An Appraisal Of Health And Wellness Apps On Mobile Devices

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---ABSTRACT---
Mobile device is transforming our live in every way, both in the digital and the physical world. In today's digital society, Mobile Phones and iPads are driving changes in health care. Diseases and Health complicationscould beminimized by leveraging on mobile apps technology. Likewise our society as consumers of health care, mobile devices could be useful to our life in the way we communicate and interact. As Health care is 24/7 in our life, mobile device is also 24/7 in our life. Prevention is better than cure and when leveraging on mobile devices for health care, many diseases could be managed and put under control. The proliferations of apps for health and wellness are strong temptations to use and rely on health care apps. A research to identify the viability of mobile devices for health care and wellness is not only desirable but significant in this era of Information and Communication Technology. This Research used content Analysis Method to appraise Mobile Apps on Health and Wellness. The APPs were downloaded from Google store, examined and rated their effectiveness on their claims for heart and diabetics measurement. The research is of significant to Health care institutions, Academic Institutions, Policy makers, individuals and the general Public. One of the findings of the study was the failure of the tested apps to prove the claims they purported. One of the recommendations is for stake holders on health care to ensure strict monitoring of software apps with a view to provide standard and control.

I. INTRODUCTION

Information and Communication Technology (ICT) is changing virtually all aspects of our life, including health management and control. ICT make use of Hardware and Software to execute data processing, analysis and transmission. One of the most commonly used technologies for communication nowadays is the Cell Phone. Cell Phones evolved over the years into what is today known as Smartphones. This is a type of phone that has all the features of PC (Personal Computer) with additional features that enable user to interactively simulate and examine objects, events, and living things on real-time basis. Smartphone is becoming the focal point of our life.

The CPU and other functions of the Smartphone make it easier for the user to install Software for processing some functions or activities. Software developers design Software specific to smartphones. Google store contains millions of Software for Smartphone installations and applications. One of such Software is Health and Wellness Software for mobile devices (or Mhealth Apps). The use of mobile technologies to monitor and improve health and wellness is referred to as mHealth. This is a a rapidly growing area practice (Nilsel,2014). The emergence of smartphone device has removed time barrier in accessing, transferring information and patients for treatment on complicated health issues. According to Fox (2012), in the year 2012, 85 % of adults in the USA owned a mobile phone, of which 53 % were smartphones. This trend in USA is rapidly reflecting in Africa and Nigeria in particular.

In this paper, the term mHealth is used to refer to services, guidelines, tutorials, and activities that are deployed on smartphones form Play stores for the user to download and use for the promotion of heath leading to wellness and healthy living. mHealth provides a platform for patients and medical practioners to engage in health matters leading to diagnosis of diseases to information management on health matters. According to Marin and Daniel, et al. (2014), mHealth is information on demand, health record management, nutrient management, and on. There are a number of researches on mHealth and the literature is ever increasing. There are very few papers that reported on the practical application or use of the mHealth Apps and their approach differ from this paper.As a result of the increasing number of Smartphone users, more Software Developers are producing more Mhealth Apps. for business and testing purposes. The availability of Mhealth on Google store encourages user of Smartphones to download the Apps on their phone for the promotion of health and wellness. In this paper, the term mHealth is used to refer to services, guidelines, tutorials, and activities that are deployed on smartphones form Play stores for the user to download and use for the promotion of heath leading to wellness and healthy living.

The massive downloads of Mhealth Apps by users of Smartphones may not take into considerations the many factors that could ascertain the viability of the Software in terms of reliability and content validity. The rampant and unguided use of Mhealth Software may lead to undesirable health conditions to user. In order to protect life in this digital age, a research in viability appraisal is timely and desirable. The method used to collect data is the use of Mhealth Apps on real time; and a structured form was designed to record results obtained from each Mhealth App within a period of time using the App by a Smartphone user. While the users enjoyed the implementation of the Apps, yet consistency of results from the Apps by the different users is a concern that becomes a remarkable discovery by this research. This could be further elaborated in the sections of data analysis and recommendations.

Unless a research is carried out on the performance capability of Health Apps, the Apps shall continue to be used unregulated, uncontrolled, and may lead to epidemic in health complications. The issue of accuracy in diagnostic abilities of the Health Apps and coupled with absence of proof of efficacy are fundamental concern that require this research. Lack of formal review of an Apps also require a research findings that could provide useful information to the user before attempting to use an App. Misleading claim by a developer of Health App is a serious issue that is worth investigating.

II. OBJECTIVES OF THE STUDY

The goal of this research was to ascertain the claim of Mheath Apps for Health and Wellness.In the attempt to achieve this goal, the research addressed the gap existing in local software development in digital health, thereby opening opportunities for Entrepreneurship for our teaming school leavers in computer science and Information Technology to develop local content for Health Informatics.

Statement of the Research Problem

Every individual in our community and society wants to become healthier and free from all malicious diseases and symptoms. Our life style, eating habits, physical activities and environmental factors contribute significantly to our wellbeing and health conditions. Unless these factors are properly controlled and monitored, they may go out of control to the extent of threatening and affecting our health and wellbeing. As we are today living in a digital age, where society is bypassing desktop computers and embracing mobile devices like ipads and Smartphone, likewise health education and counseling are bypassing traditional health care centres. Health care applications are now running on mobile devices. There are various Mobile Apps for health care and wellness. The Apps for Health and Wellness claim that using the Apps prevents complications to major diseases and as well promotes good health.

An informal survey conducted by the lead Researcher on *User download of Mobile Apps* revealed that mobile users are downloading Health Apps on their phones and that users are giving the Health Apps high regard like a helpless patient before a Medical Practitioner. Most of the Health Apps may have one shortcoming or the other; and the general impressions given by the Mhealth Apps is they can help to cure or modify a disease. Based on this claim, users may wholeheartedly rely on the Mhealth Apps to address their health problems and complications. This looks like a dangerous trend that could cause more health problems than promoting health and wellness. Most especially in developing countries where Doctor-Patient ratio is very low, users may resort to Mhealth Apps for counselling and solutions to health problems.

Unless a research is carried out on the performance capability of Health Apps, the Apps shall continue to be used unregulated, uncontrolled, and may lead to epidemic in health complications. The issue of accuracy in diagnostic abilities of the Health Apps and coupled with absence of proof of efficacy are fundamental concern that require this research. Lack of formal review of an App also require a research findings that could provide useful information to the user before attempting to use an App. Misleading claim by a developer of Health App is a serious issue that is worth investigating. Thus, this research considers it worthwhile to subject some Health Apps to user-practical use in order to ascertain reliability and performance capability of the Health Apps.

Research Questions

In order to address the Research Problem, the Research attempted to answer the following Research Questions'

RQ:*What ranking users awarded to a particular mhalth app in terms of validity attributes and what is the proportion or percentage of the ranking?*

1.5 Research Hypotheses

To answer the Research Question, a Null Hypothesis was tested at 0.05 level of significance.
H01 :*There is no Significant difference between the mean scores of users of the Health Apps and the claims of the mHealth apps on the measure of viability.*

III. METHODOOGY

This research was designed in the following pattern:
Seventy Five (75) users were issued with Android/smartphone each for the purpose of the research. The users downloaded two health and wellness applications from Google store.

Instruments Used for Data Collection

The instrument used to collect data for this research is User Experience Test (UET) rating of mHealth apps. In the context of IT, software developed to perform certain functions is subjected to real-time use by individuals.

Data Analysis

The data in this research was analysed using Rating scale and Rubrics. Tables, Bar charts, and Pie chart, were used for the graphical display of the distribution of the ordinal data.On testing the Null hypothesis, Analysis of Variance (NOVA) was used.

Analysis on Heart monitory apps.

Table 1 : Test result of 75 Users on Heart Monitoring App in 5 Months

Variable	Variable Description/Score Scale					Total Score
	25-21	**20-16**	**15-11**	**10-6**	**5-0**	
Validity	Excellent, very consistent	Good	Average	Low	Frustrating	15
Reliability	Excellent	Good	Average	Low	Frustrating	20
Adoptability	Excellent	Good	Average	Low	Frustrating	5
Performance	Excellent	Good	Average	Low	Frustrating	5
Impact	Excellent	Good	Average	Low	Frustrating	3
TOTAL						45

Great	**Good**	**Average**	**Poor**	**Bad**
75-65	70-60	50-40	30-20	10-0

From table 1, the 75 users considered the apps as reliable but in tems of adoptability and performance the users rated the apps as frustrating. In other words users were in delimma as to the cosistency of the apps. This follows that if consistency and performance earned low grade by users, impact of the apps to the claims the apps declared became doubtful.

Fig. I : Pie chart depicting percentage of user grading on Heart Monitoring App.
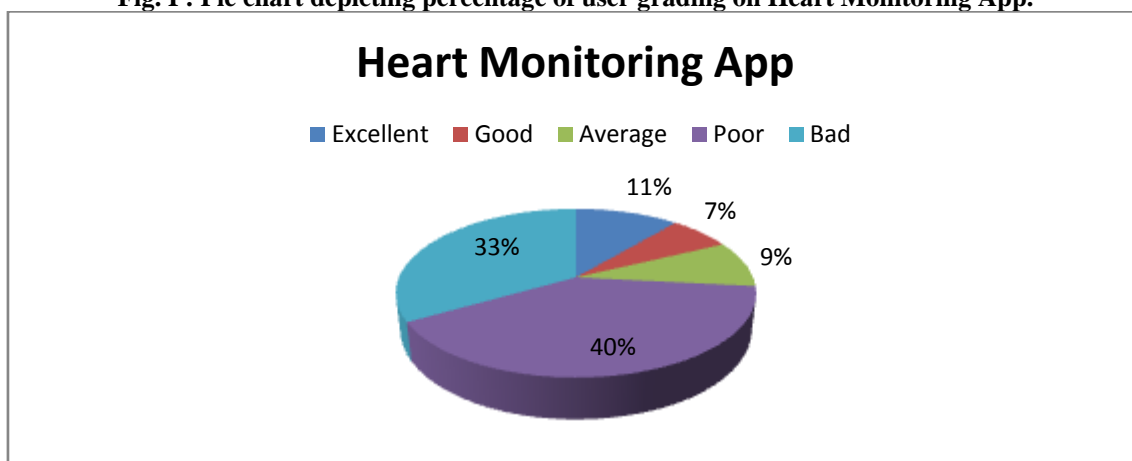
To further understand the specific result of all the apps in the first month of implementation, figure 1 indicates that 7% is considered good while 40% is considered as poor as per the validity of the apps. The total appraisal of

the apps indicates that only 9% of the apps's claims are in the category of average in terms of validity appraisal. The 11% as excellent is not enough to consider the apps as valid in the rating of the apps as per measurement of validity.

Summary of Finings of Heart Monitoring App as per appraisal of Viability

App/Attributes Glucose Sensor	Rating Description	Test of Hypothesis
Validity	BAD	*no Significant difference between the mean scores of users ofHeart Monitoring app and the claim of the app on the measure of viability*
Reliability	POOR	
Adoptability	MODERATE	
Performance	POOR	
Impact	BAD	

Table 2: Test result of 75 Users in 1st Month Glucose Sensor App and its attributes for Viability appraisal

Variable	Variable Description/Score Scale					Total Score
	25-21	20-16	15-11	10-6	5-0	
Validity	Excellent, very consistent	Good	Average	Low	Frustrating	10
Reliability	Excellent	Good	Average	Low	Frustrating	5
Adoptability	Excellent	Good	Average	Low	Frustrating	5
Performance	Excellent	Good	Average	Low	Frustrating	5
Impact	Excellent	Good	Average	Low	Frustrating	5
TOTAL						30

Great	Good	Average	Poor	Bad
75-65	70-60	50-40	30-20	10-0

From the table above, the 75 users rated the apps and the aggregate results indicate that validity of the apps as per to the claims on health and wellness specific to each app is concerned has earned bad grade. The aggregate rated grade is 10 and this falls in the class of bad validity. While in the first month, the user appraisal of validity was poor, in the second month the grade changed to bad. Thus, instead of observing improvement in the app for glucose measurement, worst observation was recorded. The same result is obtained on reliability, adoptability, performance and impact. This is further elaborated in the following figure that gives percentage to the description of the class of validity appraisal.
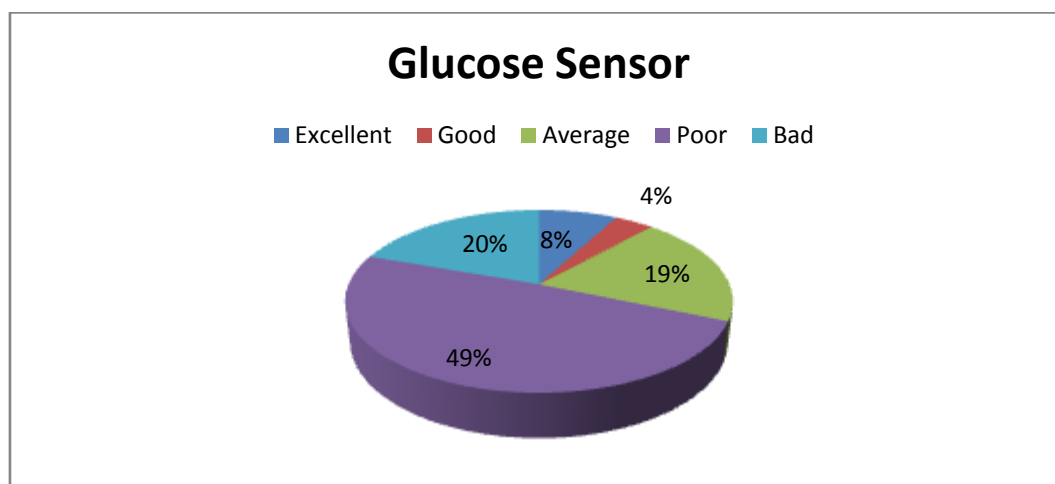
The chart shows that 49% of the converged results of the 75 users rated the app for glucose measurement as poor. The app earned 4% excellent, which is not adequate enough to justify the app as valid to its claim. Thus, as per as claim for glucose measurement, the app was considered poor.

IV. DISCUSSIONS ON FINDINGS

For the appsappraised, we have enthusiastically involved end users and/or referred to user data in all stages of the appraisal and evaluation. This appears to have been one of the general achievement issues in being able to plan and test appropriate mobile apps in everyday life situations. This study based on variability appraisal of some mHealth apps aimed at ascertaining the credibility of the apps for impact in the improvement of health issues to end user. There are three key findings of the study. First, this study reveals that the apps appraised failed to prove the claim they purported. This revelation is really significant and disturbing with the increasing use and confidence of mHalth apps by owners of smartphone devices. This is serious challenges to health care in our society just like drug addiction is to our society. Second, the results show that the attributes of the mHealth apps were ranked and assessed with low and poor grade by end users in this study. This shows that these attributes should be considered seriously by mHalth developers so that improvement can be achieved and higher rating could be achieved in further researches. Third, this study also revealed that Security is another important consideration when evaluating apps. Many apps now require users to create an account with a username and password, as well as enter personal information, such as profession or place of employment. These data have the potential to be collected and sold to third parties for marketing and advertising purposes.

Thus, users instead of users getting value for the use of the mHealth apps they may end up being used for trading purposes instead of getting value for health related matters. There is desirable motive to be enthusiastic over mHealth. Mobile technology support much-needed, thoroughgoing transformation in healthcare systems over the glove; and in turn brings significant social and economic benefits. However, mHealth is still a work in progress and is growing and changing along with societal health wellness condition. The mHealth marketplace is increasingly producing variety of halth apps focusing on different diseases and health threatening factors. While fitness and health applications are hot now, the future for mHealth applications lies in user monitoring and consultation. Access and use of mHealth applications is still on the rise and there is promising and lucrative opportunity for application developers in health care. Yet, our studies demonstrate the weakness of health applications to the claims of the apps.

In this research users experience frustrating issues as per the claims of the apps, including users' frustration in getting consistency results in appraisal and the failure of apps to provide the right user experience (Franko&Tirrell, 2012). Users in this research experienced dilemma of inconsistency and performance of results displayed at different time the apps appraised. Users faced the confusion of deciding which results is correct as compared with the series of results obtained from the appraisal.(van Velsen, et al. 2013). Therefore the fundamental and greatest challenge for health applications is the quality of the perceived usefulness and ease of use in the process of practical implementation of the apps in real life situation. All the users who used the apps throughout the five month of assessment apps indicated the failure of the apps to prove functionally to the claims they purported.

Summary of the Study

Health and wellness apps (mHealth) are potential remedies and are valuable for a wide range of uses, including clinical treatment activities, prevention of disease, public health activities, and in therapy situations. This research used short-term and small sample size in a controlled trial and assessed the viability and reliability of some number of health and wellness applications.

V. CONCLUSIONS

Health and wellness apps are becoming invaluable tools for independent personal use. Their functionalities and uses continue to grow. They shall in their near future become part of medical advice and prescription in our society by medical practitioners. They may even more widely integrate into nearly every aspect of clinical practice.Although some smartphone owners may be reluctant in downloading and using the apps for health and wellness, such attitude may not be unconnected with the viability and reliability of the mHealth apps. Mobile technologies have been global and essential in our daily life. It signifies evolution of health care service by using modern mobile information and communication technology, which essentially restructure when, where, and how health care services are provided for improvement in health and wellness.

VI. RECOMMENDATIONS

Smartphone companies should develop new features such as wireless sensor technology that can fit in into clothing, accessories, and/or the living surroundings to deliver health and wellness data that one can obtain seamlessly and ubiquitously throughout day-to-day routine activities.Medical device manufacturers should develop devices such as an Internet-connected inhaler to treat protracted obtrusive pulmonic illness. The device should be capable of detecting and reporting usage and data that can be transmitted to a patient's smartphone through a dedicated platform, which could send data into the cloud. The data shall allow patients to screen their own health conditions.Healthcare providers in collaboration with software developers should develop an

application that motivate patient to appropriately monitor congestive heart failure therapy through daily check for excessive fluid retention, which if it transpires can be addressed promptly.

The National Agency for Food and Drug Control (NAFDAC) should include mHealth apps as Medical Device. This is to ensure that contents of mHealth have proof of efficiency and reliability so that the rampant download and use of the mHealth apps would no put our citizens in danger. **Mobile devicesare perfect tracking tools.** Notwithstanding their numerous benefits, mobile devices and apps can all be highly privacy-invasive. Smartphones are internet- and geolocation-enabled, as are most tablets, and even some portable devices. Owners of these devices remain in most times with the devices and never turn off the devices.

The mobile applications ecosystem is generally unregulated. This is a particular concern with health and wellness apps, which often gather both demographic and health (or medical-like) data that does not fall under the protections of any health privacy laws. When one uses the apps, user often create a record of data such as diet, daily exercise, glucose readings, pregnancy, and/or menstrual cycle. Usually, health and wellness data is only protected to the extent it is stated in a privacy policyif there is a privacy policy at all. Also, numerous health and wellness apps permit and inspire users to share what is considered sensitive information through social media. Shared information becomes public property where owner has little or no control over it. This research calls for integration of mHealth among the IT services to be regulated and monitor by NAFDAC.

Although it may be difficult to evaluate the validity of a an app over the web, prospective user, try to assess the credibility of the developer of an app. The website of the developer of an app is a good source of information that could provide useful information to prospective user. Prospective user should also look for user reviews either through the app store or online. User can also learn about the app or the developer in the media.The proliferation of mobile apps is rapidly increasing in large number every day. Health apps are having a greater portion in the increase of mobile apps. The demand for health apps is increasing as well. Categorization of apps is an enormous task by itself. Therefore, when it comes to health apps, care should be taken to ensure that people are not misled by erroneous information. In conventional health-care delivery, when health professionals are at fault, patients can use the legal system for redress, but no such mechanism is currently in place for mobile health care. And there is a growing desire to specifically streamline health apps to this direction

VII.LIMITATIONS

This study was an appraisal viability of mHealth apps that focus on non-physical activities. There were several limitations to this study, but the first one was the choice to appraise only free apps. Studies have shown that free apps are downloaded more than premium apps (West et al., 2012). Researchers often experiment with free apps to become acquainted with the structures and functionality. The aim for studying free apps was that these were the ones that were being downloaded and used by many users. Instead of analysing bunch of health apps, this research focused on apps that were highly rated by reviews and thus added value and significance to the study.The study wanted to measure, validity, reliability, adoptability, performance, and impact attributes of health apps not related to physical activities. The limited time available to analyse more attributes of the apps restricted the scope of this study. Another important aspect is the dynamic nature of the app market which is constantly changing at a fast pace. The app market is so competitive that ranking the app becomes crucial for its presence in the app market. Even our evaluation of these apps can be obsolete because newer, enhanced apps are replacing the current standard of apps. At the same time, this this can at least contribute in a small way to the existing literature on mobile apps and to enrich overall app experience. The study intends to lay a strong foundation for future health applications to consider the importance of incorporating evidence-informed practices, adherence to recognized health guidelines, and to focus on the credibility of online health apps. Therefore enough time is required to train user on health app over a long period of time. As a result of time limit within which this research is supposed to be completed, such long term training were not offered to the user. However, this does not render the results obtained as invalid but this research is considering the short time for user familiarization as a weakness that further research should address.

Suggestions for Further Study

It is obvious that mHealth apps have penetrated into healthcare area, most significantly to assist in promoting individuals' self-regulation of health conducts, more can be accomplish to fully utilize the unprecedented benefits of mHealth apps within healthcare. Therefore, it is necessary that more extensive studies with methodological coverage should be carried out to address quality and reliability of healthcare through mHealth apps. The results could wakeup the healthcare professionals and stakeholders in making successful plans for the adaptation and implementation of mHealth in our society. In other words the large scale research can be used to illustrate to key stakeholders in the healthcare services of the usefulness of mobile devices in the treatment and prevention of disease thereby improving mHealth policies and increasing adoption of structured healthcare delivery method. Despite the fact that a considerable portion of the population is using

mobile health apps, research on this area is in its infancy and is fairly limited. Heart and diabetics apps are growing in popularity, and with the release of thousands of apps, it is necessary to keep pace with the latest trends and technology. Future research should be conducted to assess the incorporation of evidence-informed practices, interactive features, and credibility of health information.

More in-depth qualitative research should be conducted on how weight loss apps are impacting the lives of people and there should be more research on the design and development of the apps. This study has only analyzed the content of popular weight loss apps in the two major smartphone platforms and has set the stage for the continuation of this work in both mobile communication and human mobile interaction. While this study has provided a bird's-eye view of the present trend and status of popular heart and diabetics apps, more research is needed.

Implication of the Study

The phenomenal growth of mobile health apps in the recent past and their global reach is mind-boggling. The effectiveness of apps for individual users is a subject that is slowly receiving more scrutiny among research scholars; the findings of this study can help lay the foundation for design and development of evidence-informed apps that incorporate interactive features with credible health information. Results from this study demonstrate the paucity in the involvement of health professionals in the development of health apps. At the same time, there is a need for professional health organizations to venture into the field of mobile health care, and there is a wide space for health organizations to explore the potential and opportunities for delivering health care.

The presence of millions of users just for health and wellness alone is proof that individuals are ready to adopt technology to address health issues. It is also well observed condition that Nigerian society is growing heavier with each passing day, and the prevalence of health challenges is spinning out of control. The global reach of mobile apps and the widespread adoption of smartphones offer a great opportunity for optimizing and delivering affordable health care to all. At the same time, there is still a considerable section of the population who either don't have access to technology or are not tech savvy. Many people are hesitant to switch to smart devices because of the ease with which personal information can be accessed and shared. Authorities are aware of the situation, and the FDA has set clear guidelines for the launch of health apps. The results from this study point out that app developers can find a way to bypass these guidelines and regulations Overall, the findings of the study have several implications for health apps and, specifically, for weight loss apps. One of the fundamental findings of this study is that the majority of weight loss apps do not adhere to evidence-informed practices and nationally recognized health guidelines. This study has only reinforced the existing vacuum documented by previous studies and the need to develop apps with components of evidence-informed practices. The study intends to stimulate healthy discussion among the various stakeholders in the field of mobile health apps. It is important to note that the findings of this study are also applicable to the general area of health apps. The potential to explore the concept of interactivity features through apps could guide app developers in general to integrate these components to enhance user experience.

REFERENCE

[1].   Altini, M., Penders, J., and Roebbers, H. An Android-based body area network gateway for mobile health applications. WH '10 Wireless Health, pp. 188–189, 2010.

[2].   Anonymous. Mobile phones used to gather medical data. Appropr Technol. 2009;36:57–

[3].   Arthur Willem Gerard Buijink,Benjamin JelleVisser,Louise Marshal (2012).

[4].   Årsand E, Frøisland DH, Skrøvseth SO, Chomutare T, Tatara N, Hartvigsen G, et al. Mobile health applications to assist patients with diabetes: lessons learned and design implications. J Diabetes Sci Technol. 2012;6:1197–206

[5].   Belknap R, Weis S, Brookens A, Au-Yeung KY, Moon G, DiCarlo L, et al. Feasibility of an ingestible sensor-based system for monitoring adherence to tuberculosis therapy. PLoS One. 2013;8(1):e53373

[6].   BIOSTEC 2013 - 6th International Joint Conference on Biomedical Engineering Systems and Technologies.

[7].   Blumrosen G, Avisdris N, Kupfer R, Rubinsky B. C-SMART: efficient seamless cellular phone based

[8].   patient monitoring system. IEEE IntSymp World Wirel Mob MultimedNetw. 2011;2011:1–6. doi:

[9].   Burke LE, Styn MA, Sereika SM, Conroy MB, Ye L, Glanz K. Using mHealth technology to enhance self-monitoring for weight loss: a randomized trial. Am J Prev Med. 2012;43:20

[10].   Cafazzo JA, Palmert MR, Casselman M, Katzman DK, Hamming N. Design of an mHealth App for the

[11].   self-management of adolescent type 1 diabetes: a pilot study. J Med Internet Res. 2012.doi:

[12].   Clifford GD, Clifton D. Wireless technology in disease management and medicine. Annu Rev Med. 2012;63:479–92.

[13].   De LepperAM, Eijkemans MJC, Van Beijma H, Loggers JW, Tuijn CJ, Oskam L. Response patterns to interactive SMS health education quizzes at two sites in Uganda: a cohort study. Tropical Medicine International Health TM IH, 00, 1–6. 201

[14].   Doswell WM, Braxter B, Dabbs AD, Nilsen W, Klem ML. mHealth: technology for nursing practice, education, and research. J NursEducPract. 2013;3:99–109. doi:

[15].   Doswell WM, Braxter B, DeVito Dabbs A, Nilsen W, Klem ML. mHealth: technology for nursing practice, education, and research. J NursEducPract. 2013;3(10):99. doi:

[16].   Felkey BG, Fox BI. Mobilizing care through portable information devices for patients and providers.Hosp Pharm. 2010;45:801–2.

[17].   Fiordelli M, Diviani N, Schulz PJ. Mapping mHealth research: a decade of evolution.J Med Internet Res. 2013;15:e95.

[18].   Fjeldsoe BS, Marshall AL, Miller YD. Behavior change interventions delivered by mobile telephone short-message service. Am J Prev Med. 2009;36:165–73
[19].   Foreman KF, Stockl KM, Le LB, Fisk E, Shah SM, Lew HC. Impact of a text messaging pilot program on patient medication adherence. ClinTher. 2012;
[20].   Reuters News, March 12, 2012, "Chicago hospital doctors say iPads raise their efficiency," http://www.reuters.com/article/2012/03/12/us-ipad-idUSBRE82B1BQ20120312
[21].   Fox, S. "The Power of Mobile." (Pew Internet Life Project) .http://www.pewinternet.org/Commentary/2010/September/The-Power-of-Mobile.aspx
[22].   Parsons, T. "Consumer Electronics Can Help Improve Patient Health." (Johns Hopkins Bloomberg School of Public Health) .
[23].   Medical apps for smartphones: lack of evidenceundermines quality and safety Evidence-Based Medicine Online First, published on August 25, 2012 as 10.1136/eb-2012-100885
[24].   Global Mobile Health Market Report 2010–2015 (online research in healthcare):
[25].   Paschou, M., Nodarakis, N., Tsakalidis, A., and Sakkopoulos, E., Mobile Healthcare Systems: Generating Dynamic Smartphone Apps to Serve Multiple Medical Specializations - Assisting Monitoring Patient@Home and Health Record Follow-up.