tele medicine and E-hospital; Tehran: Civilica, 2010.
2. Peyman RH, Ahmadi M, Aziz R, Zahra S, Farahnaz S, Nader M. Clinical Care Improvement with Use of Health Information Technology Focusing on Evidence Based Medicine. *Healthcare Informatics Research*. 2012; 18(3): 164-170.
3. Chan V, Ray P, Parameswaran N. Mobile e-Health monitoring: an agent-based approach. *Communications, IET*. 2008; 2(2): 223-230.
4. Larkin H. mHealth. *Hospitals & health networks/AHA*. 2011; 85(4): 22.
5. Vatsalan D, Arunatileka S, Chapman K, Senaviratne G, Sudahar S, Wijetileka D, et al., editors. Mobile technolo-

gies for enhancing eHealth solutions in developing countries. *eHealth, Telemedicine, and Social Medicine*, 2010. ETELEMED'10 Second International Conference on 2010, IEEE.

6. Luxton DD, McCann RA, Bush NE, Mishkind MC, Reger GM. mHealth for mental health: Integrating smartphone technology in behavioral healthcare. *Professional Psychology: Research and Practice*. 2011; 42(6): 505-512.
7. Archer N. Mobile E-Health: Making the Case. *Mobile Government: An Emerging Direction in E-Government*, I Kushchu, ed, IGI Global. 2007.
8. Cafazzo JA, Casselman M, Katzman DK, Palmert MR. 133. Bant: An mHealth App for Adolescent Type I Diabetes-A Pilot Study. *Journal of Adolescent Health*. 2012; 50(2): S77-S8.
9. Han D, Ko IY, Park S, editors. An evolving mobile e-Health service platform. *Consumer Electronics, 2007 ICCE 2007. Digest of Technical Papers International Conference on, 2007, IEEE*.
10. Saffarzadeh M, Manuchehri K. Learning through by mobile electronic applications. 2 th Conference on E- city; Tehran, Municipality, Civilica, 2009.
11. Ryu S. Book Review: mHealth: New Horizons for Health through Mobile Technologies: Based on the Findings of the Second Global Survey on eHealth (Global Observatory for eHealth Series, Volume 3). *Healthcare Informatics Research*. 2012; 18(3): 231-233.
12. Mosavi far S, Azamat, Zolfagari M, Pedram S, Haghani H. Investigation of two follow up methods; Mobile and phone on therapeutic regimen in diabetes patients. *Diabetes & Lipid*. 2010; 4(10): 407-418.
13. Nasiripur A, Ashkan, Radfar R, Najafbeigi R, Rahmani H. survey of effective factors in development of e-Health in Iran. *Hospital journal*. 2009; 10(1): 55-62.
14. Safdari R, Masuri N, GHadyani Mh, Shokrizadeh Arani L. Importance of electronic registry system to referral protest because of medical negligence. *Scientific journal of forensic medicine*. 2004; 11(2): 99-106.
15. Takfab. Electronic health record system - on line services. Tehran: Ministry of Health, 2010.
16. Hanauer DA, Wentzell K, Laffel N, Laffel LM. Computerized Automated Reminder Diabetes System (CARDS): e-mail and SMS cell phone text messaging reminders to support diabetes management. *Diabetes technology & therapeutics*. 2009; 11(2): 99-106.
17. Feyzollah Zade H, Nickpeyma N, Kalagari S, Izadi A, Yaghmayi F. Opinion of nursing students about applying personal digital assistant as education-assist tool. *Iranian jounan of medical education*. 2011; 11(8): 983-985.
18. Lindquist AM, Johansson PE, Petersson GI, Saveman BI, Nilsson GC. The use of the Personal Digital Assistant (PDA) among personnel and students in health care: a review. *Journal of Medical Internet Research*. 2008; 10(4).
19. Krishna S, Boren SA, Balas EA. Healthcare via cell phones: a systematic review. *Telemedicine and e-Health*. 2009; 15(3): 231-240.