

# Evaluating E-Health Services and Patients Requirements in Jordanian Hospitals

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**Abstract:** *the aim of this research is to bring latest status of e-health services in Jordan, and to describe current requirements of e-health services development. The significant barriers being faced by the Jordanian health sector and preventing the adoption of e-health services technology was addressed. The study has shown positive patients attitude towards the existence of e-health services, however it has shown a negative awareness regarding technological background required for using such services. Finally, this research draws vital recommendations for adaptive e-health services development considering the country requirement.*

**Keywords:** *E-health, patients, readiness, awareness.*

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## 1. Introduction

The continuous development in the field of information and communication technology (ICT) has contributed to the huge growth of internet and electronic services, thus it has become possible to exchange information and to communicate using faster, reliable and low cost methods. The availability of such services and multimedia contents, without many constraints towards time or place, has enabled the use of Information and Communication Technologies (ICT) within many different sectors. The broad acceptance of commerce technologies and the foundation of different business models have encouraged their application to the activities of health sector by increasing the integration of work processes, reengineering of supply chains and distributed access to information. The incorporation of Information and communication technologies infrastructure within the health sector processes and services has been referred to as Electronic Health or as abbreviated by the word "E-Health" [8]. Electronic health services (E-Health) scope is not constraint to the local health level; it might exceed to reach activities at federal or even regional levels. It also can refer to internal activities within health sector and external relations that might include other businesses or suppliers, other governments or citizens [13]. E-Health has brought different benefits such as [18, 12] :

- Efficient health operations and services.
- Improved relations with government and other businesses.
- Improved the quality and access to services for citizens.

- Enhanced the participation level of citizens with health sector activities.
- Availability of e-health services for new and alternative (non-invasive) medical procedures.
- Reduced use of traditional emergency services.
- Improved non-emergency services.
- Decreased waiting time for non-emergency services.
- Greater awareness of services among rural and remote residents and caregivers.
- Availability and timely accessibility of critical information in the event of emergencies.

This field of services is bringing many benefits and is achieving a steady change from the traditional health care delivery system to appropriate electronic health care delivery systems. The current and continuous growth of e-health concepts, technologies, applications and strategies are all contributing to the change and development of e-health [19]. Moreover, e-health new methods and strategies are also encouraging new approaches towards non-invasive medical interventions, and providing alternative way through focusing on preventive measures, and greater emphasis on self-care and rural medicine. E-health has showed a great potential in nation's health care growth and development through reducing administrative costs and eliminating inappropriate and unnecessary emergency services, improving patients experience and enhancing the health service quality [5].

This paper describes the current status of e-health in Jordanian public and private hospitals; in which e-health implementation and adoption challenges are addressed. The study has presented a comprehensive e-health system model including all required components and functionality. Using content analysis and

questioner approaches, the study has measured patients' awareness of e-health services and attitudes towards utilizing such services [14].

## 2. E-Health Driving Forces

Different factors are participating in driving towards a better implementation and wider use of e-health services and technologies. Modern technologies are now pervasive in many societies; more users each day are having significant access to consumer-oriented e-health information and services. Such capabilities and services are creating a social trend in changing customer's attitudes towards accepting and adopting e-health. Users' involvement in many technological services and applications through the internet are also driving towards better adoption of e-health [17]. Also the provided benefits of reducing the administrative and medical costs has provided more efficient information flow and more effective workflows that added to the growth of e-health. Moreover, users access to information they desire precisely, being physicians, nurses, staff or patients, have helped in promoting the use of e-health in a wider scope [9].

The huge burden on the current health sector has also raised a demand for alternative solutions achieving improved healthcare services quality and utilizing daily used technologies allowing for interaction between staff, patients and their health records [24]. All of the previously mentioned factors have created an expectation that future healthcare systems should eventually adopt the e-health vision and functionalities.

## 3. E-Health Barriers and Challenges

People resistant towards the technological advancement behind e-health is considered the most essential ingredient for vibrant e-health development and adoption. Additional barriers are associated with current health care policies and mechanisms that are hindering the development of e-health, such as not having a concurrent and clear legislation against fraud and unethical practices towards protecting patient data privacy and confidentiality of. Moreover, the lack of standards or coalescing agreement on standards has proved to be degrading e-health infrastructures development, thus this affected the spread of e-health products and services [15].

Having too many different platforms, software standards, security procedures are attempting to hinder the adoption of e-health technology marketplace. The complexity of presenting common shareware without compatible standards creates excessive or unnecessary delays in collaborative projects. The lack of standards is also presenting the risk of magnified user resistance, especially from health professionals [6]. Another area of challenge is the change in the work design. In many

cases, consumers, providers, and insurers are not prepared for the changes in their respective information management roles. The shift to e-consumer empowerment means that e-provider corporations will become information disseminators rather than information gatekeepers. Accepting such change in business functioning is critical to the success of e-health operations [23].

Another e-health challenge is the literacy problem among different users, also the monolingual dilemma facing many users and societies are presenting a natural barrier to information sharing [21]. Many other factors can be defined as barriers for adopting e-health, such factors are mainly concerned with the country and society that is surveyed or approached in the research study.

## 4. E-Health Services and System components

According to [3], the most important benefits of e-healthcare systems towards patients include:

- Control over medical records
- Providing the ability to compose health concerned questions better.
- Provide a less intimidating venue caused by the relative anonymity which may allow patients to be more comfortable in asking questions they may not ask during physical meeting
- Allowing the provision of services through different routes according to the technological infrastructure initiated by the medical institution.

E-health services might vary from simple to more complexes, based on different factors such as (Medical institution policies, budget, user awareness and time). E-health services are mainly associated with technological development in the field of internet and telecommunications. Hence, patients and supportive staff can utilize e-health services through the web or any other access means, such as mobile phones. E-health services provided by medical institutions towards patients come in different forms, and are attached within a unified system described as Electronic Medical Records System (EMRS) [11]. EMR is defined as an inter-organizational information system that have the capabilities of capturing patient's medical encounter within the medical provider, including storage and retrieval of patient information, assessment and plans for patient care [10]. EMR systems smoothes the progress of physicians and other health care professionals by providing the following services [25] and [22]:

- Monitor the health status of their patients with electronic representation of medical charts and tables.

- Providing a better support towards health care decisions with evidence based guidelines in timely and location wise manner.
- Enabling faster and reliable referrals to specialists and other health care providers.
- Computerize ordering of prescription drugs, laboratory tests, and radiology results.
- Store and retrieve patients' medical records from different locations.

The use of such EMR systems is an urgent demand especially in developing countries, such as Jordan. However, developing countries are facing financial burdens preventing the provision of improved health services to specialists and patients, and are having challenges to accomplish the required technological advancement towards e-health developments. As shown in figure 1 below, the EMR system consists of several interacted modules. Such modules are organized in a collaborative framework achieving a unified functionality, and providing information services to system users such as patients, doctors, and professionals.

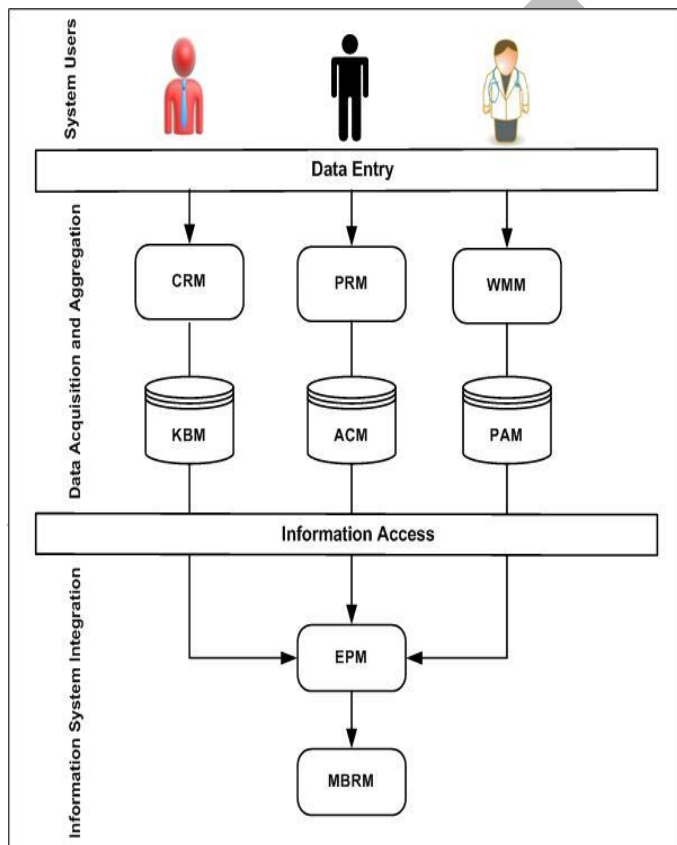


Figure 1. EMR System Components.

#### 4.1. Patient Registration Module (PRM)

This module is used for patient's details registration. It helps tracking and maintaining important details of patients, health insurance plans and all related medical history. This module interacts with the Ambulatory

Care Module (ACM) for providing access to all patients' up-to-date and historical medical information.

#### 4.2. Ambulatory Care Module (ACM)

This module holds patient's medical records such as information related to family medical history, statistics on vital parameters, immunization records, surgical procedures, allergies, physical examination reports, diagnosis results, lab reports, radiology reports, EKG charts, MRI, CT scan reports, medication reports, and any other notes from other physicians in a central repository [16].

#### 4.3. Workflow Management Module (WMM)

This module is used for managing the workflow within a health care organization. Such module holds the functionality towards creating work lists for various professionals such as Specialists, General Practitioners, Nurses, and Lab Staff [14]. This module interacts with the Patients Appointment Module (ARM) in order to create the needed work lists in the health care organization, and to make reservations required for specialists, general practitioners, and for other resources such as medical labs, emergency rooms, operation theatres, and so forth [16].

#### 4.4. Patients Appointment Module (ARM)

This module holds a repository of information related to patients' previous or future medical appointments; including patients' visits dates, required clinics, patients' disorders and treatments, and support doctors and specialist [11, 16].

#### 4.5. Clinical Registration Module (CRM)

This module is used for clinical references registration. It is used for holding all required information for identifying different disorders, medical complications and tracks information on latest drug productions and related clinics, laboratory and delivery system [11].

#### 4.6. Knowledge Base Module (KBM)

This module interacts with the CRM in order to hold a repository of clinical references for different disorders, medical complications and tracks information on latest drug dosages and delivery systems [9]. Such information is made available for search and access by medical professionals for any reference information [16].

#### 4.7. E-Prescription Module (EPM)

This module is used for generating and tracking electronic prescriptions [9],[11]. The provision of medical prescription is based on the integration of information made available for previous modules. Physicians can use this module for writing

prescriptions electronically, which are then transmitted to the specified drug stores. Physicians can also make orders electronically for different referrals and laboratory and radiology tests. Users can track test orders status and extent to which a particular prescription is filled by a drug store [16].

#### **4.8. Medical Billing and Receivables Module (MBRM)**

This module is used for tracking charges associated with medical prescription, diagnosis, medical check-ups, medical procedures, surgical procedures, lab tests, and medical prescriptions [11]. This module is responsible for retrieving patients' insurance details and sending medical claims to insurance clearance agencies. This module should track all the accounts receivables from insurance agencies, and if payments are not received from insurance agencies within the stipulated period, it re-bills the customers for outstanding dues [9, 16].

### **5. E-Health Services in Jordanian Hospitals: Current Overview and Evaluation**

Many hospitals in Jordan are facing several problems with the daily processes of health care professionals while handling patients' medical records [20]. These problems are mainly concerned with the use and management of paper-based records. The existence of paper-based records becomes a major problem with the increasing possibility of losing or misplacing records [1]. Moreover, the issues concerned with data inconsistency and data integrity are other problems related to paper-based records. An additional problem is the non-integrated databases across hospitals, which pose a large problem, providing major obstacles to collecting, accessing, and viewing patient's records [4].

Jordan consists of (without medical centers) 104 hospitals, serving health care to around six million people. Hospitals in Jordan can be categorized as follows: government hospitals, ministry of defense, universities and private sector. Jordan is considered as a developing country, which is still having several limitations preventing the development of a complete e-health system fulfilling the national healthcare needs [2]. However, there has been a governmental commitment to improve existing healthcare level [1]. This was targeted by implementing Hakeem project, which is the name of the first national e-Health initiative project in Jordan. This project was launched in October 2009, and was managed by the Jordanian non-profit agency (Electronic Health Solutions) [7]. Hakeem aims to provide efficient and improved healthcare services to patients, through facilitating a digital platform that will provide up to date electronic

medical information and services all over the participating healthcare facilities in Jordan. Also, this project aimed to help healthcare system in achieving better management of chronic illnesses, and advanced quality of healthcare service through providing the capability of alerting patient and associated medical care centre with certain exams, tests, or medication when such information is required. Hakeem project is considered as a great step towards the provision of e-health services in Jordan; however, this project is still in its early phase and is facing obstacles preventing its wide deployment among all hospitals [1,7].

#### **5.1. Evaluation Methodology – Jordanian Case**

This research considers evaluating e-health systems and services towards patients in Jordanian public and private sector hospitals; this was approached through incorporating two different methodologies. The first was focused on examining health institutions' websites, in order to analyze its e-health content. The second methodology was focused on conducting two questionnaire studies measuring patient's awareness towards e-health services, and measuring hospitals' management point of view regarding e-health implementation challenges. Accordingly, the evaluation methodology is divided to three steps

- Content analysis [14], evaluating 17 Jordanian hospitals websites in order to measure the percent of hospitals providing dedicated electronic services towards patients. The results of this investigation have shown that most of the surveyed websites provide only informative services and less than 5% provides interactive e-health services.
- A questionnaire was submitted to management departments and computer centers in the surveyed hospitals, in order to define the challenges towards implementing e-health services to Jordanian patients using web sites and mobile applications.
- A second questionnaire was applied to group of patients measuring their readiness and need for an e-health service among patients.

The first questionnaire was applied to IT and management staff in the surveyed hospitals. This questioner was focused towards analyzing the reasons behind the absence of health services in Jordanian hospital. A likert scale of 5 points ranging from (1: Strongly Disagree to 5: Strongly Agree) was used to measure the effect of the following concerns on e-health services availability:

- Lack of proper knowledge in the field of e-health.
- Lack of expertise towards designing and implementing e-health services.
- Lack of financial capabilities towards implementing such services.

- Lack of motive towards implementing such services.
- Conflict towards hospital policies and procedure.
- Lack of patients' awareness towards such e-health services.

Data collected from all participating hospitals was analyzed using "one-sample-test" and a "Two Independent Samples-t-test" was used for differentiating between data received from private and public sector hospitals. Table 1 and 2 summarize the analysis results regarding hospital attitudes towards e-health successful implementation challenges.

**Table 1.** One-Sample Test - First questionnaire.

|     | Calculated t | df | Sig. (2-tailed) | Tabulated T |
|-----|--------------|----|-----------------|-------------|
| AVG | 0.732        | 16 | 0.475           | 0.0882      |

**Table 2.** Two Independent Samples t-Test – First questionnaire.

|     | t     | df   | Sig. (2-tailed) | Hospital | n  | Mean   | Std.    |
|-----|-------|------|-----------------|----------|----|--------|---------|
| AVG | 0.585 | 15   | 0.567           | Private  | 13 | 3.1282 | 0.37978 |
|     | 0.391 | 3.38 | 0.719           | Public   | 4  | 2.9583 | 0.843   |

Where:

- N is the number of surveyed hospitals
- STD is the standard deviation.
- SIG is the significance value.
- t is the one sample t-test value.
- T is the Tabulated t value.
- df is the degree of freedom.

Result achieved from one-sample test, shows that the calculated t (0.732) is larger than the tabulated T (0.0882) with a significance of (0.475) that is larger than (0.05), thus it was concluded that the surveyed hospitals are having negative status towards implementing e-health services, and all hospitals agree that the mentioned points are considered as the main imposing challenges towards e-health adoption in Jordanian hospitals. The results of the two independent samples t-Test, as shown in table 2, gives more details regarding private and public sectors hospitals, in which both sectors are having negative status towards e-health services with a significant values larger than (0.05). In addition, public hospitals are apparently having more negative status towards the challenges with respect to the results displayed in Table 2.

The second questionnaire was conducted to analyze additional constraints preventing the implementation and usage of e-health services, taking into consideration patients' point of view. This questionnaire was used to measure the readiness and need for e-health services among patients. In which, it was divided into two categories. The first category contained the following questions, and was focused on

surveying patients' technological preparedness towards e-health:

- Do you know what the term e-health means?
- Do you feel confident using a PC?
- Do you have internet access at home?
- Do you personally use your PC to browse internet?
- Do you personally use your mobile phone to browse internet?
- Do you have someone to assist you in browsing internet through your PC or mobile?

The second category contained the following questions, and was used to survey patients' needs towards specific e-health services:

- Have you visited hospitals website before?
- Do you believe that having online treatment plan service is important?
- Do you believe that having online reminder services is important?
- Do you believe having appointment system within the provided e-services is important?
- Do you believe having prescription system within the provided e-services is important?
- Do you believe having e-emergency system within the provided services is important?
- Do you believe having e-health services within hospitals web site, will help you get engaged in using e-health services?

The data was gathered from the participants and was analyzed using "One-Sample-Test" for all the participating patients in the surveyed hospitals, see table 3 and 4, and using "Two Independent Samples t-Test" for differentiating between patients regarding private and public sector hospitals, see table 5.

**Table 3.** One-Sample Test – First Category.

|                | calculated t | df | Sig. (2-tailed) | tabulated t |
|----------------|--------------|----|-----------------|-------------|
| First Category | -5.805       | 51 | 0.000           | 3           |

**Table 4.** One-Sample Test– Second Category.

|                 | calculated t | df | Sig. (2-tailed) | tabulated t |
|-----------------|--------------|----|-----------------|-------------|
| Second Category | 9.616        | 51 | 0.000           | 3.5         |

By taking the result calculated by one-sample test for the first category measuring technological preparedness towards e-health (table 3), it was shown that the calculated t (-5.805) is smaller than the tabulated T (3) with a significance of (0.000), which is smaller than (0.05). Thus, it was conclude that the participating patients in the surveyed hospitals are having negative status towards technological preparedness towards e-health services. Moreover, the results of one-sample test for the second category

measuring the needs towards specific e-health services (table 4), showed that calculated  $t$  (9.616) is larger than tabulated  $T$  (3.5) with a significance of (0.000) which is smaller than (0.05). Thus, it was concluded that participating patients are having positive attitude towards the needs of implementing e-health services in Jordanian hospitals. After analyzing the data in terms of public and private hospitals (table 5), results in terms of the first category, have shown that the significance difference is (0.002) which is smaller than (0.05). Thus, it can be drawn that there is a difference in terms of e-health preparedness level among participating patients from private or public hospitals. Considering the second category, the significance is (0.512) which is larger than (0.05). Hence, there is no difference in terms of e-health services needs among participating patient visiting public or private hospitals.

**Table 5:** Two Independent Samples t-Test – Second questionnaire.

| Category        | t      | df | Sig. 2 | Hospital Type | n  | Mean   | Std. Deviation |
|-----------------|--------|----|--------|---------------|----|--------|----------------|
| First Category  | -3.23  | 50 | 0.002  | private       | 17 | 1      | 1              |
|                 |        |    |        | public        | 35 | 2.2571 | 1.44187        |
| Second Category | -0.661 | 50 | 0.512  | private       | 17 | 4.7647 | 1.25147        |
|                 |        |    |        | public        | 35 | 4.9714 | 0.95442        |

## 6. Conclusion and Recommendations

Jordan as a developing country is facing significant barriers to implement e-health system models due to limited resources and poor ICT infrastructure in some areas. This research has identified additional constrains preventing successful e-health services implementation; this includes lack of hospital administration awareness and expertise towards e-health, limited financial resources, and restrictive hospitals policies. The survey towards patients' showed a wide interest towards having e-health services and most participating patients shared similar e-health services needs, and many agreed that incorporating such services would enhance the daily processes and quality of services provided to fulfill their needs. However, patients have shown limited awareness regarding the technology behind e-health services utilization. In addition, patients have addressed limited availability of e-health technology requirements at the patients' side.

An improved incorporation and utilization for e-health is required in order to promote better quality of services among the health sectors. This can be achieved by initially increasing the awareness and readiness of e-health services to both hospitals' administration and the public, by addressing its significance and affect on the health sector efficiency. In addition, health care institutions have to adopt new policies allowing the integration of e-health services into the healthcare structure. Afterwards, optimized e-

Accordingly, it was concluded that the Jordanian patients are having limited awareness regarding the technological background required for e-health services utilization. However, the required technology is not widely available among participating patients. In the same concern, patients visiting public and private hospitals are sharing similar needs towards implementing e-health services in Jordan. The results have shown that Jordanian public and private hospitals are facing several challenges preventing the wide implementation of e-health services; however public hospitals are having more negative experience towards these challenges. In addition, the study has addressed the lack of hospitals' administration awareness of e-health services and its positive effect on developing the healthcare system experience.

health services should be developed considering patients' requirements, preferences and available infrastructure and resources. Finally, such services have to be gradually integrated allowing an easy transition from the traditional healthcare process.

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