IMPLEMENTATION OF ELECTRONIC MEDICAL RECORD IN HOSPITAL MANAGEMENT INFORMATION SYSTEM IN DEVELOPING COUNTRIES: A SYSTEMATIC REVIEW

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ABSTRACT

Background: The developing world faces health crises that threaten the lives of millions of people. Lack of health care infrastructure, shortage of well-trained health professionals, poor implementation of public health, and lack of access to health information are considered important barriers to scaling up. Different approaches have been implemented to overcome this gap. The implementation of e-health and especially electronic medical records may help improve and enhance healthcare in these countries. This study aimed to review systematically the implementation of electronic medical record in hospital management information system in developing countries.

Subjects and Method: A systematic review was conducted by searching published articles from 2014 to 2019, from PubMed database. The keywords for this review were electronic medical record (EMR), implementation, hospital information system management, and developing country. The inclusion criteria were review, systematic review, clinical review and guidelines in English language, and maximum 5 years publications. After review process 5 articles were included in this review.

Results: The success factors of the implementation of EMR application were methods of using good data, human resources, effective management, infrastructure planning, and good technical implementation.

Conclusion: The success factors of EMR implementation are method of using good data, human resources, effective management, infrastructure planning and good technical implementation.

Keywords: electronic medical record, implementation, hospital information system management, developing country.

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BACKGROUND

There are many countries that have problems with the lack of adequate quality health care services for citizens, even though these countries have a large burden of disease. There is an imbalance in the distribution of doctors in about half of the countries that are members of the World Health Organization (WHO). These countries lack one doctor per 1000 people, while the United States has 2.45 doctors per 1000 people, and there are around 3 and 5 doctors in most European countries (Fritz et al., 2015).

WHO also states that more than 9 million neonatal deaths worldwide occur each year in the early weeks of life. It mostly occurs in the developing countries. It is important to take care of babies in the developing countries by providing better ways of care. Infant mortality is considered as an indicator of socio-economic development. Therefore, most countries give large investment in increasing the Neonatal Intensive Care Unit (NICU) to save babies with high risk criteria (Mirnia, 2014).

Various methods were conducted to overcome this disparity in health services,

including increasing the number of health workers and strengthening the health system through structural reforms. One possible approach to supporting the lack of medical staff was providing Information technology (IT) for daily work, so that the information was available. It also gave patients the opportunity to save the medical data in a structured format. This approach will create valuable in order to make the right decision for the health care system (Fritz et al, 2015). Doctors and health care providers in this field have many difficulties which can be resolved with some precise information obtained from data collected, stored and analyzed (Mirnia, 2014).

The use of IT in the field of health services in the developing countries was explained by Fraser almost 10 years ago. However, there were many projects that were still at the initial installation level. In addition, weak health service infrastructure in countries with low resources caused a lack of qualified human resources. Most of the health care institutions also did not have specialized IT staff for their Electronic Medical Record (EMR) system. Every new project must consider these lacks and utilize available human resources efficiently (Fritz et al., 2015).

SUBJECTS AND METHOD

1. Study Design

This was as systematic review study using PRISMA Protocol. The articles were collected from PubMed and Medline Plus in order to obtain relevant results from 2014 to 2019. The keywords were Electronic Medical Record, Implementation, Hospital, Information System, Management, and Developing Country. The combination of the keywords was carried out by Boolean operators with variation of "AND".

2. Inclusion and Exclusion Criteria

The inclusion criteria were types of scientific article document articles, using English language, related to the Electronic Medical Record topics, and in the 5-year publication limits. The exclusion criteria were not scientific articles, did not use English language, published for more than 5 years. After the review process, 5 eligible articles were found.

The authors filtered the titles and studied the abstracts that would be used as the reference. If the reference was considered irrelevant, incomplete, or incompatible with the material, it would not be included. The researchers confirmed the necessary studies regarding the implementation of Electronic Medical Record in hospital information system management in the developing countries.

3. Data Extraction

The electronic database was searched for 7 days from 5 June 2019 to 30 June 2019 independently by one author. The titles, abstracts, and discussions were studied to identify studies that included the relevance for reference. The researchers also looked at the contents of all reference studies in order to obtain information and sources regarding the implementation of Electronic Medical Record. The conclusion based on reference analysis was conducted afterwards.

RESULTS

Five selected articles were systematically reviewed:

1. Success Criteria for Electronic Medical Record Implementations in Low-resource Settings: A Systematic Review (Fritz et al., 2015).
2. Design and Evaluation of Electronic Briefs of Neonatal Intensive Care Unit in Taleghani Hospital, Tabriz, Iran (Mirnia et al., 2014).

3. Development of Electronic Medical Records for Clinical and Research Purposes: The Breast Cancer Module Using an Implementation Framework in a Middle Income Country- Malaysia (Nor et al., 2019).
4. Development of Hospital-based Data Sets as a Vehicle for Implementation of a National Electronic Health Record (Keikha et al., 2018).
5. Challenges in the Use of the Mental Health Information System in a Resource-limited Setting: Lessons from Ghana (Kpobi et al., 2018).

The five articles were eligible for review according to the inclusion criteria set by the authors. These criteria for the implementation of EMR included functional, organizational, technical, training, political, ethical, and financial categories. Less than one third of these criteria were overused. Another important thing was management's commitment to have different steps, such as the allocation of resources or membership of the directorate (Fritz et al., 2015).

Microsoft Visual Basic was recommended software for designing program. However, some authors used Microsoft Access and computer program written in the same language to design program. The reason for choosing Microsoft Access was the simplicity of the accessibility of this software and its implementation in different hospital systems. In addition, the data could be transferred easily to Excel and SPSS software.

The use of this program was easier and simpler compared to other programs (Mirnia et al., 2014). Meanwhile, EMR contained various important data categories. The data categories were administrative data, meeting/face-to-face data between doctors and patients, problem data, treatment plan data, provider data, check-up data, historical data, diagnostic data, cases data, insurance data (Keikha et al., 2018).

In Malaysia, the development of an EMR system module that was successfully applied was in the breast cancer case. They used Quality Implementation Framework (QIF) called i-Pesakit. The completion of i-Pesakit Breast Cancer Module required the management of clinical data electronically, integration of clinical data from various internal clinical departments towards the establishment of a patient-focused data management model (Nor et al., 2019).

There were various challenges identified from staff experience in the use of EMR, namely increased staff workload, complicated data collection processes, limited staff involvement in the implementation process, poor resource allocation, and data dissemination (Kpobi et al., 2018).

DISCUSSION

Electronic Medical Record (EMR): an electronic automated paper-based medical record system. Electronic Medical Record (EMR) is patient medical records in an electronic format regarding person's health information written by one or more health workers in an integrated manner. Electronic medical record can be accessed by computer or electronic system from a network. The main purpose is to provide or improve efficient and integrated care and health services (Heinzer, 2010).

The main criteria for the successful use of EMR depend on the functioning of the system implemented, followed by the organizational structure and support for the project, and the availability of the infrastructure. Funding has not yet been found as the main criterion, although it seems to be an important factor because it is almost

always mentioned at first, when talking about the low regulation of resources.

The financial problem may occur due to many of these projects were funded by donors, with unclear initial and continuing costs. Nearly half of the health IT projects in low and middle income countries is based on donor funding. This study showed that there was an investment refund in the use of low resources after 3 to 5 years. The initial funding is very important to bridge the gap until the EMR produces value for health care institutions. Otherwise, an argument can be made to use the budget for direct medical treatment directly. In this study, it seems that the success factors are similar to those found in the low-income countries.

However, it must be recognized that there were differences in certain individual factors such as technical infrastructure criteria which include a stable power supply and network, a problem that has been resolved in most high-resource settings (Fritz et al., 2015).

There were 14 QIF steps carried out in the four main phases involved in this study, namely (i) conducting preliminary consideration regarding host arrangements, (ii) creating a structure for the implementation, (iii) carrying out a sustainable structure after the implementation began, and (iv) enhancing future applications. The architectural framework of this module combined clinical and study needs in accordance with the Personal Data Protection Act of patients (Nor et al., 2018).

Considering that one of the main challenges in implementing EMR is the issue related to information security and confidentiality, researchers recommend that the confidentiality category, with very limited control data elements, must be considered for the optimal use of EMR. Teleconferences, televideos, and home visits have been considered as the new aspects of various types of meetings and reflect technological advances in health care. The researchers also recommend that this type of meeting is considered in the main category.

Besides, the place of care category was written on the header of all paper-based documents, indicating the health center where the treatment occurred, and must be considered in the EMR because the treatments were provided at various locations, from rural health care centers to urban medical centers as well as care center and social rehabilitation. To document the roles and responsibilities of the service providers, it is very important to add an element of authenticator data/signature to each data category (Keikha et al., 2018).

Human Resources (HR) is a very important factor in this implementation. Although the administration generated regular reports from the data collected by the system, the participants did not report knowledge of the report. It showed the lack of clear interest in the EMR function by the study participants. In addition, they considered that EMR was only a routine (and added) work process where the feedback was not received by them. As a result, the HR did not have much interest in making EMR work optimally.

The hospital staff was likely to follow the 'use' new EMR movement without truly believing its benefits. It is a little different from what is suggested by the literature, where studies in other countries reported that health workers generally agreed that a well-structured EMR produced better clinical communication. Therefore, it indicates a desire to work with an improved system. In addition, this distrust might be a reflection of deficiencies in the current system. The lack of enthusiasm for working

with the new EMR probably largely came from the way the EMR was introduced.

It should be emphasized in EMR training that the benefits of EMR are enormous and useful for compliance, for better doctor communication, and for patient management. Most of the HRs told that EMR was only a facility to improve hospital records. The HR believed that it would function optimally if it was fully computerized.

Complete resources were needed from the beginning. Therefore, the EMR functioned optimally. These resources included staff training that would collect data, enter data, as well as human resources who would monitor and maintain the system. In addition, the additional resources needed were adequate computer hardware and software, as well as other logistical support. (Kpobi, 2018).

The implementation project of the Energy and Mineral Resources in low resource settings needed to be carefully planned. Ideally, this is based on best practices for avoiding waste of resources. The implementers, policy makers, and decision makers must not only focus on finance but also the functional, organizational and technical aspects of EMR. Specifically, the reliable data handling methods, effective human resources and project management, as well as technical architecture and infrastructure issues are the key factors for making implementation successful.

A good framework has a potential to guide health services in order to prepare for the clinical bioinformatics in the future because the application of health technology is still growing in the developing countries. Understanding the approach in the use of secondary clinical data in the domain of the study is very important in collecting and providing data for meaningful results. It also needs cross-sectorial collaboration.

The success of EMR functions in any country especially developing countries highly depends on the proper application and maintenance. Creating a new system does not guarantee its success. There are a variety of factors that need to be properly considered, so that the EMR becomes successful and useful. This not only applies at the institutional level, but also for the government, policy makers, human resources, and multi-sectorial involvement by collecting, processing and disseminating data appropriately, improving doctor communication, and minimizing errors.

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