# *Shiraz Second International Congress on mHealth*

## *SIM Congress*

**22-23 February 2017**

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# Contents

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## In the Name of the Most High

# M health, a way for higher quality care

In these days of global epidemics of non communicable diseases , there is a great need for people centered care focusing on health literacy , health promotion , preventive measures , behavior change, self care and continuation of safe and integrated health services . M health has the potentiality for making all of these targets a reality with current wide population coverage along with possibility of precision.

There is a growing business trend in this filed with projected raise of more than 20 times within next 20 years. As there was 600% growth in this business only in the past 3 years world wide, there may be an even higher growth rate in upcoming 20 years.

M health should be approached not only through the techniques of use of mobile system and telecommunication in health but also should be considered as a social and humanistic issue along with contemplations on the most accurate information and security of data and legal concerns.

In Iran with a young population with more than 10 million university graduates, and more than 35 millions users of data system on phones there is a great potential for use of telecommunication and mobile technology for health system. This is a great opportunity for promoting health, health literacy and all other targets mentioned above.

Health policy reach center along with information, telecommunication incubation center of Shiraz university of medical sciences held the Shiraz international congress on mobile health (SIM2017) on 22 and 23 February 2017 in beautiful city of Shiraz, Iran, considering these potentials. The congress was a frame work for exchange of international best practices along with national and local experiences. In this supplement the abstracts of the best papers in this congress are presented which we hope could help the researchers in this field along with policy makers and service providers.

We hope that this potential could be used in a realistic manner for promotion of global health and the business aspects do not become the dominant feature suppressing the importance of health and humanity in this technology.

**Kamran B lankarani M.D**
Distinguished professor of medicine
President of the congress

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# Effect of Message Framing on Improving Physical Activity in Women with Type 2 Diabetes

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## Abstract

**Background:** The effectiveness of the educational message for motivating to change behavior may be greater than the actual content of a message, depending on how the message is designed.
**Objective:** The purpose of this study was to compare the effectiveness of gain and loss framed messages on increased physical activity in women with type 2 diabetes attending a diabetes clinic in Ahvaz city.
**Methods:** This randomized clinical trial study was performed among 119 patients with type 2 diabetes who were referred to the diabetes clinic in Ahvaz in 2014. Patients were selected by convenience sampling and then randomly divided into gain (59 cases) and loss (60 cases) groups by use of random numbers table. Two groups received physical activity educational messages in a different context via short message service for 2 months. The data in this study were collected by using a standard 3-part questionnaire as well as interviews before and 1 month after intervention. Data were analyzed by using SPSS version 16 by descriptive statistics, independent t-test, and Chi-square.
**Results:** Based on the finding before the intervention, 2 groups were similar of individual variables, the mean score of physical activity, and disease characteristics. After the intervention, the mean score of physical activity in both groups showed a significant increase ($P < 0.05$). The results showed that patients who were faced with the loss framed messages compared to patients who were confronted to gain framed messages have more motivation for physical activity ($P < 0.05$).
**Conclusion:** The present study indicates that loss framed messages are effective in increasing physical activity behaviors in women with type 2 diabetes.

*Keywords:* Type 2 Diabetes; Physical Activity; Women with Type 2 Diabetes; Message Framing

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# Comparing Gain and Loss Framed Message Texting (SMS) on Foot Self-Care Behaviors Among Women with Type 2 Diabetes

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## Abstract

**Background:** The effectiveness of the educational message for motivating to change behavior may be greater than the actual content of a message, depending on how the message is designed.
**Objectives:** The purpose of this study was to compare the effect of gain and loss messages via SMS mobile phone on foot self-care behaviors in women with Type 2 diabetes who were referred to the Ahwaz diabetic clinic.
**Methods:** In this randomized controlled trial study, 189 Type 2 diabetes patients were selected by convenience sampling and then randomly divided into 3 exp. groups and cont. group. Two experimental groups received gain and loss educational message of foot care behaviors via mobile phone short message service for 2 months. Research data were collected through interviews using demographic and disease characteristics questionnaires and the summary of diabetes self-care activities were measured. The collected data were analyzed by using the SPSS 16 software, paired t-test, one-way ANOVA, and Chi-square at the level of 0.05 significance.
**Results:** Before the intervention disease characteristics, individual variables and the average score of foot care behaviors of the study groups were similar. After the intervention, a significant increase occurred in the mean score foot care in experimental groups (P = 0.001). It was also shown that this increase in loss framed message group is significantly more than the gain message group (P = 0.01).
**Conclusions:** According to the results, designing and implementing educational programs based on mobile phone short message service and loss framed messages could improve foot- care behaviors in diabetic patients.

*Keywords:* Type 2 Diabetes; Framing Message; Short Message Service; Women; Gain and Loss Framed Message

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# Impact of Mobile Device Based Software on Prescription Orders: A Quasi-Experimental Study in Iran

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## Abstract

**Background:**
One way to reduce medical errors associated with physician orders is the computerized physician's order entry (CPOE) software. The present study aimed to determine the mobile device based CPOE impact on reducing prescription orders in a hospital (as the first research in Iran).

**Methods:** We conducted a before and after prospective study in 2 intensive care unit (ICU) wards (as intervention and control wards), at the largest tertiary public hospital, in the south of Iran, during 2015 to 2016. All prescription orders were validated by 2 clinical pharmacists and an ICU physician. We compared the rates of ordering errors in medical orders during 2 phases: 1 before (manual ordering) and 2 after implementation of CPOE on mobile devices. A standard checklist was used for data collection. For data analysis, SPSS version 21 as well as descriptive and analytical tests such as McNemar, Chi-square test, and logistic regression were used.

**Results:** We detected 98 prescription errors in 3045 prescribed orders after CPOE implementation on mobile devices (3.0) versus 345 in manual prescription phase (19.1). The use of mobile device based CPOE decreased the prescription errors from 19% to 3% ($P = 0.001$). There were no differences in the control ward. More errors occurred in the morning shift ($P < 0.001$) and 3 types of errors, such as illegible orders, lack of writing the drug form, and route were significantly reduced in the intervention ward ($P < 0.05$). On the other hand, the CPOE increased 3 types of errors ($P < 0.001$).

**Conclusion:** The use of mobile device based CPOE significantly reduced the prescription errors. Nonetheless, it is necessary to be more cautious in the use of the system. It is recommended that CPOE should be used to improve the quality of delivered services in hospitals.

*Keywords:* Computerized Physician Order Entry; Mobile Device; Prescription Error

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# Designing and Implementation of Computerized Provider Order Entry Software on Mobile Device in Iran

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## Abstract

**Background:** This study aimed to identify the functional requirements of computerized provider order entry (CPOE) software, design, and implementation of this software on mobile devices in Shiraz Nemazi hospital in Iran.
**Methods:** This applicable study was conducted using review documentation, interview, and focus group discussions in Shiraz University of Medical Sciences (SUMS), as the medical pole in Iran, during 2013 - 2015. The study sample consisted of physicians (n = 12) and nurses (n = 2) in the largest hospital in south of Iran as well as information technology (IT) experts (n = 5) in SUMS. The CPOE functional requirements were examined in 3 phases. Finally, the functional requirements were distributed in 4 levels and, accordingly, the CPOE was designed and implemented on the users' (nurses and physician) mobile devices.
**Results:** The CPOE software had 7 main dimensions, namely: 1, data entry; 2, drug interactions management system; 3, warning system; 4, treatment services; 5, ability to write in software; 6, reporting from all sections of the software, and 7, technical capabilities of the software. The nurses and physicians emphasized quick access to the CPOE software, especially installation of the software on the mobile devices, and applicability of the software. Accordingly, the CPOE was designed and implemented on the users' (nurses and physician) mobile devices. The software had some items that had not been mentioned in other studies.
**Conclusions:** This study was the first specific investigation of the CPOE software design in Iran. Based on the results, this software could be implemented on the mobile devices in hospitals for improvement of health care.

*Keywords:* Computerized Provider Order Entry System; Mobile Device; Hospital

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# The Most Popular Iranian Smartphone Applications for Traditional Medicine: A Quality Assessment

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## Abstract

**Background:** Traditional Iranian medicine (TIM) consists of all the knowledge and practices used in diagnosis, prevention, and elimination of diseases in Iran from ancient times to present. It is based entirely on practical experience and observations passed down from generation to generation. The use of smartphone applications (apps) related to health (mHealth) is increasing, while there is a potential for apps to be used as a tool for self-management and disease treatment.
**Objectives:** The aim of this study was to find the most popular and reviewed Iranian applications related to traditional medicine in the stores and to rate their quality.
**Methods:** A descriptive research was conducted in December 2016. Apps were selected from the 2 largest online stores of the most popular mobile operating systems (Google Play App Store for Android, iTunes App Store for iOS) based on popularity as measured by the number of installs and reviews. The inclusion criteria were as follows: Persian language, minimum number of installs (1000 for Google Play) or reviews (1000 for iTunes App Store), relation to traditional medicine and free version. The exclusion criteria were user ratings less than 3. Apps were evaluated using MARS (A new tool for assessing the quality of health mobile apps), which consists of 5 subscale scores (engagement, functionality, visual aesthetics, information quality, and subjective quality score). MARS items are scored using a 5-point Likert scale (1-inadequate, 2-poor, 3-acceptable, 4-good, and 5-excellent).
**Results:** Of 20 potentially relevant apps searched, 3 met the inclusion criteria. Most apps were excluded due to the fact that they were unrelated to traditional medicine and not in Persian. No application was found on the iTunes App Store for traditional medicine. The mean scores for each of the domains in MARS were: engagement (3.26), information (2.35), functionality (4.33), esthetics (3.66), and subjective (2.83). The highest rated app was 3.98. Two of the apps that were reviewed in this report met the minimum acceptable score of 3.0 out of the possible highest score of 5.
**Conclusions:** This review shows that few Iranian traditional medicine apps are available in the app stores that quality, information on all of them is low. Therefore, development of evidence-based traditional medicine apps are necessary and it is also recommended that apps be implemented on the IOS platform.

*Keywords:* Smartphone; Mobile Apps; Mobile Health (m-health); Traditional Medicine

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# Effects of Security and Privacy on Applying Personal Mobile Health Record System: Patients' Perspective

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## Abstract

**Objectives:** This study was carried out to identify the effects of security and privacy concerns on patients' perception in applying personal mobile health record system.
**Methods:** This was a cross-sectional study, in which 120 patients, who were referred to the teaching hospital affiliated with Tehran University of Medical Sciences (TUMS), were randomly selected. The Patients' perception concerning security and privacy concerns on applying personal mobile health record system was surveyed by conceptual path model of theory of planned behavior (TPB). Collected data were analyzed by using regression analysis. To test the final model, structural equation modeling (SEM) was applied. Finally, the authorized model presented by analysis of moment structures (AMOS).
**Results:** Results indicate that the TPB model has considerable potential in explaining the patients' perception regarding mobile health record system adoption. The findings also show that security and privacy have a strongly significant effect on the patients' perception towards applying personal mobile health record system.
**Conclusions:** The results of this study clearly supported that privacy and security concerns are important factors in applying new comer technologies such as mobile health record system. This study acknowledged that mobile health record system should guarantee the patients' privacy and security concerns, and this fact should be considered by health care managers and policy makers.

*Keywords:* Mobile Health Record System (PACS); Theory of Planned Behavior (TPB); Patients; Structural Equation Modeling (SEM)

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# Design of Mobile Phone-based Intervention on Health Promotion for the Elderly in Shiraz of Iran

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## Abstract

**Objectives:** According to the statistical centre of Iran, a country with 75 million inhabitants in 2014, 6159000 elderly individuals gives it the equivalent of 8.2% of the total population. In other words, out of every 100, at least 8 people are elderly. However, the highest and lowest aging population in the 2014, is from the provinces of Tehran (1.1 million) and Ilam (39 thousand people), respectively. The situation of elderly population in the Fars province, although compared to the national average, is in the lower mid-table, however, the province has a main population of elderly. Fars province's population, according to the 2014 census, is 4596658 people, however, the population of the elderly people is equivalent to 8.1% of the 372,328 older adults. Increasing per capita healthcare would reach more of the older population. Nonetheless, it is proportional to the acceleration of the aging population for comfort and optimal maintenance of the cortex with the necessary planning. The average age of 20 years old, from 1982 until now, added to 78 year old Iranians and life expectancy has grown in 2016. Increasing the average age and increasing health programs is a result of aging. The wave of aging in our society has of course positive and negative consequences. One possible outcome is that many organizations and institutions were not prepared to deal effectively with this phenomenon. Technology and new mobile phone-based can intervene on health promotion, especially regarding the aged community.
**Discussion:** Mobile phones are the ideal terminal to deliver health services that enhance patients' self-management behaviors in daily life and many mobile phone-based health interventions have been proposed in previous studies. Most interventions enhanced patients' adherence behaviors by facilitating the record of health information and involving the healthcare team. Interventions that record and analyze health data allowed patients to better understand their own condition. In addition, interventions that involve the healthcare team provided patients with professional explanations for the health data and professional advices in improving their self-management behaviors. Some interventions also applied other strategies to motivate patients' self-management behaviors, such as leveraging social influence or utilizing entertainment. Health interventions in previous studies mainly focused on the external support for patients, i.e., support from the devices or from the social environment. However, patients' health beliefs barely changed during the intervention. Interventions that modify patients' health beliefs, such as perceived severity of the condition, or the self-efficacy in maintaining a healthy lifestyle, would also enhance patients' self-management behaviors during chronic condition control. Regarding evaluation of mobile phone-based intervention, mobile phone-based health interventions were proving to be helpful for the control of chronic condition. Empirical data indicated that the number of patients who achieved the goal BP level was 5 times higher when the patients received self-management support by short message services. A web-based intervention using both short message services and Internet improved patients' waist circumference, body weight, and blood pressure significantly during 12 weeks. In another study, the same intervention improved the blood pressure, body weight and, waist circumference of obese patients with hypertension during merely 8 weeks. These studies mainly collected patients' physical measures to indicate the effectiveness of the intervention. There are also studies that discussed the change of patients' internal emotions such as attitude, behavior intention, and subjective norm during the intervention.
**Conclusion:** Decision makers and health strategic providers in Iran and Shiraz city must attend to the increasing and becoming issues of older people and their old needs into the modern technology as mHealth, mobile phone-based intervention, on the elderly health promotion.

*Keywords:* mHealth; Health Promotion; Elderly People; Health Care

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# The Effectiveness of Self-Management Mobile Health Technology in Chronic Disease: A Systematic Review

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## Abstract

**Background:** Chronic diseases have a high prevalence in the world and an intense impact on the life of patients. For enhancing the health care in chronic diseases and reducing costs, the self-management approaches using technology are helpful in improving patient care and better endurance of coarseness of the diseases. Due to the high use of mobile in societies, the usage of this kind of technology, for better management of chronic diseases and the impacts of it, are studied in various studies.
**Objectives:** We conducted a systematic review to investigate the efficiency and effectiveness of m-health technology in self-management of chronic diseases.
**Methods:** We searched MEDLINE/PubMed electronically for articles published between 01/01/2006 and 08/18/2016.The inclusion criteria were set based on the type of study and beneficial or harmful effects of mobile technology based intervention in relation to chronic disease and self-management. A total of 78 articles were identified based on the searches conducted in MEDLINE from PubMed. After excluding duplicates (n = 34), we screened titles and abstracts of 44 articles based on the inclusion criteria. The remaining articles matched with the inclusion criteria (n = 38) were reviewed in full text, and 15 articles were excluded based on the exclusion criteria. Finally, 23 articles complied with our eligibility criteria and were included in this study.
**Results:** Of the 23 studies we reviewed, 13 studies assessed the impact of using mobile technology in the diseases and all of them reported a good or high level of benefits as well as improved clinical outcomes. A total of 7 studies had the purpose of investigating usability, however, only 3 of them who concluded the present mobile technology qualified as a high level of usability. Six studies explored the feasibility of the mobile technology and all studies who reported mobile technology were feasible. Three studies explored the acceptability of the mobile technology and all studies reported a high level of acceptability. A total of 4 articles had the purpose of investigating satisfaction and all of them demonstrated high satisfaction of mobile technology.
**Conclusions:** The evidence indicates the potential of m-health technology in improving symptom management through self-management interventions.

*Keywords:* M-Health; Self-Management; Chronic Diseases

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# Smartphone Applications for Iranian Users with Hypertension

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## Abstract

**Background:** The development of medical and health applications has increased dramatically over the world due to the widespread penetration of mobile network. It seems that mobile health technology has become a leading technology in the world. Meanwhile, the bulk of applications have been designed for managing hypertension.
**Objectives:** This study aims to present a picture of the current state of the smartphone application market for Iranian patients with were done.
**Methods:** Between September until October of 2016, medical categories in cafe bazar's website (for Android OS) as well as Sibche website (for the operating system iOS), Google Play (for Android OS), and IranApps that have reviews and applications designed for patients with hypertension were identified in Farsi. Finally, the attributes associated with these applications with Microsoft Excel 2010 were evaluated.
**Results:** The results showed that 25 apps from the café bazar were assigned to hypertension, on IranApps there was an app dedicated to high blood pressure, and no apps regarding blood pressure was found on the Sibche website as well as Google Play. Among these applications, 20 (92.76%) delivered content to explore ways in preventing and controlling the disease as well as hypertension. Only 6 (07.23%) were about daily record blood pressure and submit it in the form of reports and graphs. Among these 26 applications, 4 apps (30.15%) were for sale and 22 apps (61.84%) were free.
**Conclusions:** A limited number of Iranian applications, in the field of hypertension and lack of completeness in order to meet the needs of patients, represent that unlike global development for these apps in Iran, the needs of patients with hypertension are not considered. In addition, most of the apps have duplicate content. Therefore the absence of doctors and specializing in the design and development of applications raises concerns about user safety.

*Keywords:* mHealth; Hypertension; Application

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# Standards Development of mHealth at a Glance

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## Abstract

**Background:** Mobile health (mHealth) refers to the use of mobile communication technology and smart devices such as mobile phones, laptops, tablets, and so on to provide healthcare solutions. This technology may be used for prevention, diagnosis, treatment or medical follow-up in healthcare area. Smart devices help health organizations in providing essential care and health information anytime and anywhere through information and telecommunications technologies. In this way, development and implementation of smart devices are rapidly progressing around the world. Recent development of smart devices, where the patients' information are stored and distributed securely, requires a robust and compatible architecture to be able to manage the mobile data effectively.
**Objectives:** The rapid changes in technology and adoption behaviors, jointly with the many proprietary systems that are hard to integrate, raise multi-layered interoperability issues. To support innovation and successful development of mHealth, agreement on interoperability needs to be established. This interoperability means that there must be a common understanding of the data elements, structures, and terminology used in the mobile and health IT space, therefore, this interoperability requires standards to be effective.
**Methods:** mHealth is a broad field and no single standards organization encompasses the entire field. There are some international standard organizations that are at the forefront of interoperable healthcare mobile standards development. These include integrating the healthcare enterprise (IHE), Health Level 7 (HL7), and international organization for standardization (ISO). IHE and HL7, in particular, are the leading standards developers for healthcare information interoperability, messaging, and architecture. The mentioned organizations are not an exhaustive list of standard organizations doing work in various e-health areas; however, they are the high-profileest organizations.
**Results:** This paper provides a survey, which introduced the standard bodies and organizations working specifically in e-health standards. Highlights considerable applied standards for the E-health mobile applications. It is clear that the issues identified in the development of standards have an impact on the adoption, conformance, and compliance in such a diverse range of standards. These standards ensure systems and software products that are safe, valid, and meet quality parameters according to accepted standards.

*Keywords:* mHealth; Developing Countries; Health Care.

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# The Acceptance of Mobile Health Services by Physicians: The Case of Iran

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## Abstract

**Introduction:** According to the report released by the world health organization (WHO), application of mobile health and wireless technologies for supporting and achieving the objectives of health industry have changed the image of health care service delivery in the world. The present study aims at determining the level of physicians' familiarity with this very technology and investigating the factors affecting the mobile health adoption from the physicians' point of view.
**Methods:** This cross-sectional study is applied from the perspective of purpose and descriptive from that of the research type. This study was done in Zahedan University of Medical Sciences in 2016. The statistical population of the study includes all physicians working in 5 university teaching hospitals (n = 150). A researcher-made questionnaire, prepared based on the variables of TAM2 and TAM3 models, was used for data collection and hypothesis testing. The reliability of the given questionnaire was confirmed with the correlation coefficient of 0.8. Moreover, SmartPLS 3.2 and SPSS software were used to analyze data.
**Results:** Most respondents (112, i.e. 74.4%) of the study were female and 84 individuals (56%) were less than 30 years old. All the respondents used Smartphones. The score of perceived usefulness, behavioral intention, perceived enjoyment, subjective norm, perceived ease of use, image, volunteering, and objective usability constructs were higher than average baseline, representing the acceptance of mobile phone by them. The relations of all constructs with one another towards the attitudinal and behavioral objectives of the mobile health services acceptance were significant ($P < 0.05$). However, the result demonstrability construct failed to have a positive impact on the perceived usefulness ($P > 0.05$).
**Conclusions:** The significant factors affecting the mobile phone acceptance by the physicians were identified. The results of this study may provide useful information to the health mangers and policy makers in taking a step toward improving the service quality by using new technologies.

*Keywords:* Mobile Health Services; Mobile Phone; Physician; Acceptance; mHealth; Developing Countries; Health Care

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# Application of Mobile - Phone Consultation for Follow-Up of Breast Feeding Continuation in Primiparous Women

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## Abstract

**Background:** Breastfeeding is one of the most important factors in ensuring the health of infants.
**Objectives:** The aim of this study was to determine the effect of lactation counseling using a mobile phone on continuation of breast-feeding in primiparous mothers in Hamadan city, Iran, in 2014.
**Methods:** This study was a randomized clinical trial. In this study, 104 qualified primiparous women, after vaginal delivery, were randomly assigned into 2 intervention and control groups. Before the consultation, a questionnaire included demographic characteristics and continuation of exclusive breast feeding (EBF) was completed by both groups. The 4 weekly sessions during 1 month and 3 mobile phone follow-ups monthly were conducted in the intervention group. While the control group received only routine care. Four months after delivery, the 2 groups were re-examined. Data was analyzed using the independent t-test, paired t-test, and Chi-square test. SPSS version 20 has been used for analyzing the data.
**Results:** Two groups had no significant differences in demographic variables. Before intervention, there was no significant difference on breastfeeding methods between the intervention and control groups. However, 4 months after the delivery, a significant difference was observed on EBF between the 2 groups (P = 0.03).
**Conclusions:** With regard to the role of mobile phone consultation for a follow up of breastfeeding continuation, it is suggested that this approach has been used for follow-up of mothers' breastfeeding status.

*Keywords:* Breastfeeding; Consulting; Primiparous; Mobile Phone

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# Readiness of Patients with Multiple Sclerosis (MS) to Use Mobile Health Technology

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## Abstract

**Background:** Multiple sclerosis (MS) is a progressive disease of the central nervous system that has negative impacts on the quality of the patient's life. This disease is one of the most chronic disabling neurological diseases in young adults. The progress of this disease is unique and unpredictable. Self-care is one of the processes, which is used to control and prevent the progression of the disease. Some technologies such as mobile health can be used in improving monitoring as well as self-care in MS patients. Success in using this technology requires acceptance and readiness of the patients.
**Objectives:** The aim of this study was to evaluate the readiness of MS patients using mobile health technology.
**Methods:** This is a cross-sectional descriptive study that was conducted in 2016. Participants were MS patients who were referring to the MS clinic in Kerman city. We used convenient sampling method to recruit patients referred to the MS clinic during the study period. Data collection tool for this study was a questionnaire, which its validity was confirmed by 3experts in the fields of medical informatics and health information technology; its reliability coefficient was calculated 73%.
**Results:** In total, 47 patients participated in the study. More than 55% of them had an academic degree. More than 57% of the patients had not heard about mobile health technology yet. More than 98% of patients stated that if the technology is free for them they are interested in using it. In addition, the same percentage of patients were feeling comfortable in terms of controlling their health situation by physicians or nurses via mobile phone. Also, more than 93% of these patients believed that the use of this technology can participate in effective communication with their physician. About 96% of patients agreed that the use of this technology can help them recall their medical orders.
**Conclusions:** According to the results, patients were interested and have the adequate readiness to use mobile health technology. This technology can improve the self-care of MS patients through effective communication between patients and health care providers. Furthermore, this technology can help patients recall their physicians' advices and orders and therefore increase their adherence.

*Keywords:* Mobile Health; Multiple Sclerosis; MS Disease; Readiness; Health Information System

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# Investigating Transport Protocols for Mobile Health Applications of WSNs

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## Abstract

**Background:** In recent years, wireless sensor networks (WSN) has attracted the interest of many researchers due to great potential in various applications such as healthcare and mobile patient monitoring. WSNs have limitations such as storage space, energy resources, and wireless communication issues. Accordingly, popular transport protocols like TCP may not enjoy sufficient efficiency in such networks. It creates specific ideas for designing the transport protocol for the mobile health applications of WSNs to insure reliable transmission in these networks.

**Objectives:**
In this paper, we study the characteristics leading to design a transport layer protocol for healthcare WSNs and also aim to examine the efficiency of TCP and its variants, which are introduced to wireless networks.

**Methods:**
Proxy method was an idea presented in this study. In proxy state, when packets were sent to the proxy node, in case a packet was congested or lost, it was rapidly identified and packet recovery or congestion prevention operation was employed on the basis of transport protocol structure.

**Results:**
In our NS-2 simulations, we examine the effect of proxy nodes on the performance by changing their location and network size. We propose to employ proxy nodes for near to sink for improving the performance of the transport layer. Our NS-2 simulation results indicate that through put and packet delivery ratio are improved, 200 up to 50% after employing proxy nodes, while the average message delay is almost doubled.

**Conclusions:**
The present study aimed to examine and introduce a method of improving transport protocol in healthcare WSNs. Given limitations in healthcare WSNs and also in introducing an appropriate transport protocol, the use should be made of simple and general methods applicable to all healthcare WSNs

*Keywords:* Mobile Health; Wireless Sensor Networks (WSN); Transport Layer Protocol

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# Design and Implement FPGA-Based Hardware and Software for Mobile Bioinformatics

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## Abstract

**Background:** Bioinformatics is producing valuable information using basic biological information such as DNA, RNA sequencing, and proteins by using math and computer science to model biological processes. In the last decades, bioinformatics performed huge projects such as the Genome project, which started in 1991 and ended in 2001. Another important project was coding by collecting common data from functional elements of the human genome, which lasted from 2003 to 2012 using next-generation sequencing technology. Size of biological databases is increasing rapidly. In regards to software-based methods and limitations for biological sequence, there is a need for implementing non-software methods for this purpose. Field-programmable gate arrays (FPGA) has the highest processing speed between hardware equipment and is ideal for accelerating the speed of biological sequences matching.
**Objectives:** The purpose of this paper is design and implementation of hardware for accelerating biological sequence matching and also designing a web-based mobile application to display the information received from the hardware.
**Methods:** Considering related works, a FPGA-based hardware is designed in this way, which is programmed using very-high-speed integrated circuits hardware description language (VHDL) and is implemented on a FPGA Spartan-3 model using the Xilinx 14.2 software. Also Internet blocks is designed inside the FPGA to send the result of biological sequence matching to the mobile application via Internet. In addition, a software is designed for mobile phones based on the Android operating system to receive the data transmitted by the hardware through the Internet, to show it graphically and numerically, calculate the score matching and identify the genes controversial.
**Results:** The proposed system is working properly and several times faster than software-based methods. For example, for blood cancer, the chip that is doing gene matching and detecting leukemia.
**Conclusion:** By this design of hardware implementation, early diagnosis of genetic diseases can be achieved in early stages. For funding the research and production of this technology in the country, advanced drug delivery and gene diagnosis will be achieved. Therefore, health care costs are decreased and treatment is becoming more convenient.

*Keywords:* Bioinformatics; FPGA; Sequence Matching; Mobile; Speed

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# An Leukocytes Counting System for Acute Lymphoblastic Leukemia Detection

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## Abstract

**Background:** Today, blood disease is one of the most important causes of human deaths around the world, therefore, early diagnosis of these diseases are very important. Counting and classification of white blood cells (leukocytes) lead to identification of a variety of blood diseases such as leukemia. The aim of this research is producing a computer algorithm to count the leukocytes in order to help the hematologists detect acute lymphoblastic leukemia (ALL) in an accurate and time-efficient way.
**Objectives:** The purpose of this research is to design and implement an intelligent software system based on image processing algorithms and fuzzy logic to analyze and accurately count blood leukocytes to identify acute lymphoblastic leukemia (ALL).
**Methods:** The proposed image processing system consists of several sections. The first pre-processing is done to remove noise and improve image contrast. In the second step, the image is segmented using improved fuzzy clustering technique (IFCM) and active contour algorithm. In the third step, the image feature extraction and classification is done. The final step determines whether or not the image is ALL, using ANFIS neural network algorithm where its objective function is optimized by genetic algorithm.
**Results:** Using samples of blood leukocyte images taken under the same lighting conditions let us introduce a computer aided diagnosis (CAD) system, which is empowered by fuzzy techniques for detection of all types of acute lymphoblastic cancers by 98% accuracy.
**Conclusions:** A method for the detection and classification of blood leukocytes from the blood microscopic images using image processing techniques and fuzzy logic have been proposed. The results show that the proposed method is able to detect and classify leukocytes in an image with high accuracy.

*Keywords:* Blood Cell Counting; Classification; Acute Lymphoblastic Leukemia (ALL)

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# New and Emerging Mobile Technologies for Health Care (mHealth): A Horizon Scanning Review

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## Abstract

**Background:** Mobile technologies deliver new capabilities that can be beneficial to drive major aspects of health care. In patient-centered healthcare there is a need for continuing monitoring health technologies to enable the fast and accurate decision making.
**Objectives:** The aim of this study was to explore and identify new and emerging technologies that are likely to impact the future of health care and practical research.
**Methods:** We conducted a systematic search on top ranking health technology websites according to Alexa Rank. The websites included msn.com, theguardian.com, techcrunch.com, cnet.com, and telegraph.co.uk. The search was carried out with pre-defined search terms on published news articles from January to October 2016. Technologies of interest were mHealth technologies, which have a potential impact on health care, regardless of their maturity level (i.e. under development, prototype, under control trial study, or pilot study).
**Results:** A total of 262 news articles were identified through electronic search and screened. After comparing against selection criteria, 75 mHealth innovative products/interventions were included in this review. Several wearable devices such as watches and wrist-worn bands were introduced for mental coaching, physical activity, fertility, fitness, sleep, blood pressure, and vital sign tracking. Numerous reports on smartphones connected appliances for medication adherence monitoring, baby tracking, woman health, including menstruation and pregnancy monitoring, were identified. Smartphone apps for body changes visualization, pre-hospital care, sleep screen, birth control, eye examination, rehabilitation, disease diagnosis and prescription, mental health services, and organ donation were also introduced.
**Conclusion:** This study demonstrated that personalized lifestyle and move towards consumer centered medicine monitoring through mobile health technologies such as wearable and connected appliances are emerging, which will be accessible for higher proportion of patients and health providers in the near future.

*Keywords:* mHealth; Innovation; Horizon Scanning

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# Design and Implementation of a Mobile Application for Premature Babies

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## Abstract

**Background:** Being born premature is the biggest global factor of mortality in young children all around the world. Preterm birth, which occurs before the full 37 weeks of pregnancy, leads to requirement of complex medical care and maybe a longer hospital stay in all premature babies. Parents of premature babies often go through many emotional ups and downs in the early weeks and months of their baby's life. In this work, we developed a mobile application (app) named NONAHAL (premature baby) for helping parents meet their preemies requirements.
**Objectives:** The aim of this study was to increase the family's knowledge about the fact and attendance of parents in evolution stages of their premature babies as well as creating an atmosphere for interlocution between parent's and the medication board.
**Methods:** Development of NONAHAL is included of 8 phases and the application is developed by agile developing methodology. By using the scrum technique in the analyze and design phase, at the end of each process and after specifying the workflow, user interface experience design is accomplished with psychological viewpoints in color and shape aspects. These aspects are specially implemented for each part separately.
**Results:** The app contains all the prematurity information. The application also has all the following features: Week by week development, allowing parents to share events, thoughts and milestones by other parents, evaluation of stress in parents, as well as evaluation of the NICU department in each hospital.
**Conclusion:** With respect to the fact that the application is developed for preemie's parents who are in a touchy period of time, the design process is custom, joyful, attractive, and soothing in all stages.

*Keywords:* Mobile Healthcare; Agile Methodology; UI/UX Design

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# An Innovative Portable Device for Detecting and Sending the Occurrence of the Seizure

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## Abstract

**Background:** Epilepsy is the most common neurological disease. Tonic-clonic seizures (Grand Mal) are a type of generalized seizures with fast spiactivity, gradually decreasing in frequency and increasing in amplitude (tonic phase), interrupted by slow waves (clonic phase), and followed by post-ictal EEG depression. The unpredictable nature of seizures poses risks for the patient like falling down as well as other dangerous situations.

**Objectives:** We are going to present an innovative "portable, wireless EEG monitoring with the ability of real time detection of grand-mal seizures in the starting point. In addition, an alarm will be sent to the patient's family and doctor notifying them, as well as the emergency unity asking them for an ambulance by sending the GPS data to them." It can facilitate timely intervention and hence minimize risks. The system can analyze recorded EEG waves from the 4 main brain areas and then extract rapid increase spikes of EEG rhythms as feature of seizure-occurrence-time. The task of the software is to the analyze EEG waves, extracting features, and commanding the hardware unit to call and report an emergency situation to increase the patients' safety. The doctor can view the patient's EEG information at any time.

**Methods:** The proposed system is a wireless and portable EEG, including 2 innovative hardware and software parts. The main part is the hardware, processing, and controlling unit using the ARM chip as well as the telecommunication unit. The first stage of the process is capturing raw EEG signals by placing 2 bipolar electrodes in each mentioned areas. Then, the EEG goes to the processing unit for extracting epileptic seizure features, which includes by rapid polyspike activity with increase in EEG rhythms using the fast fourier transform (FFT) as software unit. These features were considered as occurrence time of seizure. Using this features control unit commands telecommunication to call defined contacts.

**Results:** This methodology was applied on EEG data sets that belong to 3 subject groups (healthy subjects, epileptic subjects during seizure-free interval, and epileptic subjects during a seizure). An overall classification accuracy of 99% was achieved and the device could have an emergency call to the selected contacts for patient's emergency condition

**Conclusion:** The results confirmed that the proposed algorithm and device has a potential in classification of EEG signals and detection of Epileptic seizures that could help the doctors and the patients, even the patients' families, for better detection, protection, and care.

*Keywords:* Epilepsy; EEG; Telemedicine; Real Time Detection; Grand Mal Seizure

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# Effect of Follow Up by Using Social Network Based on Mobile on Self-Management Behaviors Among Patients with Hypertension

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## Abstract

**Background:** Given that hypertension is one of the biggest preventable causes of death worldwide, one of the problems of these patients is the lack of proper implementation of self-management behaviors, self-management education, and follow-up of these, which are patients are important.
**Objectives:** This study aimed to compare the effect of self-management and follow-up with social networks based on mobile on self-management behaviors of hypertensive patients.
**Methods:** This quasi-experimental study was conducted with 50 patients who had primary hypertension and were referred to the Alzahra hospital, Isfahan, in 2016. Through convenience sampling, patients were selected and allocated to the follow-up and without follow-up groups randomly. Patients in both groups received self-management education for 3 sessions consecutively. Then, the researcher communicated with the patients in the follow-up group with a social network for the next 6 weeks. Data gathering was conducted by the self-management behavior in hypertension questionnaire before and 6 weeks after entry to the study. Data were analyzed by descriptive and inferential statistics through SPSS V.21.
**Results:** According to the results, there was a statistically significant difference between both groups regarding total self-management behaviors and its dimensions after intervention ($P < 0.0001$). Improvement of self-management behaviors was observed in patients with a follow-up in comparison with the patients without a follow-up.
**Conclusion:** Self-management education and a follow-up with social networks based on mobile were effective on self-management behaviors in patients with hypertension. Therefore, nurses can take positive steps towards improving the self-management of these patients through education and utilizing mobile based technologies for following-up.

*Keywords:* Self-Management Education; Self-Management Behaviors; Social Networks Based on Mobile; Hypertension

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# Dicom Viewer on Mobile and Smart Phones

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## Abstract

**Background:** Recent developments in sensing and communication technology have led to an explosion in the use of mobile devices such as smartphones and tablets. Dicom is used worldwide to store, exchange, and transmit medical images. Dicom images are essential in modern diagnostics. Rapid and easy availability of these images right at the point of care is a crucial factor.
**Objectives:** We created a mobile application (App) to access Dicom images anywhere and anytime. Since, such existing mobile Apps are unable to connect to our Kpacs radiology devices, we designed a specific mobile App that can effectively be connected to our Kpacs.
**Methods:** There is an increasing need for developing applications on mobile phones to view and treat medical images of all kinds. Dicom, as a medical image standard, is used in nearly all medical centers and hospitals. In addition, Dicom viewers have already been developed on computer networks to serve physicians and hospital staffs to view, process, and manipulate Dicom images. Therefore, having Dicom viewers on mobile and smart phones can greatly help physicians for rapid access to medical images anytime and anywhere. We have used Java, Android, and OpenCV programming to create a native Dicom viewer App. Our App is for primary processing and preservation of medical images in Dicom format. This App is equipped with most common tools for manipulation of Dicom images and has the advantage of being accessible to everyone.
**Results:** Dicom viewer App includes some benefit features: such as opening and saving medical images in Dicom format, brightness/contrast controlling, performing zoom and pan on Dicom images, having medical image processing operations, and being suitable for patients to show Dicom images on their own mobile phone.
**Conclusion:** This important technology provides physicians with the ability to immediately view images and make diagnoses without needs to be back at workstation. Physicians are now able to access images at home while they are on background duty or just in every place in the hospital. Moreover, even patients may view and interact with their personal images on their own mobile phone.

*Keywords:* mHealth; Dicom Images; Mobile App; Java Programming

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# A New Skin Viewer and Analyzer on Mobile Phone

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## Abstract

**Background:** Skin image processing on smart phones has become one of the striking and serious research areas in the past few years. A large number of people cannot benefit from the quality care that they need. Mobile application technology offers ways to help with these challenges. An application (App) called UMSkinCheck was reported in 2012, which provides guidance on how to check for skin lesions and moles and also includes information on skin cancer prevention. Last year, another skin cancer App called mole detective was reported. This App gets pictures of skin moles and analyzes them and also calculates a person's risk of skin cancer based on the characteristics of their mole undertaken by dermatologists. In 2016, the SkinVision App, which claims to assist in the early detection of melanoma, was created. This App uses a mathematical theory to analyze photos of skin lesions and moles taken by the user.

**Objectives:** We propose an automatic method for segmenting the skin lesions and extracting features that are associated to them as well as detection skin disorders. In the suggesting step, at first, the region of skin lesion is segmented from the whole skin image; next, some features like the mean, variance, RGB, and HSV parameters are extracted from the segmented region and then by using a classifier to detect skin disorders. We integrate these steps into a mobile App for primary processing and analysis of skin images anywhere and anytime.

**Methods:** Apps on mobile phones have wide applications in different scientific fields including medicine. By use of image processing algorithms and Java programming, physicians have been more successful in the diagnosis of different skin diseases and have achieved much better treatment results.

**Results:** Skin viewer and analyzer App can include some benefit features: such as monitoring, tracking, and understanding individuals' skin health, having medical image processing operations, as well as allows the individuals to capture all of their moles and skin conditions to thoroughly understand their skin.

**Conclusion:** This important technology provides physicians with the ability to immediately view the skin and make a diagnosis. Skin Apps offer a unique technology to detect early and potential signs of lesion disorder and skin cancer growth.

*Keywords:* mHealth; Skin Disorder; Mobile App

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# Role of E-Health and Mobile Health in Management of Asthma: A Review Study

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## Abstract

**Background:** Asthma is one of the common non-communicable diseases. Approximately 235 million people suffer from asthma around the world. Appropriate management of asthma can enable people to enjoy a good quality of life. The major international clinical guidelines now recommend including a self-management program in the routine management of patients with asthma. However, the implementation of self- management program in clinical practice, and their uptake by patients, is still poor.
**Objectives:** We investigated the literature for finding last evidences regarding the effect of e health and m health on different aspects of asthma management.
**Methods:** Academic databases of PubMed, Cochrane (central), and Scopus were searched, using different combinations of terms such as "e health", "E Health", "mobile health", "m health", "M Health", "M health", "Tele monitoring", "SMS", "MMS" and "Asthma". The searching was limited to the English language and only systematic review or meta-analysis studies were reviewed.
**Results:** We found 10 systematic review (SR) studies that included assessment of e health or m health on management of Asthma. These SR studies included RCT (randomized control trials), before-after, and observational studies. These studies consisted of at least a total 134556 participants comprising of 10374 children. These studies were conducted in USA, Cameron, Italy, France, Canada, and some other countries. In these studies, different aspects of Asthma were evaluated such as self-management, medical adherence, scheduling visiting time by physicians, peak expiratory flow measurement, asynchronous communication and discussing between patients and providers, as well as monitoring 4 items of asthma (cough, night symptoms, sleep quality, and maximum tolerated activity). However, few studies investigated the cost effectiveness and long term efficacy of m health or other e health facilities on management of asthmatic patients.
**Conclusion:** Although there are some strong evidences regarding the value of integrating m health in management of asthma, evidences about its long term benefit, cost-effectiveness, feasibility, and changing the outcome are limited. Therefore, the lack of large scale and strong clinical trial studies, for answering these questions is felt more than before.

*Keywords:* E-Health; M Health; Smart Phone; Asthma; Self-Management

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# Mobile Health and HbA1c in Diabetics: A Review Study

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## Abstract

**Background:** The global diabetes mellitus (DM) prevalence would increase from 171 million in 2000 to 333 million in 2025 and to 366 million in 2030. Moreover, DM, as the 20th cause of DALYs in 2002, will be the 11th cause of DALYs in 2030. On the other hand, e-health (electronic health), including mobile health (m health), has been claimed that it would empower diabetic people to better manage their condition.
**Objectives:** We aimed to answer this question: To which extent could e health and m-health change the management of DM by reducing the level of HbA1c?
**Methods:** Academic databases of PubMed and Scopus were searched, using different combinations of terms such as "e health", "E Health", "mobile health", "m health", "M Health", "M health", "Tele monitoring", "Diabetes Mellitus", "HbA1c", "Glycosylated Hemoglobin", "Smart Phone", "SMS" and "MMS". The searching was limited to the English language and only systematic review or meta-analysis studies were reviewed.
**Results:** Overall, 13 systematic reviews and meta-analysis were assessed. All of them included RCT (randomized control trials). In sum, 555 articles, including 67481 (in the range of 4 to 37695) people were studied. The time of publishing these studies was between 1980 - 2014. These studies were conducted in 25 countries from all continents. One article was reported from Iran. Interventions were: SMS (short message service) by mobile phone or Email, MMS (multi media messaging service), Video-conferencing and personal digital assistant (PDA). A total of 3 studies reported a significant decrease in HbA1c after applying interventions. Six studies reported a small but significant decrease in HbA1c, including a pool effect of 20.1% - 20.5% and effect size of 44% in decreasing this index. Four studies did not report any significant reduction in HbA1c.
**Conclusion:** There are many clinical studies that assessed the effect of e health or m health on diabetes management. The main bulk of these studies show a significant but small effect on reduction HbA1c. On the other hand, there are some studies that did not conclude such an effect. Therefore, strong evidences provided by large scale studies are needed to support the long term effect of e health or m health on the diabetes management.

*Keywords:* E-Health; M Health; Diabetes Mellitus; HbA1c; Iran

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# Designing an App for Evaluating the Effects of Sound Waves (Music) on Plant Growth

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## Abstract

**Background:** The effect of music on plant growth is still a dubious issue among scientists and experts. Researchers and experts conducted many studies to demonstrate that musical stimulation improves plant growth. The role of technology cannot be ignored today. Nature, in particular plants and their importance in life, are neglected due to existence of various industries and human attachment to them.

However, nature and supervening natural disasters give a warning to humans submerged in technology and artificial industry and remind them of the importance of plants and taking care of them. Biological scientists are constantly trying to find a way to live a better life, a way to conserve nature, produce high-yield plants, and use genetic manipulation to obtain better, nutrient -rich products.

**Objectives:** To improve living conditions, researchers and scientists try the use of sound waves (music) and investigate their effects on different aspects of life. Successes have been reported in this regard including the positive effect of music on cow lactation, mental illness treatment, labor productivity growth, etc. This study aims to examine the effects of sound waves (music) on plant growth.

**Methods:** The effect of sound waves (music) on plant growth is investigated in this research by designing and developing an app that can monitor acoustic features (frequency range, intensity of sound, etc.).

**Results:** Most people think that plant growth is predetermined and is stopped temporarily or permanently only in response to different tensions. Plants seem to be out of behavior and intelligence since they have no obvious motion. However, plants dominate every prospect. Biomass allocated to plant species is 77%. Plants monitor at least 23 different environment variables continuously due to their significant sensitivity. People, in particular farmers, have long hoped to find better ways in improving farming, to grow plants faster, and to have richer harvest. According to studies, music affects the processes of germination, growth, and development of plants as well as physiological phenomenon (photosynthesis), flowering time and rate, and also plant performance. Among different types of music, mild music has a greater effect. Heavy music like heavy metal and rock is not only not useful, but also has a negative effect on plant growth. Rock music may result in shorter plants. Mild music makes plants give off more oxygen, therefore, the amount of Carbon dioxide received increases. This will lead to more growth of fruit and flowers as well as improved performance. Moreover, evidence shows that sound waves cause production of more resistant and healthier plants. Farmers and affiliated industries face one of the growing problems in the world, which is drought and water scarcity in different countries such as Iran. According to research, plants influenced by music need less water. Therefore, paying attention to this issue may be helpful in this situation of water scarcity and have a role in solving this problem.

*Keywords:* Sound Waves; Cellular Phone; Application; Music; Growth of Plants

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# Mobile Health and Its Security in the Face Cyber Attacks

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## Abstract

**Background:** Today, mobile phones are used as useful tools in medicine; however, the risks of using them have always been an important concern of doctors and the medical community. The aim of this study is to evaluate mobile device risks of being attacked in cyberspace and how to deal with them.
**Objectives:** As we know, mobile phones and other portable electronic devices, including laptops, tablets, and etc. are always one of the favorite targets for small theft. In addition to the financial value of them, they are good choices for online thieves and hackers to access medical databases and IT systems in the medical community. In this work, the author studies the risks of mhealth and the ways to deal with them. These approaches include strong encryption on mobile health systems and a distrust of the links in unknown emails.
**Methods:** This study is a review-analysis based on library sources and online articles. Data were collected using the resources available in PubMed-Medline, Springer, Magiran, and the Journal of Medical Internet Research. The results of the most common health risks were developed as an analytical method.
**Results:** The results showed that 'Medjacking' attacker or attackers to devices used in mobile health not only endanger the patient's health, but are also a threat to the security of information systems used in hospitals or health systems. The best approach to handle such a problem can be by choosing a strong password on the mobile device and using tools such as URL X-ray to open the contents of the emails.
**Conclusion:** Although, vast use of mobile devices in mhealth increases the risk of virtual attack, using a proper security system installed on the device can avoid this danger.

*Keywords:* mHealth; Security; Mobile; Information Systems; E-mail

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SIM Congress

2017 mHealth Shiraz International Congress

۴ و ۵ اسفند ۱۳۹۵
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برای برترین طرح ها و چکیده مقالات


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