ELECTRONIC PRESCRIBING SYSTEMS IN LEBANON: A READINESS ASSESSMENT

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Abstract
A number of impediments exist hindering Lebanon from improving healthcare services, despite the interest of the different stakeholders. Accordingly, the Lebanese healthcare sector lives with problems in allocating resources and upgrading health facilities, low investment in healthcare, and a sharp need to improve the quality of patient care. A previous study tackled the feasibility of one of the suggested improvements which is the adoption of an Electronic Prescribing (EP) system. The purpose of this study is to assess the level of readiness among the stakeholders. The study embarks upon the issue on the economic, technical, and organizational levels. The main conclusion includes the challenges and limitations that should be addressed for successful implementation. Such a study complements the feasibility analysis in exposing the deficiencies in current healthcare practices and bringing to light the essential need for such a system. This study comprises an extensive examination of relevant literature and the implementation of practical research. The theoretical aspects are clear and documented, showing that technically and economically EP systems are feasible in Lebanon. The results of the study are based on a questionnaire that was completed by stakeholders, doctors and pharmacists to assess the organizational feasibility. The analysis in this study aims at elucidating the diverse levels of individuals’ willingness to engage with a new technology or their resistance to change. The quantitative research methodology is applied on the results attained, to perform the statistical analysis. The study is concluded by providing recommendations on improvement measures.

Keywords: e-health readiness, electronic prescribing, healthcare, Lebanon

1 INTRODUCTION
Improving healthcare services in Lebanon is a major topic of interest. The Lebanese healthcare sector is witnessing a level of instability since the government is facing problems with allocating resources and upgrading health facilities. Instead, patients are relying on private healthcare professionals and institutions. While the healthcare sector is encountering low investments, the need to improve the quality of patient care increases.

Currently, the paper-based process used for medical prescriptions is one of the weak points in the Lebanese healthcare sector. The presently adopted prescriptions method causes high levels of medical errors due to bad handwriting. With handwritten prescriptions, the risk of inaccuracy increases and the problem of unclear doses arise. Another problem is that pharmacists in Lebanon prescribe medications sometimes without a doctor’s consultation. This is causing medication errors especially when the pharmacist is not aware of the patient’s history, drug-allergy reactions, age, weight, and correct doses. Here, the need for an Electronic Prescribing system arises since pharmacists will be provided with a medical history of the patient and hazard prescriptions will be reduced. The EP system will also solve the National Social Security Fund (NSSF) surveillance problem currently occurring in Lebanon. A patient with no insurance is capable of acquiring a medication prescription using a relative’s name already having insurance. An EP system can monitor and prevent such a problem leading to a higher level of efficiency. Another problem is the waste of resources. Both pharmacists and prescribers are spending time and money with the current paper-based process. With an EP system, paper expenses are reduced and time delays decrease.

Listing the existing problems with the current prescription process employed in Lebanon gives an idea about the fundamental need for an EP system. An adoption of such a system minimizes the resources spent and maximizes the quality of patient care.

This study evaluates the degree of readiness for EP system implementation in Lebanon and measures its feasibility on three levels: economic, technical, and organizational.

With an estimated population of 4,227,597 people, Lebanon is classified as an upper middle income country. The GNP per capita is $8,880 and total expenditure on health per capita amount to $663. The GDP is approximately $39,006,223,284 of which 8.1% is allocated towards health [9]. Lebanon’s healthcare system has been highly fragmented since “the war considerably weakened the institutional and financial capacity of the government and public sector and its role in the provision of health care services steadily declined” [1].

As indicated in the study of Lebanon National Health Accounts:

The proportion of government budget allocated to health sector is a little over 6.5 percent. Public
sources account for 17.98 percent, private sources for 80.06 percent of health care financing and international donors for the remaining 1.96 percent. This pattern of expenditures is reflective of the fact that Lebanon relies largely upon the private sector for the provision of services, financing is fragmented, and there are inadequate supply side controls [1].

2 LITERATURE REVIEW

EP systems originated in the US with the aim of acting as computerized decision support tools to aid in the prescription process. The general definition for EP entails the utilization of computer systems for facilitating the medicine prescription, administration, and supply process within a hospital with the ability “to capture a full prescribing history for a patient in a transferrable manner, and open up the potential for use of databases and decision support tools to assist the prescriber in medicine selection” [4]. The primary stakeholders involved in operating an EP system are doctors and pharmacists. The system serves several functionalities including prescribing with the provision of clinical decision support tools, e-recording, administration, and patient identification, medication screening, reviewing, and dispensing, stock supply control, auditing and reporting, and others [8].

EP is a significant field that must be explored and taken into consideration due to the benefits that it grants which include but are not limited to the following:

- Replaces paper records that take up shelf space [4].
- Reduces a healthcare provider’s amount of consumables such as papers, pens, and charts leading up to savings [4].
- Reduces the medications error rate. Statistics from the US baseline analysis of medication errors show that there is an average of 1,111 prescribing errors per week and that EP implementation may prevent 64.4% with an additional 22.4% that may also be prevented with an effective system design [4].
- Reduces the transcriptions error rate by eliminating the problem of missing medication charts and need to rewrite them [8].
- Provides a full EP history with fast and accurate information retrieval [4].
- Facilitates the supply and monitoring processes by supporting direct communication between departments and pharmacies and eliminating the need for pharmacists to reenter medication details through the sharing of databases [8].
- Possesses Decision Support (DS) tools that aid in the prescription process and are utilized in the drug dictionary, formulary information, dose checking, and medicine allergy and interaction checking [8].

- Improves prescription completeness and legibility by ensuring that each prescription will have its own details such as medicine, form, strength, dose, duration, etc… [4].

The implementation of an EP system will have diverse impacts on the willingness of individual users, organizations, and government to conform to the new technology.

Impact on the Individual. Healthcare professionals might embrace or reject an EP system’s implementation. Those who are of acceptance will view the new technology as a means for improving health outcomes, achieving performance objectives, reducing risk in their spheres of practice, and complying with legal, professional, and ethical requirements. On the other hand, those who are resilient to change will be concerned with the negative consequences that the new system might impose such as the modifications in working practices and the generation of new errors [4].

Impact on the Organization. The lack of EP systems adoption is primarily due to hospitals’ large organizational structure. As the number of departments within a hospital increases, the stakeholders’ engagement becomes harder, and professional rivalry intensifies leading up to difficulties in the change management, implementation, maintenance, and training processes. The political constraints within an organization should be dealt with by acknowledging, securing, and engaging all stakeholders. Other constraints include the financial cost of the software, interoperability, security, privacy, legal, and political issues [4].

Impact on the Government. At the government level, the development of private IT health systems weighs down cumbersome burdens such as re-keying patient details and demographic data duplication. Implementing different systems across the country implies that “when an individual moves to another region, or is treated in a different hospital, their electronic patient record (EPR) has to be rebuilt on a new system, potentially introducing inconsistencies” [4].

On the national level, governments are concerned that the EP system to be implemented must conform to the following criteria [4]:

- Present faultless and consistent national operations and patient care.
- Present standard user interfaces for healthcare professionals to work with.
- Present a reliable national clinical governance and public health management reporting framework.

Costs. The study conducted by the Texas Medical Association in 2007 revealed the typical costs for EP
implementation with EMRs ranging from low, mid, to high cost systems for an average of 3.5 Full Time Equivalent (FTE) physician practice as shown in Table 1 [5].

Table 1. EP System Implementation Costs [5]

<table>
<thead>
<tr>
<th>Item</th>
<th>Low Cost</th>
<th>Mid Cost</th>
<th>High Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Licenses</td>
<td>$31,980</td>
<td>$61,020</td>
<td>$71,000</td>
</tr>
<tr>
<td>Data Conversion</td>
<td>$2,995</td>
<td>$2,900</td>
<td>$5,000</td>
</tr>
<tr>
<td>Other Licenses</td>
<td>-</td>
<td>$6,691</td>
<td>$8,000</td>
</tr>
<tr>
<td>Training</td>
<td>$6,205</td>
<td>$26,449</td>
<td>$50,635</td>
</tr>
<tr>
<td>Installation</td>
<td>$4,480</td>
<td>$12,345</td>
<td>$4,940</td>
</tr>
<tr>
<td>Discounts</td>
<td>($23,215)</td>
<td>($19,402)</td>
<td></td>
</tr>
<tr>
<td>Annual Recurring Costs</td>
<td>$12,871</td>
<td>$26,834</td>
<td>$21,537</td>
</tr>
<tr>
<td>Hardware/Network</td>
<td>$30,000</td>
<td>$30,000</td>
<td>$30,000</td>
</tr>
<tr>
<td><strong>Project Total</strong></td>
<td><strong>$88,531</strong></td>
<td><strong>$143,024</strong></td>
<td><strong>$171,710</strong></td>
</tr>
</tbody>
</table>

3 METHODOLOGY OF WORK

3.1 RESEARCH OBJECTIVE

The objective of the research is to assess the national readiness of Electronic Prescribing implementation in Lebanon. As discussed previously, EP grants long-term healthcare benefits. Due to the digital divide between developed and developing countries, the latter are primarily concerned with proper health care management. An Electronic Prescribing readiness assessment questionnaire is an essential requirement for the success of EP in terms of adoption and acceptance [6].

For the purpose of this study, an EP readiness assessment was conducted as a means for analyzing and evaluating the feasibility of EP implementation in Lebanon. It is of quite importance to perform such an assessment prior to system implementation since most of these systems are doomed to failure in developing countries. This is due to resource constraints and a lack of IT infrastructure and support, stakeholder awareness, and a drive for new system adoption [6].

3.2 METHODOLOGY CHOICE

E-Health readiness is defined as the level to which a country or society is ready to accept the electronic emergence of automated systems related to health processes. Assessing the readiness is the course of evaluating the benefits and challenges of such an emergence.

There exists a variety of tools and methodologies to assess E-Health readiness. Each assessment tool has its own benefits and problems. There is not a single methodology that can be adopted as it is. In order to conduct such an assessment study in Lebanon, and reach reliable results, readiness components and variables must be assembled from more than one E-Health readiness methodology.

This study used Morton and Wiedenbeck’s survey based upon the Diffusion of Innovations (DOI) theory and the Technology Acceptance Model (TAM) [7]. The study also made use of Harvard’s Readiness for the Networked World: a Guide for Developing Countries built upon the Computer Systems Policy Project (CSPP) on Global Electronic Commerce Readiness [3]. These surveys were chosen because they are based upon models that have been tested in prior studies.

In this study, E-Health readiness is measured based on three scales: economic scale, technical scale, and organizational level. These three variables were derived from the three E-Readiness methodologies described above.

- **Economic scale**: assesses hardware and internet affordability. It also measures basic economic challenges including paper costs, call costs, time costs, and error costs.
- **Technical scale**: shows to what extent individuals are familiar with computer use. Besides, the technical side involves users’ readiness to be exposed to adequate training sessions. Network speed and quality is also assessed on the technical level.
- **Organizational scale**: measures the effect of EP on the productivity inside an organization. The effectiveness level and the quality of work are assessed as well.

3.3 EXECUTION FRAMEWORK

**Literature Search.** A large amount of time was invested in literature search in order to write an in depth literature review covering the most important areas of the Electronic Prescribing field. In addition, a profound search was conducted on the existence of methodologies, assessments, and questionnaires that would be of help and reliance to this study.

**Data Collection.** A structured questionnaire was developed and physically distributed to the sample population. Questions derived from factors...
suggested by Morton and Wiedenbeck’s study [7] and Harvard’s Readiness for the Networked World: A Guide for Developing Countries [3]. Some additional questions were developed based on the literature review. The questionnaire consists of 4 sections and 25 questions under the titles respondent profile (gender, profession, region, age, and years in practice), economic feasibility (hardware/internet affordability and costs), technical feasibility (computer literacy and network access), and organizational feasibility (adequate training, stakeholder autonomy, stakeholder-patient relationship, and perceived usefulness). The majority of the answers for these sections are rated on a five point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree). Answers for some questions are choice based selection.

The Sample. The study was conducted in Lebanon’s North, Mount Lebanon, and Beirut regions between March and April 2012. These regions were chosen due to the project team members’ locations being allocated in the North. The target population consisted of doctors and pharmacists who filled out questionnaires for assessing EP feasibility. The data were collected from a sample of 60 healthcare professionals consisting of 30 doctors and 30 pharmacists.

Data Analysis. Once the questionnaires were collected, the data was entered into Microsoft Excel 2007. Statistical data analysis tests based on quantitative measures were conducted displaying means, variances, and generated graphs.

4 READINESS ASSESSMENT AND FINDINGS

4.1 RESPONDENTS

Respondents included 30 doctors and 30 pharmacists. Data collected on respondent profile characteristics included gender, profession, region, age, and years in practice. The majority of respondents were male (63.33%) with females making up 36.67% of the population. Regions reported included Beirut (6.67%), North (35%), and Mount Lebanon (58.33%) where the greater part of the respondents was attributed to the latter. Most respondents were under the age of 30 (31.67%), with only 2% falling into the age category of “60 years or older”. The majority of respondents had been in practice for less than 5 years (30%), with the next larger group (28.33%) reporting 11-15 years of experience.

4.2 ECONOMIC AXIS

On the individual part, results attest that EP system implementation is economically feasible. The majority of respondents reported both computer and internet ownership (75%) and price satisfaction with the latter (43.33%). These figures portray a high level of hardware and internet affordability. The EP system was reported to have a significant potential in reducing paper, time, error, and call costs leading to economic savings in medical practice. The scale means for the Likert scale based economic factors are as follows: internet affordability, 3.38; paper costs, 3.82; time costs, 4.43; and error costs, 4.05. On average, the economic factors were computed to have a scale mean of 3.92.

Regardless of the economic feasibility on the individual basis, the Lebanese government must be willing to invest and accommodate the resources necessary for successful implementation. On the individual side, EP system implementation is economically feasible. On the government side, adequate funding does not exist for such an achievement.

4.3 TECHNICAL AXIS

Based on the feasibility analysis, results show that the higher group of respondents (60%) belonged to the younger age population of under the age of 40. In return, they have scored high in computer literacy, which implies computer exposure prior to their medical practice. It was noted that there is a lack of formal computer training programs since the majority (56.67%) responded acquiring their computer knowledge through self-guidance and 16.67% reported no computer experience or training. As suggested by Morton & Wiedenbeck (2010), “this could be reflective of the age of the majority of the respondents. It is likely that younger respondents obtained formal computer training prior to attending medical school, such as in an undergraduate program or in elementary or high school” [7]. All of the respondents use the computer regularly with 66.67% having been exposed to a healthcare system through past usage, training, and demo. This is satisfying since the majority is aware of the system’s existence. The larger faction self-rated themselves to be general or advanced computer sophisticated users.

The overall level of satisfaction to network access is unsatisfactory. The scale mean for network speed and quality is 2.77 portraying a level of dissatisfaction with the current network speed and quality state. The scale mean for network service and support is 3.05 implying a state of neutrality and a slight level of satisfaction.

Regardless of stakeholder technical readiness, there is no national health IS in Lebanon that serves as an infrastructure. This fact imposes a barrier on
technical feasibility. In order to reach technical readiness, the Lebanese government must implement an electronic centralized medical record system. Currently, Lebanon lacks a centralized database in which patients medical records should be retained for easier diagnosis and treatment. The existence of such a central system is essential since it helps doctors and pharmacists to be on the same network, communicate through a single database, monitor patient’s medical records, and share medical feedbacks.

4.4 ORGANIZATIONAL AXIS

The overall level of organizational satisfaction to EP was positive. The means fell between 3 and 4 (the “neither agree nor disagree” and “agree” categories) for all factors except stakeholder-patient relationship with a mean of 2.45. This scale mean makes sense since the item specifically asked about stakeholder-patient relationship being negatively impacted by EP system use. Accordingly, respondents disagreed revealing their certainty that EP use is not damaging to their relationships with patients. Scale means for other factors are along these lines: adequate training, 3.98; perceived usefulness, 4.08; and stakeholder autonomy, 3.02. On average, the social attitude about EP use was calculated to be 3.38 based on the five-point Likert scale.

5 CONCLUSION AND RECOMMENDATIONS

5.1 QUESTIONS ANSWERED

Based on the analysis and observations from the attained results, the study answers the following questions:

- What is the degree of acceptance and usability of an EP system among stakeholders?
  From what the survey shows, stakeholders are motivated to learn new skills. About 72% of them proved their readiness towards conducting adequate EP training. As for clinical practices, 75% of doctors and pharmacists think that an EP system will give them greater control over their clinical practices. Concerning quality of work, 78% of the interviewed stakeholders think that an EP system can help them accomplish their tasks in a faster manner, 85% of them see that EP will make their job easier, and 73% of them point out that EP will increase their overall work effectiveness. On the other hand, 27% of the interviewed stakeholders see EP as a threat where they claim that an EP system may threaten doctor/pharmacist’s privacy. Not to forget that 15% of them admit that an EP system may cause legal and ethical problems.
  Stakeholders’ opinions differ between EP allies and EP opponents. In sum, a wide range of stakeholders (75%) is ready to test and use an EP system. The degree of acceptance among these stakeholders is relevant. However, the rest of stakeholders state that an EP system is a risk that threatens their privacy, and patient’s confidence in them. Therefore, they show a low degree of acceptance.
  Stakeholders’ readiness is not enough. Adequate training programs must be established in order to help physicians develop their computer skills. Such programs can help in increasing the degree of EP acceptance among stakeholders.

- What challenges and limitations need to be addressed for successful implementation?
  In a developing country like Lebanon, there are challenges and limitations that determine access to any form of e-health technology. These barriers include but are not limited to the following [2]:
    Appropriateness of technology: the EP system must suit stakeholder, organization, institution, and community needs; Affordability: as previously discussed, the costs for an EP system implementation range between $88,531 and $171,710. The government must be willing to invest in developing a centralized system along with the required resources such as equipment, installation, training, maintenance, and ongoing support [2]; Capacity: users must be trained in order to successfully operate the EP system. Local ongoing training and support must be available to ensure appropriate skills; Relevant Content: language considerations should be taken into account since the formal language of EP systems is English. The information displayed and language used must be relevant to the target population in Lebanon where Arabic is the formal language of communication; Integration: awareness programs should be developed and disseminated to users to
introduce them on how the new technology will impact and integrate with their daily practices; Trust: users should have confidence in the EP system and understand its implications. The system must have a simple user interface which is easy to operate, so that users “focus on its utility rather than its operation” [2]; Legal and regulatory frameworks: laws and regulations regarding e-health technology use should be well understood and abided by; Political will: key policy makers and politicians should fathom the new system’s importance and “be ready to enable its integration within existing health-care systems” [2]. Other challenges that were identified during the analysis include issues regarding network access and the lack of a technical infrastructure. The network speed, quality, service, and support need to be enhanced to support the lacking national centralized system that is urged to be developed in order for any e-health technology implementation to take effect.

5.2 CONCLUSION

This pilot study was done to assess and reveal the degree of national readiness for Electronic Prescribing system implementation in Lebanon. Based on the findings, the overall result of the assessment indicates that the Lebanese healthcare sector is not primed for EP implementation. In order for the healthcare sector to be prepared for such an implementation, EP readiness must be proved on three levels: economic level, technical level, and organizational level. The study conducted shows that the readiness on these three levels is not reached yet. In fact, Lebanon shows signs of weakness in these three key areas.

5.3 RECOMMENDATIONS

In order for Lebanon to accomplish a successful implementation of Electronic Prescribing in the future, there are setbacks to overcome and recommendations to follow: planning: considering additional management and developing a comprehensive plan in order to meet stakeholders’ needs, and ensure appropriate EP adoption; weaknesses and requirements: considering areas of weaknesses that prevent the Lebanese healthcare sector from adopting an EP system. Defining weak points helps deducing needed requirements for the implementation; software modules: identifying system modules that will be used in the EP system (medical records, patient demographics, insurance information, etc…); training: conducting training and workshops in order to help physicians acquire necessary skills and make them familiar with EP system functionalities and uses; finance: performing an assessment for needed financial resources, and planning how to get needed funding and investments in the Lebanese healthcare sector; IT infrastructure: performing an assessment of hardware requirements (servers, workstations) and devices essential for appropriate EP system implementation; network: building collaboration between the Lebanese healthcare sector and the Ministry of Telecommunications in order to minimize network costs and increase network speed for better EP system use and performance; legal frameworks: Lebanese laws and regulations must be well understood. An EP system must comply with existing guidelines.

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