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Electronic Patient Record System in Hamad Medical Corporation, Qatar: Challenges and Improvements

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Abstract

The concentration in healthcare information technology increases as hospitals realize the importance of utilizing Electronic Patient Record (EPR). Also Qatari's healthcare system realizes the importance of EPR and aims to improve current patient record system in hospitals in Qatar including Hamad Medical Corporation (HMC) hospitals.

The challenge for EPR is to supply health providers and medical researchers with a complete view of health status in HMC in general. To achieve that it is needed to overcome some obstacles such as: interoperability which happens when patient has multiple medical records, achieve accountability which means the ability to identify the healthcare party who deal with medical data, overcome the lack of ability to uniquely identify patients, using standardized medical terminology, maintain patient privacy and effectively retrieve patient information.

This research was done to find solutions to the following research questions: What are the benefits of current patient record system in Hamad Medical Corporation? What is the most practical way of using patient healthcare information to help medical researchers? And how can electronic patient record systems improve the quality of retrieving diagnosis data and avoid medical errors while saving time for healthcare professionals?

The research is based on two steps: first step, evaluating the current situation at HMC and second step, enhancements were suggested to current EPR in HMC. Suggested enhancement are adding the Qatari ID to EPR to overcome interoperability and assure data integrity, adding National Drug Code NDC to be able to retrieve medication prescript by physicians and adding diagnosis from one medical thesaurus.

The methods of investigation used was: case study approach, exploring a HMC case and conducting interviews while using established theories to reach conclusions.

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تعديلات مقترحة على نظام السجل الطبي للمرضى في مستشفى حمد بالدوحة

إيمان خميس

أخصائي العمليات التقنية في المكتبة

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المستخلص

لقد زاد مؤخرا الاهتمام بنظام سجل المريض في المستشفيات كما زاد الاهتمام بالتكنولوجيا وتنظيم المعلومات. مستشفى حمد من المستشفيات الرائدة في هذا المجال في الشرق الاوسط ويهدف نظام تسجيل المرضى الى تحسين الخدمات الطبية المقدمة في المستشفيات.

التحدي الذى يواجة نظام تسجيل المرضى هو كيفية اعطاء صورة سليمة ودقيقة للنظام الصحي في المستشفى، كما يهدف لتوفير معلومات دقيقة للباحثين في المجال الطبي. ولتحقيق ذلك لابد من التغلب على بعد المشكلات:

- قابلية التشغيل البيني والذي يحدث عندما يكون للمريض الواحد سجلات طبية متعددة.
- تحقيق المساءلة وهو ما يعني القدرة على تحديد الطرف المسئول عن كل بيان داخل السجل الطبي من طاقم الرعاية الصحية الذين يتعاملون مع البيانات الطبية.
- التغلب على عدم القدرة على تحديد المرضى بشكل فريد.
- ذلك باستخدام المصطلحات الطبية موحد داخل السجل.
- الحفاظ على خصوصية المريض واسترجاع المعلومات على نحو فعال للمرضى.

قام الباحث في هذا البحث بالاجابة على الاسئلة التالية: ما هي فوائد نظام سجل المريض الحالي في مؤسسة حمد الطبية؟ ما هي الطريقة الأكثر عملية لاستخدام معلومات الرعاية الصحية للمريض وذلك لمساعدة الباحثين في مجال الطب؟ وكيف يمكن تحسين أنظمة السجلات الإلكترونية للمرضى؟ وكيف يمكن تحسين نوعية استرجاع البيانات التشخيص وتجنب الأخطاء الطبية مع توفير الوقت لأخصائيي الرعاية الصحية؟

الباحث قام بالبحث على خطوتين رئيسيتين:

- الخطوة الأولى، تقييم الوضع الحالي في مؤسسة حمد الطبية

- الخطوة الثانية، تم اقتراح تحسينات نظام سجل المريض الحالي في مؤسسة حمد الطبية.

توصل الباحث الى انه من الممكن إضافة الرقم القومي القطري الى سجل المريض الحالي في مؤسسة حمد الطبية للتغلب على قابلية التشغيل البيني وضمان سلامة البيانات،

إضافة كود الأدوية من فهرس الادوية الامريكي، وأخيرا إضافة التشخيص من المعجم الطبي الموحد الى سجل المريض الحالي في مؤسسة حمد الطبية.

أساليب التحقيق المستخدمة كانت في: نهج دراسة الحالة، واستكشاف حالة مؤسسة حمد الطبية وإجراء المقابلات أثناء استخدام النظريات للتوصل إلى استنتاجات.

Background

Healthcare systems are complex systems that include a large amount of information. There are two types of patient record systems: paper based patient record systems and electronic patient record systems. However, the amount of information stored in healthcare systems is too huge, for paper-based record system to meet the requirements of healthcare professionals and researchers.

The use of Information and Communication Technology in healthcare services centers was mainly to improve quality and efficiency of healthcare services. Also saved costs by creating, storing the patient healthcare information while sharing patient health information by using Electronic Health Record (EHR) (Haux et al.).[1]

EHR will be created by the contribution of Electronic Patient Records (EPR) from different healthcare services centers (Department of Health, NHS Executive 4)[2]. In order for EHR to be successfully applied on a national level some factors must be achieved as follows: Interoperability, Accountability, Data Integrity, Standardized Medical Terminologies, Privacy, Confidentiality, and Security. Other aspects such as cost, legal framework and demography will also help completion of a successful EHR (Foldy et al)[3]. However, most healthcare systems on a national basis are adopting Electronic Patient Record to store and share records. Though Electronic Patient Record started 30 years ago, many systems (including Hamad Medical Corporation) are still applying paper-based record and electronic systems (Smaltz and Berner 3)[4].

Other challenges facing EHRs is the variation of EPR model between healthcare systems in different hospitals, which leads to differ in the techniques used for storing process which effect sharing information between organizations. Another obstacle is lack of organization of health information in EPRs that hinder generation of statistical information. Kalra and Ingram[5] assume that these challenges can be met by standardizing the structure of EPR that will lead to accurate extraction of information from EPR.

This research is based on the current status of Hamad Medical Corporation patient record system, which is considered to be hub for health information in Qatar. Also this research is highlighting patient and researchers concerns about quality healthcare information stored in EPR.

Mainly the research is motivated by challenges facing patients' health information acquisition and challenges facing researchers in retrieving medical data. These challenges may be explained as follows:

1. Patients do not remember information about their cases (Information Daily Staff Writer)[6], which leads to losing valuable information, and healthcare professionals wish for easy access to medical information. Currently, Electronic Health Record in Hamad Medical Corporation lacks a tool that enables healthcare professional to view, comprehend and manage medical information, additionally not all patient health information is stored.

2. The different kinds of health information problems facing health system and which needs to be taken into account when retrieving health information data (Sissons)[7], which will be explained in details in the research.
3. Electronic patient systems are not customized to give information to non-healthcare professionals (Stoop, Bal and Berg)[8] such as government and epidemiologists.
4. Lack of single internationally accepted medical terminologies thesaurus that can used by different healthcare professionals.
5. Healthcare researchers' requirements to receive accurate and comprehensive health information and statistical data that aids their research.

Research Methods

The work of this research reflects investigation about EPR in Hamad Medical Corporation in Qatar, its requirements and suggested improvements. The general research methodology was a case study approach that examines EPR in its natural setting and employing multiple methods of data collection to gather information from one or a few entities. Multiple sources of evidence are used, although most of the evidence comes from interviews and published literature to reach conclusions and recommendations (Benbasat, Goldstein and Mead 370)[9].

Meetings with Healthcare Providers

Interviews with a number of healthcare professionals at Hamad Medical Corporation different hospitals were conducted:

Healthcare provider specialty	**Healthcare Organization**
Supervisor	Health Information Management Dept., Hamad General Hospital
Assistant Director	Health Information Management Dept., Hamad General Hospital
Supervisor	Health Information Management Dept., Al-Khor Hospital
Medical Coder	Health Info. Manage. Dept., Al- Khor Hospital
Clinical Document Specialist	Health Information Management Dept., Al-Khor Hospital

Table 1.1: Healthcare Advisors who have been interviewed (Personal Interview)

thcare providers, which helped in directing the focus of the research. The meetings provided a good opportunity to discover existing system, to show the research findings regarding current EPR system at HMC.

Results & Discussion:

Hamad Medical Corporation Hospitals as Case Study

HMC was chosen to be the case study because of its importance in the healthcare system in Qatar.

Hamad Medical Corporation HMC is responsible for five hospitals also service of ambulance. The hospitals are: Rumailah Hospital, Hamad General Hospital, Women's Hospital and Al Amal Hospital, these four hospitals are located in same district to form what is known as Hamad Medical City. The fifth hospital is Al Khor Hospital in Al-Khor city. HMC plays a significant role in Qatar society.

Medical Records/Health Information Management Department

The Medical Records/Health Information Management Department in HMC is in charge of control the processing, completion, and retrieving data from patient records when necessary. By ensuring strict privacy and complete usability of patient records, the department are avoiding the reason hindering implementing EPR highlighted by Benson (Hamad General Hospital)[10].

The current system that was originated in the 80s and updated in 2007. It is a paper-based medical record system with electronic patient records side by side. In the current EPR system, physicians cannot edit the patient record, they only edit the paper patient record. Which means that physicians write diagnosis, required tests and prescript medications on the paper medical record, and few authorized administrative staff can edit the electronic patient record. Since the patient systems are dual, storing patient record is dual too. The electronic patient record is saved and stored electronically, while the paper patient record is scanned and stored in electronic form by specialized company, which is simulation to Johner et al. model, while the physical paper record is stored manually in storages.

From regular visiting to HMC hospitals, researcher noticed that everyday Medical Records Department receives requests for patient records from different clinics. Once the request is received the Medical Records Department's staff process the request immediately and prepare the requested patient paper record, meanwhile the electronic patient record is being accessed by authorized staff electronically.

Medical Record Department services are:

- Record processing & completion

New permanent medical record are filled for every new patient (including new born children), each patient are assigned a unique number, this number is prepared and printed out on the patient Health Card. Reports, X-rays, tests results, prescript medication … etc. are collected in one folder for each patient, kept, stored for future use.

- Record abstracting, analysis and coding

Coding is based on International Classification of Diseases (ICD-10)[11]

- Transcription of dictation for medical records

Transcriptions is meant for providing medical data about some cases, for example, patient who needed to be treated abroad, medical reports … etc.

- Correspondence
- Record retrieval, filing and storage.

HMC is currently using a system named Medicom and it is moving to Cerner, a new software in 2016. The key difference between the two systems is the ability of adding data to the electronic record by healthcare professionals, so in Cerner physicians can add their diagnosis and prescript medications to EPR. When Cerner is implemented in all hospitals that will lead to the disappearance of paper-based medical record in HMC.

Electronic Patient Record changes a lot between the years 2007 and 2014 (Abdullah)[12], which resulted in scale of problems and realities that might arise when new system (fully electronic) is applied in all hospitals.

Interviews and Visits Results

The results below are from visits and interviews done in Hamad General Hospital and al-Khor Hospital during the period from June to August 2014.

Interoperability in HMC

Cases of patients with multiple medical records happen when the EPR is not effectively shared among different hospitals which lead to create a new patient record for the same patient each time patient visit a hospital. Supervisor in Medical Record Department in HMC acknowledges that Medical Record Department suffers from that problem "the hospital may have one patient with two patient records" Supervisor, al-Khor Hospital. She added

> "It is normal for a patient to have multiple paper-based patient records but he or she must have a unique patient number. In cases of duplicate patient number it is to Medical Record Department to decide which number would be used for that patient"

To better understand this point, it should be clear to the reader that the HMC consists of five different hospitals, each hospital has its own Medical Record Department. Each Medical Record Department is working with both systems the paper-based patient record and the electronic patient record except al-Khor Hospital which has moved completely from paper-based medical record system to electronic patient record system. The electronic patient record system is shared among all hospitals, each patient must have one electronic patient record that is shared among all hospitals and he/she might have multiple paper-based records in each hospital. However, patient must not been assigned more than one patient number. In some cases patient may have two or more EPR each one is assigned with different numbers. If any case like that is discovered by administrator, it must be directed to supervisor in Medical Record Department to merge these record and unify the patient number.

Accountability in HMC

In HMC, particularly, in the hospitals where both systems of patient record (paper-based and electronic) are still being used, it is not possible to identify the healthcare party who add, modify or delete data from patient record. However, in the new system which has been applied in Al-Khor Hospital -and expected to be applied to all HMC hospital next year- healthcare professional can identify who created, edited or deleted data in the medical record. This point is highlighted by Clinical Document Specialist (CDS) at Al-Khor Hospital, she said:

> "The new system in Al-Khor Hospital can track everything, who created the record who modified it. That is good because in case of not completed medical record, we can go to the concerned clinician and ask him to complete it" Clinical Document Specialist (CDS) at Al-Khor Hospital.

In other words, the medical record system should allow the identification of the organization or individuals creating the record or editing it. Also the system should identify multiple editing of any record and each healthcare professional or agency should be assigned a unique code to ensure the data accountability. Also the system can validate the codes according to the authorization and password of each healthcare professional and generates these codes automatically while the record is created or modified. HMC hospitals still facing lack of accountability especially in paper-based patient record.

Data Integrity in HMC

One of the major problems in health care systems is the lack of ability to uniquely identify patients. Some patients have two or three different patient record with different names and numbers. HMC hospitals suffers same problem as supervisor at HGH highlights "In cases of duplicate patient records it is to Medical Record Department to decide which record would be used for that patient. Usually, we choose the record with more data in it to be the patient record for that patient" Supervisor at HGH. From interviews and investigations researcher found that HMC could not solve this problem entirely, because the patient record system is depending on the patient number assigned by the hospital as a unique identifier for each patient. And the hospital may assign two numbers for the same patient. Unfortunately there is no statistic for the number of duplicate record for the same patient, and there is no tool which can be used to detect any duplication.

Standardized Medical Terminologies in HMC

From visiting HMC hospitals, researcher found that physicians at HMC record diagnosis, therapy, medications and any required tests on the paper patient record except at Al-Khor hospital where they record this information on EPR. After that patient record is reviewed by clinical document specialist CDS who mainly look for any uncompleted patient record to return it to the responsible clinician to complete it. Last step, the record goes to Health Coder who will assign the suitable ICD-10 code according to written diagnosis. CDS in Al-Khor Hospital highlights that not all record is completed, she said: "We get a lot of un-completed patient record" and when asked about the presence misspelling in diagnosis, she answered "Yes, there is".

Currently, there is no single standardized medical terminology used in HMC. When healthcare advisor is asked about medical terminology used in HMC, he answers "All doctors in HMC are well educated and write down diagnosis in English" Medical Coder in Al-Khor Hospital. Not the expected answer but the researcher concluded that not enough attention is given to unify medical terminologies in HMC. It is expected that without single medical thesaurus, the database would be filled with unsorted, duplicated and unorganized information. On the other hand, if a single medical thesaurus for medical terminology is used, healthcare professionals would be able to get accurate results, compare data and collect accurate statistics from patient different cases.

Privacy, Confidentiality, and Security in HMC

Patient concerns about their privacy increases when data is in electronic form as this may compromise their privacy by reducing the confidentiality of the information. In HMC supervisor in Health Information Department explains that "Only authorized people can access patient record including doctors and few administrators in Health Information Department" Supervisor in Health Information Department at Al-Khor Hospital. In order for the system to be trusted the system should allow viewing and editing of the records according to specific authorizations. Also the ability to hide and suppress some data elements according to authorizations. This will allow researchers to retrieve the medical data only for anonymous patients while masking their personal data.

Data Management and Retrieval in HMC

HMC Patients' records enter into the database via a software suite. Healthcare professionals using Cerner software (the new software) will be able to record data through a form into the appropriately field but with no standard format so each time software is changed that would require a new training for healthcare professionals. Anyway, when healthcare professionals submit their edit, this data will be transferred and stored via internet to the database. In HMC the database ensure that only authorized individuals are able to access medical records and the information contained. By asking Supervisor at Al-Khor hospital about accessing patient record, she answered "I do access patient record, but not all administrators". Researcher could not get more information if the records is secured with the approval of the patient or patient's parents to enable specific people to retrieve data from it.

Proposed Enhancement to Current Patient Record in HMC

The following table is suggestions to be added to current EPR to overcome EPRs above mentioned problems. These suggested improvements based on author observations and published literature, which includes nine new fields to be mapped to current EPR system at HMC. Also author gives the definition and justification for each field (Table 4.2).

Proposed Field Name	Definition and Scope
Date and time of every transaction (Can be repeated)	To indicate the date and time of the every record transaction. To be recorded according to Representation of Dates and Times (ISO 8601). Justification: to increase data accountability in the record.
Healthcare Party as Source of Information	Identifying the parties responsible for the content recorded in the medical record. Each healthcare professional or agency must be assigned a unique code. Justification: this will ensure the data accountability, also the system can validate the codes according to the authorization and password of each healthcare professional. It can also generate these codes automatically while the record is created or modified.
Qatari ID (Cannot be repeated)	To record the Qatari ID number. Justification: in order to maintain data integrity, Interoperability and to uniquely identify each patient.
ICD-10 (Can be repeated) Will be generated from suggested Table 4.3	To record the International Classification of Diseases number. Justification: to enable retrieve ICD codes assigned to each record. This number will be added automatically, once the healthcare professional assign a diagnosis in Diagnosis field.
NDC (Can be repeated) Will be generated from suggested Table 4.4	To include the National Drug Code that represents the medications prescribed to the patient. Justification: to enable retrieve NDC codes assigned to each record. This number will be added automatically, one the healthcare professional assign medications in the appropriate field.
Diagnosis (Can be repeated) Will be generated from suggested Table 4.3	Diagnosis assigned to patient record. Justification: to enable retrieve Diagnosis assigned to each record. Also, to control the terminology used by healthcare professionals as they will choose the suitable diagnosis from a searchable drop-down list. The list will be extracted from Table 4.3. If the healthcare professional cannot find the diagnosis (in rare cases), he/she will choose 'Other' and a new field will appear. The healthcare professional can then transcribe the diagnosis but still will have to add diagnosis date. This record will be considered as incomplete record and no ICD-10 code will be assigned. This new diagnosis automatically will be added in new table, Clinical Document Specialists and ICD Coders will review these suggestions weekly. In case this diagnosis is already existed the CDS will send the responsible healthcare professional to change the diagnosis. In case of a new diagnosis only authorized CDS with Coders' help will add this in the Diagnosis table so it will appear to healthcare professionals in the drop-down list next time.
Diagnosis Date	To indicate the date and time of each diagnosis. To be recorded according to Representation of Dates and Times (ISO 8601). This date will be attached to each diagnosis field, after entering diagnosis the system will pop-up a window to assign date to the diagnosis. Justification: to increase data accountability in the record.
Prescript medications (Can be repeated) Will be generated from suggested Table 4.4	Prescript medications assigned to patient record. Justification: To control medications' terminologies, the healthcare professional will choose the suitable medications from a searchable drop-down list. The list will be extracted from Table 4.4. If the healthcare

	professional cannot find the medications (in rare cases), he/she will choose 'Other' and a new field will appear where he/she can add the new medication.
Prescript medications Date	To indicate the date and time of each prescript medications. To be recorded according to Representation of Dates and Times (ISO 8601). This date will be attached to each prescript medication, after entering medications the system will pop-up a window to assign date to the diagnosis. Justification: to increase data accountability in the record.

Table 4.2: Proposed Enhancement to Current Patient Record at HMC

One of the common problems with EPRs is the lack of standardized medical terminologies in EPR in HMC hospitals. In order to overcome this problem the author suggests adding two fields to current EPR, which are: ICD-10 code and Diagnosis (Table 4.2). These fields must be controlled and not free text fields. In order to control those fields the author suggests creating an authority table of ICD-10 medical thesaurus including ICD-10 codes (Table 4.3). This linking between the medical term (diagnosis) and the ICD code will enable the database to automatically add the codes once the healthcare professionals choose a diagnosis from the table. The author suggests that the table includes the title of the diagnosis (the term that WHO selected for describing the patient case and accordingly assigned ICD code for it), inclusion terms (include terms included under the specific diagnosis title), exclusion terms (include terms that should not be included under the specific diagnosis title), coding hint (include two codes for certain conditions and healthcare professional decide which to choose), asterisk categories (diagnosis terms cannot be used alone), ICD-10 Code of the specific diagnosis title and other fields illustrate in Table 4.3. The author suggests this table based on the ICD 10th edition published and maintained by WHO ("ICD-10 Version:2010")[13]

Diagnosis Table		
Field Names	**Indexed OR Not**	**Description**
Title	YES	The title of the diagnostic statement as appeared in ICD-10.
Definition	NO	Definition of the content of the number. Some terminology varies from one place to other, while same name could be used to describe two different cases. This field is to be appeared beside each title as information sign.

Inclusion	YES	Examples of the diagnostic statements to be classified to that number. Or different conditions or be synonyms.
Exclusion	YES	The title might propose that these excluded terms were to be classified under that title, where in fact to be classified elsewhere. These should be cross-referenced with the title when the healthcare professional choose any of these terms a message appears 'Do you mean this..' and list title besides inclusion and exclusion terms.
Note	NO	Any specific note to certain title.
Coding Hint	YES	Includes two codes for certain conditions, and the healthcare professionals decide which to choose.
Asterisk categories	YES	Some categories (titles) cannot be used alone, If the title is one of those categories, a message appears to inform that this code is not to be used alone.
ICD-10 Code	YES	ICD-10 according to the diagnostic statement and Inclusion terms. To be assigned automatically in the patient record when that specific diagnostic statement is chosen.
Chapter number	NO	Chapter number
Chapter Title	NO	Chapter Title

Blocks of categories	NO	Blocks of categories in which the ICD-10 code included.
Three-character categories	NO	Three-character categories in which the ICD-10 code included.
Four-character subcategories	NO	Four-character subcategories in which the ICD-10 code included.
Physician/CDS Personnel		
Keyword search	YES	All fields
Physician/CDS in charge	NO	Last name, first name and initials

Table 4.3: Proposed Diagnosis Table to Unify Diagnosis Terminology in EPR at HMC

The lack of standardized medical terminologies problem continue with no standard terminologies for medications. In similar way the author suggests to use one internationally acceptable thesaurus which is published and maintained by FDA (Guo et al.; Research)[14 15]. In order to overcome this lack of standardization the author suggests adding two fields to current EPR, which are: NDC code and Prescript medications (Table 4.2). Also, these fields must be controlled. In order to control these fields the author suggests to create an authority table to NDC thesaurus including codes (Table 4.4). Linking between the medical term (medications) and the code will enable the database to automatically add the codes once the healthcare professionals choose a medication from the table. The author suggests that the table includes the title of the medication (the term that FDA selected for medication accordingly assigning the code for it) and the NDC.

Table 4.4: Proposed Prescript Medications Table to Unify Proposed Prescript Medications in EPR at HMC		
Medications Information		
Medication Title	YES	Includes the terms used by FDA to represent the medications prescribed to the patient.

NDC	YES	Code to the specific term which was assigned by FDA and published in NDC. To be assigned automatically in the patient record when that specific medication is chosen.
Keyword search	YES	All fields

Table 4.4: Proposed Prescript Medications Table to Unify Proposed Prescript Medications in EPR at HMC

Conclusions

The transformation form paper based patient record system to electronic patient record system provides healthcare professionals with more reliable and precise health information whenever they need it. Also this transformation enables the sharing of health information between different healthcare organizations.

When healthcare providers have access to EPRs and EPRs' fragments, such as, diagnosis, laboratory results, etc. would lead to facilitate therapy decisions and develop healthcare status in the country. Also when researchers are provided with accurate health information and when are provided with easy access to statistics, that would lead to develop the health status in the country.

The proposed enhancements to current healthcare system would facilitate the process of searching and retrieving the health information from EPR in efficient and effective way. With the aid of existing technology, serious improvements can be done to current medical record system at HMC in sharing and managing medical information. In order for this effort to be completed, it needs to be done on the national level and the responsibility for that to happen would be on the shoulders of National Health Strategy (NHS).

The researcher identifies the key problem facing EPR in HMC which is the lack of health data organization in EPR that hinders data retrieval and user services. For example, the Health coders apply ICD-10 codes only for inpatients (patient who is admitted in a hospital while being treated) and not applying any codes for outpatients (patient who is treated in a hospital without being admitted in hospitals). This led to uncompleted picture of current health status in HMC hospitals, which prevent researcher from doing accurate reaches based on concrete statistics. Also there is no regularly published statistical data about health situation in HMC, for example, number of patients with diabetes and their ages, spread of certain contagious diseases, percentage usages of specific drugs … etc. Accordingly, the proposed enhancements along with the new system that is expected to apply in HMC, will allow healthcare professionals to add diagnosis, treatments and therapies to EPR, would make heath information available for researchers.

Another problem will face Qatar in making national health system, which is unifying EPR form in all healthcare centers in Qatar, -knowing that there is no standard form for EPRs-. To allow one computer system to exchange data with another computer system while each of them are using

different health information systems and different EPRs forms is a big challenge. The problem is not in different EPRs formats only, but also hospitals may have a laboratory system that is different from one hospital to another, a pharmacy system that is different between hospitals, and a patient care documentation system that also is different from one hospital to another.

Finally, to achieve interoperability between different health information systems, a common format standards must be developed between these different the healthcare delivery system. Unfortunately, these standards is not consistent, which leads to increasing in costs and time-consuming customizations when implementing common communication format standards.

List of Abbreviation

CDS	Clinical Document Specialist
DSM-IV	Diagnosis Statistical Manual
EHR	Electronic Health Record
EPR	Electronic Patient Record
ER	Emergency Room
HMC	Hamad Medical Corporation
HGH	Hamad General Hospital
ICD-10	International Classification of Diseases
IHE	Integrating the Healthcare Enterprise
IS	Information System
NDC	National Drug Code
NHS	National Health System
NHIC	National Health Insurance Company
PHCC	Primary Health Care Corporation
SCH	Supreme Council of Health
UK	United Kingdom
US	United States
WHO	World Health Organization
WMA	World Medical Association

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