Implementation of an EHR system (Hakeem) in Jordan: challenges and recommendations for governance

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The electronic health record (EHR) as the repository for all patient electronic health information holds a great potential for developing countries, and several of these countries have recently adopted the EHR as a way to improve the quality of their services, reduce medical errors, and improve patient care and safety by accessing accurate information at any time. Jordan is one country in the Middle East that has an advanced healthcare system, having worked to expand and improve its healthcare services and patient care over many years. In 2010, the first national e-health initiative in Jordan, the Hakeem project, was launched. However, in spite of having an implemented EHR system, many countries, including Jordan, continue to face a number of challenges, such as poor usability because EHR systems are not easy to use or to learn. Thus, the ultimate promise of EHR systems may not be fulfilled and the work of staff not made easier (Zhang & Walji 2011).

This paper provides a summary of various challenges faced by the Hakeem project and suggests ways to govern and manage these challenges.

Overview of Hakeem Project

Hakeem is an Arabic word that means doctor in English. It is an EHR that integrates different types of health information systems, including the administrative, laboratory, radiology, pharmacy, computerised physician order entry and clinical documentation systems. The Hakeem project was based on a comprehensive open-source health information system and the EHR system known as VistA, which was deployed and implemented by the US Department of Veterans Affairs. Many countries have used VistA and have customised it according to their needs.

The Hakeem pilot project began in 2009. Initially, it included just one hospital and one comprehensive health centre. However, after the success of the pilot project, King Abdullah Bin Hussien, King of Jordan, announced that Hakeem would be implemented in all public hospitals and health centres throughout Jordan in 2010, the objective being to improve the quality of patient care and safety.

The Jordanian healthcare sector consists of 45 public hospitals and 84 comprehensive medical centres. In order to implement Hakeem in all hospitals, three phases of implementation were required. The project started with the connection of one public hospital, the Princess Hamzah Hospital, with the Amman comprehensive health centre. Then a second public hospital was connected to the system, and this was followed by all of the other public hospitals and health centres in Jordan until they were all connected.

Components of Hakeem

The Administrative Information System contains critical patient information, such as name of patient, demographic data, patient disposition, employer information, chief complaint, medical record number and other related information. The Laboratory Information System is used to collect orders, laboratory instruments results, patient schedules, billing and other administrative information. The Radiology Information System is used to track, schedule, report, and distribute patient data and images. The Pharmacy Information System records the dispensing of medications, filling of prescriptions, and records payments. The Computerised Physician Order Entry System provides a clinical electronic order dealing with laboratory, pharmacy and radiology services, which provide services such as ordering, alerting, customising order sets, and reporting results. The Clinical Documentation System produces electronic reports, incorporating physician, nurse, and other clinician notes, flow sheets, discharge summaries, transcription document management, medical records abstracts, and other such data.

Challenges to implementing Hakeem

EHR initiatives face a number of challenges. Some of these challenges are experienced generally by most countries that implement EHR systems, while other challenges are more specific to particular countries or organisations. General challenges faced by many countries, including Jordan, include financial, technological, and policy and legislative challenges, while other challenges, such as stakeholder and organisational challenges, may be more specific to the country in question.

Financial challenges

In 2005, a study conducted in Jordan to cost the implementation of an EHR estimated it to be $63,000 per bed, making the cost of implementing Hakeem in all hospitals and medical centres throughout Jordan very expensive. The fact that the Hakeem project required such a large budget was a major problem for the Jordanian Ministry of Health (MOH). Costs were associated with: (a) implementation (most public hospitals and medical centres in Jordan do not have the infrastructure required for
implementation, including hardware, software, and information technology (IT) specialists (Awokola et al. 2012); (b) maintenance and support (Hakeem requires support and maintenance after deployment); and (c) training of stakeholders to use Hakeem.

**Technological challenges**
Hospitals in Jordan generally lack technological infrastructure, and most public hospitals do not even have an IT department (Awokola et al. 2012). The high rate of change in the technological field compounds this problem. It is also difficult to support and maintain databases because of the huge volumes of data, and there are also many other ongoing problems with the system (e.g. power failures, systems crashing, data being lost).

**Policy and legislative challenges**
In most countries, policies exist to protect patient privacy and it is important that these policies be well protected and strictly adhered to (Siska & Tribble 2011). However, in Jordan, policies or regulations for privacy of patient information are not clear. In addition, there are other types of threat and attack on privacy of information in the cyber world, such as from hackers and viruses.

**Stakeholder challenges**
When implementing Hakeem, a number of challenges for stakeholders have been observed, which might explain why some stakeholders resist or reject change. Some stakeholders may not perceive any direct benefits for themselves from the project and believe that the only beneficiaries of change will be the patients. Administrative staff may fear that EHR systems such as Hakeem will replace them in future and become concerned about job security. Some view themselves as ‘experts’ and resist being labelled as novices or learners, even when a new system is being introduced. Fear of failure can also create resistance to change, which may have inhibited leadership in the healthcare sectors because they wanted to be successful all of the time.

Age can also be a factor. A number of older staff, particularly specialist doctors, simply cannot use technology. Some staff may not have had sufficient experience with technology, and many may have used traditional paper-based methods for so long that they view using computers as too complex.

There are also workload issues: doctors, nurses, and pharmacists have heavy workloads and experience a high degree of pressure in their jobs. According to Jordan MOH, the population in 2010 was 6,113,000, with only 2.65 doctors, 4.19 nurses and 1.5 pharmacists per every 1,000 people, which places a heavy burden of work on these health professionals. Introducing a new system such as Hakeem adds to their workload and reduces their productivity, because they have to enter the information and diagnosis of all patients into the system.

In Jordan, language also presents a challenge. Hakeem has been developed using English terminologies, which can be a problem for some staff, especially administrative staff, because most of them speak Arabic at work.

**Organisational challenges**
Turnover of trained employees is high, which results in companies recruiting novice employees and leads to additional training costs. There are also competitors outside Jordan, such as medical factories, who expected the Hakeem project to fail.

**Governing the challenges**
Many lessons were learnt while implementing Hakeem, which have given rise to a set of guidelines and recommended solutions for challenges faced by Hakeem in Jordan. These may also be useful to those implementing similar systems in other countries.

- Governments should consider the implementation of projects such as Hakeem as both lengthy and costly, but with great benefits to all stakeholders in the long term.
- The Jordanian Government should give full support, especially financial support, to strategic initiatives that will encourage and assist stakeholders to embrace change.
- The vision, mission, goals, and benefits of the Hakeem project should be made known and be well understood by all stakeholders.
- Hakeem should implement a clear and understandable work policy.
- Stakeholders should be involved in all phases of Hakeem development, including the design of the system and IT decisions.
- The workload for doctors, nurses, pharmacists, and others who work with patients should be reduced to allow time for these healthcare professionals to become familiar with the system and use it effectively. Time spent with patients should be increased to allow time to insert patient data into the system. Workload calculations should be averaged so doctors do not feel that they are overworking. This can be achieved by hiring an optimal number of staff to suit the number of patients.
- Healthcare staff should understand that Hakeem has not been developed to replace jobs.
- Financial and moral rewards, such as certificates, should be used to enhance productivity and encourage staff to use the new system.
- Laws related to privacy and confidential information should be well publicised and enforced so that the general population is aware of them. In Jordan, an electronic transaction law has existed since 2001.
- EHR must be easy to use, easy to learn, and have the capacity to accommodate changes in technology and processes.
- The most secure tools and algorithms to safeguard and protect data should be applied, such as encryption, watermarking and applying accountability.
- A mitigation plan should be established for emergency situations to ensure that Hakeem continues to work.
- To facilitate Hakeem services, it is better to establish an in-house training department, to simplify staff training process. Most researchers have found that
training is the best solution to decrease the healthcare staff resistance toward changes.
- Using data warehouse and data mining techniques to deal with huge volume of data. Cloud computing could also be used to store data.

**Conclusion**

The expectation is that the implementation of Hakeem will provide a modern health information management system throughout Jordan. However, many challenges still exist that could hinder the Hakeem implementation or limit its success. We hope that the recommendations outlined in this paper will assist in overcoming those challenges.

**References**


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