Health ATMs in Saudi Arabia: A Perspective

Bakheet Aldosari
Department of Health Informatics, College of Public Health and Health Informatics, King Saud Bin Abdul-Aziz University for Health Sciences, Riyadh, Saudi Arabia

Corresponding author: Bakheet Aldosari. Founding Chair & Associate Professor, Department of Health Informatics, College of Public Health & Health Informatics, King Saud Bin Abdul-Aziz University for Health Sciences, Riyadh, Saudi Arabia, E-mail: bakheet.dosari@gmail.com


ACTA INFORM MED. 2017 JUN; 25(2): 130-135

Received: Apr 17, 2017 • Accepted: Jun 14, 2017

130 Professional paper / ACTA INFORM MED. 2017 JUN; 25(2): 130-135

© 2017 Bakheet Aldosari
This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (http://creativecommons.org/licenses/by-nc/4.0/) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Health ATMs are terminals which are connected to a centrally located database storing patients’ electronic healthcare records (EHR). These machines are capable of collecting information in a far superior fashion than humans and are also able to rectify obsolete data in a manner that humans are generally not inclined to. Objectives: The main goal of this study is to assess the importance of adopting health ATMs in the Kingdom of Saudi Arabia (KSA), which can improve the confidence of patients, reward health self-management, and achieve positive health outcomes through their easy-to-use applications that are secure and accessible through various devices. Methods: Strength, Weakness, Opportunity, and Threat (SWOT) analysis was used to assess the efficiency of adopting health ATMs in KSA and reveal the said characteristics. Three focus groups assembled in the cities of Riyadh, Jeddah and Dammam during the period 2013-2014. The groups consisted of individuals experienced in the function of health ATMs.

Results: It was found that the sector possessed a number of strengths that would help it in reaching the goals outlined therein, thereby achieving successful outcomes. Conclusions: Health ATMs could be a promising new advancement in the field of health ATMs.

Keywords: Electronic Health Record, Health ATM, SWOT analysis, health self-management, health outcomes.

1. BACKGROUND AND SIGNIFICANCE

In its 33rd meeting, held on 27/12/1428 H (6th January, 2008), the Saudi Health Council gave its approval to the Secretariat of the Saudi Health Council for delineating specifications of the unified electronic health file project (including numbering system, medical coding system, and standards and procedures used in dealing with a health file), regardless of the service provider. This would help in removing duplicity in data entry, irrespective of the location of data storage, and maintain secrecy in information transfer (1).

Since then, and even before, several attempts have been made by different sectors and health organizations in the Kingdom of Saudi Arabia (KSA) to come under the purview of the Health Information System (HIS) so that these different facilities could function in a united way.

In November 2008, the largest electronic health system in KSA was launched following a series of successful tests at the Armed Forces Hospitals. The project involved indexing and tabulating innumerable papers and digital medical files of the Armed Forces personnel, designing a registration program, especially for the Ministry of Defense, and linking it to the medical systems of NEXUS AG, a leading healthcare-cum-software company based out of Europe. The health ATMs designed by them would provide patient information in the form of previous hospital stays and diagnoses, and documents such as scans, videos and pictures. The contract covered a total of 26 hospitals and more than 100 polyclinics, but, later on, the project was shelved (2).

At the 2010 Arab Health Awards in Dubai, UAE, the National Guard Health Affairs (NG-HA), a leading healthcare provider in KSA, received...
the Excellence in Electronic Health Records (EHRs) Award for its use of QuadraMed’s Computerized Patient Record (QCPR™). Founded in 1993, QuadraMed helps healthcare providers by way of software applications. Their contributions include the introduction of health kiosks or ATMs which provide patient-related information such as prior hospital stay, referral of patients, and also track patient health. The award was conferred to NG-HA for making great strides in the development of EHRs at their King Abdulaziz Medical City (KAMC) facility in Riyadh and the expansion of the application to two Eastern Region hospitals, Al Imam Abdulaziz bin Faisal Hospital in Dammam and King Abdulaziz Hospital in Al Hasa, as well as their primary healthcare centers which serve National Guard members, their dependents, and Saudi nationals who need tertiary care (3).

On the 15th of May 2012, his Excellency the Minister of Health, Dr. Abdullah bin Abdulaziz Al-Rabeeah said that the Ministry of Health (MOH) had embraced the culture of analogy as a useful approach to improve health services provided to citizens and beneficiaries. Dr. Al-Rabeeah added that the first phase of the Health Services Unified E-Portal encompassed several electronic services and programs such as Doctor E-File Program, Staff Powers Management and Control Program, and Hospital File Program. According to him, more services would be added to the portal (4).

Realizing the importance of EHRs, the King Faisal Specialist Hospital & Research Center (KFSH & RC) embarked on a comprehensive project, as far back as 2002, to replace the aging and disparate clinical information systems existing in the hospital with one, integrated, clinical information management system. Phase I of the Integrated Clinical Information System (ICIS) project, which included Enterprise Person Management, Enterprise Scheduling Management, Laboratory Information System, Radiology Information System and Computerized Physician Order Entry and Nurse Documentation, was completed in October 2002. In 2005, planning commenced for the implementation of Phase II of ICIS. It included Pharmacy, Emergency Department, Medical Records, and Operating Room Information Systems. The phase reached completion by end 2007. Currently, KFSH & RC in Riyadh and Jeddah are in the process of implementing the Electronic Medical Record Adoption Model (EMRAM) with the help of Cerner, a North American supplier of health information technology services. These efforts are being made to meet the criteria for phase VI, wherein clinical information technology is deployed and used to improve patient safety, quality, and efficiency (6).

On the 17th of December 2014, King Khaled Eye Specialist Hospital (KKESH) advanced to Phase VI of the Healthcare Information and Management Systems Society’s (HIMSS) EMRAM. The independent validation mechanism of HIMSS confirmed that the hospital met all the criteria set for Phase VI, which involved the deployment and use of clinical information technology and advanced safety features to further enhance the quality of patient care. KKESH was the first Saudi Ministry of Health hospital to achieve this global recognition. This event reflected the vision and drive of the MOH to adopt the latest technology in order to provide world-class healthcare to patients residing in KSA. Attaining Phase VII of HIMSS’ EMRAM model places KKESH among the elite hospitals that have successfully deployed this level of healthcare information technology. HIMSS Analytics tracks more than 7,500 hospitals globally (7).

But the concepts of health ATMs and EHRs, which assist physicians and other professionals while they work with patients, need to be implemented on a countrywide basis. Medical errors cause thousands of deaths and result in unnecessary healthcare costs running into the billions. EHR can be defined as “a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting, such as progress notes, medications, vital signs, past medical history, laboratory data, and radiology reports. The EHR automates and streamlines the clinician’s workflow. The EHR can generate a complete record of a clinical patient encounter, as well as supporting other care-related activities directly or indirectly via an interface including evidence-based decision support, quality management, and outcomes reporting” (8). EHR’s main objective is to substitute the hard documents with electronic ones, increase the processing of data, and reduce the associated time and costs. By adopting such a system, it is possible to facilitate and improve health care. It can be utilized as a workflow tool that gives the practice ability to collect and present information in one integrated view. Data legibility and duplication, continuous data processing, ability to detect errors and reduce frequency of loss records, support of communication between external sources of medical information, and management and resource planning are some of the advantages that can be availed of while using this system (9).

2. OBJECTIVES

The main goal of this study is to assess the importance of adopting health ATMs in KSA, which can improve the confidence of patients, reward health self-management, and achieve positive health outcomes through their easy-to-use applications that are secure and accessible through different devices. In this paper, we will conduct a Strength, Weakness, Opportunity, and Threat (SWOT) analysis of the process of adoption of health ATMs in KSA. Its strengths and deficiencies can be revealed through this assessment. Our analysis will also reflect the current state of the healthcare system in KSA, including assets and resources, within a formal framework, and help researchers in the successful implementation of e-health smartcards for improving healthcare quality.

3. REVIEW OF LITERATURE

There are two types of innovation in the medical sector. Clinical innovations include elements such as new apparatus, vaccines, drugs, and tools that directly contribute to the improvement of the health of the clients. Organizational innovations improve the method of dispensing and distributing services. It should be noted that both types of innovation seek to improve the quality of service and increase productivity or reduce costs. However, both types of innovation are not always mutually exclusive and are usually oriented toward one of the two types. The health smart card is an innovation of the second type. The introduction of the health smart card helps the health professionals to better organize their work and improves the service provided to the client to such an extent that is yet to be determined. Its implementation must
address the adoption processes, as well as maintain trust between the client and the health professional.

A smart card can convey electronic information and/or interact with a computer system through a magnetic strip, storage chip, or microprocessor chip. It also refers to small, credit card-sized cards, often made of flexible plastic, with an embedded dime-sized integrated circuit microprocessor chip that can encrypt, store, manipulate, or retrieve thousands of bits of data as well as execute small applications. Its ability to be a compact, portable, and secure computing accessory makes it a potentially viable part of the healthcare system.

German inventors Jurgen Dethloff and Helmut Grotttrupp patented their invention, smart cards, in the year 1968. Dr. Kunitaka Arimura of Japan in 1970, American Paul Castrucci of IBM in 1971, and Roland Moreno of France in 1974 followed their lead. Historically speaking, health smart cards were very popular in Europe and showcased in France by Robert Moreno in 1974. In 1990, a campaign by health insurance companies in France, led to the issuing of 250,000 "Carte Santes" (health cards). By 1992, there were 1,000 readers in medical practices across France. A host of applications are associated with smart card technology globally, such as secure identity, financial payment, transportation, telecommunication, and healthcare applications (e.g., health insurance ID cards, physician ID cards, and portable medical records).

Smart cards have developed by leaps and bounds by way of various improvements that have served to facilitate its functions. For example, smart cards can be used for cashless purchases, warranties, long distance calls, mass transit access, and discount programs. Specific hospital applications of smart cards include electronic medical records, processing of insurance eligibility and claims, secure computer access, electronic benefits transfer, keyless entry, and employee/patient photo identification. Smart card applications can reduce paperwork, improve service, and decrease response time and errors. The Institute of Medicine has estimated that medical errors cause 44,000 to 98,000 hospital deaths and can result in excess health care costs of $17 billion to $29 billion in the United States each year. President Bush recognized the need to address such a problem, and he allocated $10 million to the U.S. Department of Health and Human Services for the fiscal year 2003, so as to enable health care organizations to adopt new technologies, such as health smart cards, for reducing medical errors.

The implementation of smart cards should provide each patient with a nonvolatile, electronic medical record that includes complete medical history, immunizations, emergency contact information, medications, allergies, living will, religious restrictions for treatment, blood type, appliances (such as pacemakers), prostheses, measurements, vital signs, conditions, lab test results, etc. It would also be of valuable assistance in the sharing of information among doctors, pharmacists, nurses, and ambulance workers. Therefore, its implementation should hasten the admission process and minimize prescription errors. Moreover, the application of health smart cards would enable patients to manage their own health, as they would be able to access healthcare provided by vendors such as clinics, hospitals, and pharmacies.

### Table 1. Characteristics of key participants

<table>
<thead>
<tr>
<th>Key Participants</th>
<th>Riyadh</th>
<th>Jeddah</th>
<th>Dammam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare Executive</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>EHR Implementation Manager</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Emergency Physician</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nurse</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Medical Assistant</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Admission Discharge Transfer Staff</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Patient</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lab staff</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pharmacy staff</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Radiology staff</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Information Technology</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>HIM Manager</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>EHR Builder</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Workflow Redesign</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

### 4. METHODS

The main goal of this study was to assess the importance of adopting health ATMs in KSA. SWOT analysis was conducted to assess the adoption of health ATMs in KSA. SWOT analysis may reveal the major strengths and weaknesses of the concept. In addition, the opportunities which can be availed of and the key threats to the system could be figured.

Three focus groups were conducted in three main cities, Riyadh, Jeddah and Dammam, across Saudi Arabia during the period 2013-2014. The groups consisted of 14, 12 and 13 participants (Table 1) from the cities of Riyadh, Jeddah and Dammam respectively. They were selected on the basis of their professional background. The participants, who were attending free workshops conducted by the researcher on e-health status in the country, voluntarily took part in the discussions. The discussions were centered on the study objective. The researcher utilized questions to initiate the focus group discussions and organize the flow of conversation (Appendix). The participants were asked about their familiarity and experience with regard to health ATMs.

Focus group audio files were transcribed and qualitatively analyzed using Nvivo software (version 10). The qualitative analysis consisted of immersion (i.e., reading and exploring the data as a whole and in pieces) and crystallization (i.e., reflecting and identifying relevant substance, themes, and patterns from the immersion process). The researcher engaged in this iterative and nonlinear process to develop a coding scheme which included both preconceived and emergent themes. Common themes across the focus groups were identified and compiled in the SWOT framework (Table 2).

Analyzing the workplace prior to implementing any project contributes significantly to the success of its adoption. Scanning through the organization's resources, characteristics, and factors is an essential practice. It helps in drawing a clear and easy blueprint that reflects the organization's readiness for adopting the proposed project. This procedure is conducted during the planning stage and includes all levels of the organization. One of the most beneficial strategies used by successful organizations for this purpose is the SWOT analysis.
5. RESULTS

SWOT analysis aims to identify the organization’s strengths, weaknesses, opportunities, and threats (Table 1). In the context of KSA, these aspects are pinpointed at each level of the healthcare sector in great detail to help the concerned authorities take the correct decision with regard to the ATM project. On careful observation, it was found that the sector possessed a number of strengths that would help it in achieving successful outcomes and reaching the goals outlined in the project.

Strengths

The health sector of KSA generates a significant amount of revenue, which is an indispensable resource as far as the launch of the project is concerned. Also, there is an IT Lead, who is an expert in implementing electronic health services programs. Such a capability is considered a valuable asset that would facilitate the processes of system planning, designing, selection, and implementation. Other useful resources identified are easy access to consumers and social media. When the organization conducts trainings and seminars, it is exposed to a large number of consumers. The latter’s awareness could be increased to a great extent during these events, which in turn could also reduce their resistance. Staffs of the organization were identified to be capable of maintaining confidentiality, which means that when the project is implement, they will not suffer any security issues in terms of this aspect.

Weaknesses

While observing the internal system characteristics that could hinder successful outcomes or prevent achieving goals, we came across nine weaknesses. The sector did not have any specified policy or strategy that supports health ATM processes and procedures. Also, the organization is in a low level of adopting such system where the network can’t handle high capacity of usage, and there is expectation of having network interruption. Health ATMs require operating staff to be familiar with medical terminology, but there was a paucity of such knowledge. It was revealed that the sector had not determined its functional and non-functional requirements, workflow of all the departments, and not allocated the proper budget and ownership of the project if it is the organization to own the project or the company implementing the system. Also, there was no involvement of the stakeholders and the providers seemed to show resistance to changes.

Opportunities

A keen observation of the external environment indicated a high number of opportunities that could give the project a competitive edge. Support and encouragement from health associations and councils could ease the process of adopting such a system. The presence of robust external systems such as HIS and social media could also be utilized to support and facilitate the proposed system by way of awareness campaigns. The success of any organization depends mostly on the relationship between the demands of the external environment and the services provided by the organization. The best opportunities of the observed external environment of the proposed system are the demand of rural areas to have better access to health services, the government’s decision to improve their accessibility to health services, the consumers’ desire to be satisfied with the health services provided, and the demand of national search to accurate and timely data. The consumers

<table>
<thead>
<tr>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Expert e-health project team in implementing e-health services programs</td>
</tr>
<tr>
<td>2. The creation of the Saudi Center for Health Information Exchange</td>
</tr>
<tr>
<td>3. The KSA health sector is generating high revenue</td>
</tr>
<tr>
<td>4. Easy access to consumers</td>
</tr>
<tr>
<td>5. Easy access to social media to increase awareness of ATM</td>
</tr>
<tr>
<td>6. Conduct trainings, seminars in schools, hospitals or any institutions or agencies to provide awareness among professionals.</td>
</tr>
</tbody>
</table>

Table 2. Results of the SWOT Framework

are familiar with the concept of using an ATM machine, and this ensures a lack of resistance to such services.

Threats

The final component of the SWOT analysis involves the
identification of the environment external factors that could put the organization at hazardous risk or prevent it from reaching the goals outlined. With regard to KSA’s health sector, there are many threats that could force the decision makers to reconsider their proposal of introducing the ATM system. In order to ensure success, all health organizations need to work collaboratively toward achieving the goal of the proposed system. There is, however, a lack of cooperation among them. The proposed system requires high support, knowledge, and experience in the field, but it seems that there is lack of regional experience and references in the field of ATM, which makes it difficult to implement the system. A number of functional and non-functional status factors such as national data warehouse, unified health documentation at the national level, legal/regulatory standards regarding health ATMs, security, and network infrastructure in rural areas are not available. Related management concerns such as frequent changes in MOH leadership, unavailability of unified committee to issue ATM health in KSA, and shortage of competent professionals maintaining e-heal services also exist. Finally, consumers who are not familiar with ATM machines and others who do not accept the idea might lead a resistance against such change.

Based on the SWOT analysis (Table 1) of the organization’s strengths and weaknesses, and the external environment factors in the form of opportunities and threats. The SWOT analysis indicated some factors that are considered ones from the top reasons identified factors or reasons are poor project management and resistance of the end users (providers).

6. DISCUSSION
With the advent of the concept of health ATMs, Personal Health Records (PHRs) would function as an ATM where patients could access their health information, get monthly updates on their accounts, and receive optional services (10). Health ATMs would provide patient information in the form of previous hospital stays and diagnoses, and documents such as scans, videos and pictures. A project as far reaching as health ATMs will have a great impact on both the micro (within the hospital) and macro (the healthcare system) levels if implemented correctly.

According to Aldosari (11), the four different reasons for e-health projects’ failure are leadership failure or poor project managers, selection of the wrong vendor, IT leads, and resistance to change. From my point of view, leadership failure is one of the top reasons because in the last few years, the MOH leadership has witnessed many changes, which in turn has caused changes at the lower echelons, thereby hindering a given project’s progress. The frequent changes have a serious impact on the health system because a new leader comes with a new vision and strategy that might not be similar to the previous leader’s plan of action. Having a stable health environment is mandatory for the success of the health ATM project, which contributes toward the provision of patient-related information such as prior hospital stay, referral of patients, and also tracks patient health.

In addition, it is critical to involve stakeholders in the planning process to increase the trust and commitment of the project process or outcome (12). Stakeholders will find the project more appealing if the project managers translated the opportunities and strengths into monetary terms.

Health ATMs could benefit patients residing in rural areas, which are abundant in KSA. Health ATMs provide low-cost, easy access to personal HIS and personal care management system, which would help people in managing their health in a more effective manner (13).

7. CONCLUSION
Health ATM is a promising tool that would allow patients to become more aware of their own health, and feel empowered and able to take decisions. If this project is implemented successfully, benefits would be achieved at the organizational and national levels. The benefits would include ease of access to healthcare because there would be an increase in the number of patients served and they would also be better educated and informed about their health, which in turn would promote a healthy lifestyle and improved overall health.

Further research, however, needs to be conducted on the effectiveness of health ATMs and the ways to carry out such a project without the prospect of failure. Studying past experiences of implementing similar projects would help in avoiding the common problems that project managers face. Thus, it is crucial to educate the project managers about the benefits of learning from others as well as educating themselves about the needs and the requirements of the concerned organization. In conclusion, health ATM would be a promising new advancement in the field of health if the project were to be planned and implemented correctly.

• Implications of results: The project managers need to learn about the needs and the requirements of the concerned organization. And Health ATM is a very promising new advancement to the health field if the project is implemented and planned correctly.

• Conflict of Interest: The authors declare that they have no conflicts of interest in the research.

• Protection of Human and Animal Subjects: Human and/or animal subjects were not included in the project.

REFERENCES
6. KFSH&RC.org (c2015). Riyadh, Saudi Arabia: The King Fais-