

# Evolution of E-Health in Saudi Arabia: Mobile Technology and M-health

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## Abstract

Medicine, to date, remains as an information intensive discipline since the onset days of practice. Back then, the pearls and nuggets of wisdom were orally passed on from one generation to another as well as through apprenticeship. At the base of health and medicine lies informatics helping to store, access and retrieve humongous amounts of data for patients, conditions and ailments. Today, medicine and health have evolved to breed the present day medical practice built on tenets of electronic health (E-health). The modern trendy milestones enable rapid dissemination of new information such as outbreaks through electronic access to fundamental relevant sources such as electronic journals, shared patient data and other electronic reference websites. In a nutshell, e-health transformed and digitized the world to the benefit of medicine. In as much as having this information electronically available are beneficial, medical practitioners such as doctors are immobilized to workstations, centers and immobile desktop computers. The next era in e-health involves gaining rapid access to storage and creation of materials in a convenient manner. A fundamental tool to this is a smartphone. On its part, Saudi Arabia has developed a two phased e-health vision achievable by 2020. The author of this paper develops a masterpiece that will help nurture the next phase of Saudi Arabia's e-health vision, m-health.

Keyword: Information intensive discipline, apprenticeship, informatics, electronic health, digitized, smartphone

## 1. Introduction

The integration of medicine with technology has brought far-reaching outcomes in the health industry (Davidson, 2014). With the modern world taking great strides to incorporate technology in virtually all facets of life, the health industry has benefitted significantly through advanced technologies (Berg, 2013). The medicine world has had a tremendous evolution through the establishment of electronic health services. M-health, which is a subsection of electronic health, has proved to be a significant element in the improvement of health provision to the public (Mantas, 2012). Both industrialized and developing countries are increasingly finding m-health as an imperative part of medicine and public health. Particularly in the developing world, the rapid growth of mobile phone penetration has contributed immensely in the establishment of m-health applications in healthcare institutions (Mantas, 2012). The field of m-health has emerged as a pertinent part of the healthcare sector, with its ability to provide healthcare access to larger segments of the public. Additionally, m-health has emerged as an important field because of its capacity to improve healthcare systems in the dissemination of healthcare services to the public (Mantas, 2012). This has contributed greatly to the provision of quality healthcare.

In recent years, improvement in information and technology has played a fundamental role in the provision of modern healthcare solutions. According to Altuwajiri (2011), m-health, as a pertinent element of electronic health, makes it possible for healthcare practitioners to deliver healthcare services with ease because of the ability to overcome geographical and organizational barriers. Aldosari (2012) resonates with this assertion by

pointing out that m-health's rapid penetration into the medicine world is attributed to its ability to address emerging medical issues. Some of the pertinent issues that m-health technology seeks to address include the high costs of health services, the need to raise patient awareness on self-care, the need to make direct access to healthcare possible and the need to effectively manage chronic diseases. Thus, m-health is, without a doubt, a testament that the fields of medicine and public health are going through a tremendous evolution.

### 1.2 M-Health: Definition

The term m-health refers to the dissemination of healthcare services through the utilization of mobile devices. The term m-health is usually used in connection to the use of devices like mobile phones and tablets for the provision of healthcare services (Khalifa, 2013). Health-related information can be sent from one person to another through the mobile devices in a convenient way. As a sub-segment of e-health, m-health has emerged as an important way for physicians to communicate with fellow healthcare practitioners as well as with their patients (Khalifa, 2013). The penetration of m-health into the healthcare sector is an explicit indication of the magnitude of the evolution of e-health. Unlike the conventional ways of addressing healthcare needs and healthcare dissemination, m-health is a revolutionary field in meeting the healthcare needs of the modern world. Through the use of mobile devices, it is possible to accomplish the following healthcare activities: gathering medical and community health data, deliver health-related information to healthcare practitioners and patients, monitoring of patients and providing direct patient care (Wootton, 2015).

Based on the ability of m-health to support the functioning of the healthcare system, it is apparent that, through mobile devices like smartphones, it makes it possible to access health services with ease. In this regard, it is worth pointing out that m-health is a reflection of the evolution that the healthcare sector has been going through over the years.

## 2 M-Health in Saudi Arabia

Over the past two decades, the government of Saudi Arabia has invested heavily in ensuring that quality healthcare is attained to serve the needs of the population. Quality healthcare services have been increasing in demand in Saudi Arabia; hence, triggering the government to constantly improve the level of healthcare provision (Altuwaijri, 2012). Part of the improvement strategy has been to incorporate modern technology in the delivery of healthcare services in the country. The evolution of m-health in Saudi Arabia has brought massive benefits that are improving the level of health of its citizens.

- 3 M-health has enhanced quality access to comprehensive health information to patients, which has in turn, played a crucial role in improving the quality of care. With the incorporation of m-health in health institutions in Saudi Arabia, faster sharing of health records between patients and healthcare practitioners has improved the quality of disease management. In the same vein, the ability of m-health to penetrate in major hospitals in Saudi Arabia has reduced the costs of managing chronic diseases; through m-health, patients are able to receive valuable information and knowledge on how to administer self-care (Atkinson, 2011). As a result of the active implementation of m-health procedures, medical safety has been achieved; hence, improving the care of patients. According to McLean (2011), interdisciplinary communication towards effective patient care is achieved through the efficient sharing of information among healthcare practitioners. It is widely acknowledged that through the evolution of m-health in the Saudi Arabian health sector, ancillary healthcare departments have more time to concentrate on patient care as opposed to dealing with intensive administrative work (Atkinson, 2011). Nurses are able to spend much of their time offering clinical care instead of spending a lot of time entering records. It is also significant to note that physicians have benefited greatly from the evolution of m-health. Physicians are able to provide real-time alerts and medical services to their patients (Khalifa, 2013). They are able to foster effective monitoring of their patients. Instead of spending much time finding and reading patients' charts, physicians are able to meet the needs of their patients accordingly (Khalifa, 2013). In

the major health institutions in Saudi Arabia, m-health is bringing innovative ways of offering timely and quality healthcare services.

#### 4 Methodology

In order to undertake this study, the researcher used a quantitative and qualitative research methods by designing an online survey to collect information regarding the impact of m-health in Saudi Arabia. The researcher sent emails to healthcare practitioners, providers and patients in different healthcare institutions in Saudi Arabia. The target population composed of registered healthcare practitioners and their patients working in healthcare institutions in Saudi Arabia. The researcher assured the respondents of confidentiality and nondisclosure of gathered information. They were reassured that the information would be used for the research purposes only.

#### 5 Survey Design

The online survey questionnaire was structured in three parts, namely: background, m health infrastructure characteristics and challenges facing m health. Part one focused on the respondents' background such as age, gender, name of health institution affiliated to and their experience with m health. The researcher designed this part to form an opinion on the respondents. Part two sought to gather information on m health infrastructure and the respondents' perceptions such as privacy and security, facilities and support services, usefulness, usability, accessibility, effectiveness and functionality features. Part three set to establish the major challenges that the respondents felt most affected m health in Saudi Arabia. These included inadequate m health skills and talent, security, confidentiality and privacy of data, infrastructure and patient perception to m health.

Table 1 Survey Questionnaire

SN	Criteria	1	2	3	4	5
1.	I cannot access m health's app without a matching personal id and password.					
2.	A patient/health practitioner must provide full personal ID before accessing personal records					
3.	The m health's web App asks me to change my password periodically					
4.	The m health's web Apps and website locks my account after particular number of failed access attempts as a precaution to safety and security of personal information					
5.	There is a procedure to retrieve a patient's/health practitioner's password and/or ID					
6.	The m health's web App always provides practitioner/patient with guidance on how to caution against hacking, revealing personal details or leaking confidential information					
7.	There exists a fully functional 24/7 contact center that responds promptly and comprehensively to my inquiries					
8.	I can access the App anywhere and at anytime					

9.	Whenever I make a mistake using the m health's web App, I learned how to recover easily and quickly					
10	I can access emergency support and response ay anytime					
11	There are strong firewall and online security features to prevent information access and leakage by malicious hackers and fraudsters					
12	The m health's web App helps me to easily retrieve patient's medical history, quickly diagnose and communicate with other departments more accurately and with minimal errors					
13	Using the m health's web App has improved my understanding of medical content, boosted my knowledge and confidence as a health practitioner.					
14	Using the m health's web Apps to process confidential and personal requests has enhanced productivity, privacy and security at my work					
15	The m health's web App's feedback (information, messages, reports) enhanced coordination among health practitioners and made care giving efficient					

Out of 120 invited respondents, 116 participated in the online survey. Survey questionnaire data collection tool offers an inexpensive approach to collect reliable, accurate and valid data. Still, health practitioners have limited to spare and as such the survey questionnaire provided a structured questioning and simplified response. Likert scale ranging between 0 and 5 was also adopted to assist with data analysis.

Table 2 Likert Scale

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

## 6 Findings and Data Analysis

Collected data was analyzed using descriptive statistics by attaching elementary characteristics such as age, gender and name of institution. Besides, measures of central tendency further described the percentage composition of the respondents. For instance, 78.43% of respondents were male and the rest were female. The largest consumers of m health in Saudi Arabia were aged between 18 and 35 years. This represents a youthful population with access to smartphone telephony (Kumar, Nilsen, Pavel & Srivastava, 2013). Nonetheless, aged parents between 36 and 55 years confirmed a higher m health usage for appointment reminders. Techno savvy youthful Saudi Arabian's sought to determine their health status using m health applications (MOH). 40% of the respondents confirmed existence of health care telephone/call center help lines for emergency cases. These centers were however irregularly distributed and especially in the western region of the kingdom. Diabetes

and obesity were reported to be prominently targeted by emerging m health applications such as MyGlucoHealth app developed by Nokia greenlit and available in Ovi app store (Tan, 2014). According to Alastair Sharp of Reuters, MyGlucoHealth is a free application that allows users of Nokia handsets to upload and control blood glucose readings using a wireless meter. In addition, the application can stand alone to track blood glucose (Tatara, 2013).

The researcher further analyzed the data using SPSS 2.0 software for regression analysis. The results are summarized in table below.

Table 3 Survey Results

Number	M health variables	Mean (SD)	P - value
1.	Privacy, security & confidentiality	0.703	71
2.	Facilities & support	0.732	78
3.	Usefulness	0.657	55
4.	Usability	0.695	62
5.	Accessibility	0.707	73
6.	Effectiveness	0.787	80
7.	Functionality	0.683	60
8.	Challenges to m health	0.671	59

### 6.1 Data Validity and Reliability

The researcher adopted Cronbach's Alpha to test the accuracy, reliability and validity of responses received. The Cronbach's Alpha constant was fixed at 0.732 and using 47 test questions. It was applied to assess the reliability of each of the 8 attributes. The result of the survey was found to be highly reliable because the value was above 0.5. Reliability coefficients less than 0.6 were considered very poor and coefficients larger than 0.8 were accepted while those greater 0.85 were considered very well. Surprisingly, all Cronbach's Alpha for all the 8 attributes was higher than 0.6 implying that the results of the survey questionnaire in each of the attributes were reliable, responses were fairly accurate and the data valid.

The Cronbach's Alpha is a measurement model that exhibits the relationship between responses to each attribute and their underlying latent construct. The researcher further introduced composite reliability measure to assess the degree to which several attributes used to measure the same concept agree. In this case is considers convergent validity, factor loadings and average variance. Average variance values should be at least 0.50 for each construct for the responses to be varied.

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## 8 Conclusion

m Health heralds an invigorating and exciting era in Saudi Arabia's health system. It is the pedestal of e health revolution that started over a decade ago. It is a radical shift in health care focus from conventional treatment to prevention, early diagnosis and wellness (*WHO*). Smart phone telephony in Saudi Arabia portend a transformed environment of health research, coordinated treatment and shared decision making where data is remotely gathered and entire clinical trials possibly run without face to face meeting between researcher and participant and doctor and patient. It is the newest approach to reducing perpetually bloated health and medical related expenses. Massive data correction establish shared databases coupled with multiple and lateral fixed sensors in the surrounding will provide a rich database for exploring new methodologies in understanding health. Consequently, m health systems in Saudi Arabia will be more versatile and prevalent and explored into a myriad of uses, disruptive and transformative delivery of medical research and health care. Still, it will present numerous engineering, scientific and regulatory difficulties. The success of m health will mostly depend on transdisciplinary collaboration and research among the three pedagogies namely medical researchers, engineers and computing experts.

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