

# Implementation challenges and Research Gaps of Electronic Medical Records (EMR) in Public Sector Hospitals of Sri Lanka

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**Abstract:** Electronic Medical Record (EMR) is the lifelong electronic Health Passbook which contains patient's health information in a computerized system. This research paper reviews the implementation challenges of Electronic Medical Records (EMR) of Sri Lankan public sector hospitals. The main focus of this paper is to investigate the research gaps in national EMR implementation for systematic empirical study in order to substantiate future doctoral studies. This paper highlights the current status and research gaps of EMR implementation in Sri Lankan public sector hospitals in relation to progress, benefits and challenges. Absence of empirical evidence of systematic investigation on EMR project progress and national plan for implementation concludes with recommendations for future researches.

**Keywords:** *e-Government, eHealth, Digital Health, Public Sector Hospital, EMR, barriers for EMR implementation, Sri Lanka*

## 1. Introduction

Good health is not only important for individuals, but also for governments because it plays a central role in achieving sustainable economic development and growth as well as effective use of resources. World Health Organization (WHO, 2018) defined e-Health or digital health as “use of information and communications technology (ICT) to improve health” and highlighted its benefits “reduce healthcare costs to families, improve equitable access to quality services, efficiently link health systems with social protection programmes, and increase accountability and sustainability of health service delivery” EMR is a real time electronic record of an individual patient's health information: patient demographics, past medical history, vital signs, examination and progress notes, medications, allergies, immunizations, laboratory test results, radiology reports, and living wills (Rampatige, Abusayeed, & Galappaththi, 2010, p 54). Compared to hand-written paper-based health records maintained at each clinic/hospital, EMR provide significant benefits to patients, clinical staff, management and policy makers for effective clinical management and hospital management.

### 1.1 Purpose of the Study

This study aims to study overall EMR implementations in Sri Lankan public sector hospitals and identify the progress so far, benefits of implementation and challenges. It intends to identify the research gaps and propose recommendations with direction for future research.

## **1.2 Methodology**

This paper uses deductive approach to arrive conclusions by interpreting the meanings of findings from literature and interviews. Journal articles and publications were reviewed from online libraries and databases. Preliminary interviews were conducted with medical professionals who are involved and not involved in EMR implementations and ICTA digital health project managers.

## **2. Literature Survey**

Health is central to human happiness and well-being thus it makes an important contribution to economic progress, productive and healthy population. There are many players to support health care in a country such as government organizations, non-government organizations, private sector health organizations, donor organizations, civil society groups and communities (WHO, 2018a).

The health care system of a country can be grouped to two distinct sectors: public sector – government health care system and private sector health care system. In Sri Lanka, public sector health care system facilities are provided free of charge while private sector systems are on payment based.

The cost of health services is increasing thus health care organizations and citizens have to make health financing arrangements to ensure that people are not denied access to essential health services because they cannot afford it. As per the World Bank statistics the global health expenditure (% of GDP) in 2016 as 10.02 while United States having very high 17.07 and Sri Lanka's score is at the lowest end: 3.89 (World Bank Group, 2019). Thus finding innovative methods to provide better health care facilities with minimum cost has become very important for hospitals and governments. Digital Health helps to address the health problems and challenges faced by patients and helps reduce inefficiencies and costs in healthcare delivery, whilst also improving access, increasing quality, and making medicine more personalized and precise (Kelly, 2017). The most endorsed digital health technologies are Electronic Medical Records (EMR), computerized provider order entry (CPOE), eChanneling, ePrescribing and computerized decision support systems (CDSS) due to their financial and clinical benefits (Scott, Pillans, Barras, & Morris, 2018).

### **2.1 Electronic Medical Records (EMR)**

EMR sometimes referred to Electronic Health Record (EHR) is a real time electronic record of an individual patient's health information: patient demographics, past medical history, vital signs, examination and progress notes, medications, allergies, immunizations, laboratory test results, radiology reports, and living wills (Rampatige et al., 2010). During past three decades, a number of different forms of EMRs have been developed and implemented in developed and developing countries while other countries are currently in the process of planning and implementing EMR systems (WHO, 2006). Effective EMR implementations help achieving a comprehensive set of information providing continuity of patient care, at the right time, right place and right cost. This will not only facilitate to provide timely healthcare, but also prevent duplication of investigations, medications, delay in care, risk and reduce cost (Mogli, 2012). Many patients receive services from separate facilities (clinics and hospitals) and care providers thus the value of individual patient data for improved patient care is efficient and effective if the electronic record system could compile these data and make them accessible to other health care professionals (World Health Organization, 2012).

## 2.2 EMR in Sri Lanka

Introduction to digital health initiative in Sri Lanka has started in 1997 and many organizations: Ministry of Health, Nutrition & Indigenous Medicine, the Specialty Board in Biomedical Informatics, Redcross, Post Graduate Institute of Medicine (PGIM), the Health Informatics Society of Sri Lanka has contributed to its evolution (Health Informatics Society of Sri Lanka, 1998). The multi-disease surveillance software (MDS) has developed locally for the Ministry of Healthcare and Nutrition in collaboration with the support from World Health Organization which was initially developed for healthcare in the US and implemented in a small hospital (Chenkaldy Rural Hospital) in February 2007 then the first large hospital (Batticaloa Teaching Hospital) in April 2007 (Pole, 2010). The national EMR system in Sri Lanka is Hospital Health Information Management System (HHIMS) which started in 2010 and had successful pilot implementations in different hospitals: Dompe District hospital, Dambadeniya Base Hospital, Avissawella base hospital and Mahaoya base hospital. The Open-source version of HHIMS version 1 was implemented for the Regional Director of Health Services, Kegalle through the partnership with Information Communication Technology Agency (ICTA) in 2010 (HISSL, 2018), (Rathnayaka, 2019). Ministry of Health, Nutrition & Indigenous Medicine planned to implement this system in 47 hospitals in 2016, 100 hospitals in 2017, and 150 hospitals in 2018 (Ministry of Health, 2017).

### 2.2.1 Current Progress

The current EMR implementations in public sector (non-profit organizations) has provided significant cost benefits (Amarasiri & Dorabawila, 2018b), (Hewapathirana & Rathnayake, 2014). The four basic cost reductions were found: costs for stationeries, patient queue waiting time, supporting staff number and indirect costs such as drug balancing. The majority of economic benefits of EMR have been evaluated through Cost Benefit Analysis (CBA) techniques (Soo, Baik, & Lyul, 2013), (Karl, Tom, Alexander, & Veli N, 2006). A Sri Lankan research study also indicated that Health care professionals, supporting staff and patients had a positive perception on EMR systems (Amarasiri & Dorabawila, 2018b).

An evaluation report of ICTA shows that 52% of users find that there is hassle free quality health care services while another 35% of clients and 67% of users find that better quality in in treating patient (Management Frontiers (Pvt) Ltd, 2015). The usability and acceptance of EMR has been recorded satisfactory (Pole, 2010), (Rathnayake & Hewapathirana, 2009), (Jeyakodi & Herath, 2016), .

The current EMR solution only covers the Out Door Patient Department (OPD) and its related sections although there is provision in the system to implement it other departments such as wards, blood bank, etc. It was planned to implement the EMR system in 300 hospitals during 2016 to 2018 however, only 50 hospitals (15%) have been implemented in mid-2019 (Rathnayaka, 2019). Ministry of Health plans to issue e-Health cards for all Sri Lankans by 2020 (DailyFT, 2018), however there is no national plan for its realization. The current status of EMR implementation is stagnated.

## 2.3 Implementation barriers

Implementation of EMR has been very challenging and many barriers have been identified in developed and developing countries: Holistic approach, Aversion to change, legal complication, privacy concerns, Security issues, technical barriers, inter-operability, Leadership, Coordination among stakeholders, resistance to use, incentives and knowledge of IT. (Eden, Burton-Jones, Scott, Staib, & Sullivan, 2018),(Alkhalidi, Sahama, Huxley, & Gajanayake, 2014),(Zayyad & Toycan, 2018) (Kaye, Kokia, Shalev, Idar, & Chinitz, 2010), (Mandirola , et al., 2015), (Kaduruwane, 2012)

Further, Williams & Suzanne, 2014 highlighted that converting from a paper-based to an EMR system is complex and difficult because it represents a paradigm shift for the work of physicians and other staff. The transition requires a systematic activity and must be managed from many aspects 'clinically, administratively, culturally, and organizationally. The transition must include not only the process changes inherent in the use of a new tool, but also the technical and procedural training, and the resultant changes to physician and staff roles within the office. Subsequently, it requires a strong management commitment and motivation. Secondly, involvement of all stakeholders, care providers and other users of the system right from the beginning is necessary for survival and sustenance of the project. Involving the stakeholders will help them to have a clear understanding of why the organization is making the change.

One research findings indicated that there are many independent e-Health systems implemented in Sri Lanka without proper central coordination (Wanniarachchi, Wanasinghe, Gamage, & Gunsekera, 2014). The main barrier of e-Health implementations is unavailability of national Health Implementation policy to drive the e-Health projects. Lack of research on eHealth related projects, inadequate central coordination, current compartmentalization among key stake holders have been identified as other barriers (Rathnayaka, 2019).

## **2.4 Gaps identified in EMR implementations**

### **Gap 1 –Limited scientific research on EMR**

The scientific research on EMR is limited in developing countries (Bedeley, 2014). Very few research articles were found in Sri Lankan EMR Implementations. Most of them evaluate the user acceptance using Technology Adaptation Model (TAM) (Edirisinghe, 2017), (Fernando, 2018) or Unified Theory of Acceptance and use of Technology (UTAUT) Model (Jeyakodi & Herath, 2016). The economic value of EMRs have been quantified by different researches and confirmed that EMR helps to avoid duplicate tests, reduce adverse drug events and achieve other benefits resulted in \$1.3 billion in benefits between 2006 – 2012 (Canda Health Infoway, 2015). However, there is limited economic evaluation studies available in developing countries and suggests the greater need for economic evaluation of eHealth interventions in developing countries (Bogale, Leon, & Louwrence, 2018). Importance of policies in implementing EMR and Health Managers' Trust also have been studied (Hewapathirana & Rathnayake, 2014; Indika Jagoda, Samiddhi Samarakoon, 2014; Rathnayake & Hewapathirana, 2009). There have been few researches on EMR success stories of EMR implementation (Syed Rehan, 2018), (Rathnayake & Hewapathirana, 2009), (Jeyakodi & Herath, 2016), (Amarasiri & Dorabawila, 2018a).

### **Gap 2 – National policy to implement EMR in all departments/hospitals and national Integrated EMR**

Ministry of Health (2017) identified issues in implementing digital health projects "A *one-system-for-all model may not be acceptable to all providers; flexibility may be required as core data required for primary care consultations is identified, Need to identify the connections in terms of data sharing, Integration of existing systems in the private sector*". Currently the outdoor patient records are computerized in few hospitals and there is not connectivity among them thus the planned benefits of one health card concept is not yet possible to achieve. Margunn Aanestad (2011) indicated the building of nation-wide information infrastructures in healthcare through modular implementation strategies is important. Another research has highlighted the importance of national policies for successful implementation of country-wide digital health system (Jagoda, Samarakoon, & Rathnayaka). The Sri Lanka's digital health policy is still at a draft stage.

### **Gap 3 – Data Ownership, Data security and Privacy**

There are over 3 million patient records already available in different hospitals. Ministry of Health has identified the need of proper maintenance of this large data set ensuing data security and privacy (Ministry of Health Sri Lanka, 2016). However, the routine Information Systems audit and empirical researches on this security area are not evident to assure the data protection.

### **Gap 4 – Data analytics and decision making**

The true value for healthcare stems from providing the best level of care for patients based on well-analyzed data and predictions. The evaluation report has recommended to include data mining tools and business intelligent tools enabling decision support system (DSS) for the health sector at the provincial and national levels (Management Frontiers Limited, 2015). Thus the study on how this patient data could be used for better health care need to be studied.

### **Conclusion**

EMR is a real time electronic record of patient's health information which can reduce healthcare costs to families, improve equitable access to quality services, and efficiently link health systems with social protection programmes, and increase accountability and sustainability of health service delivery. During past three decades, a number of different forms of EMRs have been implemented in developed and developing countries while other countries are currently in the process of planning and implementing EMR systems. Sri Lankan public health sector has made significant efforts in implementing a national EMR systems however, it is now stagnated without a national plan. Researchers and implementers have identified several barriers such as coordination, leadership, interoperability, Privacy, Security, national policy, lack of empirical research, etc. Therefore it is important to conduct a systematic empirical research to find-out these barriers and develop a national policy/framework which will be instrumental for policy makers to expedite this national implementation of EMR in Sri Lanka.

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