



# INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES



[www.hrmars.com](http://www.hrmars.com)

ISSN: 2222-6990

## Improving Patient Safety and Health Care Quality through Health Information Technology: AUBMC Case Study

Maryam Zeayter

To Link this Article: <http://dx.doi.org/10.6007/IJARBSS/v11-i6/10393>

DOI:10.6007/IJARBSS/v11-i6/10393

**Received:** 20 April 2021, **Revised:** 23 May 2021, **Accepted:** 08 June 2021

**Published Online:** 27 June 2021

**In-Text Citation:** (Zeayter, 2021)

**To Cite this Article:** Zeayter, M. (2021). Improving Patient Safety and Health Care Quality through Health Information Technology: AUBMC Case Study. *International Journal of Academic Research in Business and Social Sciences*, 11(6), 1784–1805.

**Copyright:** © 2021 The Author(s)

Published by Human Resource Management Academic Research Society ([www.hrmars.com](http://www.hrmars.com))

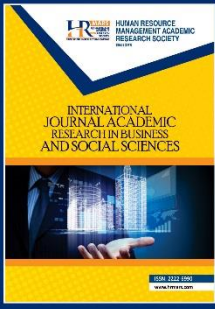
This article is published under the Creative Commons Attribution (CC BY 4.0) license. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this license may be seen at: <http://creativecommons.org/licenses/by/4.0/legalcode>

Vol. 11, No. 6, 2021, Pg. 1784 - 1805

<http://hrmars.com/index.php/pages/detail/IJARBSS>

JOURNAL HOMEPAGE

Full Terms & Conditions of access and use can be found at  
<http://hrmars.com/index.php/pages/detail/publication-ethics>



# INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES



[www.hrmar.com](http://www.hrmar.com)

ISSN: 2222-6990

## Improving Patient Safety and Health Care Quality through Health Information Technology: AUBMC Case Study

Maryam Zeayter

Beirut Arab University, Lebanon, Doctorate Business Administration(DBA)  
Lebanese International University Instructor

### Abstract

**Background:**The usage of computer-based information technology system is becoming more relevant nowadays due its dramatic effects on enhancing patient-doctor relationship and improving patient safety and health care quality. **Objective:** to identify the improvement in health care services and patient safety after using the AUBHealth portal by the American University of Beirut Medical Center (AUBMC) in Lebanon. **Methodology:** The research study used the qualitative research methodology to conduct the impact of HIT on improving patient safety and health care qualities through interviews inside AUBMC and online data research related to the case study of the “use of EHR in AUBMC” in a systematic manner. **Results:** Data accuracy is the most important achieved result stated by the interviewers after conversion from paper to electronic systems in AUBMC, following customer satisfaction, improved healthcare quality, and patient safety.**Conclusion:** EHR is an essential process adopted by AUBMC in order to optimize patient safety and health care quality.

**Keywords:** Health Care Information Technology, AUBMC, Patient Safety, Health Care Quality.

### Introduction

Health care information technology (HIT) is a comprehensive and secure management system to exchange information between all relevant shareholders such as patients, doctors, government, and quality insurance companies where healthcare professionals can easily acquire the medical history and information of a patient that will improve patient safety and treatment.

HIT is becoming part of healthcare units to optimize patient care, safety, efficiency, and quality of health delivery systems, worldwide. According to many research studies, patient safety, patient-doctor relationships,administrative functions, and health care quality are significantly improving using health information technology (Laal, 2012; Gulavani & Kulkarni, 2010).

Improving Patient Safety and Health Care Quality through HIT was chosen as a topic of this study to explore the software app EHR from Epic, norms of the portal, application in real life, and security concernsrelated to EHR in healthcare units of Lebanon with its impact on improvement of patient safety and health care services. It will cover the potential

challenges and risks associated with safety across all types of providers and professionals. The current research will provide in-depth information regarding the performance of EHR in the context of Lebanon. The current research will add more value to other healthcare facilities in Lebanon to endure the changes in the field of Health Sciences and boost the productivity of their organization using HIT. This research study is valuable for the CEOs and owners of healthcare facilities since they always aim to get higher profit and satisfied customers. In the digital era, a fast and convenient way of communication is an important aspect to stay competitive. Therefore, healthcare institutes in Lebanon will find this study extensively useful to improve patient safety and health care quality in their vicinities using personalized digital modes of communication.

The objective of the study is to identify the improvement in health care services and patient safety after using the AUBHealth portal by the American University of Beirut Medical Center (AUBMC) in Lebanon. The study will explore the competence of software to provide accurate statistical data and security concerns will be considered, as it is an imported software from EPIC. It can produce a highly positive impact on the health sector in Lebanon by encouraging patient involvement.

The exploratory research study will use the case study of the leading medical center, American University of Beirut Medical Center (AUBMC), which introduced first electronic health recorded (EHR) portal, named AUBHealth, in Lebanon to improve the patient safety and health care quality (AUBMC, 2018).

## Literature Review

The medical industry has experienced overwhelming advances over the last 50 years, and now even further steps are being taken to help optimize patient care. By turning to computer software, the use of HIT is changing the landscape of patient and doctor relationships. The overwhelming benefits of this enhanced technology stand to drastically improve several different crucial aspects of how a physician is able to acquire any necessary information about a patient, and as a result, will increase the improvement of patient treatment [6].

HIT provides the umbrella framework to describe the comprehensive management of health information across computerized systems and its secure exchange between consumers, providers, government and quality entities, and insurers. In general, HIT is increasingly viewed as the most promising tool for improving the overall quality, safety and efficiency of the health delivery system.

The HIT is most commonly used for online medical records, clinical data processing, clinical decision support, remote monitoring of patients, e-Health/e-Medicines, personal health record, e-Prescription, exchange of Health information, and so on (Gulavani & Kulkarni, 2010). Houses of HIT to address improvements in patient safety are currently driving health care organizations to automate clinical care operations and associated administrative functions. Houses of HIT to address improvements in patient safety are currently driving health care organizations to automate clinical care operations and associated administrative functions.

Health information technology shows promising improvement in the patient safety (Singh & Sittig, 2016), health care efficiency (Keller, et al., 2015), useful healthcare data (Russo, 2016), patient care (Percival & McGregor, 2016), diagnostic accuracy. A review study illustrates the improvement in communication, shared decision-making, patient-empowerment, and self-efficacy by the use of HIT interventions. Another study shows significant improvement in the

efficiency, safety, and quality of care of adults using HIT including EHR, telehealth, and decision supports (Bowles, Dykes, & Demiris, 2015). HIT minimizes the communication gaps, inefficiency in the administrative management to achieve the goal of high quality of health care and improved patient safety at low cost (Clarke, Janice, Bourn, Skoufalos, Beck, & Castillo, 2017). A review study by Roberts *et al.*, (2017), narrates great potential of HIT involvements for patient's engagement during hospitalization using interactive learning such as self-assessment, feedbacks, customized educations, etc.

Al-Rawajfah & Tubaishat, (2017) defined EHR as *"the systematized collection of digital patient and public health information"* Australian Commission on Safety and Quality in HealthCare, (2017) defined EHR as *"An online electronic application or repository through which individuals can access, manage and share their health information, and that of others for whom they are authorized, in a private and secure environment."*

An EHR is a data-based system in which the entire patient's medical data is recorded such as history, physical conditions, reports, and treatment instructions for improving the healthcare services, easy availability of data to physicians and cost-effective (Ben-Assuli, Doron, Sagi, Leshno, Ironi, & Ziv, 2015; Foster & Krasowski, 2019; Keller, et al., 2015). EHR has many benefits like data availability for all concerning shareholders, legible record, connected to pharmacies/drug banks, easier to know about the previous adverse impact of any medication/formula, accurate prescription, 24/7 availability, easy access, less storage capacity, unlimited data capacity, reduction in data loss, enables research activities by using a large number of accurate data, and speedy data recovery. According to a simulation-based study, the accuracy of clinical decisions using EHR improved as compared to the non-user of EHR. The precision in the medical decision, confidence level, and timing of the decision were significantly higher in the Physicians of emergency departments due to highly informed by accessing the previous medical information of the patients from the EHR.

There are many unintended consequences and security concerns of using HIT including tech-based issues due to malfunctions of software or hardware, uneducated or misuse of HIT, and potential safety concerns related to patient's data/ medication error (Singh & Sittig, 2016). Another case study shows the dilemma of EHR due to improper management of healthcare providers such as the requirement of approval to access data, Interpretation of EHR data, and inefficient knowledge (Russo, 2016). According to Ozair *et al.*, (2015), there are four main ethical issues related to EHR including disclosure of privacy, security gaps, data inaccuracy, and system implementations that can be overcome using proper management systems.

Many studies ensure the usage of health information technology with a positive impact on quality and patient safety (El-Jardali, Jamal, Dimassi, Ammar, & Tchaghchaghian, 2008;

Feldman, Buchalter, & Hayes, 2018; Gandhi, et al., 2019; Schwendimann, Blatter, Dhaini, Simon, & Ausserhofer, 2018). An exploratory study was conducted to use the HIT based system for the efficient procedure of pharmacy practices and improved efficiency of healthcare services. The experimental model used EHR for a safe and accurate channel for dispensing of medicines to patients by the interaction of the physician's office and a community pharmacy (Keller, et al., 2015).

A study conducted to use innovative mobile integrated healthcare (MIH) systems for patients with multiple chronic conditions. The main reason to use this innovate system is that the traditional system lacks integration and communication among different vectors, which causes delays in health care services for these vulnerable patients. The innovative MIH system

verdicts promising improvement in care coordination among hospitals, patients, families/caregivers during switches to multiple physicians and emergency visits of the patient using the sophisticated technological model and round-the-clock inter-professional team services (Clarke, Janice, Bourn, Skoufalos, Beck, & Castillo, 2017).

Saleh, Khodor, Alameddine, & Baroud, (2016) findings revealed that eHealth can positively impact the efficiency and quality of healthcare services and most of the healthcare providers at PHC centers across Lebanon are ready for eHealth implementation. Empirical evidence from the research of Alotaibi & Federico, (2017) there is a positive impact on patient safety by reducing medication errors and adverse incidents.

AL-Rawajfah & Tubaishat, (2017) conducted a study to explore nurses' views on the factors that act as barriers or facilitators to implementing EHRs in the hospitals for patient safety and quality of health care. A sample of 2793 nurses from 26 hospitals was part of the study. Findings of the study identified facilitators like *"incentive to purchase EHRs, the availability of technical assistance, and additional reimbursement"* whereas the barriers identified were *"economic burden of purchasing EHRs, a lack of information technology staff, and disruption to clinical care"* for the use of EHRs to improve health quality and patient safety.

Enhancements in the field of technology have resulted in value-based delivery models for healthcare systems at a global level that may in the form of increased quality of care through effecting optimization of patient records and reduction in health care expenditures. EHR is not just an information technology solution, in fact, it's a clinical solution for physicians, nurses, patients, paramedics etc in terms of quality care and patient safety. Effective functions of EHR systems include scheduling & billing integration, e-prescribing, lab ordering and review, data collection, internal reporting and tracking, patient documentation participation, patient access, data can be electronically shared outside practice, digital patient communication, external tracking and reporting, secure data access off-premises, health information exchange compatibility etc. The benefits of EHR patients are in the forms of increasing patient safety, reduction in medical errors, improved operational efficiencies, improved medicine management, effective communication and more access to information through electronic media whereas the benefits to healthcare professionals are in the form of better working environment that supports better coordination, decrease clinical incidents, less transcription errors and much more. Despite so many benefits, the reason for lack of EHR implementation has been due to Lack of national-level standards, high costs, uncertainty over ROI, difficulties in operating EHR systems as well as organizational change barriers (Bassim, Electronic Medical Record Adoption In Hospitals The Lebanese Experience, 2019).

The study of Alsadi & Saleh, (2019) assessed the readiness of healthcare facilities for the implementation of Electronic Health Record (EHR) systems. An integrative review methodology was adopted and various databases were used to review published articles between 2000 and 2018. The findings of the study revealed that the EHRs implementation is highly recommended due to its high impact of EHR readiness on adoption and usage.

Afrizal, Hidayanto, Handayani, & Budiharsana, (2019) findings of the study revealed *"lack of skilled manpower, insufficient senior management, and a lack of interaction among team members"* are the common barriers that affect the readiness of Electronic Health Record implementation in primary health care hospitals

Yanamadala, Morrison, Curtin, McDonald, & Hernandez-Tina, (2016) investigated the relationship between the adoption of EHR and its impact on patients' safety or health. The study identified that 3.5% of medical & surgical patients reported no EHR, 55.2% reported

partial care while 41.% reported full implementation of EHR systems. Moreover, it was found that the hospital with full EHR as compared to hospitals with no EHR showed a minimal difference.

Vahdat, Griffin, Stahl, & Yang, (2018) conducted an analysis of 52 000 visits of 93 patients on the effects of EHR implementation on the timeliness of care in a dermatology clinic. It is identified that in-room documentation can negatively impact patient care as it can cause delays for patients in order to complete in-room documentation, however, it was also found EHR systems can increase the accuracy of information.

Lebanon has the Ministry of Public Health (MOPH) as supreme regulatory authority for the promotion and development of the public Health care system. The MOPH operational strategic plan 2025 emphasizes to implement the e-Government strategy, the largest Health Digitalization plan in the Middle East and North America (MENA) for improving patient safety and health care quality (MOPH, 2018). The MOPH initially implemented the e-Government strategy into two PHCs (Qnat&Mashha) and three university hospitals including AUBMC, HDF, and SGHUMC to trail the digital system. The survey results show promising long-term outcomes, as 67% of surveyors believe Tele-Health is an effective tool whereas 75% of them think patient visits through telehealth can be enhanced using communication and awareness campaigns. This strategic plan proves to cope with the challenges of the 21<sup>st</sup> century, efficiency, the productivity of healthcare units, and improved patient safety (MOPH, 2018). The research of Badr & Asmari, (2016) revealed there is a need for standardization of process to enhance the quality of EHR systems. Another challenge that is faced in the implementation of EHR is a human error such as accidental errors in the data entry. In the case of Lebanon, there is abundant health data on small-scale health studies but lacks accuracy and relevancy for strategic decision-making. Therefore, the government needs to play a role in the generation of data on a national level and need for an official body for standardization and validation of sources.

With the rising number of Syrian refugees in Lebanon, the demand for improvement within the health care system of Lebanon has become a necessity. The only solution to this is reforming the health infrastructure with the integration of health IT that can result in an increased level of efficiencies and effectiveness within the health care system of Lebanon (Ibrahim & Daneshvar, 2018).

Strudwick, Tanimizu, Saraswathy, Yousef, & Nickerson, (2015) reviewed 7 EHR systems Family Medicine Information System, Electronic Medical Record, Al-Shifa e-health application, Hospital Information System, Electronic Patient Record, Computerized Physician Order Entry and Information Technology. The findings of the review revealed that there is a positive attitude of nurses towards using the EHR system due to its benefits in providing quality healthcare to patients as it allows the nurses to utilize the time more effectively and efficiently.

The ministry of public health is responsible for all the legislative changes in the health sector of Lebanon. Recently, MOPH adopted the strategic plan 2025 and intervene in the e-Governance strategy using five pillars including Legal Framework, data centers connected to the government, e-services, national framework to improve the patient's safety and healthcare system (MOPH, 2018). It engaged all the shareholders of Healthcare to define a roadmap for eHealth in Lebanon as an essential demand of the modern era. Improvement in patient safety and health care quality is necessary for Lebanon after an increase in the occurrence and reporting of the medical error incidents in Lebanon. The implication of patient safety and accountability is not leading to real improvement in traditional manners (El-Jardali,

Bawab, & Fadlallah, K2P Policy Brief- Full report: Addressing Medical Errors in the Lebanese Healthcare System, 2016).

A comprehensive framework of planning for advancement challenges to cater, short-term and long-term e-strategic goals, implementation within five years, and consistent monitoring is under the implementation process to improve patient safety and health care quality (MOPH, 2016; MOPH, 2018). The first phase of strategy implementation used three university hospitals and two PHCs. According to WHO Report, eHealth tools including Electronic Health Records (EHR), Patient Information Systems (PIS), Telehealth, National drug registries, National electronic registries, Decision Support Systems (DSS), Hospital Information Systems (HIS), General Practitioner Information Systems (GPIS), and Geographical Information System (GIS) are very effective in Lebanon (WHO Report, 2016).

The leading medical center, American University of Beirut Medical Center (AUBMC) in Lebanon is a pioneer in using the Health IT system in Lebanon. AUBMC started using the first electronic health records from 2000 but required high caliber integrated system to reach Stage 6 in HIMSS Classification (Healthcare Information and Management Systems Society). The customer-oriented system can improve the quality of healthcare in Lebanon and patient's satisfaction by encouraging patient involvement in medical decisions (Bassim, EHR Readiness: Building Consensus on the Readiness for EHR in Lebanon, 2019).

The electronic health recorded (EHR) portal, named AUBHealth, is a major milestone for the leading hospital, AUBMC in Lebanon to facilitate the patient and improve health care quality (AUBMC, 2018). The integrated health information system is developed and imported from EPIC for 73 Million USD in pursuit of excellence and maintain frontline healthcare provider in Lebanon to fulfill the Vision 2020 of the Healthcare Provider. Epic is considered as a name of excellence to provide the most advanced digital health care information and convenient digital support to patients about their health. Epic is used by top hospitals in the US to work collaboratively for improving patient care and innovative healthcare services (AUBMC, 2018). According to President Dr. Khuri, "The strategic alliance with Epic will enhance our mission to provide excellent healthcare services to patients in Lebanon".

Electronic Health Recorder (EHR) was launched on 3<sup>rd</sup> November 2018 as a patient-oriented portal, the first time in Lebanon. This portal enables all stakeholders including all health units, patients, caregivers, physicians, nurses, paramedical staff, laboratories, and other collaborative hospitals to access the health records and treatment procedures simultaneously without compromising patient privacy. It is considered an advanced healthcare system worldwide to provide advanced patient care to maximize the service's efficiency (AUBMC, 2018). The Epic will provide a free patient App "MyChart" which is a major convenience for the patients to access through the smartphone or computer, through which patients can schedule their appointments, communication with their care providers and many other options. Moreover, it will enhance the care coordination among the providers for long-term growth plan to access and share the medical details (history, medication, insurance, and other related information) of patients in reduced time as compared to the traditional mode of handling.

AUBHealth is a transformational initiative, which provides easy access to doctors towards real-time medical information of their patients. Moreover, the Patient will enjoy a seamless experience by eluding the duplicate diagnostic tests, bundles of papers reports, and data insecurity that enables them to save time and money.

The full-fledged implementation of the AUBHealth system in AUBMC took almost three years of planning, preparation, training, and a huge amount of resources. The app is

used by a large number of caregivers across AUBMC for the integration of clinical documentation from the pharmacy, laboratories, blood banks, radiology, medical history, billing, appointments, allergies and many more activities related to the patients. Additionally, it enables the healthcare providers' remote access to know about their planning and collaborations. The online patient portal AUBHealth available at PCs and with the name of "MyChart" App by Epic in mobile devices enables the patients to access their medical records electronically. There are many benefits to use AUBHealth containing check-in process from home, know about previous checkup timing, discussion with your physician from home, verify medications, allergies, search for specific healthcare provider within the AUBMC, and enable your parents, children, or spouse to know about your medical records. The check-in from home enables the patient to know the appointment details without going to a healthcare facility, confirm, or cancel the appointments with providing reasons/concerns (AUBMC, 2019).

AUBHealth is a major milestone in Lebanon that can surely strengthen Lebanon's position in providing advanced healthcare services to its patients. Besides, this system requires a highly qualified and trained healthcare team to assess, design, and update AUBHealth. These can be helping assets for the AUBMC and Lebanon Government to share their knowledge and expertise with relevant health information sectors.

### **Case Methodology**

This chapter entirely focuses on the research methodology, sampling design, data analysis tools, and techniques adopted to compute the holistic perspective of society for the proposed research. In this research, the researcher planned to use a fast and inexpensive qualitative approach, which is an interpretative approach to fulfill the requirements of the conducted research. The qualitative research entails the nature, perspective and in-depth knowledge of the phenomena (Frances, Coughlan, & Patricia, 2009). The research study used the qualitative research methodology to conduct the impact of HIT on improving patient safety and health care qualities. The main purpose of using this approach is to prevail in the holistic perspective of human behavior instead of computable values (Starman, 2013).

The case study research design is a vital research method to conduct the research in the health sciences based on exploring the hidden facts, analysis of their characteristics, and description of the matter. It is a framework to investigate the various hidden aspects of a particular topic using questionnaires from the participants in the situation, moreover, to assess the performance of development for providing actionable insights (Starman, 2013). The purpose of this research design is to explore the characteristics of EHR in AUBMC, Lebanon that is used to improve patient safety and health care quality.

Data collection is another important aspect of the research to evaluate the impact of the study. The research study used both primary and secondary data collection methods. The primary data collection also called real-time data in which the researcher uses systematic interviews that are conducted inside the organization. The secondary data was collected from online data research related to the case study of the "use of EHR in AUBMC" in a systematic manner for better decision-making.

The population is defined as complete or aggregate of any specific subject having similar specifications whereas a small group of the representative of that population is known as samples (Polit & Hungler, 1993). In the conducted research study, a limited sample size ( $n=4$ ) of the case study is used to understand the evolving issues related to the app which needs to be explored in the context of Lebanon. Interviews are conducted from two main



users of the AUBHealthTechnical staff (n=2) and Physicians(n=2) from the organization's population to analysis the assessments on the use of HIT in the healthcare facilities. The study intended to target the quotasampling technique that is a sub-group of purposefulsampling typeto meet the specific criteria such as relevancy, required experience, available at the targeted population. However, the quota sampling technique specifies their role based on their professions and usage of the application for different purposes(Lopez & Whitehead, 2013).

Research instruments are measuring tools to conduct the research study. Structured and Open-ended Questionnaires are the research toolsfor datacollection. The research study used standardized/structured interviews to gain valuable insight into concerned one's perception, understanding, and experience of using EHR in the vicinity of AUMBC to contribute in-depth data collection and generate better results (Frances, Coughlan, & Patricia, 2009).

The data analysis was done using Thematic Analysis to investigate the qualitative analysis of the interviewed questions. It is a flexible and accessible tool to evaluate qualitative data. It is a sophisticated approach to draw a thematic map that consists of six steps including data familiarization, coding process, developing theme (3 steps), and report production(Braun & Clarke, 2012). Moreover, the studyevaluated the impact of imported Epic software EHR on patient safety and health care quality. This exploratory study is conducted in the context of Lebanon, as there is no such study is conducted here.

### Data Analysis and Findings

This part will involve analysis of data on the basis of interviews conducted on 2 physicians and 2 technicians on the quality of the AUB-health system in the AUBMC hospital. The finding of the data analyzed from the interviews will be further discussed in detail by conducting a thematic analysis. It will be discussed that if our findings support the past findings. The thematic analysis will be based on main themes challenges, stakeholders, implementation benefits, and improvements in patient safety, improvement in health care quality and time duration. The results will provide if the AUB-Health system has shown improvement in delivering quality health care or not.

In order to analyze qualitative or quantitative data thematic analysis is performed that systemically builds an understanding of the answers given in the structured interview received from different groups or individuals (Maguire & Delahunt, 2017). The thematic analysis involves six steps involved that can be seen shown in the table below.

Phases	Thematic Analysis
Phase I	Become familiar with the data
Phase II	Generate Initial Codes
Phase III	Search for Themes
Phase IV	Review Themes
Phase V	Define Themes
Phase VI	Writing-up

**Table 1: Phases of Thematic Analysis**

#### ***Phase I: Become Familiar with the Data***

It is the first step within the thematic analysis in which the researcher becomes familiar with data after thorough reading and re-reading of the interview transcripts (Maguire & Delahunt,

2017). Interview transcriptions of the studied participants i.e. technicians and physicians of AUBMC are given in the Appendix.

### **Phase II: Generate Initial Codes**

Generation of initial codes is the second phase of thematic analysis that makes the data in meaningful and systemic information by coding a large data in a brief form (Maguire & Delahunt, 2017). Four interviews were conducted on the base of and information obtained from answers of the interviews generated initial codes in the form of a table that consists of the main themes, sub-themes and frequencies which can be seen in the appendix.

### **Phase III: Search for Themes**

Themes are patterns that tell about the significant information of research without any specific rules and regulations. Several codes have been created and examined by relating them quality within the healthcare system at AUBMC hospital Furthermore, a total of four interviews were conducted on the basis of improvement in patient safety and health care quality in AUBMC hospital.

Various main themes have been identified such as challenges, stakeholders, implementation of benefits, and improvement in patient safety, improve healthcare quality and time duration. We have selected two major themes that impact the improvements in healthcare quality and patient safety in AUBMC hospital further subthemes of two selected main themes will be discussed below.

### **Theme 1 Challenges**

Data accuracy is the most important challenge stated by the interviewers following customer satisfaction, security concerns and conversion from paper to electronic systems, user interface. Vimalachandran, Wang, Zhang, Heyward, & Whittaker, (2018) findings have suggested that data accuracy is one of the biggest challenges for effective clinical administration through EHR systems. Azeez & Vyver, (2019) findings revealed data privacy and data security as one of the challenges within the E-health system that are needed to be overcome for improvement in health quality and patient safety.

Botha, Botha, & Herselman, (2014) findings have also revealed data privacy, difficulty in transferring from paper to systems, usability and interface as the main challenges. Many other studies (Abolade & Durosinmi, 2018; Haque, Ahsan, Rahman, & Aminul-Islam, 2019) have stated these challenges. One of the interviewer statements on challenges is stated below.

*“A few of the biggest challenges within the AUB health system at AUBMC is of conversion from manual entry system to AUB health system and data privacy. We have trained our staff to use the system but most of the issue is from the side of the patients that feel the insecure due to data privacy concerns and need a simple interface especially for older patients that helps them to transfer and easier adoption of the new systems.”*

### **Theme 2 Benefits of Implementation**

Benefits of implementation are the second major theme that will be discussed with environmental, safety, quality, efficiency and cost reduction. Barbabella, Melchiorre, Quattrini, Papa, & Lamura, (2017) findings revealed that E-health care systems improve safety and quality.

Kapoor, (2014) stated many advantages of implementing EHR- systems that support are results such as improved quality of care.

Botha, Botha, & Herselman, (2014) have revealed several benefits of implementing EHR systems such as cost reduction, safety improvements, efficiency through remote access and monitoring of the patient, reduction in paper use and improved quality, etc.

Findings of (Ganesh, 2004; Devkota & Devkota, 2013; Minichiello, Rahman, Dune, Scott, & Dowsett, 2013) support that e-health improves quality and patient safety and has a positive impact on patients health if its effectively implemented. One of the interviewer statements on challenges is stated below.

*“AUB E-health system is very useful as it improves the quality of care through effective medical record keeping. Its also efficient in providing immediate assistance to patients and reduces costs through virtual monitoring, diagnosis and consultation to the patients”.*

### **Recommendations & Conclusion**

Health care information technology (HIT) optimizes patient care, safety, efficiency, and quality of health delivery systems. AUB health system has many benefits as stated in the above discussion like it improves the quality of healthcare by bringing efficiencies in the e-health system. Several challenges were also discussed such as security concerns and conversion from paper to electronic systems and user interface.

To overcome these challenges several recommendations are stated to improve effectiveness and efficiencies AUB health system and application of e-health and EHR systems in a general. It is recommended that data entry of EHR should be done by voice recognition assistance features of physicians as most of the time data entry is done by the physician himself that consumes more time of the physician on screen rather than on the patient. Secondly, it's recommended if a voice recognition system within AUB is integrated then it should effectively navigate the EHR and enter of orders. In order to make AUB health system suitable, ubiquitous medium for delivering health care it is recommended that patient safety concerns need to be overcome that predictability and efficiency is ensured within clinical care transactions.

More experienced analysts will likely have deeper insights into their data during familiarisation, find the process of coding quicker and easier and be able to code at a more conceptual level, and more quickly and confidently develop themes that need less reviewing and refining, especially if working with a smaller dataset. Writing is also likely to take a more central place throughout analysis with more experience. The point we wish to emphasise is that certain skills of analysis develop only through experience and practice. However, even experienced researchers will draw and redraw lots of 'thematic maps' when searching for themes, and engage in extensive review processes when working with larger datasets. A thematic map is a visual (see Braun & Clarke, 2006) or sometimes text-based (see Frith & Gleeson, 2004) tool to map out the facets of your developing analysis and identify main themes, subthemes, and interconnections between themes and subthemes.

### **References**

Alabdullatif, T. (2017). SABIC Green Logistics Systems and Profitability. *International Business school, Master Thesis Degree Project in Business Administration* .

- Americanhospitalassociation. (2018). *Improving Patient Safety and Health Care Quality through Health*. American Hospital Association.
- AUBMC. (2018). *AUBMC launches AUBHealth, a new comprehensive health record system, on November 3*. Retrieved from AUBMC : <http://aubmc.org.lb/Pages/AUBMC-launches-AUBHealth-a-new-comprehensive-health-record-system.aspx#sthash.2h3KQDQA.dpbs>
- AUBMC. (2019). *Your Guide to My AUBHealth* . Retrieved from AUBMC: [http://aubmc.org.lb/Documents/publications/patient\\_handbook/MyAUBHealth.pdf](http://aubmc.org.lb/Documents/publications/patient_handbook/MyAUBHealth.pdf)
- AustralianCommissiononSafetyandQualityinHealthCare. (2017). *Implementation Method and Clinical Benefits of Using National Electronic Health Records in Australian Emergency Departments*.
- Bassim, Y. (2019). *EHR Readiness: Building Consensus on the Readiness for EHR in Lebanon*. Retrieved from American University of Beirut : <https://www.aub.edu.lb/fm/CME/Documents/EHR-Readiness/ElectronicMedicalRecordAdoptionInHospitals-YBassim.pdf>
- Bassim, Y. (2019). *Electronic Medical Record Adoption In Hospitals The Lebanese Experience*. University of Balamand President for Healthcare and Hospital Affairs, Lebanon.
- Baykasoglu, A., & Kaplanoglu, V. (2007). A service-costing framework for logistics firms and a case study. *Management Research News*, 30 (9), 621-33.
- Ben-Assuli, O., Doron, S., Sagi, D., Leshno, M., Ironi, A., & Ziv, A. (2015). Improving diagnostic accuracy using EHR in emergency departments: A simulation-based study. *Journal of Biomedical Informatics* , 31-40.
- Bowles, K., Dykes, P., & Demiris, G. (2015). The Use of Health Information Technology to Improve Care and Outcomes for Older Adults. *Research in Gerontological Nursing* , 5-10.
- Braun, V., & Clarke, V. (2012). Thematic Analysis. In P. M. H. Cooper, *APA handbook of research methods in psychology* (pp. 57-71). America: American Psychological Association.
- Carter, S., & Rogers, S. (2008). A framework of sustainable supply chain management: Moving toward new theory. *Int. J. Phys. Distrib. Logist. Manag*, 38, 360-387.
- Clarke, J., Janice, L., Bourn, S., Skoufalos, A., Beck, E., & Castillo, D. (2017). An Innovative Approach to Health Care Delivery for Patients with Chronic Conditions. *Population Health Management* , 0067.
- Decelle, A., Young, R., Case, K., & Rahimifard, S. (2006). Building supply chain communication systems: A review of methods and. *Data Science Journal* .
- Elikin, P., Peter, L., Henry, C., Johnson, H., Callahan, M., David, C., et al. (2016). Improving patient safety reporting with the common formats: Common data representation for Patient Safety Organizations. *Journal of Biomedical Informatics* , 116-121.
- El-Jardali, F., & Fadlallah, R. (2017). A review of national policies and strategies to improve quality of health care and patient safety: a case study from Lebanon and Jordan. *BMC Health Serv Res*.17(1) , 568.
- El-Jardali, F., Bawab, L., & Fadlallah, R. (2016). *K2P Policy Brief- Full report: Addressing Medical Errors in the Lebanese Healthcare System*. Beirut, Lebanon: Knowledge to Policy (K2P) Center.
- Foster, B., & Krasowski, M. (2019). The Use of an Electronic Health Record Patient Portal to Access Diagnostic Test Results by Emergency Patients at an Academic Medical Center: Retrospective Study. *Journal of Medical Internet Research* , e13791.

- Frances, R., Coughlan, M., & Patricia, C. (2009). Interviewing in qualitative research. *International Journal of Therapy and Rehabilitation* , 309-314.
- Gachunga, D. H. (2014). THE INFLUENCE OF PERFORMANCE APPRAISAL ON EMPLOYEE PRODUCTIVITY IN ORGANIZATIONS: A CASE STUDY OF SELECTED WHO OFFICES IN EAST AFRICA . *International Journal of Social Sciences and Entrepreneurship* .
- GICHUKI, B. W. (2014). INFLUENCE OF PERFORMANCE MANAGEMENT ON EMPLOYEE .
- Gulavani, S., & Kulkarni, R. (2010). Role of Information Technology in Health Care. *Computing For Nation Development* , 50-54.
- iBaroody JLT. (2019). *Hospital Management Software (HMS, EHR, EMR) Clinics, Doctors, Healthcare Software Lebanon Syria Egypt Turkey Iraq Jordan Egypt HMS EHR EMR Software Services*. Retrieved from iBaroody JLT: <https://www.ibaroody.com/health-care-hospital-management-clinics-software-and-systems-sales-training/>
- Ibrahim, M., & Daneshvar, S. (2018). Efficiency Analysis of Healthcare System in Lebanon Using Modified Data Envelopment Analysis. *J Healthc Eng*.
- ISO, I. O. (2010). *ISO14001 Environmental management systems*. ISO ISBN 978-92-67-10531-4.
- Laal, M. (2012). Health information technology benefits. *AWERProcedia Information Technology & Computer Science* , 224-228.
- Lopez, V., & Whitehead, D. (2013). Sampling data and data collection in qualitative research. In V. Lopez, & D. Whitehead, *Nursing & Midwifery Research: Methods and Appraisal for Evidence-Based Practice* (pp. 123-140). Mosby: Elsevier.
- Maguire, M., & Delahunt, B. (2017). Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. *AISHE-J: The All Ireland Journal of Teaching and Learning in Higher Education* .
- MOPH. (2016). *Health Strategic Plan (2016-2020)*. Beirut, Lebanon: Ministry of Public Health, Lebanon.
- MOPH. (2018). *MOPH Strategy 2025*. Beirut, Lebanon: The Ministry of Public Health.
- Neamah, A., Ghani, M., Ahmad, A., Alomari, E., & Nuiaa, R. (2018). *E-HEALTH STATE IN MIDDLE EAST COUNTRIES: AN OVERVIEW*.
- Ozair, F., Fouzia, F., Jamshed, N., Nayer, J., Sharma, A., & Aggarwal, P. (2015). Ethical issues in electronic health records: A general overview. *Perspectives in Clinical Research* , 73-76.
- Percival, J., & McGregor, C. (2016). An Evaluation of Understandability of Patient Journey Models in Mental Health. *JMIR Publications* , e20.
- Polit, D., & Hungler, B. (1993). Study Guide for essentials of nursing research . *Methods, Appraisal, and Utilization* , Lippincott Williams & Wilkins.
- Roberts, S., Chaboyer, W., Gonzalez, R., & Marshall, A. (2017). Using technology to engage hospitalised patients in their care: a realist review. *BMC Health Services Research* , 388-394.
- Russo, E., Dean, F., Sittig, D., Daniel, R., Murphy, D., & Singh, H. (2016). Challenges in patient safety improvement research in the era of electronic health records. *Healthcare* , 285-290.
- Saeed, M., & Kersten, W. (12 January 2019). Drivers of Sustainable Supply Chain Management:. *Institute of Business Logistics and General Management, Hamburg University of Technology*, .
- Samanta, P. (2015). INTRODUCTION TO INVENTORY MANAGEMENT. *10.13140/RG.2.2.14914.99522*. .

- Sandberg, E., & Abrahamsson, M. (2011). Logistics capabilities for sustainable competitive advantage. *International Journal of Logistics: Research & Applications*, 14 (1), 61-75.
- Silva, T., Gonçalves, A., & Leite, M. (n.d.). Logistics cost management: insights on tools and. *Int. J. Logistics Systems and Management*, Vol. 19, No. 3, 2014 .
- Singh, H., & Sittig, D. (2016). Measuring and improving patient safety through health information technology: The Health IT Safety Framework. *BMJ Quality and Safety* , 226-232.
- Smallwood, J., & Al-Odeh, M. (2012). Sustainable Supply Chain Management: Literature Review, Trends, and Framework. *International Journal of Computational Engineering & Management.*, 15, 2230-7893.
- Starman, A. B. (2013). The case study as a type of qualitative research. *Journal of Contemporary Educational Studies* , 28-43.
- WHO Report. (2016). *Enabling environment – policies and strategies to support the information society of Lebanon*. Lebanon: World Health Organization .

## Appendix

## Coding of Technical Staff Interview 1

<b>Codes</b>	<b>Main Themes</b>	<b>Frequency</b>
<b>Challenges</b>		
1.0	<i>Sub Theme: Accuracy of data</i>	1
1.1	<i>Sub Theme: Conversion from Paper</i>	1
1.2	<i>Sub Theme: Achieving Customer Satisfaction</i>	1
1.3	<i>Sub Theme: Working on system</i>	2
1.4	<i>Sub Theme: Security concerns</i>	1
<b>Stake Holders</b>		
2.0	<i>Sub Theme: Patients</i>	1
2.1	<i>Sub Theme: Paramedical and medical staff</i>	2
2.2	<i>Sub Theme: I.T technicians</i>	1
<b>Implementation Benefits</b>		
3.0	<i>Sub Theme: Clarity of data</i>	2
3.1	<i>Sub Theme: Cost Reduction &amp; Efficiency</i>	2
3.2	<i>Sub Theme: Environmental Benefits</i>	2
<b>Improvement of Patient Safety</b>		
4.0	<i>Sub Theme: Remote Access to results and reports</i>	2
4.1	<i>Sub Theme: Precise data</i>	1
<b>Improvement of Health Care Quality</b>		
5.0	<i>Sub Theme: Immediate assistance</i>	1
5.1	<i>Sub Theme: remote monitoring</i>	2
5.2	<i>Sub Theme: Attentive staff</i>	3
5.3	<i>Sub Theme: Availability of previous records</i>	2
<b>Time Duration</b>		
6.0	<i>Sub Theme: More than one year</i>	1
6.1	<i>Sub Theme: Less than one year</i>	0

**Coding of Technical Staff Interview 2**

<b>Codes</b>	<b>Main Themes</b>	<b>Frequency</b>
<b>Challenges</b>		
1.0	<i>Sub Theme: Transfer of data</i>	2
1.1	<i>Sub Theme: User interface of EHR</i>	1
1.2	<i>Sub Theme: Achieving Customer Satisfaction</i>	1
<b>Stake Holders</b>		
2.0	<i>Sub Theme: Patients</i>	1
2.1	<i>Sub Theme: Nurses</i>	2
2.2	<i>Sub Theme: Technical Staff</i>	3
2.2	<i>Sub Theme: Doctor</i>	2
<b>Implementation Benefits</b>		
3.0	<i>Sub Theme: Finding of patient data</i>	2
3.1	<i>Sub Theme: Cost Reduction</i>	2
3.2	<i>Sub Theme: Efficient process and time reduction</i>	2
<b>Improvement of Patient Safety</b>		
4.0	<i>Sub Theme: safe data</i>	2
4.1	<i>Sub Theme: Precise and accurate data</i>	1
<b>Improvement of Health Care Quality</b>		
5.0	<i>Sub Theme: Immediate generation Of reports</i>	3
5.1	<i>Sub Theme: remote monitoring</i>	2
5.2	<i>Sub Theme: timed and high-quality services</i>	3
5.3	<i>Sub Theme: Availability of previous records</i>	2
<b>Time Duration</b>		
6.0	<i>Sub Theme: More than one year</i>	1
6.1	<i>Sub Theme: Less than one year</i>	0



**Coding of Physician Interview 3**

<b>Codes</b>	<b>Main Themes</b>	<b>Frequency</b>
<b>Challenges</b>		
1.0	<i>Sub Theme: Disturbance during duty hours</i>	1
1.1	<i>Sub Theme: Delayed response of customers</i>	1
1.2	<i>Sub Theme: Working on general system</i>	1
1.3	<i>Sub Theme: Security concerns</i>	2
1.4	<i>Sub Theme: Data interpretation by patients</i>	1
<b>Stake Holders</b>		
2.0	<i>Sub Theme: Patients</i>	1
2.1	<i>Sub Theme: Physicians</i>	2
2.2	<i>Sub Theme: Staff</i>	1
<b>Implementation Benefits</b>		
3.0	<i>Sub Theme: Remote Consultation</i>	2
3.1	<i>Sub Theme: Efficiency</i>	2
3.2	<i>Sub Theme: Environmental Benefits</i>	2
3.2	<i>Sub Theme: Medical records</i>	2
<b>Improvement of Patient Safety</b>		
4.0	<i>Sub Theme: Remote Access to results and reports</i>	2
4.1	<i>Sub Theme: precautionary patient information</i>	1
<b>Improvement of Health Care Quality</b>		
5.0	<i>Sub Theme Remote assistance</i>	1
5.1	<i>Sub Theme: monitoring and consultation in time</i>	2
5.2	<i>Sub Theme: Decrease in medical errors</i>	3
5.3	<i>Sub Theme: Known Patient History</i>	2
<b>Time Duration</b>		
6.0	<i>Sub Theme: More than one year</i>	1
6.1	<i>Sub Theme: Less than one year</i>	0

**Coding of Physician Interview 4**

<b>Codes</b>	<b>Main Themes</b>	<b>Frequency</b>
<b>Challenges</b>		
1.0	<i>Sub Theme: Interruption</i>	2
1.1	<i>Sub Theme: Delayed response of customers</i>	1
1.2	<i>Sub Theme: patients fear by checking reports</i>	2
1.3	<i>Sub Theme: Security concerns</i>	2
1.4	<i>Sub Theme: unsystematic data require more time to judge</i>	1
<b>Stake Holders</b>		
2.0	<i>Sub Theme: Patients</i>	2
2.1	<i>Sub Theme: Physicians</i>	2
2.2	<i>Sub Theme: Medical and Para-medical staff</i>	2
2.3	<i>Sub Theme: Management</i>	1
<b>Implementation Benefits</b>		
3.0	<i>Sub Theme: Remote and immediate Consultation</i>	2

Partici pants	Challenges					Benefits of Implementation				
	Data accur acy	Secur ity Conc erns	Transfor mation of Data	Custo mer Satisfa ction		User Interf ace	Envir on- men tal	Pati ent Safe ty	Qua lity Heal th care	Effici ency
P1	x	x	x	x	x	x	x	x	x	x
P2	x	-	x	x	x	-	x	x	x	x
P3	x	x	-	x	-	x	x	x	x	-
P4	x	x	-	x	-	x	x	x	x	-
3.1	<i>Sub Theme: Efficiency</i>								2	
3.2	<i>Sub Theme: Environmental Benefits</i>								1	
3.2	<i>Sub Theme: availability of Medical records to all</i>								1	
<b>Improvement of Patient Safety</b>										
4.0	<i>Sub Theme: a systematic data</i>								2	
4.1	<i>Sub Theme: safe and accurate data</i>								1	
4.2	<i>Sub Theme: no repetition of same tests</i>								2	
<b>Improvement of Health Care Quality</b>										
5.0	<i>Sub Theme: Remote assistance to all patients</i>								1	
5.1	<i>Sub Theme: timely monitoring and consultation</i>								2	
5.2	<i>Sub Theme: Decrease in medical errors by technical staff</i>								3	
5.3	<i>Sub Theme: high-quality care</i>								2	
5.4	<i>Sub Theme: Known Patient History</i>								2	
<b>Time Duration</b>										
6.0	<i>Sub Theme: More than one year</i>								1	
6.1	<i>Sub Theme: Less than one year</i>								0	

## Interview Transcriptions

Interview 1

Name:

Designation: Physician

**How Long you have used E-HR?**

More than one year.

**What were the major challenges during the implementation of E-HR?**

A few of the biggest challenges in implementing the AUB health system at AUBMC were related to conversion from a manual entry system to the AUB health system and data privacy. We have trained our staff to use the system but most of the issue is from the side of the patients that feel the insecure due to data privacy concerns and need a simple interface especially for older patients that helps them to transfer and easier adoption of the new systems.

**Who are the stakeholders involved in E-HR implementation?**

Patients, paramedics, doctors, and technicians

**What are the major benefits of E-HR implementation?**

AUB E-health system is very useful as it improves the quality of care through effective medical record keeping. Its also efficient in providing immediate assistance to patients and reduces costs through virtual monitoring, diagnosis, and consultation to the patients.

**What is the biggest benefit of E-HR in terms of patient safety?**

The biggest benefit of E-HR in terms of patient safety is improved quality care and remote delivery of service.

**What is the biggest benefit of E-HR in terms of healthcare quality?**

The biggest benefit of E-HR in terms of health care services was improved quality care and cost reduction.

Name: .....

Designation: Physician

How long have you used E-HR?

Ans: I am using it for 1 year and 2 months

What were the major challenges during the implementation of E-HR?

Start Working was tough, though slowly, it becomes easy to use. Security and data accuracy is still an issue, which needs tentative management.

Who are the stakeholders involved in E-HR implementation?

Patients, medical and para-medical staff

What are the major benefits of E-HR implementation? *(Both Tangible and Intangible)*

Easy to use, availability of History of Patient, quality of care, environmental benefits

What is the biggest benefit of E-HR in terms of patient safety?

Availability 24/7, Know about patient previous reports, allergy based data, their tests,

What is the biggest benefit of E-HR in terms of healthcare quality?

Improved data availability, security, and benchmarked health care services

|

Name: A. Diab

Designation:.....

How long have you using E-HR?

About a year and three months.

What were the major challenges during the implementation of E-HR?

The way of working with E-HR in general.

To convert from using paper-chart system to new electronic system.

Who are the stakeholders involved in E-HR implementation?

Medical and para-medical specially nursing

What are the major benefits of E-HR implementation? (*Both Tangible and Intangible*)

Having one language all across the medical center

Environmental benefits by decreasing the usage of papers

More concise

More clarity

One system to all (internally and externally)

electronical files

etc

What is the biggest benefit of E-HR in terms of patient safety?

Decreasing any type of medical errors from medical and para-medical

What is the biggest benefit of E-HR in terms of healthcare quality?

High quality of care and benchmarking

Name: A. Diab

Designation: .....

How long have you been using E-HR?

One year and seven months

What were the major challenges during the implementation of E-HR?

Usage and security

Who are the stakeholders involved in E-HR implementation?

Patients, doctors, Medical and paramedical staff

What are the major benefits of E-HR implementation? (Both tangible and intangible)

Quality of care

Patient safety

Cost reduction

What is the biggest benefit of E-HR in terms of patient safety?

Improved quality care

Immediate assistance

What is the biggest benefit of E-HR in terms of healthcare quality?

Improved healthcare services

Availability of patient data.