

How can Electronic Medical Record Help improve Health Services in Emirate of Abu Dhabi?

By

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3. ABSTRACT

In this research; I will discuss how far Abu Dhabi Hospitals are from implementing HIS projects and what the anticipated benefits from implementing such systems are; how can users overcome those challenges and obstacles; and how management can play a big role in making those projects succeed and achieve its goals.

For my research methodology, I will be conducting a survey that covers 3 hospitals and 3 primary health care centers; this will allow me to measure users' satisfactions in terms of usage of the system; reliability and availability. Not to forget Clinical Decision Support Systems and why they are of such an importance.

At the end, I will recommend few points for future research for those points I missed in my research or have briefly discussed

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Dedication

To my dear family

Acknowledgement

I would like to thank my colleagues at Tawam Hospital for assisting me and helping me out with the survey

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Abstract

Health Information System is the current most widely discussed topic in Abu Dhabi hospitals; as the implementation of such a system is still being rolled out to all hospitals and primary health care centers; also, let us consider the fact that those kinds of implementations are relatively new in the Middle East area. How to improve it? Or what are the lessons learnt?

This Thesis consist of 5 chapters that discuss how other authors in other countries have discussed how their HIS or EMR implementations have benefited the organizations; challenges associated with those implementations and how to overcome them in the future for better practice.

To get a sense of reality check; I have conducted a survey in a number of hospitals and clinics; there's a whole chapter that discuss the survey analysis and findings with regards to HIS implementation in Abu Dhabi

Declaration

I declare that this thesis was composed by myself, that the work contained herein is my own except where explicitly stated otherwise in the text, and that this work has not been submitted for any other degree or professional qualification except as specified.

(Mona Al Musabi)

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Abbreviations/Short Forms

EMR: Electronic Medical Record
HIS: Health Information System
EMR: Electronic Health Record
EPI: Enterprise Patient Identifier
SEHA: Abu Dhabi Health Company
HAAD: Health Authority of Abu Dhabi
PHC: Primary Health Care Center
ROI: Return on Investment
MRD: Medical Records Department
ED: Emergency Department (also ER – Emergency Room)
AS: Application Specialist (Super User)
ESM: Enterprise Scheduling Management
ERM: Enterprise Registration Management
KPI: Key Performance Indicator
JCIA: Joint Commission International Accreditation

Chapter One

Introduction

Literature review

Industry Perspective Data Standards

Privacy and Security

History of HIS implementation in Abu Dhabi

Anticipated Benefits of implementing HIS

Goals and Objectives

Chapter One

Introduction

Abu Dhabi is heading towards integrating all health care facilities in terms of information system; the first phase is started with government hospitals and so far more than hospitals and 30+ primary health care centers in Abu Dhabi and Al Ain are already integrated under one information system; the purpose is to have important shared information available to health care providers when patients are presented in their particular facility.

In this thesis; I will discuss the vision of Health Authority in Abu Dhabi around implementing a unified health information system that serves the Emirate of Abu Dhabi in terms of Government facilities initially and to roll-out to other private facilities eventually.

My research consist of four main chapter; the first chapter will discuss the literature review around implementation of HIS in different parts of the world and some studies around information management in Abu Dhabi. This chapter will also discuss the history of implementing HIS in Abu Dhabi and what are the industry's perspectives on data standards.

The second chapter discusses the benefits of implementation of health information systems and what are the challenges that face those implementations and how to keep quality measures up to the standards during and post implementation.

For this research I have done a survey to collect feedback from health care professionals after they have used the health information system and how it helped them provide better services to patients or whether implementing HIS has not affected their quality/productivity, etc., in this chapter as well I discuss some findings from interview I have done with some health care professionals.

Last chapter will discuss findings from this research and future recommendations for further researches on the topic.

Literature Review

Health Informatics is a widely discussed subject internationally, however, there has been very few studies that touches that area in the United Arab Emirates in the Abu Dhabi Emirates; particularly. The studies around health informatics in UAE or in the Gulf area are very seldom or non-existing due to the fact that the implementation of such systems is relatively new.

In this literature review; a combination of International studies relating to Electronic Health Records, and local studies relating to Information Management will be used for the discussion of previous studies in the subject.

According to the author of "The Benefits of Evidence-based Medicine in EMR Systems", EMR is rarely used among physicians although it can be very useful for physicians in term of providing information which save physician's time and help in making decision. In addition of the previous benefits of EMR, the system is useful in term of providing financial details, effectiveness and side effects of medications. This information usually is not provided by physicians who have lack on detailed information compared with the amount of money spent on them. Statistics showed about 50% decline in the number of American trained physicians who are majoring in family medicine while physician costs are expected to escalate by another 20% between now and 2015. The author conclude EMR is a way to gain success in the health sector as well as it has great benefits to payers, physicians and patientsⁱ

One of the major points that studies addressed was identifying what information needs to be exchanged; including of shared care consultation or co-ordination of activities. Different sets of information are required by different kinds of staff; management requires different information than what physicians would require and so on. So, based on roles; access privileges should be granted to prevent patient critical information.ⁱⁱ

Another Study that proposes ways to evaluate starts with emphasizing on how important evaluation of HIS is to ensure effective implementation and how it positively affects health care service delivery. As more hospitals are shaping their provision of health services by adopting Health Information System; HIS itself is not only about the software but rather the process, policies and work flows around that software that complement each other; this way an organization can enhance its efficiency and effectiveness. There are different kinds of Health Information Systems depending on the needs and functions of the organization; it can range from a very simple system that are designed to do simple transactions processing to those complex systems that provides full integration and decision support system tools.

“the act of measuring or exploring attributes of a HIS (in planning, development, implementation, or operation), the result of which informs a decision to be made concerning that system in a specific context”

This study also suggests that before buying any HIS system that there has to be extensive evaluation in terms of availability of functionalities and as evaluation serves some purposes including understanding of system performance and how it is going to improve quality of care and if there are any costs associated. Evaluation is also conducted using past experiences to identify what techniques or methodologies can be implemented to prevent any previous failure.

The researcher also points out that HIS evaluations are still in its infancy as the number of such evaluation that are published are very limited as well as considering the fact that those kinds of evaluations are difficult to perform especially with selecting frameworks to applied..ⁱⁱⁱ

The Author of 50 Reasons to get an EMR; has pointed out the benefits of having implemented an EMR system in her own medical practice center. Among those reasons; the author identified:

- a. Availability of patient charts anytime and anywhere
- b. Easiness of importing all diagnostic results and images to the patient's chart
- c. Allows to present data in graph forms and flow sheets
- d. Receive automatic alerts and reminders
- e. Easily produce reports and lists using certain criteria to improve health services and preventions (for example: produce a list of all female patients above 40 years old who have not had mammogram in the past two year and so)
- f. No ambiguous hand writing on prescriptions
- g. Paperless ordering; automatically done through the system; no more losable paper slips
- h. Greater efficiency by reducing time staff spend moving physical charts around in clinics or photo-copying pages off the medical chart
- i. Lowering cost by cutting down the time required to dictate or transcript medical visit. Also, will cut down cost spent on supplying physical paper charts.^{iv}

To support any implementation of HIS system; there should be an adequate IT infrastructure in order for the information system to perform. There has been a few studies that explains how some implementations of HIS have failed in Africa because of inadequate IT infrastructure that supports the system; such as wireless connection, tablet portable PC's or adequate server settings, etc.^v

All in all, paper records were basically eliminated after implementing HIS; and as they turn completely to electronic; it makes it easier when patient ask for phone consultation or come to clinics as walk-ins (non-scheduled appointments) since everything related to the patient is available online; there is no need to request the physical patient chart or history and so on. In this particular research; the author believes that one of the most important shared characteristics of HIS is having an integrated documentation and reporting of clinical results and having the ability to provide clinical decision support functions. ^{vi}

Another research that the best HIS evaluation framework consists of the following items:

- a. Assess the reliability of IT infrastructure (peripherals, network, hardware and software) to make sure it is optimal
- b. Assess quality and use of clinical decision support to assist management
- c. Assess whether cost is reduced and whether revenue is increased
- d. Assess if patient record management and registration is more effective
- e. Assess communication between different hospitals and health care facilities is optimal ^{vii}

On the other hand, one of the researches have put up a graph to show how EMR helps reducing cost; as we can see that by the 15th year after adopting an EMR system; it is noticed that there is a huge percentage in saving that goes up to 57.1% as seen in the below figure:

Potential Efficiency Savings With Adoption Of Electronic Medical Record (EMR) Systems

Savings category	Mean yearly savings (\$ billions)	Cumulative savings by year 15 (\$ billions)	Annual savings (\$ billions)		
			Year 5	Year 10	Year 15 (90% adoption) ^a
Outpatient					
Transcription	0.9	13.4	0.4	1.2	1.7
Chart pulls	0.8	11.9	0.4	1.1	1.5
Lab test	1.1	15.9	0.5	1.5	2.0
Drug usage	6.2	92.3	3.0	8.6	11.0
Radiology	1.7	25.6	0.8	2.4	3.3
Total outpatient savings	10.6	159.0	5.2	14.8	20.4
Inpatient					
Nursing time	7.1	106.4	3.4	10.0	13.7
Lab test	1.6	23.4	0.8	2.2	2.6
Drug usage	2.0	29.3	1.0	2.8	3.5
Length-of-stay	19.3	289.6	10.1	27.6	34.7
Medical records	1.3	19.9	0.7	1.9	2.4
Total inpatient savings	31.2	468.5	16.1	44.5	57.1
Total	41.8	627.5	21.3	59.2	77.4

Figure 1 – Study in the States to show potential savings with implementing EMR ^{viii}

However, security and privacy policies play a vital role in achieving best results of implementing HIS; only then an organization can have a better control over who has access to what; this way you are preventing an-authorized access to confidential information and protecting patient privacy. ix

What are the core functionalities that exists in any ideal HIS system? A research by the Institute of Medicine has suggested the below list of functionalities:^x

Core Functionalities for an Electronic Health Record System	
<ul style="list-style-type: none"> • Health information and data • Results management • Order entry/management • Reporting • Decision support systems • Electronic communication and Connectivity • Administrative processes • Patient support 	

Figure 2 – Functionalities of HIS System

Having a clinical decision support that is dynamic enough to support Health institutions; physicians supported and well prepared in this manner can focus on being proactive rather than reactive with regards treat chronic illnesses. High quality evidence based health care provision can save money for both payers and organizations^{xi}

Lastly, a study shows that the major reason why organizations adopt using EMR systems is to improve quality and reduce dictation/transcription time; the below figure shows how far is the application and usage of some functionalities that HIS provides as well as a graph that shows percentages of the major reasons why organizations are adopting EMR system.

EMR Functionalities Usage		EMR Component Utilization	
Result Viewing	63%	Physician Charting/Documentation	75%
Electronic Clinical Documentation	45%	Nursing Charting/Documentation	74%
Computerized Order Entry	36%	Physician Order Entry with CDS of all orders	61%
Decision Support	36%	Image Connectivity for results/PACS viewing	52%

Figure 3: Usage comparison of EMR functionalities vs. component utilization^{xii}

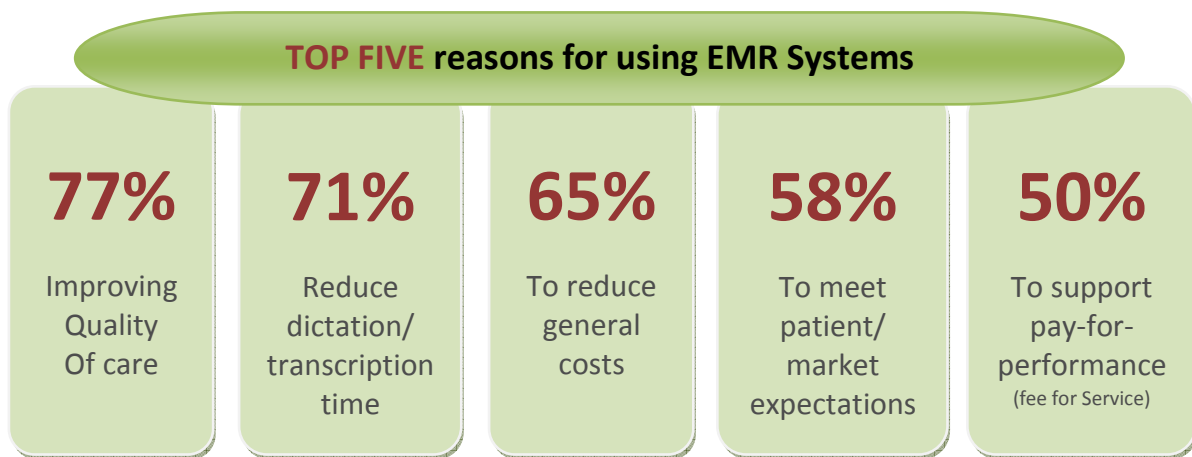


Figure 4 - *Top Reasons for using HIS* ¹

During the next parts of this research; I will discuss the above in Abu Dhabi Hospitals environment and setup and what are the obstacles and challenges that are faced during or after HIS implementation.

¹ Previous Source

Industry Perspective Data Standards

In addition to providing the best quality healthcare to patient of Emirate of Abu Dhabi; implementing an EMR system enables health authorities (SEHA and HAAD) to collect essential information of each healthcare facility and activities for decision making and trends purposes. The below figure shows the relations between each party in the health care industry.

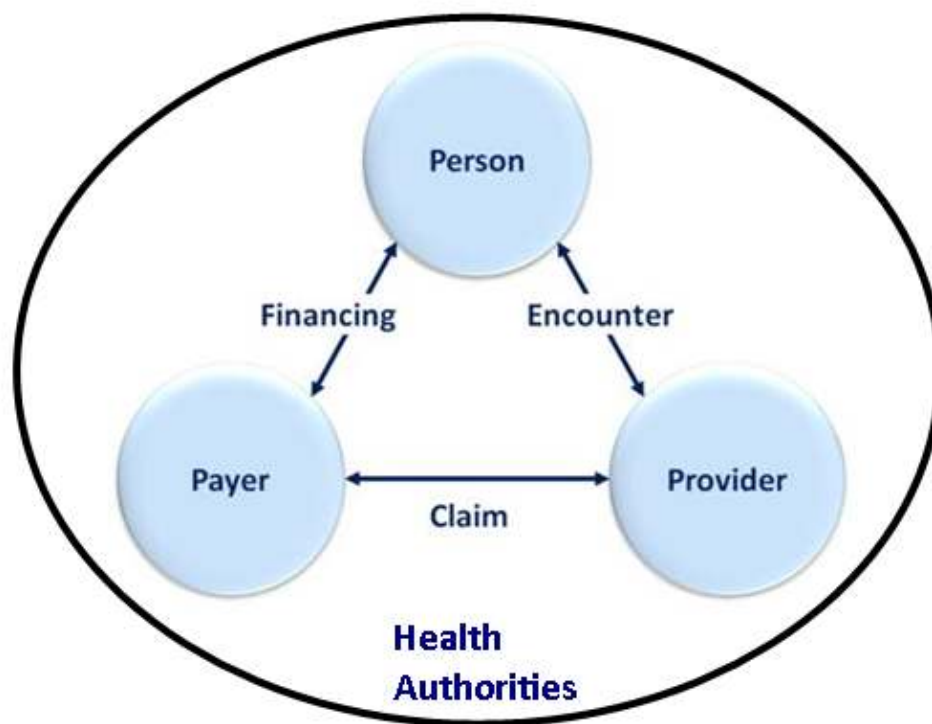


Figure 5 – Industry Standards

When a patient is seen in the hospital; an encounter is created to record all activities occurring in that visit. That encounter is the unique identifier to the health provider and which can be used to claim through the payer (whether payer is patient or a third-party insurance company). The above process can be done through an automated Billing Module in HIS; without having the clinicians to manually record each activity.^{xiii}

Industry Goals

The industry goals in addition to above is to implement an Electronic Health Record System that fits the following:

- Economy of Scale
- Standardization
- Flexible, for the purpose of integration with the other existing systems (such as supply chain, billing, etc.)

- Availability of information
- Integrated workflows
- Provision of Decision Support System
- Regulatory and Accreditation Compliance
- Insurance
- **Legal:** need to have legal set of policies and framework to prevent abuse and access violation

Considerations

- Healthcare authorities should have clear vision on the future of Healthcare provision
- Resistance of Change. Many of the staff in Abu Dhabi were used to manual processes for a very long time
- Rapidly changing IT infrastructure and the associated cost of keeping it up-to-date
- Protection of information across regions
- Management Commitment to the implementation
- Keeping quality standards
- Lack of communications between all parties in the process – patient, provider and payer
- Lack of standard indicators

The below figures shows the four levels that makes an appropriate Electronic Health Record or Health Information System.



Figure 6 – Levels of Electronic Health Information System

Why is the focus?

Valuable benefits of implementing electronic health care to patient as medical information is communicated across different facilities/institutions

Home care service providers can see patient's history even when they are in the patient's house.

HIS helps have the patient record central to all health care providers; therefore; patient information is following the patient; not the other way around.

Benefits to organizations and stakeholders by:

- Improve quality of patient care.
 - Availability of information for trending and decision making
 - Increase efficiency which eventually should reduce cost simply by earlier diagnosis; thus better prevention
 - Improve accessibility of medical information to provide better care
 - Opportunity to improve monitoring by integrating vital signs instruments; therefore, reduce human errors
 - Alerts and system built in formulas and logic
- Educational by training to use IT solutions in an effective way^{xiv}

Privacy and Security

On the other hand, when promoting to implementing of any EMR system; there has to be privacy and security considerations as it is very much different from the paper system; security policies should consider the following points:

- 1- **Access Management:** Paper systems was all about having access to the physical files of patients; with HIS the case is different; all of health care providers have access to patient's information one way or another; it could be only information that is related to his/her department such as Lab staff can only have access to see history of Lab results and so on. This can be defined through a well-studies security matrix to define different roles with different levels of access based on the user's job
- 2- **Password Management:** Password policies can help secure information; first by making sure that each individual is using his/her own account to access medical charts; second, by making sure that users are not sharing any password to different access on the system. Users should be forced to change their password often and keep a history of past 3 used passwords for example. However; it should not be very frequent; otherwise; users tend to forget their passwords.
- 3- **Audit Trails:** this is very important in terms of preventing abuse of access to patient medical information or history; by making it possible to identify who had accessed a particular medical file or reviewed a particular record; will

help prevent abuse and un-authorized access to confidential information. Most HIS provide audit trail tools that can provide different criteria and search options.

If an organization has gone through all steps for implementing an HIS; I believe it is very important that they invest in security and privacy to prevent unauthorized access and data corruption

Recent history of Healthcare provision and HIS implementation in Emirate of Abu Dhabi

All Abu Dhabi health care facilities (hospitals and Primary health Centers) were managed by Ministry of Health until the year 2002 where General Authority for Health Services (GAHS) took over the operation management of all government health care providers in the Emirate of Abu Dhabi. Later in the year 2007; GHAS broke into two entities: **Operational** consisting of Abu Dhabi Health Company (SEHA) and **Regulatory** being Health Authority (HAAD)

The objective (of GAHS then and HAAD and SEHA now) was to implement a state-of-art Health Information System that was fully integrated among all public health facilities in the Emirate where the goal was to create a unique electronic record of “one patient – one record” for any individual seeking treatment in any healthcare facility in the whole of the Emirate of Abu Dhabi. This move has significant implications for the future of healthcare provision, improving clinical effectiveness and promoting patient safety.

GAHS started preparing for the project back in 2003, this process was accomplished in three steps. The first step involved a study and assessment of the existing situation in GAHS hospitals and other facilities. This was followed by specification of users’ requirements and preparing the tender documents, the third step included issuing the Request for Proposal to specialist suppliers worldwide, and evaluating the solutions offered in response, in order to select the best option.

The evaluation process took over 18 months. Eight international HIS suppliers, from the US, Europe, India and Australia were considered. The US-based “Cerner” Corporation came out as the best-fit solution to GAHS.

The selection was driven by rigorous evaluation approach where vendors were required to demonstrate the code as pre-scripted realistic scenarios carefully prepared for the purpose. Over 400 hospital users were involved in the evaluation and final selection process.

The go-live implementation plan was scheduled over SEHA’s hospital as following: Tawam in March 2007, Sheikh Khalifa Medical Center in July 2008; Corniche Hospital went live in early 2008; Rahba Hospital went live in July 2008; Al Ain Hospital was taken live in November 2009. Madinat Zayed Hospital and Mafraq Hospital are still to go live in last quarter of 2010. There are about 40 other Primary Health Care Centers (PHC’s) distributed all over Abu Dhabi cities; some of those clinics are already live with HIS and the rest are scheduled to go live until mid or late 2011.

Cerner Middle East is now based in Dubai and has expanded its implementation in the middle east to start in Saudi Arabia; Egypt and Qatar; and it has been rated as the best health information system in the United States for 7 years (2001-2008); however, as we progress through this research we will realize that not any system that is suitable for European and American health care fields can be easily adopted or customized for a health care field such as in the UAE; as it was a community service and supported completely by government with totally different sets of policies and procedures. However, compulsory insurance plans have been introduced to all citizens in the past few years and that caused all organizations to go through a huge change management process as many workflows has changed as well as a whole new set of information that needed to be captured for reported to Abu Dhabi authority.

Those changes did not only cost money; but also had to go through a huge process re-engineering to change the way screens looked and their usage workflows; most users had to go through re-training and the case was like just implementing a new system.

However, in my opinion; system's capabilities and limits can prevent health care facilities and providers from utilizing the information in its best; this will be discussed in more details in the challenges part of this research.

Anticipated Benefits of Implementing an HIS



Access

- The HIS Electronic Health Record is a patient-centric record of care which will be easily accessible to clinicians, 24 hours a day, seven days a week.
- Health records will be shared efficiently, securely and confidentially between linked Hospitals and PHCs.
- Patient information will be stored and updated electronically with important safeguards to protect patient confidentiality.
- Access to HIS by authorised health and care professionals will involve a number of security checks and will be on a 'need to know' basis.

Clinical

- Diagnostic results will be accessible to clinicians faster than with paper-based methods – via Inbox alerts and HIS Results viewers.
- No more handwriting headaches! All orders, notes and prescriptions will be on-line and legible.
- Reduced duplicate clinical testing as Physicians will be alerted of duplicate test entries in real-time.
- More accurate clinical data will improve reporting capabilities.

Safety

- The care provided will be safer because vital clinical information (current and historic) regarding the patient's diagnosis and treatment (such as current medication, details of previous operations, test results and allergies) will be available to all

Patients

- Reduced “repeated” patient questioning because of access to updated, current data.
- Improved communication between care providers and patients will facilitate quicker

- | | |
|---|-------------------------------|
| authorised clinicians. | and more effective treatment. |
| <ul style="list-style-type: none">• Reduction of multiple (possibly conflicting) records due to a single source of accurate up-to-date patient information. | |

Viewing:

- Time savings from not having to locate a chart
- Convenience from anytime, anywhere access to real-time and historical patient data
- Not limited to a single person at a time
- Comprehensive longitudinal view of patient data
- Trending of data across venues and encounters
- Accurate patient and consulting lists

Interacting:

- Alerts for unsigned orders and abnormal test results
- Automatic reminders for follow-up activities

In addition to the above; HIS once implemented should provide best-practice and quality healthcare. The clinician will have access to all of the patient's medical information regardless of which SEHA facility the patient has received care.

The ability to schedule appointments through internet and receive confirmation and reminders on the patient's mobile phone.

Continuous, online staff training which ensures that staff are always kept up-to-date with international developments in their respective fields. This is achieved through Internet communications with reputable hospitals in other parts of the world (for example to discuss difficult cases)

The system will provide continuous performance monitoring and improvement. Problems and medical errors can be uncovered quickly through the system's features.

Re-enforcing patient safety, as the Cerner system inherently prevents it users from making many common mistakes, such as prescribing conflicting medicines and entering the wrong dosage. These features will become particularly useful as all the information about the patient's medical history will be kept in a single electronic file.

It is very crucial when treating an emergency patient to know what medications the patient is allergic to and the patient's history before proceeding with any kind of treatment; the system will be able to provide those details to the health provider.

Goals & Objectives

Below are the goals and objectives of the HIS Project team in each hospital; those goals were to ensure continuity of support to all hospital staff^{xxv}

Goals	Objectives
<ul style="list-style-type: none"> Support Hospital Information System (HIS) implementation and within the time frame set for the project All active end users demonstrate appreciation to Cerner HIS implementation and training All active end users receive Cerner HIS training and meet competency requirements All new hiring (End Users) to receive Cerner HIS Training and demonstrate competency by the end of the didactic orientation 	<ul style="list-style-type: none"> Develop An overall perception that the new systems are the ultimate enablers for clinical operations best practices Implement a communication plan that is designed to create excitement for HIS implementation and application training and motivation to End Users, encouraging their full participation in learning events Ensure administration support, demonstrated by their approval of completed training plan and approval of necessary resources Ensure departments management actively support for the learning plan Defined requirements for training environment(s) that have the appropriate learning tools set by Best Practices, and have this in place two weeks prior to start of learning event. Deliver Cerner HIS training that enable 80% competency on the assessment of the new systems and processes Ensure 100% attendance compliance for training Ensure end users meet competency requirements and assigned passwords as per of it. End Users that can identify at least three support resources available to utilize the applications and/or system by the go live date Facilitation of ongoing training of new hires with 100% participation and demonstrated competency by the end of the didactic orientation. Defined post-conversion plan for return competency validation, for role changes and continuing education.

Chapter Two

Challenges

Measuring Quality

Were anticipated benefits met?

Health Artificial Intelligence, are we there yet?

Chapter Two

In this chapter I will be discussing challenges associated with HIS implementations; quality measures to be considered during or post implementation; I will also compare whether the anticipated benefits of implementing HIS has been accomplished or not and finally will discuss about Health intelligence.

EMR Challenges

With the introduction of any new technologies; there always are challenges associated. And when this technology is implemented in a high-critical field such as Health Care then impact of those challenges can be enlarged multiple times. Below is a list of main challenges that any HIS might encounter:

1. Availability of adequate IT infrastructure that supports transmitting, retrieving, storage of information. This includes communications means such as wireless and fiber optics
2. Resistance to change by health care providing clinicians; especially in areas that have been using paper for so long that they find it difficult to adapt with any computerized system
3. Constant Training; this could be one of the major challenges and can be solved by conducting periodical refresher training to certain group of users such as physicians just to make sure that if users have picked up a bad habit as they use the system that they know what the right way to fix that
4. Return on Investment; as installing an EMR system is considered as expensive projects; in terms of installing hardware such as PC's and Printers which typically have a life cycle of 3 years. Therefore, every 3 years management is considering new costs with regards to maintaining their EMR system.
5. Downtime normally cause disruption of getting benefits of any EMR system and is very crucial in critical care areas (ICU, ER, etc.). Downtime procedures should adequate enough to allow users survive any interruptions in system connectivity.
6. Complexity of process rather than making it easier. Some parts of the HIS seem to be complicating processes rather than simplifying them as users are requested to follow more steps to get something done
7. Cost of implementation. HIS implementation is not cheap and it requires ongoing cost expenditures whether it is for software maintenance and licensing or Hardware upgrade and replacement or retaining qualified staff.

8. Keeping up to the industry standards; as health care standards are dynamic and subjected to change all the time. Will that force to change the system or work processes?
9. Complexity with Sharing information across facilities; although all facilities are under one umbrella (SEHA), however each facility has its own Patient File numbers and few shared demographics information. Although all SEHA facilities are reporting to the same entity; however, each facility (or a group of facilities) has its own operational management that are considered as competitors to each other, therefore, sharing information can be a limitation sometimes as each hospital would want to retain their patients with limited access to their facility.
10. Security levels on computerized systems; this can be a challenge with health care professionals who have been used to paper work for a long time; password policy can be irritating to them especially when having to change it periodically; and when having to sign-on every time they need to submit an action on the system that requires credentials. This has two side effects; it helps retain all information protected but also can discourage end-users to give good feedback on the system.
11. Before purchasing any readymade system; it is required to make sure that it can be implemented with minimum amount of change needed to fit the local environment.

Measuring Quality

Quality is very important in Health Care Information Systems and can be measured not in terms of the system itself but in terms of the results by improved services and work flows and represents a powerful tool for decision support, we can use the below points to discuss measuring of quality or any HIS implementation using different criteria; including:

- 1- Building Quality Warehouse; to have all information required to allow judge on quality improvement measures; this way you will have access to a lot of information which allows do data manipulation on different levels without actually affecting the performance of Live system
- 2- Accuracy of reports, users should have a trusty source to rely on when it comes to reporting and finding information; there's nothing worse than having inconsistence reporting when it comes to health care and patient critical care

- 3- Availability of Information all the time; this way un-necessary cost can be reduced by allowing doctors not to duplicate lab tests orders or x-ray orders
- 4- Cost Reduction; there can be a significant cost reduction in terms of preventing placing duplicate lab or x-ray orders for the same patient or ordering the same medications if the patient is still going on a medication course already
- 5- Improved Efficiency; no paper slips lost during the process, orders are transferred automatically through the system. There is no wasting time trying to look up for the physical file
- 6- Better point of care, by allowing reporting of abnormalities and early detection therefore early prevention of diseases
- 7- Health Information system can be used as a key source of information when measuring KPI's
- 8- Alerts that are built in the system improves quality; for example, if a patient is allergic to a certain medication and physician orders that by mistake; the system alerts for such cases to prevent wrong prescription or over dosing^{xvi}

In Tawam Hospital being accredited for JCIA (Joint Commission International Accreditation) had a set of criteria on which they evaluated the reporting and availability of clinical information; this shows how important is to have accurate real time clinical data.

Were Anticipated Benefits Met?

Now, two years after implementation of HIS in Tawam Hospital and some other facilities; what are the tangible and non tangible benefits that existence of such a system has achieved? And are there any downfalls to that implementation? What is causing those downfalls?

Well, to start off, the major concentration of implementing HIS was to have an electronic record of the patient that was available anytime and from anywhere. I believe this has been accomplished however; the system is facing frequent downtimes and slowness as more facilities are joining the bus and rolling-out HIS in their hospitals/clinics. This is one downfall of having a 100% centralized information system with no replication servers at hospitals level. If a server is down; all hospitals will be down without prior notice and when the system is down; no one can have

access to complete patient information; the backup tool is very limited in terms of information it is showing.

Secondly, in terms of sharing critical information across different institutions/facilities; this is completely not accomplished not because of the limitation on the system but because of the policies and restrictions applied by each hospital; which is pretty much contradicting with “one patient, one record” motto. The information that is shared across different facilities at the moment is the basic demographic information.

Restricted access to medical files is implemented on role level and that has been very helpful in controlling who should have access to what; therefore, unauthorized access is highly eliminated, again this success was because of the policies and regulations that supported the Information system rather.

Diagnostic results and x-ray images are accessible any time where in physicians can see any lab result they want to on any patient file; this is a great option that the system was able to reduce the amount of the time and efforts that used to take to search for a specific result in the paper based patient file.

All Orders/prescriptions are done automatically on the system, no more bad hand writing. There are barely any orders lost throughout the process; thus, the efficiency and quality has increased to help provide better health care services.

The system has been able to provide with a more accurate clinical data by improving reporting capabilities

Reduction of multiple patient records; as it is not very easy to search for a particular patient record using a different set of search criteria; and if they come across a patient with multiple old records; they are able now to merge the two histories together. This is very important when producing statistics; patient with multiple files can be easily mistaken as different people; and patient statistics will not match based on number of medical records.

Overall, it seems that HIS has been satisfactory with improving quality and efficiency and providing health care practitioners with a good tool to help them perform their jobs better.

In the next chapter; we will discuss users’ HIS satisfaction which will enlighten us whether HIS is being used properly to serve the organization and the patient or not!

Health Artificial Intelligence, Are we there yet?

Although Artificial Intelligence could be far from reality at the moment as most hospitals and health care facilities are spending the time and efforts to implement standard and some complex functionalities or HIS in their organization; however, that does not stop us from discussing the medical health intelligence as the next trend in health provision in the area.

Artificial Intelligence in Health is basically evidence-based and it is completely dependent on existing history or diagnosis vs. symptoms; so, based on previous histories and a series of symptoms it can “guess” the diagnosis and therefore the treatment and any off-the-counter medications if needed.



Figure 7 – Health Kiosk

Opinion of the Kiosk Experience	
Easy to use	98%
Would recommend to family/friends	91%
Would recommend development of modules for other uses	95%

Figure 8 – Health Kiosk Experience Results

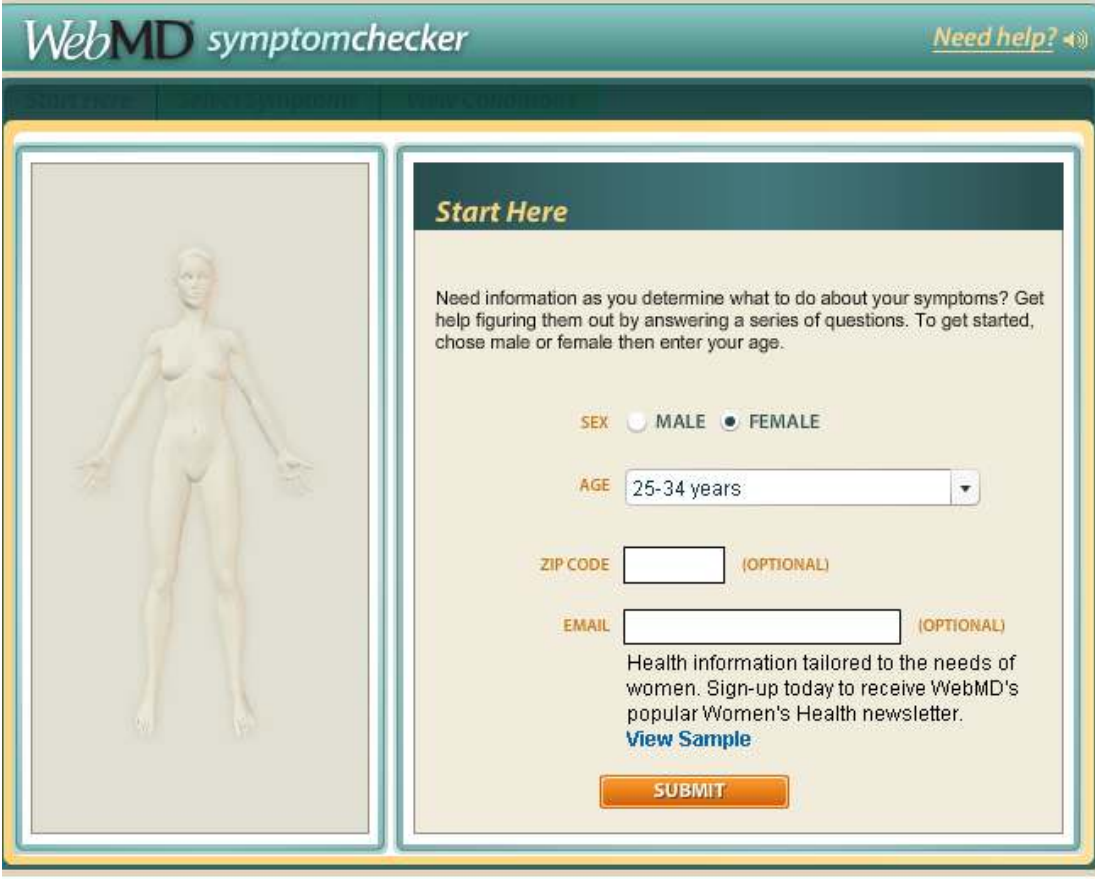
As seen from the figure above; people have rated 98% on easiness of use of Health Kiosks; which means that ^{xvii}

Health without Doctor?

According to the writer of Health Care without the Doctor; researches have suggested that with some kinds of medical instruments that are designed for home use; there has been improved health outcomes. For example; remote computer monitoring of blood glucose level in diabetics used at home has improved its outcomes; while other researches pointed out that asthma patients learned very quickly how to use the breathing device with internet based monitoring system even though they have never used a computer before; this just shows how easy those “applications” can be used and giving the same outcomes compared to tests performed by clinicians

In addition, allowing patients to monitor their own vital signs or results; encourages them to stay within the target range; it also can prevent any incidents that might be caused because of high blood pressure for example. ^{xviii}

There are online web sites that provide online diagnostic reports; such as: www.webmd.com symptom checker and www.yourdiagnosis.com ; both provide a very interesting visual and interactive online program where in the user puts a series of symptoms and demographic details; for the application to come up with a diagnosis and a treatment.



The image shows the WebMD symptom checker start screen. At the top, the logo "WebMD symptomchecker" is on the left, and "Need help?" with a speaker icon is on the right. Below the logo, there are three tabs: "Start Here", "Select Symptom", and "View Conditions". The "Start Here" tab is active. On the left side of the main content area, there is a 3D anatomical model of a female human body. On the right side, under the "Start Here" heading, there is a text block: "Need information as you determine what to do about your symptoms? Get help figuring them out by answering a series of questions. To get started, chose male or female then enter your age." Below this text are four input fields: "SEX" with radio buttons for "MALE" and "FEMALE" (where "FEMALE" is selected), "AGE" with a dropdown menu showing "25-34 years", "ZIP CODE" with a text box and "(OPTIONAL)" label, and "EMAIL" with a text box and "(OPTIONAL)" label. Below the email field is a paragraph: "Health information tailored to the needs of women. Sign-up today to receive WebMD's popular Women's Health newsletter." followed by a blue link "View Sample". At the bottom right of the form is an orange "SUBMIT" button.

Figure 9 – WebMD symptom Check Start Screen



The image shows the "YourDiagnosis" gender selection screen. At the top left is the "YourDiagnosis" logo with a stethoscope icon. At the top right is a small cartoon character icon. The main content area has a light blue background with a green abstract shape. On the left, the text reads: "What is your Gender?" followed by "When you have selected your gender please press Continue." On the right, there are two vertical rectangular buttons. The left button is labeled "Female" and features a blue silhouette of a female figure. The right button is labeled "Male" and features a light blue silhouette of a male figure. At the bottom of the screen, there are two large blue arrows pointing left and right. The left arrow is labeled "Go back" and the right arrow is labeled "Continue".



Height: cm

Height: feet

inches



Please
select the
relevant
country

United Arab Emirates

[back to world map](#)

The screenshot shows a web-based diagnostic questionnaire interface. At the top, it says "Click on all relevant boxes or if none, just continue." followed by the question "Do you have any of the following complaints?". Below the question, there are 13 rectangular boxes arranged in three columns. The first column contains "Pale sickly appearance", "Fever", "Trouble sleeping", and "Unusually thirsty". The second column contains "Often get sick", "Fatigue or tiredness", "Headache", "Breathing difficulties", and "Nausea". The third column contains "Weight loss", "Stress or anxiety", "Muscle aches and pains", and "Change in your behaviour". At the bottom of the interface, there are three blue buttons: "Go Back" on the left, "Save and Exit" in the center, and "Continue" on the right. The background is a light blue and green abstract design.

Figure 10 – sample screens from yourdiagnosis.com

As noticed, those online web “systems” are user friendly with extensive user of graphical interfaces and illustrating pictures; let alone the fact that they are available 24/7 at just a finger click.

I believe that several reasons and trends have a huge influence on the way health care is provided; the fact that the computer base communication is rapidly growing and the reality that new generations are much more comfortable with electronic information communication; considering all those reasons, I believe that the future of health care provision will be with minimum clinicians intervention.

Chapter Three

Research Methodology

Survey Analysis

Interviews

SWOT Analysis

Chapter 3

Research Methodology

For this thesis; I have adopted two methodologies that I believe complete themselves; I have done a survey and some interviews with some health care professionals from which I will do a SWOT analysis to see how different elements can affect the implementation of an HIS.

Survey

A set of different surveys were conducted through 4 hospitals and 2 primary health care centers including: Tawam Hospital, Al Wagan Hospital, Sheikh Khalifa Medical Center, Rahba Hospital, Jahili Clinic and Naima Clinic. The survey was created on Module-basis (i.e: Lab, Pharmacy, etc.); in the following section, I will analyze each module separately and in the end I will consolidate findings overall. The interesting fact about the survey is the time length variation of HIS implementation in all above mentioned facilities; which means that staff who filled the survey have different experience in using the system. (Sample surveys are available in the appendices)

The questionnaires were basically designed to evaluate the HIS in terms of modules and functionalities and users were to rate each functionality in terms of how it improved providing health care services. The scale used is from 1 to 5 (*1 being poor and 5 being excellent*)

The selection of the target audience for the survey was done to cover a sample of the population (10% of total number of staff for each Module; for example, we had around 400 physicians; we randomly distributed the survey to 40 staff)

1. SurgiNet Module

For the Surgery Module (known as SurgiNet in Cerner) we have distributed 15 surveys; 9 from which have filled and submitted the surveys; as seen in the results below the total average that Surgery users have rated on the SurgiNet module of the HIS is Good (3) but most interestingly; all users have rated being able to locate the patient as Very Good

SurgiNet (OR)		
SN SurgiNet Organizer	Average	No. of Replies
Finding the patient in the SN Organizer	4	9
Check in the patient	4	9
Peri - operative documentations	4	9
Added New Segment	4	9
Fill in the pick list	3	9
Finalize your document	4	9
Reprint specimen label	3	9
Scheduling Appointment Book		
Finding your area (i.e. main OR, Cath lab ...)	4	9
Complete the required fields	4	9
Select the appropriate procedures	3	8
Find the available room and time	3	9
Confirm your appointment	4	9
Cancel , reschedule and shuffle the appointments	3	9
Preference Card		
Finding preference card	3	8
View the content of the preference	3	8
Update the preference card	3	8
Using the copy wizard icon	2	7
Create and copy preference card	2	8
Using the global pick list update	3	8
Total Average	3	

2. Respiratory Therapy

As for the Respiratory Therapy; surveys were distributed to 6 staff and there was 4 replies; the total average of Respiratory Therapy Survey is **Good**

Respiratory (RT)		
Patient List	Average	No. of Replies
accuracy of the list	4	4
easiness to use	4	4
easiness to modify	4	4
PAL		
Easiness to use	3	4
Easiness to modify	3	4
Accuracy of content	3	4
Shift Assignment		
Easiness to use	3	4
Validity once set	3	4
Appropriateness for daily workflow	3	4
Accuracy of list	4	4
Auto updating	4	4
Scheduling (Outpatient)		
Easiness to find patient	4	2
Finding the pertinent data of a patient	4	2
Easiness in booking and checking in of patient	4	2
Proper workflow from app scheduling book to PowerChart	4	2
Power Orders (Inpatient/Outpatient)		
Easiness to use	3	4
Restriction of placing the orders from physician to nurses, technicians	3	4
Powerform Documentation		
Easiness to use	3	4
Availability of data needed	3	4
Modifying the form	3	4
Availability of extra space for additional information	3	4

Access Documentation		
Accessing documentation of physicians	4	4
Accessing documentation of other disciplines	3	4
Task List		
Auto updates in time	3	4
Flexibility in completing shared task	3	4
Access Diagnostic Test Results (In Documentation)		
Easiness finding the result	3	4
Easiness in transcribing results	3	3
MAR		
Easiness to use	4	4
Appropriate scheduling for the scheduled medicines	4	4
Signing	4	4
PathNet (Specimen Log in/Accession Result Entry)		
Easiness to use	4	4
Appropriate for daily workflow	3	4
Viewing the result	3	4
Total Average	3	

3. Rehab (Physiotherapy and Occupational Therapy)

As for Rehab; we have distributed 15 surveys; 8 of them got back and the total average of Rehab is **Good**

Rehab	Average	No. of Replies
Power Orders Rehab (Inpatients= Consults; Outpatients= Referrals) (i.e. finding/ placing/ signing/ completing orders, finding ordering physician)	3	8
PAL (Patient Access List, Inpatients) (i.e. easiness to use, updating functionality, appropriate content, flexible to modify, useful for daily practice)	3	5
Shift Assignment (Inpatients) (i.e. easiness to use, finding resources & locations, appropriate for daily workflow, 4 days shift enough)	2	4
Scheduling Tab (Outpatients) (i.e. easiness to find patients, open files, get an overview of future appointments)	3	7

Prioritization (Outpatients, Senior staff) (i.e. easiness to use, all necessary info available, finding all relevant queues)	3	4
Access to Documentation (own profession and other professions, i.e. nursing, doctors, x-rays, etc) (i.e. finding previous documentation own/others, knowing position of who documented)	3	8
Power Form documentation (i.e. easiness to use, appropriate content for all your patient groups, time needed, saving/ signing/ modifying the form)	3	8
Total Average	3	

4. Radiology (Known as RadNet in Cerner)

There were 8 surveys distributed among Radiology Departments in Facilities; and the total number we received is 4. The overall average of Radiology Module is **Very good** and it seems that users are satisfied with what the system is providing them

Common	Average	No. of Replies
Retrieval of modality worklist	4	4
Filtering exams according to modality	5	4
Filtering exams to appropriate exam rooms	4	4
Patient search	4	4
Accuracy in patient data retrieval	4	4
Obtaining results for other tests eg: Lab	5	2
Seeking scheduled appointments	5	4
Cancelling exams	5	4
Reason for exam field is clearly displayed	5	4
Starting and completing an exams	5	4
Checking radiology reports	5	4
Reporting templates	4	4
Ability to track TAT	5	2
Data Collection (Powervision)	4	3
Radiologists		
Checking and signing transcribed dictations	3	1
Retrieval of previous studies	4	2
Accessing the EMR quickly	3	1
Ordering tests (eg Blood) in Power Orders	3	1
Total Average	4	

5. Medical Records (Profile) Module

For the Medical Records Departments we have distributed 5 which all have been received back; the total average of **Very Good**

Profile	Average	No. of Replies
Patient Search in HIM applications	5	5
Chart tracking in HIM:Tracking	4	4
Chart request and Request queue	4	4
Deficiency allocation and monitoring	5	2
Transcription	3	2
Coding Module	3	2
Reporting	4	2
Total Average	4	

6. Physician documentation (Known as Power Note)

This survey is intended for Emergency Room physicians; and it was distributed to 10 physicians; we have received 5 back. The total average rate of ED is **Very good**

PowerNote ED	Average	No. of Replies
Using PNED for physicians documentation is	5	10
Find and search for a note in PNED is	4	10
The sequences of the PNED parts is	4	10
Total Average	4	

7. Physician Documentation (Power Chart)

For Physicians survey, we have distributed about 50 surveys; however, we only received back 16. The average rate is **Good**

Inbox		
Usage of Inbox Messaging	16	4
Result Endorsing	16	4
• Are the results to endorse functionality user friendly and patient safe?	15	3
Document Signature and Dictation Functionality	15	3
Power Orders		
Using Pharmacy Power Order	16	4
Using CT Power Order	15	4
Using MRI Power Orders	15	4
Using Nuclear Medicine Power Orders	16	4
Using Nursing Power Orders	12	4

Please rate use of Care Sets	16	3
Patient Chart		
Rate Layout of Charts	15	3
How easy is to maneuver in it?	15	4
Was the 24 hour patient summary user friendly?	13	3
Was the 72 hour patient summary user friendly?	13	3
Documentation		
Please rate functionality of Physician Documentation	16	3
How easy is it to maneuver in the documentation chart?	16	3
Finding previous document	16	4
Please rate document structure	16	3
Total Average	3	

8. Laboratory (Known as PathNet)

For General Laboratory, 20 surveys have been distributed; 12 were received back; however for other Laboratory specialties; only 2 were received back out of 6 distributed. The average rate for Laboratory is **Very Good**

GL (General Laboratory)	No. of Replies	Average
DOE (Department Order Entry)	11	4
ORV (Order Result Viewer)	12	4
ARE (Accession Result Entry)	11	4
Specimen Log In	11	4
Pending Inquiry	11	4
Container Inquiry	9	4
Label Re-Print	10	5
Work-list Request	8	4
Storage Tracking	7	5
Transfer Specimen	6	4
Collection Inquiry	8	4
TAT Monitor	7	4
Review Queue	7	4
Power Vision	3	3
AP (Anatomical Pathology) Module		
DOE (Department Order Entry)	2	5
ORV (Order Result Viewer)	2	4
ARE (Accession Result Entry)	2	4
Processing Tasks	2	4
Maintain Case	2	4
Outstand Task	2	5

Work-List & Labels.	2	5
Blood Bank Module		
DOE (Department Order Entry)	2	4
ORV (Order Result Viewer)	2	4
Collection Inquiry	2	4
Specimen Log In	2	4
Pending Inquiry	2	2
Receive Products	2	4
Correct Inventory	2	4
Modify Products	2	4
Dispense & Assign Products	2	3
Patient Product Inquiry	2	4
Transfer Products	2	2
Return Products	2	4
Modify Cross-Match	2	4
Final Disposition	2	4
Product History Review	2	4
Quarantine Products	2	4
Release Products	1	4
Result Entry	2	2
Microbiology Module		
DOE (Department Order Entry)	2	4
ORV (Order Result Viewer)	2	4
ARE (Accession Result Entry)	2	4
Specimen Log In.	2	1
Pending Inquiry	2	4
Container Inquiry	2	5
Label Re-Print	2	5
Transfer Specimen	1	5
Collection Inquiry	1	5
Batch reporting	2	5
Microbiology result entry	2	4
Total Average	4	

9. Pharmacy (known as PharmNet)

As for Pharmacy, 10 surveys were distributed to all locations; and only 4 were received back. The average rate for Pharmacy Module is **Very Good**

PharmNet (Pharmacy)		
Inpatient Med. Manager	Average	No. of Replies
Editing the view of unverified order monitor according to pharmacy location and shift and sorting orders by priority, start date and patient	4	7
Accessing patient profile from unverified order monitor	4	8
Viewing patient demographics, problems, allergies clinical diagnosis in patient profile	4	8
How do you see the sequence of order sentence, any suggestions?	4	6
How easy is to deal with order alerts in medication med manager?	4	7
Searching for a patient with the right encounter	3	8
Verifying different types of medication orders from patient profile	4	7
Adding order comments and product notes in med manager	4	8
The process of manual product selection	4	7
Changing the dispense category if it is not defaulted correctly	4	7
Power Chart		
Accessing current and past medication orders and prescriptions in medication profile in PowerChart	4	8
Viewing current list of home medication prior to admission in document viewing	2	6
Viewing the different types of medication order on MAR	3	6
Documenting clinical pharmacy interventions in ad hoc charting	4	6
Documenting patient education	4	7
Viewing clinical interventions and patient education	4	6
How do you find viewing lab results from med manager	4	7
Batch Dispensing		
Running manual batch update	4	7
Reprinting batch labels	3	7
Batch Reports		
Printing patient cassette labels	3	7
Printing MAR for all wards in case of planned downtime	4	6
Printing patient medication profile by nursing unit or patient	2	1

MM Item Inquiry		
Viewing the quantity on hand at pharmacy store or other pharmacy locations.	3	9
Retail Pharmacy		
Viewing patient demographics, problems, allergies clinical diagnosis	4	8
How do you find alerts in medication Retail MedManager?	3	8
Searching for a patient with the retail pharmacy lifetime encounter	3	4
The process of manual product selection to fill Mediation orders	3	5
Dealing with different kinds of profile actions	4	5
Power Chart		
Accessing current and past medication orders and prescriptions in medication profile in PowerChart.	4	7
Documenting clinical pharmacy interventions in ad hoc charting	4	7
Documenting patient education	4	7
Viewing clinical interventions and patient education	4	8
Viewing lab results	4	8
Total Average	4	

10. Registration and Scheduling (ERM/ESM)

Registration and Scheduling were targeted as the biggest group to be surveyed as they are one of the biggest groups that deal directly with patients to collect all demographic and other patient related details; however a very limited feedback was received from them. We have distributed over 40 surveys among clerks in different facilities randomly, however, we only received 4 back. The overall rating for Registration and Scheduling Modules was **Very Good**

ERM	Average	No. of Replies
Patient search	4	4
Launching PM conversations	4	4
Logging into the system	5	4
Using the conversations through Bed Board	3	3
Using the work list tab	3	3
ERM Data Collection (Power vision)	4	4
Reporting templates	4	4
Starting & completing the registration in admitting patients	5	4
Starting & completing the registration through First Net	3	4

Ability to track patient's transactions through transaction audit	4	4
Filtering the conversation fields (Nurse/Ambulatory- Medical Services –Nationality -).	4	3
ESM		
Schedule & reschedule the appointments	5	4
Check in the patients	5	4
Appointment books	5	4
appointment inquiries	5	4
Collect the orders & schedule the appointments	5	4
Dealing with transaction audit	4	4
ESM Data Collection (Power vision).	4	4
Request list inquiries	4	4
Total Average	4	

11. Nursing

Nursing survey distribution was just like the registration and scheduling; we have targeted a large group of them; so, out of 80 surveys distributed, 40 were received back and their overall rating was **Good**

NURSING	Average Score	No. Of Replies
<u>Documentation</u>		
Documenting	3	39
Following the progress of a patients file	3	40
Finding a document	3	40
<u>Shift Assessment</u>		
Making a shift assignment	3	30
Finding your allocated patients	3	31
Shift Assignments are always reliable	3	29
<u>Patient Search</u>		
Finding a patient file	4	40
Finding the right patient encounter	4	39
Finding a patient file by MRN	3	40
<u>Search Engine</u>		
Finding an order	3	39
Completing an order	3	36
Reading an Order	3	39
<u>Task List</u>		
using the task list makes my job easier	4	35
seeing my completed nursing tasks	4	35

Charting from the task list	4	35
Seeing all my due tasks	4	35
<u>Ad HOC Folders</u>		
Finding a form	3	39
Seeing what forms are available	3	38
<u>Specimen Log In</u>		
Logging in a lab specimen	4	31
<u>Patient Product Inquiry</u>		
Using Patient Product Inquiry	3	31
<u>Results Tab</u>		
Finding results	4	40
Finding a specific result	4	40
Seeing the normal/abnormal parameters of each result	4	40
<u>Assessments Tab</u>		
Using the assessments tab	3	36
I can find specific assessments	3	36
Using the time frame criteria	3	33
<u>Power Orders</u>		
Searching for the orders	3	37
To build your order sentences	3	34
Modify/Cancel orders	3	36
<u>MAR</u>		
Charting medications on E MAR	4	33
Find the medications orders in MAR	4	37
The sequence of the medication orders in MAR	3	37
<u>Scheduling Tab</u>		
Using the scheduling Tab	3	17
I can find a patient using the scheduling tab	3	17
Opening a patient file from the scheduling tab	3	17
<u>Triage</u>		
Using the Triage form	3	4
Assigning acuity level	3	4
The sequences of the Triage form parts	3	4
<u>In Box</u>		
Using the assessments tab	3	13
I can find specific assessments	3	14
Using the time frame criteria	3	13
Total Average	3	

Summary of Survey

As seen in the survey analysis above; all rates varied between 3 and 4 (Good and Very good); that can how that users are satisfied with the current Health information System which is a good indicator to management that they were investing in the right direction. However, this survey was totally anonymous; therefore, I believe that there might be a deviation on the transparency of the results. However, that was the only methodology that I could apply in my survey in addition to some interviews.

Below is a graph that shows an overall average rating per module as divided in the survey.

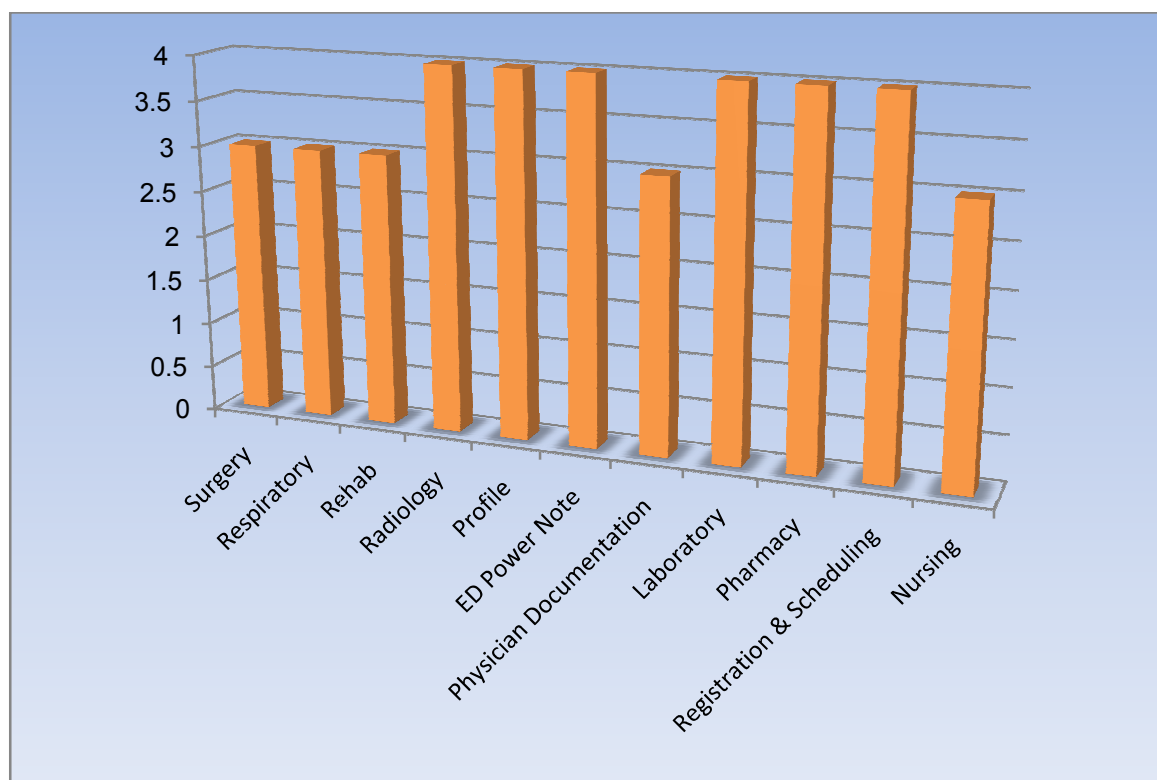


Figure- 11 Survey Summary Graph

Interviews

Based on few interviews conducted with different health care providers we can conclude that implementation of HIS has helped save time and efforts and increase quality on the other hand; the availability of information through reports has helped a lot of departments determine their needs for additional resources (hardware, human, etc.)

According to **Mitchel Jesson, Head of Medical Records Department in Tawam Hospital**; Health Information system should help the decision making authority in the hospital make decisions with regards to opening additional specialties in rural areas where trends show big group of certain patient categories. For example; if 40% of Tawam Hospital OB/Gyn patients are from Naima area; then the hospital management would be able to make the decision of whether to open an OB/Gyn speciality clinic in Naima Clinic or not. This way, you are retaining your patients by providing them services they need in a closer proximity and maybe would attract more patients from the same area who go to different hospitals.

Mitchell adds that Hospital information System is crucial in terms of locating the right person by providing more search criteria to users such as names; phone numbers; previous encounters; insurance details, etc., this way we are eliminating medical errors if a wrong medical file was selected

In addition, with regards to Medical Records Department; implementation of Hospital Information System has saved our time and efforts in terms of availability of information on the system; so, as soon as the physician has finished documenting an encounter; we are able to code that medical chart immediately; where in we used to attempt to track paper files all over clinics just to get the coding done.

Finally, Mitchell has suggested that implementing of an HIS can take a very long time and we are just starting; EMR implementations in the United Arab Emirates are still in the first phase and will require a very long time to mature.

And that what **Saifi Lokhandwala; HIS Project Manager** at Tawam Hospital agrees with; in fact, he compared HIS implementation in UAE to those in the UK where he used to work as HIS specialist that it is taking a whole new measures in European and western countries. In the time, we are trying to get our troops together to clean our data and organize our work flows and processes; people have started to use Medical Booths and online clinics that can offer to diagnose one's medical problems and offer best treatment based on symptoms.

“But all of this does not mean that we are not on the right track. We are heading there; but those things take time” Says Saifi who also emphasizes on management’s role to get over the obstacles that might hinder any system’s implementation. As he stated; that aligning all activities of implementation with Hospital’s mission and goals is a difficult thing; but it is what needs to be done, only then you know what you are doing and why you are doing it!

From a projects management prospective; an organization should retain its qualified staff and that is by compensating them and encouraging with financial packages or even encouraging them emotionally by giving them more tasks and acknowledging their efforts towards serving the Hospital and patients

And on the other hand, Saifi has stressed out that one of the major obstacles was to stay within the budget; *“as we progressed in our project implementation; our expenditure has gone up dramatically, people just kept adding things until we reached to a point where anything additional was put on hold till further notice”* Saifi comments. It appears that communications is one of the major obstacles that face any project manager especially in health care; the management needs to be informed; other technical staff, all hospital users and even patients

Based on an interview with **Mohammed Massad; Application Specialist and a Trainer for the ERM/ESM Modules**; he believes the biggest challenge that is facing any successful implementation is keeping the users up to date in terms of training on any new changes in the system. *“Many users think that the initial training session at the go-live time is enough; but they are wrong, even if there are no visible changes on how the screens looks; there’s always a constant change in the work flow”* says Mohammed. He also adds that very frequently Insurance Companies or Health Authorities are requiring new set of information to be provided to them and to accomplish that we need to figure workarounds and to implement that we need to make sure that all users know how to get their way around it and that can only be done through proper training.

SWOT Analysis

Below is a quick SWOT analysis of implementing an HIS

<ul style="list-style-type: none">- <u>Strengths</u><ul style="list-style-type: none">○ Data Protection○ Easy to Audit○ Full Insurance information○ Availability of Audit Trails○ Locating correct Patient record	<ul style="list-style-type: none">- <u>Weaknesses</u><ul style="list-style-type: none">○ Complex processes○ Weakness in sharing of data
<ul style="list-style-type: none">- <u>Opportunities</u><ul style="list-style-type: none">○ Improve Quality○ Simplify procedures○ Helps Decision Support○ Improve care delivery○ Increase efficiency	<ul style="list-style-type: none">- <u>Threats</u><ul style="list-style-type: none">○ ROI○ Continuous Training○ Privacy of information (too much security could reduce ease of use)○ Adaption of HIS○ Sharing of Data○ Communication

Chapter Four

Findings

Future Recommendations

Conclusion

Chapter Four

Findings

Over all observation throughout this research; the survey and the interviews and just general word-of-mouth in the hospital; the Health Information System since its implementation has provided good value to the hospital in general and to different departments in particular; however, there tends to be some delays in some areas such as registration desks and pharmacy; patients are queuing up for long times, so those departments should have their workflows reviewed.

Business Values:

Two years after implementing HIS in Tawam and other facilities, The HIS has already improved quality and consistency of providing healthcare, all parties involved including patients, clinicians and the organization have gained benefits after implementation.

Clinicians:

- Most important benefit for clinicians and healthcare providers is that they have the updated details of the patient chart handy.
- Historical information from other clinics such as Rehab can be obtained easily without having to disturb physician's work
- Automated order entry and prescribing helps in cutting down a lot of time; wherein health providers can spend more time attending to the patient rather than trying to find information or writing down orders/prescriptions
- Available information can help in medical researching in the future
- Helps locating the proper patient; as there are many attribute criteria when performing a patient search
- Avoid duplicating of lab or x-ray tests ordered

On the other hand, **patients** can also benefit from implementing an EMR system by:

- Ensuring that medications and test are placed on the right medical chart, thus, avoiding adverse events
- Availability of information in each visit; before implementing the system, the physical file used to travel from one clinic to another if the patient is having two appointments at the same time which used to take a quite long time.

Future Recommendations

- In terms of research methodology; I would recommend that focus groups are conducted as it gives a more transparent evaluation of the system; anonymous surveys might not server the same goal and may be of little help in terms of researching.
- For future research I think it will be a good idea to explore interface and integration HIS to other in-house application pros and cons from a technical and management point of view
- As discussed throughout this research; HIS implementations in the UAE are still in the early stage; it will be interesting to see actual numbers in terms of cost vs. ROI when the system is mature enough
- In addition; it will be a good research to do a comparison between government HIS implementation to those in the private sector.
- I believe it will be very essential to discuss Artificial Intelligent in Health Care (also known as Artificial Intelligence in Medicine AIM) as I believe few years from now it will be the new hot topic in the area to discuss

Conclusion

To conclude this research, I can say that before implementing any Health Information system whatsoever; to have a vision and a set of goals that need to be achieved by implementation of that system. This way the organization can measure success and find out what were the downfalls if any.

In addition; there should be a set of required functionalities that are expected to be performed by the Information System. Standards around those functionalities should be in place and should be developed in the context of a real business model and realistic application use case.

As we have seen in the survey analysis; that most users are satisfied with the current functionalities that are being provided by the Health Information System implemented in those hospitals and other facilities; one of the most interesting point that most users have agreed on was the ability to locate the accurate medical chart; this is very important in many ways including misplacing medications in the wrong file; therefore, messing up the history of both files (the actual patient, and the file that was selected by mistake). Also, reporting has become easier than before as information is available all the time.

I have to mention that management involvement and support is very crucial to the success of implementing HIS projects; without management support; projects are doomed to fail especially when working with different people from different backgrounds (Nursing, Medical, etc.)

At the end, I would like to thank all those who helped me out through this research whether by providing information or by supporting me emotionally; it was not an easy job.

Chapter Five

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Appendices

Chapter Five

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2. **Mr. Saifi Lokhandwala**, HIS Project Manager at Tawam Hospital. Interview date: 23/6/2009
3. **Mr. Mohammed Massad**; Application Specialist and Trainer for ERM and ESM modules at Tawam Hospital. Interview Date: 12/9/2009

Appendix 1

Sample Questionnaire