Deanship of Graduate Study
Al-Quds University

Assessment of electronic health records (e-health) implementations in UNRWA clinics. A survey of health providers perceptions.

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M.Sc Thesis

Jerusalem- Palestine

2018/1439

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A thesis submitted to the graduate school in partial fulfillment of the requirements for the degree of health policy and management/school of public health.

Al-Quds University.

2018-1439

Al-Quds University

Deanship of Graduate Studies

Thesis Approval

Assessment of electronic health records (e-health) implementations in UNRWA clinics. A survey of health providers perceptions

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Jerusalem-Palestine
1439 – 2018

Dedication

To the pure spirit of my father, to my beloved mother, to my dear husband, Fouad who gave me love and support, to my daughter, Hala to my son Kareem, to my sisters Reem, Amal, Shaima, to my brothers, Mohammed, Ibrahim, to my friend Lamia those whom offered me spiritual and emotional support.

Shatha Abdullah Mohammed Zahdeh

Declaration

I certify that this thesis submitted for the degree of masters in health policy and management is the result of my own research, except where otherwise acknowledged, and this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Signature: 

Shatha Abdullah Mohammed Zahdeh

Date :2018 /4/28

Acknowledgment

First and foremost, I would like to offer my sincerest gratitude to my supervisor Dr. Mohammed Shaheen, for his supervision, guidance and assistance throughout this study. I would like to express many sincere thanks to the Faculty of Public Health staff at Al-Quds University.

Abstract

Background

Electronic Health Record (EHR) systems are increasingly being implemented in hospitals and health centers of developing countries to improve patient care and clinical service. UNRWA launched the EHR system (e-health) as an operational step to facilitate the delivery of health services to increase the efficiency and quality of care. However, no assessment studies are available concerning the level of success, components of e-health system, and perceived outcomes of implementing e-health. Health provider's satisfaction is one helpful indicator for measuring of information system (IS) success.

Aim

The researcher aims to assess the e-health system success by identifying the perception of those who use the system (health providers) in seven UNRWA clinics based on Delone and Mclean framework for health information system success. The researcher aims to identify the characteristics of e-health system by studying user's perception on its components: the system quality, information quality, and service quality.

Method

The study was conducted from October 2017 to December 2017. The design of this study was a combination of quantitative cross-sectional survey and qualitative focus group sessions. To meet the study objectives and conceptual framework, the questionnaire "Canada Health Infoway System and Use Assessment Survey" which was adapted from National Benefits Evaluation Framework (Lau, Hagens, & Muttitt, 2007), was used. This questionnaire measures the information system success by Delone and Mclean model. The sample included 110 health providers that were working in UNRWA in the middle area of the West Bank. The validity of the questionnaire was tested and the total instrument reliability test (Cronbach's Alpha) gave a score of 0.7 for most of the dimensions indicating good reliability. In addition to the survey, three focus group sessions were conducted. The focus group was largely participant guided, but the questions were focused on the benefits, the drawbacks of the system,, and the suggestions that users believe to improve the system in general.

Results

Results showed that 78% of the respondents were overall satisfied with the e-health system. Among the three dimensions that describe the system, ‘information quality’ got the highest satisfaction (76%), while service quality (48%) and system quality/performance (48%). were the least satisfied. Most of the respondents (76%) agreed that the system improved the net quality of health but only around the half (59%) agreed that the system improved the net productivity.

Conclusion

In spite of the relatively high overall user satisfaction with the e-health system at UNRWA clinics in the middle area of West Bank, the researcher find that specific components of the system mainly in its performance and service quality need to be revised by policy makers. Most of the users were dissatisfied by the level of training they received prior the usage of the system and the quality of service and support by IT department which in addition to poor system performance highly impact on the overall productivity of the work.

تقييم تنفيذ السجل الصحي الالكتروني في عيادات الأونروا، استبانة تعكس مدى رضى مزودي الخدمات الصحية عن السجل الصحي الالكتروني.

إعداد: شذى عبد الله محمد زاهدة.

إشراف: د. محمد شاهين.

ملخص

تزايد تطبيق السجل الصحي الالكتروني في المستشفيات والمراكز الصحية في الدول النامية وذلك لتحسين الرعاية الصحية للمريض، اطلقت الأونروا السجل الصحي الالكتروني لتسهيل تقديم الخدمات الصحية وزيادة فعالية نوعية الرعاية الصحية، لكن حتى الان لا يوجد دراسات تقييم لمدى فعالية هذا السجل ، وتقييم الفوائد المرجوة من تطبيقه. يعتبر رضا مزودي الخدمات الصحية عن هذا النظام ومكوناته مؤشر لمدى نجاح وفعالية هذا النظام.

أهداف الدراسة:

تقييم مدى نجاح النظام الصحي الالكتروني من خلال معرفة وجهة نظر مزودي الخدمات الصحية في سبع عيادات في الأونروا، بناءاً على الاطار النظري لتقييم البرامج المعلوماتية للعاملين ديلون وماكلين، كما تهدف الدراسة الى تقييم مكونات النظام من حيث نوعية المعلومات ونوعية الخدمات التقنية والدعم الفني المقدم للمساعدة على استخدام النظام.

المنهجية:

تم عمل هذه الدراسة خلال الفترة من تشرين الاول الى كانون الاول من عام 2017، من خلال استخدام استبانة مأخوذة من دراسات سابقة لمعرفة انطباع مزودي الخدمات الصحية في منطقة الوسط في الضفة الغربية.

كانت نسبة الاستجابة 77.2% ونسبة الثبات بلغت حسب مقياس كرونبخ الفا 0.7% .

اشتملت الاستبانة على خمسة ابعاد للتقييم وهي: نوعية النظام، ونوعية المعلومات، ونوعية الخدمات والدعم الفني، ومدى رضى مزودي الخدمات الصحية والفوائد الاجمالية من استخدام النظام.

النتائج:

اظهرت النتائج ان هناك رضى عام بين مزودي الخدمات الصحية عن السجل الصحي الالكتروني بنسبة 78%، ومن بين الثلاثة ابعاد التي توصف النظام، حصلت نوعية المعلومات على نسبة الرضى الاعلى، حيث بلغت 76% ، بينما حصلت نوعية النظام على 48%، ونوعية الدعم والمساندة على نسبة 48%.

76% من المشاركين بالدراسة يعتقدون ان السجل الصحي الالكتروني عمل على تحسين نوعية الرعاية المقدمة للمريض بينما59% فقط يعتقدون ان السجل الصحي الالكتروني عمل على تحسين انتاجية العمل.

الخلاصة:

على الرغم من ان نسبة رضى مزودي الخدمات الصحية في منطقة الوسط التابعة للانروا في الضفة الغربية، عن السجل الصحي الالكتروني تعتبر عالية نسبياً، إلا أن بعض مقومات السجل الالكتروني مثل الاداء الخاص بالنظام، ونوعية الدعم والمساندة بحاجة إلى مراجعة واهتمام أكثر من صانعي القرار، كما أن معظم مستخدمي النظام اشاروا الى عدم رضاهم عن التدريب المخصص قبل استخدام النظام، وايضاً عدم رضاهم عن اداء النظام مما قد يؤثر على انتاجية العمل.

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Abbreviations

Abbreviation	Explanation
CDS	Clinical Decision Support
CPOE	Computerized Physician Order Entry
D&M	Delone and McLean
EHR	Electronic Health Records
FHT	Family Health Team
HIE	Health Information Exchange
HIS	Health Information System
ICT	Information Communication Technology
IOM	Institute of Medicine
IS	Information System
IT	Information Technology
UNRWA	United Nation Relief and Works Agency for Palestine Refugees in the Near East

Chapter one:

Introduction

1. Introduction

Technology investment, like any investment, results from careful consideration based on analysis and evaluation, and as such, companies want to know if their technology investments results in future success. Naturally, organizations are interested in knowing the return on these investments. The impacts of information technology are often indirect and influenced by human, organizational, and environmental factors. Therefore, measurement of information systems (IS) success is both complex and illusive (DeLone & McLean, 1992a).

Because of the importance of IS success evaluation, many studies were conducted to know how IS affects organizational success. The organizations want to see the impact of these systems on the productivity and overall quality of care. The effectiveness of these system depends on many factors like organizational, environmental and on factors related to people using them (Petter, DeLone, & McLean, 2008a). Measuring success of IS is a multidimensional concept that can be evaluated at various levels. Therefore, many models were developed to assess the success of IS.

Health information system (HIS) is one type of information system that store, manage, or transmit information related to the health of individuals or the activities of an organization that work in the health sector, these systems are designed to help healthcare providers with managing daily tasks and patient information. HIS encompasses all health data sources required by a country to plan and implement its national health strategy. Examples of these data sources are electronic health records for patient care, health facility data, surveillance data, census data, population surveys, vital event records, human resource records, financial data, infrastructure data, and logistics and supply data.

An example of health information technology is electronic health record (EHR) which is an electronic version of a patient's paper record. EHRs offer the advantage of making information about patient care available, in a secure way, to multiple authorized users. It represents longitudinal data (in electronic format) that are collected during routine delivery of health care (Cowie, 2017).

Menachmi and Collum in their review defined EHR as "a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports" (Menachemi & Collum, 2011a). EHR is also defined as a repository of information regarding the health status of a subject of care, in computer processable form (Deutsch,Duftschmid&Dorda,2010)**.**

EHRs can improve the way medical information is stored, communicated, and processed by those who are delivering health care. According to (King, 2014), adopting EHRs may results in many desirable outcomes related to patient safety**,** quality of care, and efficiency. Therefore, it is essential to know how the adoption of EHR by those who used it can be increased and how the attitudes of those final users (i.e. health providers) may affect EHR success.

Dinev in her book wrote about the perception of health providers toward EHR the following: "Individuals — whose acceptance of, and cooperation with, a digitized health care system is critical — form their perceptions from within this complex framework. A fully functional health care information technology environment, such as EHR, would lead to individuals' acceptance only if the individuals first form an overall positive attitude towards that environment "(Dinev, Albano, Xu, D'Atri, & Hart, 2016)**.**

1.1 Study problem

EHR has been widely adopted by many health providers to improve the health care, performance, quality of care, and reduce health costs. United Nation Relief and Works Agency for Palestine Refugees in the Near East (UNRWA) provides many health services for millions of Palestinian refugees in five regions: Jordan, Syria, Lebanon, West bank, and

Gaza. It has implemented health information system (HIS) recently. The researcher isn't aware of any assessment process that took place to assess e-health benefits and users satisfaction at UNRWA health centers. This is the task the researcher wanted to accomplish in this study.

1.2 Study justification

HIS has provided many opportunities to decrease medical errors, increase the efficiency and the quality of patient's care and safety. On the other hand the negative impacts of HIS when users resist the implementation of the system or when the implemented system is inefficient. This will lead to big loss of money that was invested in these systems (van der Meijden, Tange, Troost, & Hasman, 2003; Tilahun & Fritz, 2015a). Several studies indicate that failure of EHR systems may be due to lack of evaluation or feedback from the users (Zheng,Padman,Johnson,&Diamond,2005).

One of the important vision of the health department in UNRWA is to have substantial impact on the health status of Palestine Refugees so that they can achieve a long and healthy life. The logic behind the health reform is that improving the quality of healthcare support will enable Palestine refugees to be healthy and free from diseases. To improve quality of care and achieve effectiveness, one need to improve processes governing the quality of care such as reducing of staff workload, and improving daily operations. This may be acheived through comprehensive evaluation of the indicators related to quality of care, effectiveness, and productivity. Irrespective to the results that may be achieved, the evaluation is a chance to alert the organization for the weaknesses in the system through recommendations based on careful assessment.

1.3 Objectives

1.3.1 General objective

Assess e-health system success by analyzing the perception of those who use the system (health providers) in seven UNRWA clinics based on Delone and Mclean (D&M) framework for health information system success.

1.3.2 Specific objectives

1. Assess the perception of health providers regarding e-health quality including response time, privacy and reliability.

2. Assess the e-health information quality including overall quality of information, accuracy, layout and format of the pages, availability of the information when needed.

3. Evaluate the e-health service quality including support and training to encourage end users to use e-health.

4. Evaluate user satisfaction including overall satisfaction about e-health, ease of use and integration e-health into workflow/making jobs easier.

5. Assess the perceived net benefits by investigating productivity (Overall productivity and reduced need to obtain results manually) and quality of care (overall quality of care and coordination of care).

1.4.3 Research questions

1. Are e-health users satisfied by the quality and the performance of the system?
2. Is the information of e-health considered accurate and in well-designed format?
3. How do e-health users evaluate the support and the training provided by UNRWA?
4. Are the health providers in UNRWA clinics overall satisfied with e-health system?
5. Did the implementation of e-health in UNRWA clinics achieve the net benefits regarding productivity and quality of care?

Chapter two:

2. Literature review

This chapter includes a hint about the history of EHR worldwide, the beginning of EHR in UNRWA, the steps of implementation of e-health and the different versions of e-health system.

2.1 Background

The idea of computerizing health records has been around since 1960, when hospitals first started using computers. First of all the computerized systems focused on financial processes, because of the need for correctly patient billed for the treatment they received. At the same time, hospital laboratories were becoming increasingly computerized, which meant test results were available in electronic form and could be integrated with the basic demographic information, then these records have been developed into a variety of purposes, including a single access point for relevant, active data about the patient, an informal work space for recording ideas and impressions.

EHRs have been implemented by the increase number of hospitals and health clinics worldwide, for example there have been many initiatives from governments in many countries like USA (Abramson, 2012), United Kingdom (Robertson, 2010)**,** and Denmark (Høstgaard, Bertelsen, & Nøhr, 2017)**.** The implementation in low and middle income Countries like Palestine is still limited. Although proven beneficial, it has been reported that the quality of data collected in low income countries has been inaccurate, unreliable and not timely (Hassan, 2017). Many of these countries still facing challenges in providing comprehensive medical record compared to developed countries, because of many factors like finance, no clear health policy, and shortage in technical and human resources (Whittaker, Aufdenkamp, & Tinley, 2009)

In Palestine UNRWA is the main comprehensive primary health care provider for Palestine refugees in the Near East and has implemented the largest humanitarian operation in the region for over 60 years. The Agency aims to protect and promote the health of Palestine

refugees registered in the five regions of UNRWA. It aims for them to achieve the highest attainable level of health as indicated in the first human development goal, a long and healthy life, of the UNRWA medium term strategy 2016-2021.

Palestinian refugees served by (UNRWA) are experiencing increasing rates of diagnosis of non-communicable diseases, raising in cost with limited resources. The organization started to adapt new strategic plans to meet these changes. In 2011, UNRWA launched the Family Health Team program (FHT) which is a patient -centered approach aims to give a good quality primary care services to Palestinian refugees in the five UNRWA regions (Lebanon, Gaza, the West Bank, Jordan and Syria). The FHT program works as a consistent health system care for the family and its members with the same doctor, nurse, and midwife, so to enhance better relationship between patient and health providers. This system provides the best continuity of health care by streamline the patient flow in the clinic (one family, one health team). In addition to FHT, UNRWA launched the EHR (e-health) as an operational step to facilitate the delivery of health services to increase the efficiency and quality of care. The Health Department believes that the e-health project is important because of its support to make it possible to achieve the Family Health Team (FHT) approach in addition to its role in supporting the health department as a whole. The e-health project in UNRWA has three components:

1. The e-health system development component which includes the development of processes; requirement analysis, system design, testing and troubleshooting.
2. The capacity-building package included purchasing personal computers, power supplies, printers, network infrastructure, making Internet connections available, and training staff on usage of computers in general and the e-health system in particular.
3. The e-health project adoption component included rolling out processes related to the installation of hardware, general help desk support, e-health support, development of roles and responsibilities on quality management procedures, and e-health performance monitoring processes.

So e-health system started before UNRWA moved to the FHT approach and, as a result, development of the e-health system was conducted in two stages: the first stage which includes the use of five versions of classical e-health system, every version is upgraded from the previous version with no clear changes, and the second stage which was the new e-health that linked with FHT (FHT version 5) ,it was a reflection of the UNRWA health

reform as it introduced the FHT approach in UNRWA health centers, e-health FHT system, based on the classical five versions, tried to gradually adopt all components of the health reform by incorporating additional elements such as family history, reporting. The FHT versions developed and released are defined below, (adapted from): (Department of internal oversight services. Evaluation of e-health project, 2016).

1. FHT version 1: released Feb 2013: reason for the release was piloting at Amman New Camp health center in Jordan and Aqbat Jaber in West Bank.
2. FHT version 2: released Aug 2013: reason for the release bugs fixing to stabilize the piloting.
3. FHT version 3: released Apr 2014: reason for the release enhancement / bugs fixing.
4. FHT version 4: released Jul 2014: reason for the release enhancement /bugs fixing.
   5. FHT version 5: released to be rolled out in July 2015: reason for the release fixing reports generation, many enhancements done and bugs fixed.

E-health transforms patient's files to electronic format including the preventive and curative services that can be accessible by any medical provider. This comprehensive EHR system (e-health FHT) has different components (modules) that can be used in the various units of healthcare facilities that include:

1. Outpatient consultations, which includes curative consultations, assessment of non-communicable disease patients or new child examinations.
2. Maternal services, specifically, pre-conception care, antenatal follow-up, postnatal care and family planning.
3. Child services, which include child immunization, child growth monitoring, new-born assessment.
4. General support health services: Dental, laboratory, specialists and pharmacy (medicines dispensary including maintaining/dispensing the non-communicable disease periodic / repeated medicines on regular basis). Figure 1 represents a screenshot from e-health system (lab department). Figure 1 represents an example of lab module in e-health system.

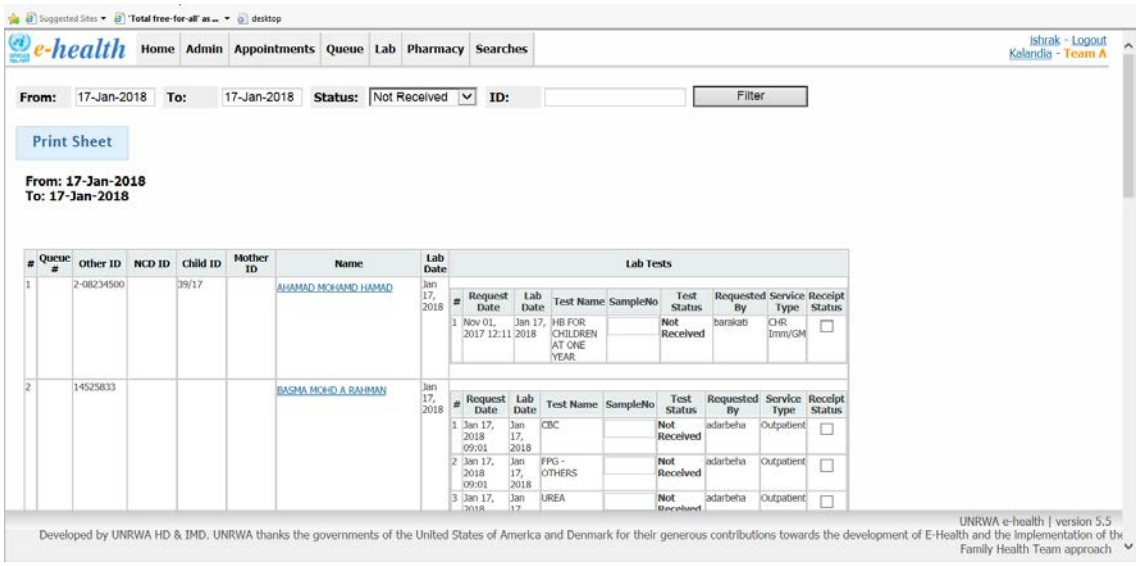

Figure 1: Screenshot of the e-health system currently implemented in UNRWA clinics (example: lab module), the main modules have sub-modules that will be displayed upon clicking.

Initially, UNRWA started the piloting process of implementing the e-health in the Lebanon Field Office and funded by Denmark. The project concluded in October 2009 and resulted in the development and piloting of three modules of (HIS) that could be accessible once it was rolled out by 100 users in all of UNRWA's Lebanon 29 health centers, then the development process moved to headquarters in Amman, where the patient record system had developed to satisfy user need and improve service quality. Then in 2013 The piloting process completed its way to the West Bank field office, which was in Aqbet Jaber camp. As a result, the development and support of the classical system stopped with its last version classical v5.6, still used by many health centers and the e-health project concentrated on developing the successive FHT versions which used nowadays. By 2017, e-health is running in all UNRWA regions including West Bank. The steps of implementation based on UNRWA evaluation report is explained in Figure 2.

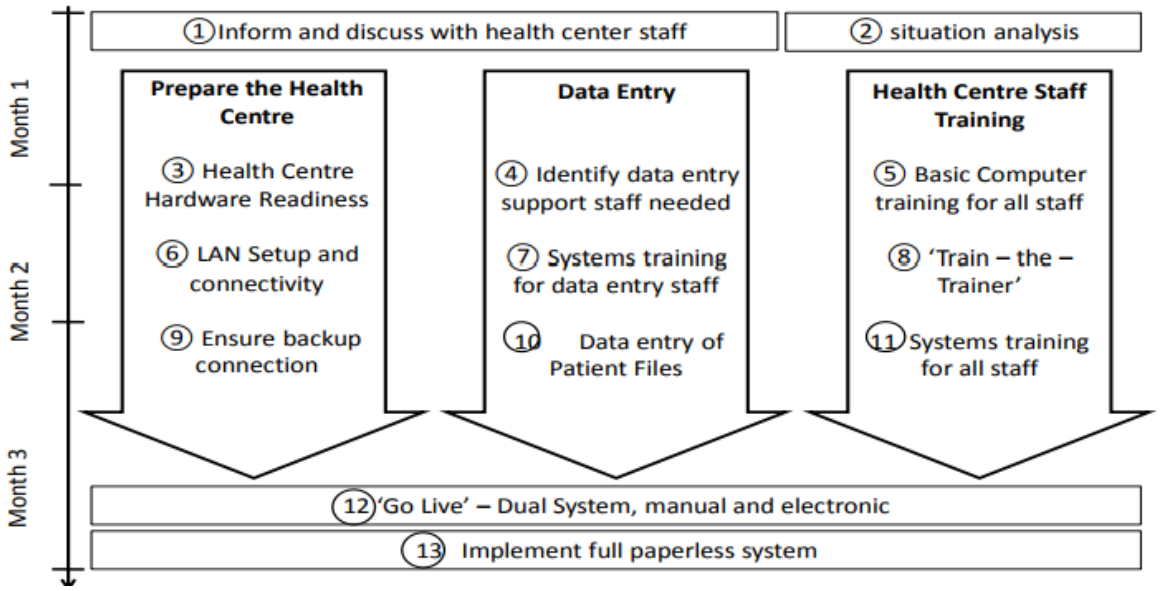

Figure 2: Description of the 13 steps of E-health implementation adopted by UNRWA . Adapted from: (Department of internal oversight services. Evaluation of e-health project,2016).

Training of staff located in clinics was one of the important steps that UNRWA focused on and planed for, but unfortunately the annual budgets are located, and there is no standardization at field offices, or standard training manual exists and no standard certification mechanism is established to ensure bench-marking and quality of systems end users, so to deal with the existed situation the health department employed a doctor and head nurse to provide quality control services and reviewing functionality, bugs and reports, this step helped the team to give them support also improve the implementation of e-health FHT system. The training of the FHT version is being conducted by each field office information technology support staff while the health department core team takes care of the orientation whenever a workshop is planned at headquarter (there were no dates or plan was given or available).

UNRWA estimated the cost of implementing e-health program based on its final evaluation report (Department of internal oversight services. Evaluation of e-health project,2016). as follows:

1. Computer equipment: US$ 150,000 for each field office, estimated total for the five fields US$ 600,000,with annual minimum of US$ 20,000 for upgrade/upkeep (estimated total US$ 100,000 for the five fields).
2. Communication/internet line: estimate of US$ 100,000 per field office (estimated total for five fields US$ 500,000) will require for fixing communication issues with minimum US$ 20,000 annual upkeep (total estimated annual US$100,000). Estimated first year: US$ 1,000,000; estimated second year: US$ 180,000; estimated third year: US$180, 000.
3. Software final tuning: Estimated first year: US$ 65,000; estimated second year: US$ 0; estimated third year: US$ 0.
4. Roll out phase: Estimated first year: US$ 120,000 and estimated second year: US$ 80,000 and estimated third year: US$ 50,000.

Finally: Total estimated first year cost: US$ 1,790,000

Estimated second year: US$ 800,000

Estimated third year: US$ 64,000.

The ultimate goal of e-health is to approach the six expected aims: improving care, safety, patient contentedness, timeliness, efficiency, and quality. After more than three years of being active in West Bank, it is important to make an overall assessment of e-health system and to figure out its impact on approaching the six aims. This system provides the possibility of data collection, processing, analysis, but unfortunately the reporting process is still having problems and there is little difference between reports that result from manual registries versus reports that result from e-health system. Although this problem these final processes leads to the appropriate indicators for monitoring and evaluation of health system performance. Also, this system will not only improve health care decision-making in action but also plays the greatest role in the development of effective organizational performance through the provision of information and patient records to service providers (Saghaeiannejad-Isfahani, Saeedbakhsh, Jahanbakhsh, &Habibi, 2015). Saghaeiannejad-Isfahani and colleagues proposed that the information system is effective when it is able to respond to users' information needs, otherwise, it would step into the vanity and in order to be prevented from entering the early stage of information systems futility, it is required to assess the effectiveness of the system periodically to realize the possible failures in order to improve the system.

Evaluation phase is important in the development of any system. To our awareness, the e-health system at UNRWA health centers has never been evaluated in comprehensive way. For fulfilling the goals of the system implementation to achieve the maximum benefits of the system, The researcher aim in this study to evaluate the e-health system based on Delone and McLean model (D&M) which was created in1992 and updated in 2003. This model is the most used method for evaluating information system success(Tilahun & Fritz, 2015), it provides comprehensive understanding of IS success, through explaining the relationships between variables for IS success (Yu & Qian, 2018).The basic dimensions in this model are system quality, information quality, service quality, system use, user satisfaction, individual impact and organizational impact. In 2003 D&M updated the model to include a new independent variable which is the service quality variable, and all the impact variables (individual and organizational were grouped into one impact which is called (net benefits), a general term that include all the impacts that result from implementing IS (Delone & McLean, 2003).

Even though most health professionals perceive that using EHR can help eliminate paper based-documentation and unavailability of patient data in critical situation (Chisolm, Purnell, Cohen, & McAlearney, 2010) and because implementing EHR involves human and financial investment, there is a growing need to determine the essential elements that lead to adaption of the system, and finally system success. Measuring success of information system is difficult, because success does not has clear definition, it depends on setting, objectives and stakeholders (van der Meijden, 2003) and (Tilahun & Fritz, 2015) and there is still no clear answer of which constructs best measure information system (IS) success.

Although there are some countries such as the United States, United Kingdom and Australia have growing and strong healthcare infrastructures that receive continuous funding and support from its governments, it is still obvious that there is significant failures exist in these systems, so because of that, there is strong support and motivation to achieve goals associated with comprehensive development of successful information technology systems (Avison & Young, 2007). These countries encourage researchers to make additional researches that result into development in health sector. In contrast to many developing countries, which suffer from many weaknesses and challenges including

limited finding, low resources settings, weak infrastructure and finally some challenges regarding health workforce whose some of them were computer illiterate, which is considered to be a barrier for many initiatives regarding implementing health information systems. So according to these differences between developing and developed countries, (Sood 2008) in his paper outlined that the determining factors that affecting the health information system success in developed countries are different of those factors in the case of developing countries. Hence, there is a critical need for rigorous evaluation for these information systems with different setting, to understand the factors of success and failure of information systems. These countries encourage researchers to make additional researches that result into development in health sector (Sood, 2008).

Evaluation of EHR means "the act of measuring and exploring electronic health records properties (in planning, development, implementation),the result then of this evaluation is used to make decisions regarding the information system in specific context"(Sadoughi, Kimiafar, Ahmadi, & Shakeri, 2013).When the evaluation is based on suitable technique it will lead the organization to positive step to the future (Rigby, 2006)**.** Evaluation could be possible when the success and failure factors of these systems are identified.

Success means that whether the information system achieved the intended purposes for implementation, it must be carried out within certain time and budgets, while the users are satisfied and this satisfaction must be stable (Fortune & Peters, 2005). Because the information systems are complicated and multidimensional, they reported as succeeded or failed in different situations (Wateridge, 1998). Due to the high expenses of implementing information systems, the organizations want to achieve the minimum benefits at least, so studying success or failure has special importance (Rahimi & Vimarlund, 2007). There are many industrial and health sector organizations reported failure of the their information systems in their reports.

According to (Brender, 2010) important factors of success and error include functional, organizational, technical, managerial, cultural, legal factors, examples are the following: (1) consisting functionality with user requirements and work processes, (2) willingness to change, intensive communication, training of and cooperation between IT and other persons involved, (3) understanding the culture of the health sector and an evolutionary approach, (4) commitment at the highest level and coordination of IT/business strategies, (5) project management, (6) high usability and interoperability or integration based on

standards, (7) taking basic legal requirements into account, and (8) adequate cost-effectiveness, benefits, and funding.

(Brender, 2008) mentioned that the environment of the organization itself is considered to be a challenge or barrier in front of the IT group in that organization, so one can conclude that knowing expectation of users, management and communication are considered to be strong predictors of successful implementation. The evaluation process itself has many challenges including absence of clear framework, and also information systems can influence the improvement of treatment and the patient's health level (Ammenwerth, Gräber, Herrmann, Bürkle, & König, 2003) and (Kaplan, 2001) so due this influence on life of patients, the evaluation process should take place under accurate criteria (Rigby, 2006) and (Lorenzi & Riley, 2004).

The introduction of new information technology systems into an organization is certain to change the workflow (Alharthi, Youssef, Radwan, Al-Muallim, & Zainab, 2014) and sometimes system users are not satisfied because of problems in using the system such as delays in ordering and disturb workflow (Khajouei, Wierenga, Hasman, & Jaspers, 2011). Understanding information system success is an ongoing area of interest not only to researchers but also to practitioners and management stakeholders. Such understanding helps highlight the value of the system and can serve as a basis for subsequent decisions regarding such systems (Ojo, 2017)

Healthcare organizations have aimed to provide more customer-oriented services (Berretoni, 2011). To achieve this goal, one need to improve the quality of care which requires timely access to high-quality information. However, the paper based documents of the patients, which may be unavailable when needed, creates a barrier in front of the health providers**.** To resolve this problem, health information systems have been established the past 30 years (Sittig & Singh, 2011).

An EHR system is an information system that helps to collect the information of the patient from birth to death so that it can be saved, certified, and shared in different places by healthcare providers. Electronic health record (EHR) systems have the ability to transform the health care system from a mostly paper-based industry to one that utilizes clinical and other pieces of information to assist providers in delivering higher quality of

care to their patients (Zheng, 2005). Researchers have examined the benefits of EHRs by considering clinical, organizational, and societal outcomes.

An information system is effective when it is able to respond to users' information needs. Otherwise, it would step into the vanity and in order to be prevented from entering the early stage of information systems futility, it is required to assess the effectiveness of the system periodically to realize the possible failures in order to improve the system (Saghaeiannejad-Isfahani, 2015). Usually the information systems are developed well and complete but not evaluated, so this system need to be evaluated to ensure the achievement of goals of implementation such systems.

Although there is evidence that using EHR eliminates medication error (Wolfstadt, 2008),and reduce unnecessary tests, and improve quality (Kossman, 2006), several studies indicate failure of EHR systems due to lack of user input and lack of evaluation of feedback on use of the system (Bowman, 2013) and (Alharthi, 2014). There is no clear criteria that can predict the success or the failure of certain information systems but evaluation criteria must be measured in suitable way.

2.2 Models of evaluating information system success

There are limited number of frameworks that guide the evaluation criteria for information systems, and here are the three famous models in the literature.

2.2.1 Delone and McLean (DeLone & McLean, 1992b)

The two scientists provided a framework for measuring the success of information systems. The framework includes six major dimensions or categories: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. System quality measures (characteristics of the system, such as response time, ease of use, system reliability, system accessibility, system flexibility and system integration. Information quality measures (measures of information system output like final reports) are addressed mostly from the perspective of the user and are therefore subjective in nature, such as information accuracy, timeliness, completeness, reliability, conciseness, and relevance. Also these measures used for user satisfaction. Measures of information use, including reported use versus documented use, frequency of use and extent of use. These measures are considered to be valid only if system use is voluntary. Measures of user satisfaction

(user perception to the use of the output of an information system) are the most widely used criteria of system success, mainly, because of their validity, and also the presence of reliable tools, such as satisfaction questionnaires. Individual impact measures (Orso, Ruotsalo, Leino, Gamberini, & Jacucci, 2017) are associated to measures of performance, such as quality of decision making, time efficiency of task accomplishment. Measures of organizational impacts are associated with economic sector in the form of cost reduction, cost effectiveness and profitability.

After ten years the updated D&M model had appeared, (DeLone and McLean, 2003), the authors reviewed old IS success model and discussed how the model has been validated by research in the field. The two researchers updated the model by; (1) adding "service quality" dimension, a third dimension to the two original system characteristics, "system quality" and "information quality"; (2) updating the term "intention to use" to "use" as a measure for system usage and (3) combining the" individual impact" and "organizational impact" variables into "net benefits" variable. They further suggest that the "net benefits" variable must be defined within the context of the system under study and within the frame of reference of those assessing the system impact, as these variables substantially influence what constitutes net benefits and hence IS success.

2.2.2 Internationalist models

This model (Kaplan, 1997) explained the relationships between system characteristics, individual characteristics and organizational characteristics and the effects among them. These evaluation based on the impact of information system on organization and the impact of organization on the information system, these evaluation models are based on Rogers' Classic Diffusion Theory (Haider & Kreps, 2004)**,** emphasize on how innovation is communicated through certain channels over time among the members of a social system. The evaluation questions in this model are: (1) what are the anticipated long term impacts on the ways that departments linked by computers interact with each other; (2) what are the anticipated long term effects on the delivery of medical care; (3) will system implementation have an impact on control in the organization; and (4) to what extent do medical information systems have impacts that depend on the practice setting in which they are implemented?

(Kaplan,1997) in his model emphasized that when the evaluator collecting and analyzing data through this framework, he/she should be sensitive to the four Cs (communication, care, control, and context) because it is difficult to study processes over time, so Kaplan suggested five methodological guidelines that can be useful when developing a comprehensive evaluation plan. The evaluation framework must include: focus on a variety of technical, economic, and organizational concerns; use multiple methods; be modifiable; be longitudinal; and be formative as well as summative. (Kaplan, 1997)

2.2.3 Cognitive Evaluation Approaches (Kushniruk, Patel, & Cimino, 1997)

This framework identify the need for improved methodologies for the evaluation of medical systems and their user interfaces. Conventional methods of evaluation, such as questionnaires and interviews with users, rely on the user's memory of their experience with using a computer system by another words what the user believe when dealing with systems, and this could be different from the actual behavior. Therefore, there is a need to incorporate into system design and evaluation processes sound methodologies for the assessment of medical systems and their user interfaces. This approach borrowed from interdisciplinary perspective and draw from a number of areas including cognitive psychology, computer science, systems engineering, and the field of usability engineering. Many cognitive approaches to the assessment of health information systems have been developed based on ideas from cognitive and usability engineering. Usability can be broadly defined as the ability of a system to allow users to carry out their tasks safely, effectively, efficiently, and enjoyably (Preece, 1994)**.** Cognitive and usability engineering approaches to the assessment of health information systems involve: (a) explain how easily a user can carry out a task using the system, (b) assessing the effects of systems on work practices, and (C) identifying problems users face with systems. Evaluation in this context includes collecting information about the actual *process* when using a system by users performing certain tasks (Andre. Kushniruk & Patel, 2004). This approach which is can expressed by user-centred approach focuses on characterization of cognitive skills involved in using a system to carry out tasks and explanation of problems of users with different levels of expertise and experience, as they learn how to use system (Andre. Kushniruk, 2001). It emphasizes that users must gain sufficient knowledge, skill, and familiarity with systems to use them effectively and safely. Methods applied this framework for evaluating health information systems include (1) usability testing – which can be defined by the

evaluation of information systems that involves testing of users whom they perform certain tasks using an information technology (2) cognitive task analysis – characterization of the decision-making and reasoning skills of subjects when they perform activities. The cognitive task analysis is based on making a task hierarchy describing the activities of individuals that take place in an organization (with or without the help of IT department). In health care, these tasks might consist of activities such as a physician entering data into an information system or a lab technician entering lab results for the patient. After determining the tasks, the method includes observation of users with varying levels of expertise (medical students, residents, and physicians) when they perform wanted tasks of interest. This cognitive approach involves video recording of users while they performing work through selected tasks. The eight steps employed in carrying out cognitive evaluations of health care systems and user interfaces include: (1) development of the test plan; (2) study design, including selection of representative users; (3) selection of representative task /contexts; (4) set up of the test environment; (5) conducting the usability test; (6) data analysis; (7) recommendations to designers; (8) iterative input to design (Andre. Kushniruk & Patel, 2004)**.**

Table 1 represents the three HIS successes evaluation models with advantages and disadvantages for each model.

Table1: Main models for evaluating HIS successes, advantages and disadvantages.

Model of IS evaluation success	Principles of evaluation	Advantages	Disadvantages
D&M model (Delone,Mclean,2003)	Assessment of each dimension of the IS success(system quality, information quality, service quality, user satisfaction, usage of IS and net benefits),through asking users about certain items in each dimension.	Possibility for compliance.	Impossibility to evaluate the usage dimension if the IS is mandatory.
Internationalist model (Kaplan,1997)	Studying the relationships between system characteristics, individual characteristics and organizational characteristics and the effects among them.	Understanding the four Cs (communication, care, control, and context which affect the implementation and the finally the impacts of implementing HIS	It is difficult to study processes over time.
Cognitive Evaluation Approaches (Kushniruk, Patel, & Cimino, 1997)	Conventional methods of evaluation, such as questionnaires and interviews with users. Also using IT equipment (example: video recording) to see the behavior of users	Difficulty of compliance and sometimes unavailability of IT equipment like cameras	• Rely on the user's memory of their experience with using a computer system. • Could be different from the actual behavior.

After exploring the three frameworks for evaluating information system and explaining each one of them, the D&M framework had chosen to be the baseline of our study, due to many reasons: (1) the framework applicability for evaluation of health information system such as many studies that evaluating health information systems used in health facilities including primary health care centers, or hospitals in many developed and developing countries (Tilahun & Fritz, 2015)**,** (2) the framework is used to evaluate health information systems in developing countries which have similar context regarding environmental and cultural factor like Kuwait. Saudi Arabia (Buabbas, Al-Shamali, Sharma, Haidar, & Al-Shawaf, 2016)**,** (3) the possibility of implementing another frameworks like Cognitive Evaluation Approach which suggested by Kushniruk, Patel and Cimino (Andre. Kushniruk & Patel, 2004), is limited due to the absence of technical instruments like cameras and recording equipment that used for observing users of health information system while performing their tasks.

2.3 Adoption and barriers of electronic health record (EHR)

EHRs can improve the way medical information of patients is stored, communicated, and processed by those who provide health services**,** therefore adoption of EHR will result in many desirable outcomes including patient safety (Blumenthal & Glaser, 2007) and (King 2014), quality of care (Cebul, 2011), efficiency (Cheriff, Kapur, Qiu, & Cole, 2010), enhance communication between patients and multiple providers (Palabindala, Pamarthy, & Jonnalagadda, 2016),and reduced cost (Adler-Milstein, 2013)**.** Because of those benefits and continuous support from governments to use computerized system, there are increasing number of hospital and health centers that adapt EHR(Abramson, 2012), (Robertson, 2010). Studies discussed the high adoption rate of EHR, high level of user satisfaction and enhanced patient care. In 2008, the New England Journal of Medicine reported that 82% of EHR users report improved clinical decision-making, 92% report improvement in communication with other providers and their patients, and 82% of users report a reduction in medication errors.

Despite broad agreement on the benefits of using electronic health records, health care providers have moved so slowly to adopt these technologies. Lack of readiness causes

weakness of organization to convert into EHRs level. Meinert in his study mentioned that the slow rate of adoption suggests that there are strong resistance among physicians, because physicians are the main front line user-group of EMRs, if they support and use EMRs this will have a great influence on other user groups in a medical practice, such as nurses and administrative staff. As a result, physicians have a great impact on the overall adoption level of EMRs (Meinert, 2009)**.**

According to study done by Mille and Sim regarding physician practices that had implemented an EHR, quality improvement depends heavily on physicians' use of the EHR and not paper for most of their daily tasks (Miller & Sim, 2004). The adoption and meaningful use of (EHRs) is main national policy in USA, which aims to improve the quality and efficiency of the healthcare system. This topic has received support from US government, it was close to $30 billion in 2009 to promote adoption of inter-operable, certified the EHRs (Rao, 2011). But before implementation, many significant barriers to implementation that must be addressed by leadership before the formal adaptation by the hospital or the health center (Simon, 2007). Before converting from paper -based care to an EHR system, organizations must find suitable administrative and medical workforce to work on implementation, which includes continuous connection between organization and the vendors of those EHR (Palabindala, 2016). When giving the continuous communication with the EHR vendor about specific needs and workflow design the priority, then the organization may be ready to the implementation process. McGinn, in his review (McGinn, 2011), discussed some perceived barriers to EHR adoption among health providers and managers like design or technical concerns, perceived ease of use, Interoperability, privacy and security concerns, cost issues, productivity, familiarity and ability with EHR, motivation to use EHR, patient and health professional interaction, and lack of time and workload.

2.3.1 Design or technical concerns

When talking about the barriers of implementing EHR, the design of the system and its technical concern is most frequently mentioned barrier, it is about limitations related to software or hardware problems, and system problems (that is, slow system speed, unplanned downtime, incomplete design specifications, programming errors or bugs).Many studies showed that these technical problem is considered to be a barrier against implementing EHR, (Lium, Tjora, & Faxvaag, 2008), (Linder, 2006)**. (**Bowman, 2013) in his paper mentioned that poor EHR system design and improper use can cause

EHR-related errors that make the integrity of the information in the EHR is not suitable to use, leading to errors that endanger patient safety or decrease the quality of care**.** Also, complexity of the EHR system, for example: multidisciplinary of screens, options, could be a barrier, that leads to continuous problems during usability, making physicians for instance to spend extra work time to learn effective ways to use the EHR. This time costs are an important barrier to obtaining benefits, as greater burdens on physicians' time decrease their use of EMRs, which lowers the potential for achieving quality improvement (Ajami & Bagheri-Tadi, 2013) .

2.3.2 Perceived ease of use

Ease of use feature in different studies was perceived as being both a barrier and facilitator to EHR implementation, it was associated with design and technical concerns. Some systems were reported by users as user-friendly, they believed that EHRs was easy to use and good tool to facilitate work processes (Pyper, Amery, Watson, & Crook, 2004). But in another studies, the systems didn't respond to user's needs, so users were not satisfied, they perceiving the EHR system is difficult to use (DesRoches, 2008). Some examples that make the users unsatisfied regarding easiness of use are the lack of understanding of EHR features (Hier, Rothschild, LeMaistre, & Keeler, 2004) or confusing screens.

2.3.3 Interoperability

Interoperability, defined as the exchange in health data involving more than one organization and/or setting of care (Sinha, Sunder, Bendale, Mantri, & Dande, 2012), it was perceived interoperability was a barrier to EHR implementation. Non organized sharing of patient information with other IT systems was perceived as a barrier by users,(Thakkar & Davis, 2006) and (Zurita & Nøhr, 2004) and in some cases led to negative outcomes. For example, when exchanging lab result between different organization, and those results were not fully implemented in medical practices, in this case both EHR and paper-based systems have to be used to manage test results, and this will produce non organized use of EHR by physicians.

2.3.4 Cost issues

Cost issues is a barrier to EHR implementation. Part of the studies of EHR implementation focus on high costs pertaining health professionals and patients (Randeree, 2007; Øvretveit, Scott, Rundall, Shortell, & Brommels, 2007b), whereas others study issues related to

managers and physicians mostly talking about specific issues such as lack of resources and funding (Urowitz, 2008; DesRoches, 2008; Houser & Johnson, 2008; Simon, 2008; Gans, Kralewski, Hammons, & Dowd, 2005), high start-up costs (Thakkar & Davis, 2006; Simon et al., 2007), high maintenance costs (Menachemi, 2006), and uncertainty about return on investment (Thakkar & Davis, 2006). Costs could be purchase price, coordination, monitoring, negotiating, upgrade, and governance costs (Ajami & Bagheri-Tadi, 2013b). These costs remain the biggest barrier to adoption (Rao, 2011).

2.3.5 Productivity

Productivity defined as "the quality, state, or fact of being able to generate, create, enhance, or bring forth goods and services",("Productivity definition | Define Productivity at Dictionary.com,". In a medical office, productivity refers to the number of patients seen and managed during the course of a defined period of work ("The Impact of EHRs on Productivity — Physicians Share Experiences | AmericanEHR,"). Health providers in the literature perceived that the productivity decreased after implementation of EHR, and this is because the increase in workload, which leads to an expected decrease in productivity. Loss of clinical productivity and decreased job performance, particularly during the transition period to an EHR system, were perceived as barriers (Randeree, 2007), (Simon, 2007), and (Gans, 2005). (Kossman, 2006) study for example, the nurses perceived that EHR could be a barrier when computer go down unexpectedly, they think that EHR use can hinder their job performance, including increasing time spent retrieving or documenting information, decreasing time spent with the patient, and hindering critical thinking. Although some studies considered reduced productivity as a barrier, health providers in other studies considered this issue as a facilitator for health professionals, managers, and patients, which reported EHRs as positively influencing workplace efficiency and communication (Thakkar & Davis, 2006)

2.3.6 Familiarity and computer literacy.

Physicians, health professionals, and managers perceived this factor as a barrier. For instance, managers expressed concerns about patient computer literacy (Urowitz, 2008) or general lack of knowledge about EHRs (Houser & Johnson, 2008), whereas health professionals perceived themselves as lacking computer experience (Greenhalgh, Stramer,

2008) and (Alonso, Iraburu, Saldaña, & de Pedro, 2004). When talking about the level of computer literacy needed in EHR, the level of computer literacy required from health providers is consider to be less than that needed in the case of physicians, because physician has to own good typing skills to enter patient medical information, notes and prescriptions into the EMRs, and some physicians lack them (Boonstra & Broekhuis, 2010).

2.3.7 Lack of time and workload

Studies discussed lack of time and the workload barriers that could reduce adoption of EHR in the perception of physicians, other health care professionals and managers. Studies mentioned health care professionals complains about heavy workloads (Greenhalgh, Wood, Bratan, Stramer, & Hinder, 2008) and (Chronaki, 2007) and EHR use as being time-consuming (Rahimi, 2008), (Randeree, 2007) and (Likourezos, 2004). Some studies explained the perception of physicians tended to focus on detailed reasons, such as the lack of time to acquire, implement and learn to use EHRs (Simon, 2007), (Menachemi, 2006) and (Audet, 2004).

2.4 Impacts of EHR implementation

The advantages of electronic medical records over the paper based is clear including availability and ability to transfer the data, and also the possibility to support different views of record for nurses, physicians and other health providers, also these records helps to facilitate clinical decisions and enhanced integration of care (Hartswood, Procter, Rouncefield, & Slack, 2003). Also EHR systems not only increase accuracy and reduce mistakes, access to laboratory data, and immunization history but also improve organizational and societal outcomes (Alsaffar, Yellowlees, Odor & Hogarth, 2017). Moreover, the collected patients' data can be used in research, giving an opportunity to study diseases and extract knowledge from clinical data (Menachemi & Collum, 2011a), which is considered to be a good opportunity to study diseases and extract clinical data.

Next, benefits of implementing EHR will be explored in details.

2.4.1 Improved clinical decision

One of the benefits of using EHRs is the ability to access computerized records for patients and eliminate poor handwriting which could be a reason for medical errors (Winslow, Nestor, Davidoff, Thompson, & Borum, 1997), in addition to providing good chance for sharing information between healthcare providers, and collecting health information for educational and research purposes (Miller & Sim, 2004). EHR systems can include many potential capabilities, three of them are considered to be promising benefits that result from implementation of EHR, which finally will lead to improved quality of care and reducing costs at the health care system level: Clinical Decision Support (CDS) tools, Computerized Physician Order Entry (CPOE) systems, and Health Information Exchange (HIE)(Menachemi & Collum, 2011a).

A CDS is the system that helps the provider in making decisions that aim to better patient care. providing the latest information about a drug, cross-referencing a patient allergy to a medication, and alerts for drug interactions and other potential patient issues that are flagged by the computer are all examples of the functions of CDS system. These functions form the means that help to deliver care in more safety and efficient way. When CDS systems usage are increased, medical errors can be expected and avoided leading to much more efficient and safe care.

2.4.2 Lower risk of disease

EHRs, especially those with CDS tools, have been linked to an increased adherence clinical guidelines and effective care. Although the presence of good behavior and nice intention to health providers, many of them do not adhere to best practice guidelines. Menachemi &Collum, 2011 in their study mentioned some of reasons for this non adherence include a) clinicians do not know the guidelines, b) clinicians not realizing that a guideline applies to a given patient, and c) lack of time during the patient visit. EHR systems try to solve these issues. In the public health field, adhering to the guidelines that present in EHR as alerts keep individuals healthy and lowers the risk of disease outbreaks in communities. Researchers have focused on preventive services like vaccines, they studies the relationship between the vaccine administration and adherence. computerized physician reminders increased the use of influenza and pneumococcal vaccinations from practically 0% to 35%, for hospitalized patients (Dexter, 2001).

A similar study, but in the outpatient setting, found that computerized reminders were associated with improved influenza and pneumococcal vaccination rates among rheumatology patients taking immune-suppressant medications (Ledwich, Harrington, Ayoub, Sartorius, & Newman, 2009). Specifically, influenza vaccinations increased from 47% to 65% of patients, and pneumococcal vaccinations increased from 19% to 41% of patients. Another study focused on the effect of EHR with CDS system is the study by (Kucher, 2005) when he studied the physicians adherence by guidelines that ask the physician to give patients with high risk for deep vein thrombosis, the anti-coagulation prophylaxis. They found a 19% increase in the use of anti-coagulation prophylaxis when using computer alerts, and this translated into a 41% reduced risk of deep vein thrombosis or pulmonary embolism at 90 days after discharge. In primary care setting it is found that computerized reminders in EHR are associated with increase of proper hypertension treatment by 11.3% (Rossi & Every, 1997).

2.4.3 Reduced medical errors

Electronic health records (EHRs) are essential to improving patient safety (Blumenthal & Glaser, 2007)**.** Safety is one important matter that studies interested about when discussing about EHR impacts, it is defined as: "avoiding injuries to patients from the care that is intended to help them"("Quality Management in Healthcare, 2018).

Computerized physician order entry CPOE systems allow providers to enter orders (eg, for drugs, laboratory tests, radiology, physical therapy)through using computers instead of writing on paper. Using computers eliminates the risk of making dangerous medical errors caused by bad handwriting of physicians. Using CPOE also makes the physician order more efficient, because nurses or lab technicians for example don't have to ask the physician about the order when he/she hesitates about certain order.

Previous studies suggest that serious medication errors can be reduced by as much as 55% when a CPOE system is used alone (Wolfstadt, 2008), and by 83% when coupled with a CDS system that creates alerts based on what the physician orders (Bates, 1999a)**.** Using a CPOE system especially when it is linked to a CDS, can result in improved efficiency and effectiveness of care (Menachemi & Collum, 2011b). Also, CPOE system was associated with a 55% reduction in serious medication errors in the hospital setting (Bates, 1998a).Moreover using CPOE system, with adding CDS can reduce medical errors to

86%(Bates, 1999b). Also in outpatient setting it is found that computerization resulted in an error rate reduction from 18.2% to 8.2% (Devine, 2010).

2.4.4 Reduced redundant tests

Another advantage of using electronic health records is when the patient information are available, it is possible to share these data, which is named by the (HIE) system which includes the process of sharing patient-level electronic health information between different providers (Nahit,2008). This system enables the sharing of patient information, HIE can reduce costly redundant tests that are ordered because one provider does not have access to the clinical information stored at another provider's location, usually patients visit many health locations where they receive care, and have variety of these information in these location such as general physician, specialist physician, pharmacies, and other locations, such as hospitals and emergency departments. Over a lifetime, these data accumulates in different places, all of which are stored in silos. Historically, providers rely on faxing or mailing each other to share information, which makes it difficult to access when needed. HIE enables the exchange of this information via EHRs, which can result in much more cost-effective and higher-quality care.

2.4.5 Increased efficiency

Researchers studied the relationship between EHR and efficiency in health care. Institute Of Medicine (IOM),defined efficiency as the avoidance of wasting resources, including supplies, equipment, ideas, and energy(Institute of Medicine (US) Committee on Quality of Health Care in America, 2001). Continuous repeating laboratory tests is one form of waste, because redundant tests are costly (Bates, Goldman, & Lee, 1991). Many studies examined the relationship between using EHR and redundant lab tests For example, a study in cardiovascular surgery department examined the effects of EHR that includes CDS system with alerts on the redundancy of blood tests (Niès, 2010). The result was significant reduction of unnecessarily serology test by using those alerts. Another study discussed the negative association between EHR and reduced redundant tests, which is found a 14.3% decrease in the number of diagnostic tests ordered per visit and a 12.9% decrease in diagnostic test costs per visit when using an EHR with CDS and CPOE components (Tierney, Miller, & McDonald, 1990). It is found that the perception of nurses

was improved efficiency, they perceived that EHR helped them to make quicker documentation, information retrieval processes, it speeds up the process to give medications, get reports, and to communicate with other facilities (Kossman, 2006)

2.4.6 Improve quality of care

Quality of care has been defined as "doing the right thing at the right time in the right way to the right person and having the best possible results"(Mosadeghad, 2012). Quality includes six dimensions that aim to reduce the burden of illness, injury, and disability, and to improve the health**,** those dimensions of quality are patient safety, effectiveness, efficiency, patient centredence, timeliness and equity. (National Healthcare Disparities Report 2004: Appendix C).

Studies that review the relationship between implementing EHR and quality of care in general, discussed the patient safety, effectiveness, and efficiency (Menachemi & Collum, 2011b)**.** Physicians for example linked EHR implementation with increased quality of care, reduced medication related errors, improved follow-up of test results and improved care coordination and communication within the care team (Greenhalgh, 2010), (Kaushal, 2009), (Rantz, 2011) and (de Veer & Francke, 2010).

(Kaushal, and colleagues,2009),studied the perception of doctors about implementing EHR and its effect on quality of care, coordination of care between the team, patient and physician communication, access to up to-date knowledge and medication errors, and found positive effect. In Holland, there was study based on distribution of a survey among 610 Dutch nurses, it is found that 67% associated EHR with improved quality of care and safety (de Veer & Francke, 2010), whereas in Australia the impression of nurses was that EHR had not improved patient care (Dezarn, 2006)**.** Studies discussed the adherence of guidelines for care of patient as part of quality, it is found that implementing EHR resulted in better adherence to professional practice and hospital objectives (Boyer, Samuelian, Fieschi, & Lancon, 2010a), (Banner & Olney, 2009) and (Ahn, 2006). This maybe opposed to the perception of another 41 health providers that have mixed findings regarding the impact of EHR on care quality, coordination of care between team and communication with the patients and providers specially physicians. (Glaser, 2010).

2.4.7 Communication between physician and patient

Although the desirable benefits that result from implementing EHR, negative consequences also could be found in reality. one of that consequences is the impact of

implementing EHR on the communication between physicians and patients. (Pearce and colleagues 2008), in their paper showed that the behavioral changes linked to the use of the EHR include the following: increased time spent with the EHR during the appointment between physicians and patient, especially during the first minutes of the appointment, increased of silence while the physician concentrates his thinking on filling data on computer, and decrease in eye to eye interaction between the physician and the patient (Crampton, Reis, & Shachak, 2016) and (Alkureishi, 2016). Such behaviors tend to distract physicians from giving attention to what patient saying or even the face expression by them for their patients (Sinsky & Beasley, 2013). Studied showed that the time which doctor spend during filling data on his/her computer has negative correlation with physicians' interest for patient's psycho social and emotional conversations (Booth, Robinson, & Kohannejad, 2004). To address this problem experts in medial communication suggested certain steps to keep the physician interacted with his/her patient, these recommendations include opening the computer before the patient inter to physician room, to explain to the patient that the physician is recording the patients information and let him see the screen of computer when this is possible, and to stop filling data on computer whenever the patient starts to express his feelings or express empathy (Booth, 2004) and (Duke, Frankel, & Reis, 2013). (Stewart, 2000) in this paper discussed the importance of the nature of the beginning of the encounter between physician and patient and its role in enhancing and creating a partnership relation. Some experts suggested to take a university training course in the undergraduate medical curriculum (Wald, George, Reis, & Taylor, 2014). Han noticed that when medical students study online course about physician patient relationship, their behavior became more patient -cenredeness while using EHR, than the control group (Han, Waters, & Lopp, 2014).

Physician-patient relation is a multidimensional concept, the researchers discussed it by explaining:(1) The amount of time spent with patients (2) the quality of clinician–patient interactions. Several studies (Boyer, Samuelian, Fieschi, & Lancon, 2010b) and (Carayon, Smith, Hundt, Kuruchittham, & Li, 2009), found that there is no significant difference between the amount of time that physicians spent with patients, whether if they used paper-based or electronic documentation.

2.4.8 Workload

The literature discussed the impact of EHR on workload through two perceptions: the first one that believe that the EHR implementation has increased workload just like the study in

Southwest Florida, which includes the perception of 100 nurse, the results were that the majority (64%) of nurses perceived the EHR system as contributing to an increased workload, while the remaining 36% reported that it did not (Moody, Slocumb, Berg, & Jackson, 2004). (Samoutis, 2007) found physicians in primary care centers reported use of EHR negatively affected their workflow whereas McAlearney and his colleagues mentioned that implementing EHR results in increasing workload and make extra work like frequently rebooting computers and correcting computer errors, actions to address the limitations of the EHR (McAlearney, Robbins, Hirsch, Jorina, & Harrop, 2010), such as using scanned documents of the patients (Lærum, Karlsen, & Faxvaag, 2004).

2.4.9 Productivity

The perception of the impact of implementing EHR between health providers in literature was mixed. While some of these providers perceived that EHR has positive influence and increase in productivity, some of them believe that EHR reduced productivity. Increased productivity was reported in a study of 38 clinicians in a small practice in the USA that measure productivity**.** Increased productivity can be explained through decreased time being required to develop a summary of records to the patients, simplified work functions for medical secretaries (Lærum, 2004)**,** and increased efficiency of clinical processes (e.g., lab ordering). Laboratory turnaround time was also found to be faster (McAlearney, 2010). Decreased productivity also was a result in some studies, for example, (Boyer, 2010) found reduced productivity, and he explained that due to some changes in missions and responsibilities, disturbances of workflow, and the time needed to learn about EHR system. (Samoutis, 2007) also found reduced productivity in his study in a primary care setting**.**

2.4.10 Organizational outcomes

Studies examined the organizational outcomes that result from using EHR, including increased revenue, avoided costs, and other benefits that are less tangible, such as improved legal and regulatory compliance, improved ability to conduct research, and increased job/career satisfaction among physicians (Menachemi & Collum, 2011a). Increased revenue comes from decrease in billing errors, improved cash flow, and enhanced revenue. Several authors have confirmed that EHRs enable providers to capture patient charges in a timely manner (Schmitt & Wofford, 2002) and (Williams, 1990)**.** In EHR system, many billing errors be eliminated, which will lead to increase a provider's

cash flow and enhance revenue (Mildon & Cohen, 2001) and (Agrawal, 2002)**.** Clinicians also perceived EHR implementation would result in improved billing and administrative task(Robertson, 2010) and (O'Connell, Cho, Shah, Brown, & Shiffman, 2004)**.** (Dezarn, 2006) reported that reduced administrative and repetitive tasks were found to be one of the major benefits of EHR.

A study of five ambulatory offices in the USA examined chart pulls, new chart creation, filing time, support staff salaries and transcription costs, and found evidence to support a positive Return On Investment (ROI) as a result of an EHR pilot project implementation (Grieger, Cohen, & Krusch, 2007). Moreover, it was found that using EHR instead of paper will reduce transcription cost for paper (Agrawal, 2002).

2.5 Summary

Although EHRs have an essential role in patient safety, quality of care, and improved efficiency, but implementation is still facing many barriers due to different factors, which may lead to hinder or decrease adoption of EHRs which finally reduce the individual and organizational impacts which the health care industry aim to achieve. Evaluation studies for implementing EHRs are very crucial to know the desirable benefits and to see weaknesses, that could affect general benefits. Until now only simplified report has discussed the new EHR (e-health) in UNRWA, therefore this study came to fulfill this gap using a comprehensive framework.

Chapter three:

3. Conceptual framework

D &M model developed in 1992 for IS success and modified in 2003.This study is based on the modified model, the validity of the model had approved by many studies (Tilahun & Fritz, 2015), (Van der Meijden, 2003) and (Palm, Dart, Dupuis, Leneveut, & Degoulet, 2010). (Van der Meijden,2003) in his review used this model to categorize the different measure of success and found evidence that support D&M model constructs of success.

Also the D&M model is effective in the nurses use of Information Communication Technology ICT and synthesis of ICT basic elements (Booth, 2012). (Park, 2009) analyzed the performance of the information systems in 38 hospitals by using the D&M model, and they found that both system quality and information quality significantly influenced user satisfaction.

A study by (Tilahun & Fritz, 2015), approved that this framework was applicable and suitable for evaluation of HIS. It was found that the constructs and relationships mentioned in the D&M model are applicable in assessing the success of a system. Also (Cho,2015) in his study used this model to evaluate the information system in three public hospitals in Korea. All these studies approved that the three dimension of quality (system, information, service) are all significantly correlated with user satisfaction. Moreover, D&M model was used in different countries and different setting. For example it was used for evaluation in many developed countries with good resources such as USA (Messeri, 2013) and France (Palm,2006). Also it was used to evaluate health information system in low resources setting such Ethiopia (Tilahun & Fritz, 2015)**.** The model was also used in evaluating HIS in countries that have some similarity to the West Bank regarding culture and environment like the evaluation of Picture Archiving and Communication System (PACS) in Kuwaiti

hospitals (Buabbas, 2016), and the physicians satisfaction upon implementing new electronic health record in Saudi Arabia (Alharthi, 2014). This is why D&M model was adopted in the current study.

The importance of this model for our study is represented by the ability of this model to help us to achieve our objectives regarding assessment of main elements in our information system(evaluating the e-health system success through identifying user satisfaction, system quality service quality, information quality, user satisfaction and net benefits). Figure 3 represents the updated D&M model for information system success.

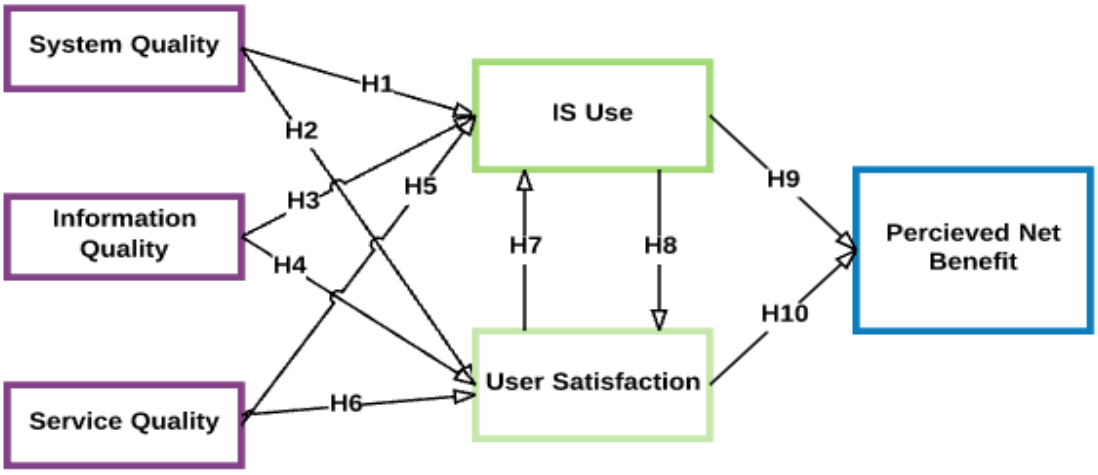

Figure 3: Constructs and hypothesis (H1-H10) of the updated D&M model for information system success. (adapted from D & M framework for IS success), (D& M, 2003).

Based on this framework, the six dimensions are considered to be interrelated rather than independent (Delone & McLean, 2003), and the implementation of a new information system includes various features quality (system, information, and service quality) which could affect use and user satisfaction. Next, users experience these features by using the system and are either satisfied or dissatisfied with the system, its information, or its service. It is also suggested that some benefits tagged as net benefits will be achieved as a result of use and/or user satisfaction. These net benefits could consequently affect user satisfaction and continued use of the system (Ojo, 2017).

This model is based on six dimensions in each of these six dimensions, two or more categories that are related to each dimension are measured. All dimensions except system

use will be explained in details (see next). The system use is applied rarely and it's context dependent which is difficult to measure. In addition, most IS are mandatory, as the case in UNRWA, and assessing use in such environment is useless (Tilahun & Fritz, 2015).

Independent variable: it is defined as the variable that is stable and unaffected by the other variables you are trying to measure. It refers to the condition of an experiment that is systematically manipulated by the investigator. It is the presumed cause (Sullivan, 2008).The independent variables in this study will be the dimension of the e-health system itself(system quality, information quality, service quality and user satisfaction).

Dependent variable: (Howitt and Cramer 2005) defined the dependent variable as the variable that depends on other factors that are measured. These variables are expected to change as a result of an experimental manipulation of the independent variable or variables. It is the presumed effect(Sullivan, 2008). The dependent variables in this study will be the (Perceived Net Benefits) dimensions (productivity, quality of care).

3.1 Conceptual definitions

3.1.1 Independent variables

3.1.1.1 system quality

System quality is the most important criterion for the success of an information system which refers to the desirable features of an information system. According to D&M, system quality is considered to be one of the most studied dimensions of IS success is system quality.

It refers to measures of the information processing system itself, in other words how goodness is the hardware and the software work together.

System quality is defined as the system's overall performance, as perceived by users (Chen, Hailey, Wang, & Yu, 2014) which consists of three categories: functionality, performance and security (Tharmalingam, Hagens, & Zelmer, 2016).

- The functionality: of the health information system (HIS), is its ability to carry out the operational capabilities (Lau, Hagens, & Muttitt, 2007) such as patient registration, data entry, results reporting.
- Performance is the technical functionality of HIS including its accessibility, reliability, and response time. Accessibility refers to the availability of the system locally,

reliability refers to the dependency of the system operations, and response time is the length of time that computer responds to users actions such as data entry (Lau, 2007).

- Security and privacy refers to the technical ability of the system to protect the data being recorded, stored, and accessible for subsequent use.

3.1.1.2 Information quality

- It is the desirable characteristics of the system output like final reports (Petter, DeLone, & McLean, 2008b)**,** D&M information system success model, demonstrated that information quality is an antecedent to system use and user satisfaction that lead to system benefits (Tao, LeRouge, Smith, & De Leo, 2017). It consists of two components: content and availability.

- Content includes completeness, accuracy, relevance, and comprehension of the information.

- Availability means the timeliness of the information when or where needed(van der Meijden , 2003)

In the literature reviews there are many criteria and many ways to categorize information quality. (Chen,2014) in his review collected a total of 49 attributes were used in the studies to describe data quality, such as completeness, accuracy, timeliness, validity, periodicity, relevance, reliability, precision, integrity, confidentiality, comparability, consistency, concordance and others. Because it's almost impossible to measure all these attributes, in this study perceived overall quality of information, layout and format, availability of information when needed, and accuracy were the only attributes that were measured.

3.1.1.3 Service quality

(Petter 2008) defined this dimension as "the quality of the support that system users receive from the IS department and IT support personnel".

The main category here is responsiveness which focuses on post-implementation technical support and its availability by the information system developer and also includes training for health providers (end users), (Delone & McLean, 2003).

According to (Chen,2014), training is organized activity that given to the final users (health providers in this study), to give them the suitable information and instructions to improve their performance. (Yaghmaie & Jayasuriya, 2004) considered that health staff with better computer training have more positive attitudes toward computers, less computer anxiety and more awareness of others' expectations about computer use than untrained staff.

Many old health providers have little knowledge and experience about computers (Yu, Hailey, & Li, 2008). According to (Zhange, 2012), the perception of the users of the system were highly influenced by the level of training and support services they received.

3.1.1.4 User satisfaction

User satisfaction is defined as users' level of overall satisfaction with their interaction with an IS (Petter, 2008b).

The agreed hypothesis to say that the information system is successful when the implemented system is accepted to be used by the end user, and the users are satisfied with the system, so satisfaction is regarded as the most common measure of IS success (P. Seddon & Kiew, 1996).

(Mazzoleni,1996) describe the user satisfaction as" essential to the survival of the system". Many information systems were failed because the health professionals users are not satisfied users (Alharthi, 2014).

User satisfaction includes ease of use, user satisfaction, and integration into workflow.

- Ease of use covers how ease is to learn and use the system.
- User satisfaction refers to opinions of the health providers compared to their expectation from implementing the e-health system.
- Integration of workflow means the ability of the e-health system to make jobs easier(Tharmalingam, 2016).

D&M suggest that system quality, information quality, service quality and use positively impact on user satisfaction (Petter, 2013).

3.1.2 Dependent variables

3.1.2.1 Net benefits (e-health success)

This dimension is regarded one of the important measure that complements the evaluation of IS success and effectiveness of the e-health system. Although it may be more desirable to measure system benefits in terms of numeric costs (eg: cost savings and time savings), such measures are often not possible because of environmental variables that may influence the numbers(Wu & Wang, 2006). Therefore, there has been little consensus on how net benefits should be measured objectively and thus they are usually measured by the perceptions of those who use the IS.

Therefore, ‘‘perceived system benefits’’ or ‘‘perceived usefulness’’ has been adopted as an important alternative of IS success. It could be at the level of individual impact or at the level of organizational impact (Petter, DeLone, & McLean, 2008b).

Perceived net benefits is how much do the system users believe that the system has improved job performance, productivity, and quality of care. D&M suggest user satisfaction will positively predict net benefits.

3.2 Operational definitions

This section includes how each dimension with its corresponding questions/items were measured in the survey.

3.2.1 Independent variables

3.2.1.1 System quality

10.1 The response time of e-health system is acceptable.

10.2 e-health system keeps privacy for patients information.

10.3 The performance of e-health system is acceptable.

10.4 The overall quality of e-health system is very good.

3.2.1.2 Information quality

11 The overall quality of information is acceptable.

12.1 The information in e-health is accurate.

12.2 The layout and format of pages in e-health are acceptable.

12.3 The information in e-health is available when I need.

12.4 The Information in e-health helps me to take better clinical decisions.

3.2.1.3 Service quality

13 Support that given to encourage me to use e-health is accepted.

14 Training that given to me to use e-health is accepted.

3.2.1.4 User satisfaction

7. Overall satisfaction towards e-health is accepted

8. E-health system is easy to use.

9. E-health made the integration of workflow is better/makes job easier.

3.2.1.5 Demographic factor

Demographic factors here was:

1. What your profession.

2 Gender male/Female

3.Age.

4. Do you provide direct care to patients?

5. computer skills

6 Name of your clinic.

3.2.2 Dependent variable

3.2.2.1 Perceived net benefits

15. Do you think that e-health enhanced coordination of care.

16. Did E-health affect productivity at work increasing/decreasing /not changed.

17 Did E-health affect quality of care, increasing/decreasing/not changed.

18 and 19 are present in the survey to know the health providers perception regarding e-health and, if it reduce the need to return to manual documents for patients, also to know providers perception, when they use both the manual paper and e-health system specially for lab technician whose using manual papers until now, and even in the trial time of implementing e-health system for the other providers.

Chapter four:

4. Methodology

4.1 Study design

A quantitative cross-sectional survey based on D&M model, and also qualitative focus groups were used to assess the three qualities (system, information and service quality),user satisfaction and finally perceived net benefits. The survey distributed among health providers in seven UNRWA clinics at the middle area of west bank. E-health used in these clinics since four years. In addition to the survey, three focus group sessions were conducted to investigate the perception of health providers about other benefits and drawbacks of implementing e-health systems that were not studied in the survey

4.2 Study settings

UNRWA offers preventive and curative health services to sustain and promote the health of Palestine refugees, from conception through pregnancy, childhood, adolescence and adulthood and active aging. These services include family planning, pre-conception care, antenatal care and postnatal follow-up, infant care (growth monitoring, medical check-ups and immunizations), school health, oral health, outpatient consultations, diagnostic or laboratory services and the management of chronic non-communicable diseases (“Services,” n.d.).

The study was conducted four years after introduction of the system in the clinics, with the support from the government of United States of America and Denmark**,** which is mandatory in all departments in UNRWA clinics. The universe of this evaluation study

were seven clinics in middle area in the West Bank field office, The clinics are located in Al-amaary, Qalandia camp, Jalazoon camp, Ein Areek, Bet Soreek in Ramallah city Shufat camp in Jerusalem, Aqbet Jabr camp in Jericho city. The admins of e-health program were two groups: the first group consists of a doctor and head nurse to provide quality control services and reviewing functionality, bugs and reports, the second group consists of two persons in IT department that give the technical support to help the implementation process.

4.3 Population

The target group for this evaluation study is the UNRWA health providers (physicians, dentists, nurses/midwifes, lab technicians, and pharmacists) in the middle area of West Bank who are the end users of e-health system. The total health providers in the middle area in the West Bank (Jerusalem area) are 133 health providers in nine clinics, but seven clinics (124 health providers) were included in the study. Technicians in radiology department and social workers were excluded because they aren't using e-health system. Table 2 shows the total number of health providers in each clinic at the middle area of West Bank.

Table 2: The total number of health providers in each clinic of the middle area of West Bank.

Clinic	**# of employees**
Amary	30
Qalandia	22
Beit Sourik	15
Ein Arik	8
Aqbet jabr	19
Shufat	10
Jalazone	20
Total	**124**

4.4 Sample

The whole number of employees that are eligible for the study were 110 employees, based on the inclusion criteria. Those health providers were eight physicians, 44 nurses/midwives, 15 lab technicians, eight pharmacists, and four dentists who worked before and after the implementation of e-health system. The total number of distributed surveys were 110 survey, 85 were completed in the seven UNRWA clinics. The surveys distributed among e-health users between October to December 2017. The response rate was 0.77% (79 completed surveys). Only six surveys were excluded due to incomplete filling.

4.5 Inclusion criteria

E-health users that met the following criteria were included in the study:

1. E-health user must be one of the following category: physician, dentist, nurse/midwife, lab technician, and pharmacist. Other health providers such as radiology technicians and social workers don't use the e-health system in UNRWA clinics and so excluded from the study.
2. E-health user must be contemporary to the two periods (paper based periods and e-health period).

4.6 Study tool

The evaluation of e-health system was through a survey named "Canada Health Infoway System and Use Assessment Survey"("Canada Health Infoway System And Use Assessment Survey. The evaluation is guided by a national benefits evaluation framework (Lau , 2007), designed to be completed by system users, and consists of a core set of questions with Likert-type scale(1=Strongly disagree, 2=Moderately disagree, 3=Not sure or not changed, 4=Moderately agree, and 5=Strongly agree). Not all questions from the standard system and use survey were asked in all dimensions to reduce respondent burden from one hand and to make suitable to the clinics context. Items under system quality, service quality, information quality, and user satisfaction adapted from the national benefits evaluation framework (Lau, 2007). Items of 'productivity' and 'quality of care'

were adapted from (Tharmalingam, 2016). The survey was translated into Arabic and modified slightly according to UNRWA e-health system characteristics.

The final survey after modification and translation consists of 19 items that are aligned with each dimension of the framework (Table 3) shows each dimension and its corresponding items. The first page in the survey is an identifying for health provider profession, computer skills, name of clinic. It includes five sections that represent the five dimensions in D&M framework. The first section is about user satisfaction which includes(overall satisfaction, ease of use, and better workflow/make job easier).The second section evaluates system quality which includes four items, (performance, reliability, privacy, and response time).The third section evaluates information quality (overall quality, format/layout, accuracy, and available when needed). The fourth section is evaluating service quality (training and support). Finally, the fifth dimension evaluates the net benefits that results from implementation e-health which is here in this study are represented by impact of the system on productivity (overall productivity and reduce manual needs), and net quality of care (overall quality of care, coordinate of care, and clinical decision support).Each item in every dimension is explained in the conceptual definitions for variables.

Table 3: A summary for conceptual and operational definition of each dimension of D&M framework.

Dimension	**Conceptual Definition**	**Operational Definition**
System quality (Independent variable).	-Functionality -Performance: -privacy	-Response time -Reliability -privacy
Information quality(Independent variable).	-content -availability	-Overall quality of information - layout and format. -availability when needed. -Accuracy.
Service quality (Independent variable).	Responsiveness	Training and support
User satisfaction (independent variable).	Opinion of health providers about e-health compared to	-Overall satisfaction -Ease of use

	expectation from e-health implementation	-Integration of workflow/make jobs easier
Net benefits (IS success as dependent variable).	1. Productivity	-Overall productivity - Reduced need to obtain information manually
	2. Quality of care	-Net quality -Clinical decision support. -Coordination of care

Three focus group sessions consisting of 11 health providers, each working at Amary health center and Aqbet Jabr centre were also conducted. The discussion in the focus groups focused on benefits and drawback with systems and improvements that users would suggest. Each focus group was conducted in one hour session. Participants were questioned by the researcher, and the feedback were recorded on papers. After the focus group, recordings were scanned into computer files.

4.7 Data collection

The data collection process first started with meeting the head-nurse in each clinic participated in the study, to take a general look about the history of the employees, and who are nominee to fill in the surveys. After identifying the qualified numbers of employees, the survey reviewed by the main manager of the implementation of e-health, Dr.Ahmed Jubeh. After that the surveys were distributed among employees between November and December 2017 in their formal break. The average time spent for filling the survey for each employee was 10-15 minutes. The researcher also collected information from employee in three sessions of focus group one hour each. The participants talked about their concerns in the e-health system in addition to highlighting other benefits of the system over paper-based records. The researcher also heard their suggestions to improve the system or what other features they would like to implement. The researcher recorded the notes from each session and the notes were scanned and saved as PDF files.

4.8 Pilot study and reliability testing

The reliability of the survey for measuring the various elements were evaluated using Cronbach's alpha (most of the dimensions were around 0.7). In a pre-test phase, the

content of the questions were evaluated in a small target group composed of two physicians, five nurses, one lab technician, and one pharmacist in Budros and Beit-Our clinics. Participants had not difficulty in answering the questions. The filled questionnaires in the pilot phase were used in the study

4.9 Statistical analysis

Descriptive statistics were calculated as frequencies and proportions for categorical variables (i.e. health profession and work location), also means and standard deviations for continuous variables (i.e. items corresponding to the six dimensions). The scale level of satisfaction was collapsed, such that:

- Responses 4 (agree) and 5 (strongly agree) were combined into “satisfied”
- Responses1 (strongly disagree), 2 (disagree) and 3 (not certain) into “not satisfied”.

Overall satisfaction was computed by averaging the answers to the three corresponding items (Table 4). The correlations of overall satisfaction with the remaining items were measured using Pearson's correlation coefficient. An alpha of <0.05 was considered to be statistically significant. All statistical analyses were performed using MATLAB.

4.10 Permission and ethical considerations

- The study was submitted to Al-Quds University, faculty of public health and get the permission to conduct the study.
- Approval was obtained from UNRWA to collect the data within clinics.
- Confidentiality of the gathered data were preserved, no publication of result were happen, the study had done for educational purposes only.
- Privacy, confidentially and autonomy were maintained throughout the research process. Moreover, the names of participants were not required.

Chapter five:

5. Results

This chapter presents the results of the statistical analysis of the data. Descriptive analysis presents the characteristics of the respondents in the seven clinics, in addition to the analysis of the dimensions of information system success. The relation between selected variables, as well as a summary of the focus groups are described in this chapter.

5.1 Sample characteristic

Of 110 health providers who used the e-health system daily in seven UNRWA centers at the middle area of west bank (Al-Ammary, Jalazon, Aqbet Jabr, Ein Arek, Shufat, Qalandia, and Bet Soreek), 79 were included in the final analysis, representing a 77.2% response rate. The health providers were physicians, nurses, lab technicians, pharmacists, and dentists. Figure 4 shows the health providers characteristics; the majority were nurses (56%), most of the participants were female (77%), and most of the respondents were from Al-Amary health center (29%) where most of health providers in the middle area are located. Only 1% of the users reported poor computer skills. Figure 5 shows the distribution of participant's age. Most of the participants were above 30 years old and the number of participants that are in 30s years old, 40s and 50s are almost similar.

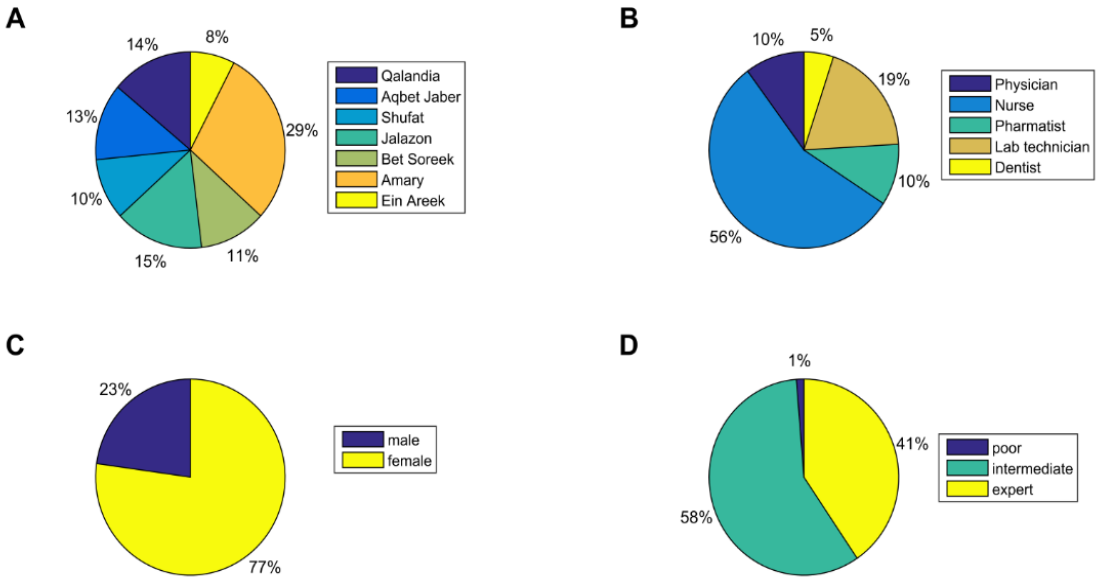

Figure 4: demographic characteristics of participants in term of A. clinic's location, B. participant's professions, C. gender, and D. computer proficiency.

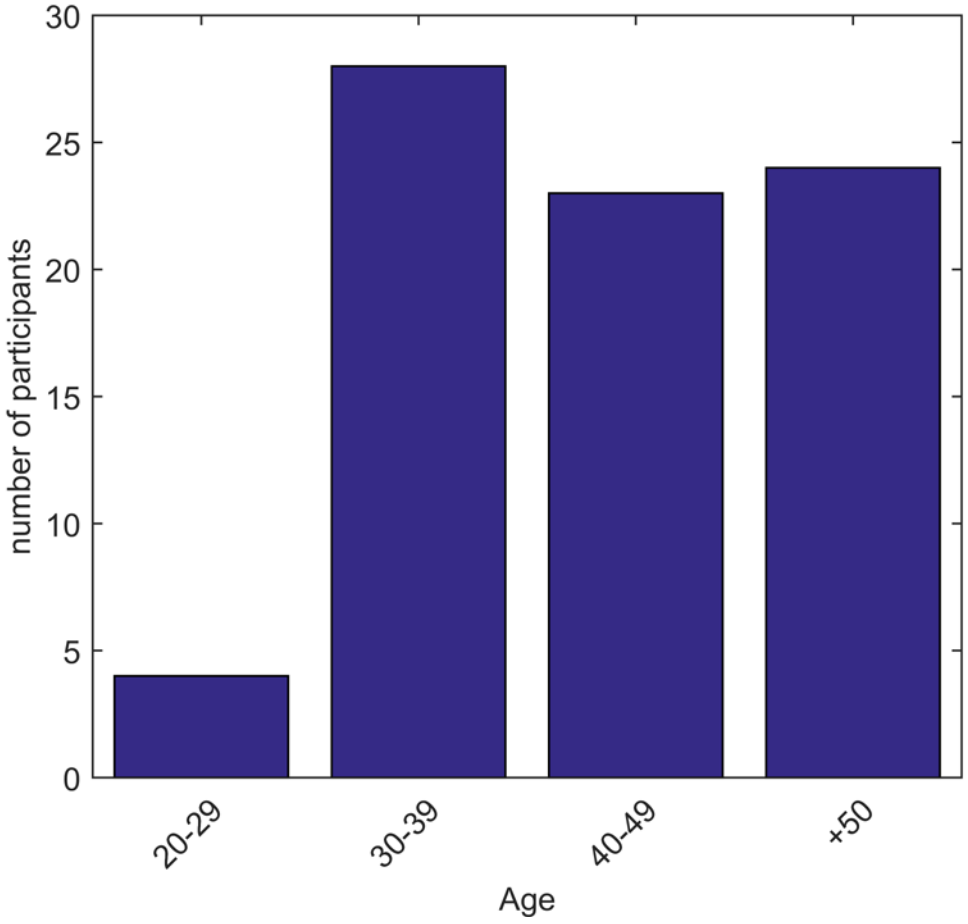

Figure 5: Bar graph of the distribution of participant's age

5.2 Reliability and overall satisfaction

The reliability of the dimensions measured in the survey were evaluated using cronbach's alpha which is the expected correlation of the items that measure the same dimension (Table 4). The values of all the dimensions were above 0.7 indicating good reliability except two dimensions "productivity" and "quality" in which cronbach's alpha was 0.6 – 0.69 (acceptable reliability). Table 4 also shows the percent of respondents that were satisfied by each dimension in addition to the mean and the standard deviation measured from the scores of the corresponding items. Results show that 78% of the respondents were overall satisfied with the system. Among the three dimensions that describe the system (information quality, system quality, and service quality), 'information quality' got the highest satisfaction (76%), while less than half of the respondents were agreement with service quality (48%) and system quality/performance (48%). Most of the respondents

(76%) agreed that the system improved the net quality of health but only around the half (59%) agreed that the system improved the net productivity.

Table 4: Mean responses and agreement with statements on overall satisfaction with the system component.

	Cronbach's alpha	% agreement	Mean	Standard deviation
User satisfaction	0.71	0.78	4.14	0.73
system quality	0.73	0.48	3.57	0.97
information quality	0.70	0.76	3.74	0.82
service quality	0.93	0.48	2.99	1.18
productivity	0.60	0.59	3.41	0.45
quality	0.66	0.76	3.72	0.49

5.3 Satisfaction with system quality, quality of information, and service quality

Two out of the four items on system quality (performance), "response time" and "reliability of the system", were agreed to more than 80% of the respondents, and more than 60% agreed that the system "maintain the privacy of patients" (Table 5), yet less than half of the respondents (36%) agreed that "system performance is efficient". While high variability is seen among the items measuring system quality, lesser is observed among the items of information quality. Around 65% to 75% of the respondents agreed with 'overall quality of information', 'accuracy of the information', 'layout/format', and 'availability of the information when needed'. The service quality of the system on the another hand was the least dimension agreed among respondents where only half of the respondents were satisfied by either the 'level of support' or the 'quality of training'.

At the focus group, the following limitations/concerns were reported: users were concerned about the performance of the system specifically the **cut or slow in internet connection** which may results in data loss. A pharmacist said: "*The cut in the internet or slow in net speed is generally an obstacle in providing high quality service to the patients. The documents and the information in the paper-based record is sometimes much accurate than e-health because during the cut in connection we shift to paper record and some of these papers aren't filled back into the system*". A nurse raised this issue in a different context: "*There are several problems in the system. For example, the slow in internet connection and it sometimes even get disconnected and as a result, some patient's information are lost, and so the monthly reports/statistics at the system becomes inaccurate [as it doesn't include those patients that were received care during the period of slow/cut in internet connection]*".

Moreover, users reported that some the system's functions are producing **inaccurate results (system errors)**. Lab technicians reported that the system is producing wrong monthly descriptive statistics. They were concerned because this is supposed to be a simple task in which the system counts the number of time every test was performed. They think that probably other functions of the system are producing errors but they are yet unaware of them.

In agreement with our finding that users were generally dissatisfied with service quality, at the focus group sessions users reported that **they weren't trained well** prior the move to the system from paper records. A pharmacist said: "e-*health made my job easier by 80%, but I think they had to train the health providers before start using the system. We were obligated to use the system irrespective to our skills and how much we know about computer*". A physician explained this problem as follow: "*I work here as a physician for 20 years. My skills in using computer is intermediate. I didn't receive any kind of training before using e-health system and I had to depend on myself [to learn/understand it]*".

In addition to the lack of specified training, users reported that the **service is poor**. A lab technician emphasized on this as follow: "*The system is acceptable. But since I am aware of other systems in other institutions, I believe it's not the most friendly. In addition, when I face a certain problem or defect in the system, I couldn't resolve it even if I contact the person who is in charge for the program*".

One reason why users were frustrated from specific components of the system is that they show concern at focus group about **not being involved in the stage of system development**. They feel that many of the system component that aren't satisfying could be made better if they were consulted. For example, a nurse reported that the system is preventing an ordering of HbA1C test if it was already performed in the same year. She explained this in detail as follow: "*I face some problems while using e-health. For instance, according to UNRWA policies, we aren't allowed to order Hemoglobin A1C more than once in a year, yet we need for some diabetic patients another test in the same year. The system refuses the order for the second test*". Another issue was raised by a lab technician concerning printing out the results:" ***Printing the results is not that easy****. We have to navigate from different pages and it's even much complicated when we have to search an old result. It took us sometimes long time to retrieve old results and print them out. When a test isn't available in our clinic and need to be performed externally, we find it hard to find the required test to fill it once we got the results from the external lab.*".

Since some of the health providers are aware of other e-health systems in other institutions, they found **some features missing**. For example, the system is missing an alarm to indicate a possible drug-drug interaction. A pharmacist suggested this feature as follow: "*The drug-drug interaction alarm is a feature in other external clinics, and is also a feature in [UNRWA] e-health but is not activated. I suggest to set up the alarm as it can lower the possibility of giving the patient by mistake drugs that can interact with each other*".

Beside these limitations in the system, the researcher found support from focus group sessions with the results from survey in which users were generally satisfied by the quality of information. Users reported that the system reduced manual errors due to poor handwriting or mistakes. A pharmacist highlighted this point as follow: "e-*health system facilitated the delivery of care to patients. Now the name of drugs are clear and I don't have to guess which drug the physician has written down*". In addition, users found that the information provided by e-health system reduced the problem of repeating tests or ordering unnecessary tests which eliminates associated costs. A lab technician emphasized on this point as follow: "e-*health allow for better quality of provided service and care. I can now see the tests required and those already performed simply on a screen in front of me instead of bunch of papers. The way tests are ordered is much efficient than before and we can find any duplicated tests easily"*.

5.4 Net benefits: quality of care and productivity

When looking at the two dimensions that estimate the overall net benefits of the system (i.e. net quality and productivity), high variability among the items are noticed. Almost 80% of the respondents agreed that the system helps in 'coordinate of care' and even almost all of them (95%) found that the system help in 'clinical decision support', yet the majority disagree that the system improved overall quality of care (27%). Similarly, around 59% found that the system 'reduces manual needs' but only one out of five (22%) found that the system 'changed the overall productivity'.

At the focus group, physicians reported that the **computerized system affect the quality of care as it reduced the time spent talking and communicating with the patient**. This is because they paid more attention to the computer screen. One of the physicians said: "*As a physician, I think the system is good and it was a paradigm shift from paper-based record to electronic data. Yet, I think that communicating with patient is of lower quality than before as I have now to concentrate more on the screen to fill the information of the patient*".

A nurse from Mother Child Health (MCH) department raised a concern about the quality of care**(system limitation)**, the system provides to premature or low birth weight. She explained this in details as follow: "*I found a limitation in the system in dealing with premature or low weight babies. For example, when I was using the paper-based record, any patient whose head circumference is less than expected, I used to draw on a scratch of paper a curve and ask the mother for several visits to monitor the change. This feature is missing in the e-health system and I had to go back to the paper record to follow up*".

However, the system improved the efficiency of visits and minimizes crowdedness which may have an impact on the overall quality of care. A lab technician said: "e-*health has improved patient's visits as it's now much organized. People [patients] come in specified day and time instead of coming all at the same time and that organized the workload very well*".

5.5 Correlations with overall satisfaction

To find which item(s) correlate significantly with overall system satisfaction, the linear correlation between each item in the study against the overall satisfaction was modeled. Table 5 shows that 'level of support' and 'quality of training', and to less extent 'system response time', were the only items that correlate significantly with overall satisfaction ($P < 0.05$) and show strong to moderate positive correlation ($r > 0.5$). All the items of information quality except 'privacy', and two of the items of system quality ('system reliability', and 'system performance') also show significant correlation with the overall satisfaction, but the correlation was weak to moderate ($r < 0.5$). None of the net quality and productivity items were significantly correlated with overall satisfaction and/or show strong to moderate positive correlation. To sum up, service quality was the only dimension where all of its items are significantly correlated with overall satisfaction and as well show strong to moderate positive correlation.

Table 5: For each item (rows), the mean score, standard deviation, number of participants that agree with the question, percent agreed, and the correlation to overall satisfaction are shown.

Item	Mean score	Standard Deviation	% agreement	No.	r	p-value
response time	3.75	0.78	0.81	64	0.53	5.9e-7
privacy	3.91	0.96	0.62	49	0.20	0.07
reliability	4.01	0.67	0.85	67	0.452	2.7e-5
system performance	2.61	1.46	0.36	29	0.32	4.4e-3
quality of information	3.75	0.65	0.66	52	0.42	1.3e-4
accuracy	3.65	0.85	0.76	60	0.11	0.35

Item	Mean score	Standard Deviation	% agreement	No.	r	p-value
format	3.50	0.95	0.67	53	0.27	0.02
available when needed	4.06	0.84	0.76	60	0.29	8e-4
clinical decision	4.01	0.47	0.95	75	0.10	0.37
training	3.06	1.134	0.51	40	0.58	2.5e-8
support	2.91	1.23	0.48	38	0.63	6.5e-10
coordinate of care	3.86	0.50	0.80	63	-0.04	0.75
overall productivity	3.22	0.41	0.22	17	0.21	0.06
quality of care	3.29	0.51	0.27	21	0.12	0.28
reduce manual needs	3.60	0.49	0.59	47	0.04	0.7

6. Discussion

6.1 Principle findings

The purpose of the study was to evaluate the e-health system in UNRWA clinics at the middle area of West Bank through a comprehensive assessment of user satisfaction and determinant factors using D&M model. High overall satisfaction with the system was reported in which 78% show positive attitude toward the system. In general, users show positive view on the quality of information but they were not satisfied by the system quality/performance and service quality. Despite their overall disagreement with productivity of the system, participants acknowledged that the technology improved the quality of care in agreement with a study conducted by (Clayton, 2005).

6.2 User satisfaction

Almost all of the users (92%) found the system to be ‘easy to use’. This result is incompatible with previous studies that report lower rate (60-70%) (Palm, 2010), (Alharthi, 2014) and (Tilahun & Fritz, 2015a). Furthermore, 91% of the users believed the system ‘makes jobs easier’. The overall satisfaction (78%) is higher than previous reports from Malaysia (Amin, Hussein, Wan, & Isa, 2011), Oman (Al Farsi & West, 2006), Saudi Arabia (Alharthi, 2014)**,** Ethiopian (Tilahun & Fritz, 2015a), and Kenya (de Veer & Francke, 2010). Since UNRWA has adopted e-health system several years after its first implementation, it’s likely that nowadays programs have been improved considerably and are now user-friendly making the work flow easier relative to paper-based records. The infrastructure is also a factor that may highly increase the overall satisfaction (Tilahun & Fritz, 2015a). For example, a study in China (Jia-lin, Siru, & Fei, 2013) reported a satisfaction rate of 70.7% in two hospitals. Another possible explanation is that most studies evaluate the system after no longer than one year from its implementation. Indeed, user’s experience with such systems increase over time, and so their overall acceptance of the system. In this study the system is evaluated four years after its first implementation hence the dissimilarity between our results and previous studies.

Most of the studies that evaluate e-health system, study as well the factors that affect its success. (Palm,2006), reported that system quality and service quality are strongly correlated with satisfaction. Another study by (Chatzoglou, 2012), found that information quality and service quality directly and positively affect user satisfaction. All studies and models of e-health evaluation (van der Meijden, 2003), (Palm, 2006), (Tilahun, Zeleke, Fritz, & Zegeye, 2014) and (Bossen, Jensen, & Udsen, 2013), considered system quality, information quality, and service quality as the main determinant factors for user satisfaction. In this study, service quality was the only dimension in which all of its items (i.e. level of support and quality of training) were significantly correlated with user satisfaction and show strong to moderate correlation (Table 5) which is compatible with several studies (Kaplan, 1997) and (Chisolm, 2010). Although not as strongly correlated as service quality, some features of the system related to information and system quality were as well significantly associated with user satisfaction. These includes response time, reliability, system performance, overall quality of information, and information format/layout. These findings are in support of previous studies, where they reported that

efficient and fast systems that provide useful patient information are essential for the satisfaction of health providers (Lorenzi & Riley, 2004)

6.3 System quality

Despite relatively high overall positively evaluation, there was a clear negative evaluation about system performance. While 81% positively evaluated the response time of the system, only 36% were positively evaluated the overall system performance (Table 5). This finding is supported from members of focus group. They reported examples where the system produces errors or mistakes. For instance, most of lab technicians reported at one focus group session that some functions in the system are corrupted. The system doesn't produce accurate monthly count of the number of times each test was performed. This increases the workload because they have to do manual operations to overcome system's errors. They reported another example in which sometimes physician's orders are not delivered through the system to the lab, and so requested tests have to be manually ordered. Such examples explain the frustration of users with the quality of the system and its overall performance.

There are conflicting views on the security and the privacy of such systems, some studies reported that the system protect information well(Fortune & Peters, 2005,and (Wateridge, 1998), while in others less than one third of the users had a positive view of the effect of computers on patient privacy (Rahimi & Vimarlund, 2007). In our study, most of the users (62%) evaluated positively system privacy (Table 5) This finding is in agreement with a recent study at Saudi Arabia (King, 2014), who attributed the high satisfaction in privacy among their participants to the individual health information in their country which is generally not abused, whereas in other countries patients with certain diseases may be denied jobs or health insurance coverage. This as well may explain the moderate satisfaction on system privacy in our country.

6.4 Quality of information

Patient information is critical for delivering the best care. Lack of accuracy and completeness of information should alert the hospital management to improve reporting from departments that provide patient information, such as laboratory department. This

includes both conducting the requested tests without unnecessary delay and entering accurate, timely results into the system. In our study, users positively evaluated the overall quality of the information: 85% reported that the information was accurate and more than 90% were agreed about the format and layout of information which is higher than similar studies in USA (Aaronson, Murphy-Cullen, Chop, & Frey, 2001) and Saudi Arabia (Alharthi, 2014). Moreover, most of the users, lab technicians in particular, emphasized in focus group on the usefulness of the system in avoiding duplicate testing. They believed that the availability of the information in proper layout helped them reducing tests duplication. Previous studies highlight the benefits of e-health systems in saving money by minimizing duplicate tests and savings in drug expenditure, for example, Wang and colleagues (Chaudhry, 2006) estimated an average of 8.8% and 14% in testing reductions at laboratory and radiology respectively as a result of e-health implementation. The high satisfaction with the quality of information can also be attributed to a major benefit of e-health system over paper-based report, the avoidance of mistakes and poor handwriting. Members of focus group, pharmacists in particular, raised this benefit of e-health over paper-based records as they now don't have to guess the name of the drug due to poor handwriting. Finding from previous studies suggest that errors can be reduced upon the usage of e-health system. For instance, in hospital settings, serious medication were reduced by 55% when a computerized order entry is used alone (Bates, 1998b),and by 83% when this system is coupled with "alerts" based on what the physician orders(Bates, 1999b). Another study approached the outcome of e-health system on medication errors in outpatient setting and found that it can reduce the error rate from 18.2% to 8.2%(Devine, 2010). The implementation of the "alert" system to warn the pharmacist for a possible drug-drug interaction was suggested in one of focus group session.

6.5 Service quality

Similar to recent studies (Tilahun & Fritz, 2015a), less than 50% of the users considered that the level of training was adequate. (Morton & Wiedenbeck, 2009)found that younger users may find the training adequate because of their prior experience with computers. Although almost all of the respondents in our study reported good (57% of the respondents) to expert (39% of the respondents) experience in using computer, they were dissatisfied with their training. Users in our study experienced computer uses before but they expected

probably more specified training on the system. For instance, a physician in one of the focus group sessions reported that he depended on himself to learn and understand the system as he was expecting a specified training prior the use of e-health.

Beside training level, only half of the users found that the system support was acceptable, a percentage similar to other studies (Alharthi,2014), and (Tilahun & Fritz, 2015a). Delayed support from the information technology department when needed can increase user's frustration with the system. Studies have shown that good support by information technology departments and better collaboration with health providers improves the success rate of already installed systems (D. Meinert & Peterson, 2009) and (Ventres, 2006)

The need for system support depends on the sophistication of the system. In our study, user dissatisfaction with system support is likely due to the fact that the system is sophisticated and not made only from basic functions. Indeed, members of focus group raised this point. Users feel that they weren't directly involved in the stage of system development and so some parts seem complicated. For example, printing out lab results take long time because the user need to go back to the history of the patient to determine the date when the test was performed and they keep moving from one page to another to find the completed tests. Another example raised by nurses in which the system prevent them from ordering hemoglobin A1C test for a patient who did the test in the same year. Yet, some diabetic patients are required to do the test at least twice a year. Moreover, a lab technician in one of the focus group session reported that even contacting the service in most cases doesn't resolve the problem or the concern. These examples show the importance of having continuous support from IT department as it can highly impact on the net benefits of the system mainly on its overall productivity.

6.6 Quality of care

Because delivering accurate information in proper format and its availability when needed has great impact on the quality of care (Shachak, Hadas-Dayagi, Ziv, & Reis, 2009), and since users in our study positively evaluated the quality of information in general, high agreement with the net quality of the system was expected. Indeed, 95% of the users believed that the system help in clinical decision, and 80% agreed that the system improve the coordinate of care. Surprisingly, only 26% were satisfied by the impact of the system in the overall quality of care. Actually, 73% of the users answered the question of whether the system has affected the quality of care provided to patients, either increasing or decreasing,

as ‘not changed’. It’s possible that the negative view on system performance and service quality convinced most of the users that the impact of the system on quality of care is yet below expectations. However, one of the limitations of the system reported in a focus group session may point to a different explanation. Users reported that the system reduced the time of communication between health provider and patients. (Frankel, 2005), studied whether the use of e-health system improve or interfere with providers’ communication with patients. Authors found that the system increased the complexity organization of medical visits by adding mental or physical tasks for providers.

Yet, for providers experienced in using computers and the system specifically, the system improved the organization of clinical information, lessening the complexity of the visit. Similarly, authors found that health providers with good interpersonal skills use the system without a negative effect on patient–provider communication while clinicians with poor interpersonal skills before using the system showed worse patient–provider communication with addition of the system. These findings suggest that the system has dual effect of either improving the quality of care if providers experience good computer skills and interpersonal skills, or worsening the quality if the providers have poor computer and interpersonal skills. Most of the respondents in our study reported good (57% of the respondents) to expert (39% of the respondents) computer skills, yet as was shown above, users were frustrated from the level of training they received plus that some tasks in the system are complicated and require special knowledge. Future studies may investigate the effect of provider’s communication and interpersonal skills on the quality of care as it hasn’t been studied in this study.

6.7 Productivity

In general, users reported negative view on the impact of the system on overall productivity. Most of them (78%) reported that the system didn’t change the overall productivity. When the dissatisfaction of users with system performance and service quality is considered, this finding may seems reasonable. However almost all of the users (96%) found that the parallel user of paper-based records and e-health system is annoying. This may point to factors unrelated to the component of e-health system itself but rather to other policies in UNRWA clinics that may significantly impact the overall productivity. (Mikkelsen,2001) studied the challenges of parallel documentation and found that it is a source of dissatisfaction which is in line with our study.

6.8 Conclusion and recommendations

In spite of the relatively high overall user satisfaction with the e-health system at UNRWA clinics in the middle area of West Bank, specific components of the system mainly in its performance and service quality need to be revised by policy makers. Most of the users were dissatisfied by the level of training they received prior the usage of the system and the quality of service and support by IT department which in addition to poor system performance highly impact on the overall productivity of work. Beside this, specific e-health-related policies may as well affect the overall productivity of the system. Here the combine usage of both e-health system and the traditional paper-based record was studied but other policies can as well influence the overall acceptance of the system thereby future studies are called upon. The results of this study may pave the way for more improvement in the system and alert decision makers about its current weaknesses and suggestions from the users. Although our study covers all clinics in the middle area of West Bank, further studies are required to assess user satisfaction in other area and study additional factors such as age and sex. Furthermore, future studies are required to assess the net benefits of e-health system after taking appropriate modifications mainly on system performance and service quality to follow up.

6.9 Study limitations

The study covered almost all the aspects and dimensions related to the evaluation of e-health system. However, there are some limitations that need to be considered:

1. The study was carried out in clinics located only in the middle area of the West Bank. Because of limitations related to free movement from middle area to north or south in the West Bank, the researcher decided not to include clinics therein. Since e-health system is identical in all UNRWA clinics from the north to the south, the researcher isn’t aware of any factor that may affect the generalization of the results here to all other UNRWA clinics in the West Bank. In spite of this, similar studies on regions that weren’t covered here are called upon to check if the results obtained here, in particular those related to service quality, can be generalized. This should alert policy makers to take appropriate actions in the appropriate place.

2. This study is based on five dimensions of the D&M model to evaluate computerized medical records. Yet, there are many other organizational policies and human factors which may influence the overall acceptance of the system. For example, the researcher collected information about one of the policies that UNRWA adopted in which health providers are required to use both e-health and paper-based records in some tasks in particular at the lab work. Users were generally frustrated from this policy and it may affect the overall acceptance mainly the productivity net benefits of the system. Future studies can include those additional variables to have a complete picture of e-health success.

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Appendix A

استبانة

المقدمة: تهدف الدراسة إلى معرفة مدى أثر استخدام السجل الصحي الالكتروني في الرعاية الصحية على إنتاجية العمل ونوعية الرعاية المقدّمة في عيادات وكالة الغوث الدولية في منطقة الوسط في الضفة الغربية

الرجاء الاجابة على الأسئلة التالية:

1. ما هي مهنتك؟

□ طبيب عائلة □ ممرض \ممرضة أو قابلة □ صيدلي\اصيدلانية

□ فني\اة مختبر □طبيب اسنان

2. الجنس □ ذكر انثى □

3.العمر: □ 20-29 □ 30-39 □ 40-49 □ 50+

4. هل تقوم حالياً بتزويد رعاية مباشرة للمريض؟

□ نعم □ لا

5. كيف تقيم مهارتك باستخدام الكمبيوتر؟

□ لا يوجد مهارة

□ مهارة متوسطة

□ مهارة متقدمة

6. ما هو اسم عيادتك؟.....

القسم الأول: رضى مستخدم نظام e-Health بشكل عام

7. ما هو مدى رضاك/ي على استخدام E-Health بشكلٍ عام.

□ راضٍ بشكل كبير □ رضا متوسط □ لست متأكدا

□ غير راضي بشكل متوسط □ غير راض بتاتا

8. (نظام e-Health سهل الاستخدام):-

□اوافق بشدة □اوافق بشكل متوسط

3. يمكن الاعتماد على e-Health في الأداء الجيد للعمل.					
4. بشكل عام نوعية برنامج e-Health هي نوعية ممتازة.					

القسم الثالث: نوعية المعلومات

11. بشكل عام، عندما تفكر بنوعية المعلومات التي يزوّدها e-Health، هل تجد نوعية المعلومات:

□ مقبول بشكل كبير □ مقبول بشكل متوسط □ لست متأكدا

□ غير مقبول بشكل متوسط □ غير مقبول على الإطلاق

12. الرجاء الإشارة إلى مدى موافقتك أو عدم موافقتك مع الجمل الآتية:

	أوافق بشدة	**أوافق بشكل متوسط**	**لست متأكدا**	**لا أوافق بشكل متوسط**	**لا اوافق بشدة**
1. المعلومات في e-Health دقيقة.					
2 نموذج تصميم وشكل الصفحات في برنامج e-health يعتبر مقبولا					
3. المعلومات في e-Health متوفرة عندما احتاج إليها.					
4. المعلومات في e-Health تجعلني أتخذ القرارات التي تخص مصلحة المريض بسرعة.					

القسم الرابع: نوعية الدعم والمساندة للتشجيع على استخدام e-Health

13. بشكل عام، عند التفكير بنوعية الخدمات المقدمة للمساعدة على استخدام برنامج e-Health (الدعم الفني، التدرب على الاستخدام)، هل تجد نوعية الدعم:

□ مقبول جداً □ مقبول بشكل متوسط □ لست متأكدا

□ غير مقبول بشكل متوسط □ غير مقبول على الإطلاق

مستوى تقديم المساعدة والدعم الفني للتشجيع على استخدام e-health يعتبر

□ مقبول جداً □ مقبول بشكل متوسط □ لست متأكدا

□ غير مقبول بشكل متوسط □ غير مقبول على الإطلاق

القسم الخامس: الفوائد الإجمالية

15. بشكل عام، أتوقع من e-Health ان يساهم في تعزيز التعاون بين الزملاء في تقديم الخدمات الصحية

□ اوافق بشكل كبير □ اوافق بشكل متوسط □ لست متاكدا

□ غير مقبولة بشكل متوسط □ غير مقبولة على الإطلاق

16. هل تعتقد أن e-Health يؤثر على إنتاجية العمل (Productivity) زيادة أو نقصان؟

□ ازدياد كبير جداً □ ازدياد متوسط □ لم تتغير □ تناقص بشكل متوسط

□ تناقص بشكل كبير

17. هل تعتقد أن نظام e-Health يؤثر على نوعية الرعاية المقدّمة للمريض؟ زيادة او نقصان

□ ازدياد كبير جداً □ ازدياد متوسط □ لم تتغير □ تناقص بشكل متوسط

□ تناقص بشكل كبير

18. اعتقد ان E-health قلل الحاجة الى الحصول على النتائج عن طريق البحث في الملفات بطريقة يدوية.

□ اوافق بشكل كبير □ اوافق بشكل متوسط □ لست متاكدا

□ غير مقبولة بشكل متوسط □ غير مقبولة على الإطلاق

19. أعتقد أن الجمع بين استخدام الأوراق واستخدام E-health اثناء العمل هو امر مزعج :

□ اوافق بشكل كبير □ اوافق بشكل متوسط □ لست متاكدا

□ غير مقبولة بشكل متوسط □ غير مقبولة على الإطلاق

Evaluation of E-health system

1. What is your profession?
□ Family physician
□ Nurse/midwife
□ Pharmacist
□ Lab technician
□ Dentist

2. Gender □Male □Female

3.Age □20-29 □30-39 □40-49 □+50

4.**Do you currently provide direct care to patients?**
□ Yes □ No

5.**How would you rate your computer proficiency?**
□ None
□ Average
□ Advanced

6 Where are you located? (Clinic name).

SECTION 1: OVERALL USER SATISFACTION

7. In general, how satisfied are you overall with the e-health system you are currently working with?

□ Highly satisfied □ Moderately satisfied □Not sure
□Moderately dissatisfied □ Not satisfied at all

8. E-health system is easy to use

□Strongly agree □Moderately agree □Not sure
□Moderately disagree □Strongly disagree

9. E-health system helps to improve workflow /makes job easier.

□Strongly agree □Moderately agree □Not sure
□Moderately disagree □Strongly disagree

Section 2: System quality

10. Please indicate your level of agreement or disagreement with each of the following statements below.

	Strongly Agree	**Moderately Agree**	**Not sure**	**Moderately Disagree**	**Strongly disagree**
1. The response time from e-health is acceptable					
2. e-health adequately provide for the privacy and security of my patient's information					
3.e-health is reliable in its performance					
4. Overall, the quality of e-health is excellent					

SECTION 3: INFORMATION QUALITY

□ □ □Not sure
□ □

12. Please indicate your level of agreement or disagreement with each of the following statements below.

	Strongly Agree	**Moderately Agree**	**Not sure**	**Moderately Disagree**	**Strongly disagree**
1) Information in e-health is accurate					
2) The format and layout of the information in e-health is acceptable					
3) The information in e-health is available when I need it					
4)The information in e-health allows me to make patient care decisions and/or recommendations more quickly					

SECTION 4: SERVICE QUALITY

13. In general, when thinking about the quality of the services (technical support) provided for e-health, do you find the quality of this support to be:

□ Highly acceptable □ Moderately acceptable □ Not sure
□ Moderately not acceptable □ Not at all acceptable

14 . The level of on-going Training provided for e-health is:

□ Highly acceptable □ Moderately acceptable □ Not sure
□ Moderately not acceptable □ Not at all acceptable

□ Highly acceptable □ Moderately acceptable □ Not sure
□ Moderately unacceptable □ Not at all acceptable

e-health affect productivity increasing or decreasing

□ Highly increasing □ Moderately increasing □ Not changed
□ Moderately decreasing □strongly decreasing

17. In general, do you expect e-health affect quality of care for patients, increasing or decreasing

□ Highly increasing □ Moderately increasing □ Not changed
□ Moderately decreasing □strongly decreasing.

18. I think that e-health reduce the need to obtain results through using manual documents:

□ Highly acceptable □ Moderately acceptable □ Not sure
□ Moderately not acceptable □ Not at all acceptable

19. **I think that using both e-health and papers during work is annoying:**

□ Highly acceptable □ Moderately acceptable □ Not sure
□ Moderately not acceptable □ Not at all acceptable

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Appendix B

Consent form

Fwd: Fw: RE: طلب عمل دراسة تقييم e-health

To: shazaza1@hotmail.com
Cc: KHALILI, Mohammad, ZEIDAN, Fida, JUBEH, Ahmad, HEALTH CENTER, Amari, AL-HILO, Khaled, AWAD, Nuha
Dear Shaza
Kindly to inform you that In principle the Health Department do approve for you to conduct the study at UNRWA PHC centres, however we need to process this request as below:

To accept the research(study) request , we must have the following requirements :

1. Request from the University. Or the institution
2. The study Methodology
3. Ethical approval
4. Commitment from the researcher to share the finding with us
5. The study not to be used for publications (For Internal UNRWA Review)
6. No invasive technique