

# Facilitators and Barriers of Electronic Medical Records Systems Implementation in Low Resource Settings: A Holistic View

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**Abstract.** Electronic Medical Records (EMR) systems show promise for facilitating health care improvement in quality patient care, patient safety and cost reduction. Nevertheless, their adoption requires careful planning and execution for successful implementation and optimal benefits. The main objective of this review was to identify, analyse and categorize facilitators and barriers to the implementation of EMRs in resource constrained settings in order to gain insight for successful EMR implementation. A literature review on papers from 2007 to 2017 concerning facilitators and barriers to EMRs implementation was conducted. The study included 18 articles that met selection criteria. Four categories of facilitators and barriers including a total of 28 sub-categories were identified from content analysis. These are *technical, human, processes and organizational*. EMR implementers should pay attention to these issues and adopt a change management strategy for sustainable EMR use in resource-constrained settings.

**Keywords.** Electronic medical records implementation, facilitators, barriers, low resource settings.

## 1. Introduction

The adoption of Electronic Medical Records (EMR) systems in the healthcare industry has been on the rise in recent years, resulting in digitization of patient records and hence making patient data readily available for treatment, care and analysis [1,2]. These implementations have been escalated by the promises of improved quality patient care, patient safety and cost reduction [3,4]. In the US, the adoption was driven by a presidential executive order ‘Electronic Health Records for All Americans’ in 2004 [5]. In developing countries, adoption of these systems has largely been driven by the need for better data management systems to support care and reporting for patients with *Human Immunodeficiency Virus (HIV) and Tuberculosis (TB)* [6]. Despite the benefits of EMR systems use in health care practices, the adoption rate remains low in developing countries [7].

Implementation of EMR systems is complex, costly and can be highly disruptive to conventional workflow [8]. Successful EMR implementation requires careful planning

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and balancing of service delivery needs in order to optimize the anticipated benefits. Several publications highlight the various strategies undertaken at diverse levels and settings to ensure successful implementations[9]. While these factors could be generalized regardless of the settings, organizational and user needs can be different due to cultural factors and issues like lack of computer skills.

This paper provides an overall impression on current determinants of EMR system implementation success in resource constrained settings with a view to advance successful implementations and scale-up sustainable initiatives.

## 2. Methods

Literature searches were performed in several databases, including PubMed, HINARI, SCOPUS, AJOL and Google Scholar for papers referencing digital health records systems, barriers and facilitators of EMR implementation and other studies related to eHealth and EMR implementations in low resource settings. Terms for digital health records systems used included: electronic health record, electronic patient record, electronic medical record and patient health record. Databases were systematically searched for papers in English between January 2007 and December 2017.

Our search yielded 140 eligible studies, which were appraised using PRISMA guideline. 25 duplicates were removed while the remaining 115 were further assessed in relevance to the study. 18articles remained for content analysis. Papers on mHealth systems used for data capture were excluded.

## 3. Results

18studies met the inclusion criteria. The observed facilitators and barriers from the relevance-filtered publications were reported either as original observations or from systematic reviews. Thematic analysis coding identified four categories of critical factors pertaining EMR implementations in low resource settings: *technical, human, processes and organizational*. These categories are represented in the developed conceptual framework in Table 1, with elements within these categories identified as being important for EMR implementation in low resource settings based on the review. The frequency with which these elements appear in the literature is included next to each element listed in Table 1.

From the literature, a majority of the critical factors in EMR were observed to be technically related. Despite the drop in costs of computers and internet, the prices still account for a significant barrier in resource-constrained settings [10]. A number of authors pointed the importance of systems interoperability to facilitate seamless data sharing even within departments in a facility [1,7].

While most studies underscored the importance of training as a major EMR implementation factor, subsequent technical support and computer skills are as important. Pole, in the EMR implementation in Sri Lanka states that *'the main secret of success was continuous training of hospital staff over a 2 to 3 year period'* [11]. Holden on other hand emphasized the importance of social environment where colleague support is present [12]. Most studies stressed training should involve all the actors in the health care systems; users, management and technical support team.

**Table 1.** Categorization of EMR implementation critical factors with frequency of citations.

Technical	Human
<ul style="list-style-type: none"> <li>- Internet/Interoperability (7)</li> <li>- Stable electricity (8)</li> <li>- System customization/open source (5)</li> <li>- Availability of standards (4)</li> <li>- System usability/learn/use (5)</li> <li>- Infrastructure/hardware (3)</li> <li>- Data storage backup (3)</li> <li>- System security (physical/logical)(2)</li> <li>- Software upgrades (1)</li> <li>- System complexity (1)</li> </ul>	<ul style="list-style-type: none"> <li>- Computer skills (9)</li> <li>- User acceptance (3)</li> <li>- High expectations (3)</li> <li>- Experience (1)</li> <li>- Staff turnover (1)</li> <li>- Workload (2)</li> <li>- Patient-provider relationship (1)</li> </ul>
Processes	Organizational
<ul style="list-style-type: none"> <li>- Training (12)</li> <li>- Technical support (8)</li> <li>- User involvement (5)</li> <li>- System champions (2)</li> <li>- Incentives/motivation (3)</li> </ul>	<ul style="list-style-type: none"> <li>- Funding (7)</li> <li>- Project leadership (5)</li> <li>- Procurement issues (1)</li> <li>- Selection of the system (1)</li> <li>- EMR adoption plan (2)</li> </ul>

The most commonly emphasized issues under organizational category relate to funding and leadership. Most of the implemented EMR systems in sub-Saharan Africa are a result of donor-funded projects with unclear sustainability plans [6]. One study in Kenya shares strategies it deployed to assure meaningful and sustainable EMR implementation [13]. This includes good will from the government, sensitization of leadership, user training, and formation of health facility-level multi-disciplinary teams, stable electricity provision and leadership from the county management. Evidently, this strategy cuts across all the implementation issues emphasized by most authors. Three studies suggested the need for incentives to keep the users of the system motivated, which should not necessarily be monetary.

#### 4. Discussion and Conclusion

Healthcare organizations are complex and hence introduction of EMR system can bring further complications especially to the workflow, which can lead to rejection of the system regardless of the setting. Users are likely to embrace systems that do not interfere with their workflow [11]. Thus, EMR systems designed or customized to fit the intended environment is important. In addition, simplicity/usability of a system act as a great support to sceptical users and those lacking IT skills. How the organization manages change is a panacea to system acceptance. It was shown that individuals' attitudinal-behavioural limitations or resistance to change plays a greater role than other limitations [14].

Shortage of qualified human resource challenge demands for staff training as well as employment of skilled staff. However, Were *et al* [15] argue that an EMR implementation model that relies on employing highly trained full-time IT staff or dependence on foreign experts is not scalable due to the associated costs and limited available skilled personnel. Instead, they proposed a model that uses a national Technical Expertise Center (TEC), a global developer, and implementer networks to support multiple local implementations.

Availability of free open source systems such as OpenMRS, Bahmni, FreeMED, GNUHealth and OpenEMR overcomes the upfront system acquisition barrier with only

feature customization and local adaptation to consider [16,17]. It is important to note that sufficient funds are paramount not just for implementation phase but also for subsequent maintenance in terms of supervision and continuous training.

Despite the differing EMR capabilities/versions from country to country, major critical factors of EMR implementation for low resource settings were identified. Successful implementation of EMRs in the complex healthcare organization requires social-technical approach and system design adapted specifically to the organization. This sets the stage for more comprehensive evaluation of how these critical factors apply within specific country settings.

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