Title Page

**Electronic Medical Record Use and Challenge Comparison In Developing Countries and Rural U.S. Regions**

by

**Ilham Abdi**

BS, The Ohio State University, 2017

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This essay is submitted

by

**Ilham Abdi**

on

April 2, 2020

**Essay Advisor:**

Samuel Friede, MBA

Assistant Professor

Health Policy and Management

Graduate School of Public Health

University of Pittsburgh

**Essay Reader:**

Dilhari R. DeAlmeida, PhD, RHIA

Associate Professor

Health Information Management

School of Health and Rehabilitation Sciences

University of Pittsburgh

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**Abstract**

Samuel Friede, MBA

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Ilham Abdi, MHA

University of Pittsburgh, 2020

**Abstract**

Electronic medical record (EMR) systems have the ability to improve clinical work by providing the right details about the right people at the right time, allowing use of clinical and personnel resources efficiently. In public health, this is significant because electronic medical records have contributed to improved health outcomes and a decline in medical errors. This is specifically important in low resource settings where there is also a need for reliable data to support public health and local support organizations. Developing countries, such as Morocco and Kenya, face many obstacles to implement and use electronic medical records within their healthcare spaces.  Rural hospitals in the U.S. and developing countries face some of the same challenges implementing and using EMR as well as their own set of unique challenges. Rural U.S. cities and developing countries are both considered resource constrained, however their challenges in implementing electronic medical records have not been formally compared. Overall, they face very similar challenges regarding EMR implementation and usage, specifically financial and human capital constraints.

Table of Contents

[1.0 Introduction 1](#_Toc39058244)

[2.0 Literature Review 3](#_Toc39058245)

[3.0 Barriers in Developing Countries 4](#_Toc39058246)

[3.1 Usage and Challenges in Morocco 5](#_Toc39058247)

[3.2 Usage and Challenges in Kenya 9](#_Toc39058248)

[4.0 Barriers in Rural U.S. 14](#_Toc39058249)

[4.1 Usage and Challenges in Iowa 16](#_Toc39058250)

[4.2 Usage and Challenges in Appalachian Maryland, Virginia, and West Virginia 18](#_Toc39058251)

[5.0 Discussion 20](#_Toc39058252)

[6.0 Conclusion 23](#_Toc39058253)

[Bibliography 25](#_Toc39058254)

# Introduction

Although electronic health records have been around for over 40 years, their use and implementation has increased exponentially in the last two decades.  From 2007-2012 their use and implementation nearly doubled in the United States, growing from 34.8% to 71% (“A History of EMRs: 10 Things to Know.” *Becker's Hospital Review*). The growing use of electronic health records is due to the realized benefits of this technology in improving patient care.  There are many benefits to using electronic medical records, one of which is decreased medication errors, in fact, EMR’s decrease adverse drug events by 52% (Hoover, 2016).  Overall, the increased use of electronic health records lead to improved patient outcomes and overall efficiency in patient care. In the 2011 Physician Workflow Study, 78% of physicians reported that the use of their EMR system enhanced overall patient care, 65% reported that it alerted them to potential medication error, 47% reported that their EMR reminded them to provide preventative care, and 33% reported that their EMR helped them identify needed lab tests (Hoover, 2016).  Additionally, there has been growing concern regarding who has access to patient records. Electronic medical records help address that concern by tracking who is accessing what patient records and if it is clinically or administratively necessary. This allows for increased protection of private patient information.

There are several advantages when using EMR systems compared to using conventional paper-based records, such as reduced documentation time for healthcare professionals, instant access to patient data and improved physician-patient interactions. Possible benefits of EMRs over traditional paper records include wide-ranging access, error checks, and physical damage protection (von Laszewski et al, 2011). The difference in adoption rates of basic EMR systems has significantly increased over the last 4 years, based on hospital size, teaching status, and location (DesRoches et al., 2012). The implementation of electronic medical records is necessary to turn the current healthcare system in the United States into one that is more effective, more reliable, and one that consistently delivers high-quality care (Bowman, 2013).

Implementation and utilization of EMR's in urban settings is easier since they typically have better access to resources. Rural hospitals and clinics in the U.S. are slower in adopting that technology. This is due to a multitude of reasons, but the main reason being high cost of obtaining and implementing an electronic medical record. Typically, once an EMR has been selected and implemented, the cost of upkeep is another barrier financially constrained health care organization’s have to overcome.

# Literature Review

PubMed, governmental agencies, and the American Hospital Association were the primary sources of information for the following text. The keywords used for PubMed searches were “(((((("Electronic Medical Record"[Mesh]) OR "Electronic Health Record"[Mesh])) OR ((Developing Country[Title/Abstract]) OR Rural U.S. [Title/Abstract]))), “(((("resource constrained") OR "low-resource"))”, and “((implementation OR use))” which resulted in a total of 120 studies. After an initial review, a majority of the studies were discarded due to them being unrelated to the topic at hand. Some exclusion criteria were geographic location, study question, lack of results, and irrelevant content. Subsequent information was a result of reviewing through PubMed and the American Hospital Association.

# Barriers in Developing Countries

Incorporating an electronic medical record into patient care is a priority in developed countries but it faces significant barriers in developing countries when moving forward with adoption and implementation. Interventions with electronic health records hold the promise to enable better healthcare. In developing countries, however, implementation of the EMR systems has been scarce. Many developing countries share the problem of not being able to provide high-quality healthcare services, even while their populations suffer from many burdensome diseases that need to be treated with adequate healthcare services. About half of the countries of the World Health Organization (WHO) (most of them on the continent of Africa) report to have less than one physician per 1,000 individuals whereas the United States has 2.45 physicians per 1,000 people, and in most European countries there are between 3 and 5 physicians per 1,000 people (Fritz et al, 2015). To overcome this gap, various approaches have been implemented, such as increasing the number of health workers and strengthening the health system through structural reforms. About 10 years ago Fraser et al described the importance of using IT in healthcare projects in the developing world; however, many projects remain at the level of pilot installation and do not seem to be able to provide sustainable solutions. In addition, developing countries are allocating their workforce toward services that are deemed necessary and many times this does not include hiring or training IT staff to dedicate toward electronic medical records (Fritz et al, 2015). Any new project must take this deficiency into account and make efficient use of the available staff in order to ensure that electronic medical record implementations can be long term and sustainable. Health IT implementation projects therefore need to be designed very carefully and focused on best practices in order to scale up programs, save valuable resources, and avoid any possible harm (Fritz et al, 2015).

Although EMRs have great potential to improve patient care quality and effectiveness in practice, adoption of EMRs is a challenge for clinicians. Barriers include the purchase and support of high-priced hardware and software, while at the same time allocating ample staff and personnel time to train and manage their medical practice. Additionally, advantages of EMRs contributing to efficiency are not readily evident, since various workflows and procedures need to be taught (Fritz et al, 2015).

## Usage and Challenges in Morocco

Morocco University Medical Centers, known in French by locals as Centres Hospitalier Universitaires (CHU), are Morocco's largest and most advanced public health centers. A qualitative study was carried out at four out of the country's five CHUs. Though every public hospital operates under the Ministry of Health in Morocco, they tend to operate as a separate entity (Parks et al, 2019). Common challenges of implementing EMR throughout the public hospitals across Casablanca include buy-in from leadership, fund allocations, and inconsistent EMR implementation across CHU’s. In Fes, only three of the five public hospitals implemented electronic medical records. All 10 public hospitals in Rabat implemented electronic medical records, and they are the only city of public hospitals that uses a Moroccan vendor. The other hospitals either use a Spanish vendor of electronic medical records, or a French-Canadian vendor that makes it difficult to achieve interoperability (Parks et al, 2019). These difficulties are similar to the ones in the U.S. when a health care organization uses two different EMR systems. Not only do all public hospitals fall under the Ministry of Health inside Morocco, their funding is also controlled by them. The Ministry of Health can be blamed for the lack of coordination across public hospitals when it comes to electronic health records, since they have the ability to coordinate but allow silos to continue.

Hospital managers who usually have no idea how to pick the best EMR provider are responsible for choosing their electronic medical record. Choosing the wrong EMR means getting stuck with it due to the costly nature of replacing it. “There is foreign high-performance software, and small local things and all that… It is the hospital administrator who will be lost. He will not know what to do or where to start.” (Parks et al, 2019).  This is the concern of many hospital administrators who are placed with the responsibility of implementing and maintaining electronic medical records but have no formal background in information technology (Parks et al, 2019). Without people who are well-equipped to select the right EMR vendor, difficulties and errors are bound to happen. This is especially worrisome when there isn’t someone trained in this area of expertise to rectify potential errors. One public hospital in Morocco was notified about funds being available for an EMR by the Ministry of Health six months prior to opening to the public and ended up being rushed into selecting an electronic health record.  Additionally, since each set of public hospitals operate as separate entities, the cost of EMRs are high and it is difficult to negotiate a lower rate (Parks et al, 2019). EMR adoption cost is much higher when each CHU is negotiating with a vendor, even if it is the same vendor. The cost has the potential to be lower if all hospitals were to collaborate in selecting one vendor and negotiating a country wide rate.

When dealing with issues regarding implementing EMRs within different public hospitals, the same problems keep occurring due to hospitals not taking the initiative to learn from other hospitals previous mistakes.  This leads to a cycle of failed and delayed implementations. However, there are a handful of sites who have fully and successfully deployed electronic health records but there is a lack of collaboration between these sites. This is a clear missed opportunity for improvement for those sites that are struggling to achieve successfully deployed electronic medical records.

Morocco currently lacks an interoperable framework or a uniform policy on health information. Getting policies and standards in place on a country-wide scale will help address many of the issues surrounding eHealth records across the country. Government lack of coordination is one of the factors contributing to the silo character of these public hospitals. In addition, a lack of interoperability means that valuable information for patients is not exchanged across the country, which could help to improve good patient outcomes (Parks et al, 2019).

Many developing countries have limited resources allocated to healthcare in general, which is further apparent when considering electronic health records. Those resource constraints are no different in Morocco. Pioneers in information technology for the healthcare sector are pushing for the management of existing resources to maximize impact (Parks et al, 2019). Besides financial constraints, Morocco faces constraints on the workforce too. There is a shortage of people who are adequately trained in medical informatics, which would help both in implementing EMRs and in their sustainability. EMR implementation and sustainability is typically put on hospital administrators who have no formal training in health informatics.

The challenges of leadership and governance constitute the greatest obstacle to the successful implementation of electronic medical records. Most informants point their fingers at the Health Ministry for not stepping in to unify the efforts of the country towards a successful and sustainable implementation of EMRs in Morocco. As a result, several challenges arose and were addressed at CHU level rather than country-wide level. Challenges include language issues, resistance to change and innovation, data ownership, and lack of domestic use of patient identifiers in Morocco affecting continuity of care for patients (Parks et al, 2019).

Regarding language challenges, most advanced EMR systems are written in English, meaning that the codes and prescriptions for diagnosis have English references that need to be adapted. The terminology also affects any training material provided to physicians and personnel. Higher education and medical information technology education in Morocco in particular are taught in the French language. With no coordinated efforts and leadership to provide a centralized access point and training for advanced systems typically presented in English, Moroccan CHUs have to opt for those vendors / systems that offer French-language versions of software. (Parks et al, 2019).

Another challenge that each CHU faces is the resistance to change. This is a growing obstacle for introducing something which is not the norm. Resistance to change has been widely researched as a result of IT integration in health-care organizations. Resistance to change in Morocco, as elsewhere, is one factor that constrains the successful implementation of EMRs. Resistance to change was not limited to hospital users but was also found among hospital leaders who could not see the integration of health care and information systems (Parks et al, 2019). Hospital leaders did not grasp the need and actually opposed an interdisciplinary medical program. They stressed that there should be a clear separation between the School of Information Systems and Technology and the School of Medicine, while also claiming medical doctors need not be qualified in electronic healthcare. This is found to be worrying due to another identified constraint being that there are not enough properly trained people in healthcare informatics, so not having leadership buy-in on this issue makes addressing this barrier difficult (Parks et al, 2019).

## Usage and Challenges in Kenya

A major driver of recent years' increased use of electronic medical record systems has been the belief that such systems can support the provision of high-quality care. Features such as a clinical decision support system may play a role in reducing medical errors by providing point-of-care information to support decision making by alerting a physician to drug interactions when they create an electronic prescription. More recently, as the digital infrastructure, electronic medical records have been introduced to promote learning health systems that allow for continuous improvement through a process of data analysis of electronic medical records and strategies for quality improvement. Despite the challenges of resource constraints, insufficient data collection systems, lack of incentives to gather health information, and inadequately trained personnel, low-income countries have seen increased use of electronic medical recording systems through aid-funded projects linked to specific diseases.

In Kenya, for example, electronic medical records were used in programs that specifically promote HIV treatment leading to well-developed programs for this field of the disease. For both HIV and tuberculosis (TB) management, the result of digitization has been better record-keeping, patient management, follow-up, and control of information (Muinga et al, 2018). While these implementations were largely successful, the challenges faced included limited interoperability with other systems, and a lack of direct use by clinicians because these systems are often used by clerks who enter data on behalf of the clinical team. It poses a challenge as clerks may neglect critical information that the clinician might not have been able to disclose or clearly articulate in lay-persons terms when summing up the nature of the visit.

The Kenyan Ministry of Health (MOH) has begun to adapt one of the major programs, the Open Medical Record System or OpenMRS, for use in public health facilities, in support of the perceived success of these disease-focused clinic-based systems (Muinga et al, 2018). A Kenyan software development firm was engaged in the development of the openMRS system which enabled faster system development and faster resolution of emerging problems. A strategy has been put in place to have a support team responsible for program handover over a longer period (approximately six months) helping them to provide greater system support to health centers and thus ensure continuity of the system. The project manager used WhatsApp groups to support implementation within the countries counties whose membership includes system users and facilities to enable faster problem resolution (Muinga et al, 2018). This is a great example of using the available resources when in a resource-constrained setting.

Early stakeholder involvement in new counties helped foster a sense of ownership that had been a major barrier to program adoption during previous system implementation attempts. The new county administration teams in turn assisted the introduction of the program by providing resources, both monetary and human capital, where appropriate. In addition, the project management team trained "trainers" who were a team composed of a national team leader, health workers (e.g. health records information officer, pharmacist, laboratory technologist, or nurse) who worked in the area, and IT staff participants (Muinga et al, 2018). These teams underwent a three-day training that was supported by county and World Health Organization funds. Each time an implementation took place, the eHealth unit at the Ministry of Health also sent a member to be present to help with any unforeseen challenges (Muinga et al, 2018).

The project employed the use of zero clients and a server to address the threat of laptops raising a security concern due to theft. Zero customers are all-in-one computer terminals that take up relatively less space and are easier to deploy and hold. Also, the network was set up using a Local Area Network, as opposed to a previously unreliable wireless network (Muinga et al, 2018). The lack of power, inadequate hardware, and networking, together with other low-resource eHealth projects, were a major challenge to system setup during the deployment of the electronic medical record system. Multiple power sources have been used in earlier projects to ensure the availability of power and system if one of the sources fails. The implementation team addressed the power and hardware issues for this project by adding additional human resources, which were geographically local for troubleshooting and fixing issues as they arose.

In the international eHealth literature there is growing consensus that overcoming problems caused by human factors such as computer literacy and attitudes can be a major step towards successful implementation of EMR in both developed and developing countries. Issues due to human factors caused significant implementation problems as well as concerns regarding user acceptance of the new system (Muinga et al, 2018). The patients thought the device belonged to those outside their clinics, which influenced control of the system. To overcome this, early use of more inclusive system design strategies, such as codesign or participatory design, can help ensure system buy-in from potential users.

Using open source software can provide some relief from the high cost of proprietary software which is a well-documented barrier to EMR adoption (Muinga et al, 2018). Open source software is also often associated with online community support which is constantly improving the software. Community members collaborate and participate in the global OpenMRS community where they learn from the model of collaboration and receive mentoring to learn and develop the software (Muinga et al, 2018). Tapping into these communities can help reduce over-reliance on one person or software provider for system updates that are required as the software develops to meet evolving user needs and contributes to the operational self-sufficiency concept noted by Surana et al as essential to implementing any information and communication technology project.

The introduction of EMR systems in low-income settings is a daunting task. Open source software may offer some relief from the high cost of software licensing in low-income settings such as Kenya, but the familiar challenges of clinical and administrative buy-in, the need to train users adequately, and the need to provide ongoing technical support are common across Kenya as well as the rest of Africa.

# Barriers in Rural U.S.

Several small rural hospital leaders and managers have gradually integrated new strategies for incorporating health information systems to improve health care services delivery into their planning process. There are benefits when using EMR systems compared to using traditional paper-based documents, such as decreased reporting time for healthcare professionals, instant access to patient data and increased physician-patient interactions. The gap in adoption rates of at least basic EMR systems has significantly increased over the last 4 years, based on hospital size, teaching status, and location (DesRoches et al., 2012). There is a reported 15-percentage-point gap in system adoptions between large and small hospitals in 2010 (25.7% vs. 10.7%, respectively), which widened to 22.2 percentage points in 2011 (20.8% vs. 43.0%, respectively). The adoption of HIT, including EMRs, is essential to transform the current healthcare system in the United States into one that is more efficient, more secure and consistently delivers high-quality care (Bowman, 2013).

Residents living in rural areas rely on the hospital which operates as the primary care source in their communities. According to AHA (2011), almost 2,000 rural community hospitals often serve as anchors for health-related services in their region, providing the structural and financial backbone of physician practice groups, health clinics, and post-acute and long-term care. Different health care units, including pharmacies, offices of general practitioners, and other organizations of medical providers, use electronic medical records as regional or national interoperation systems. Implementation of EMR systems involves a range of business changes, cultural changes, technical infrastructure, financial resources, and coordination (Boonstra et al., 2014).

Despite facing difficulties from operating in remote geographical locations, rural hospitals provide their patients with the highest quality of care. Hospitals in rural areas have over time implemented electronic systems but at the lowest rate of any studied category, with 19.4 percent having at least one primary system in 2011 (DesRoches et al., 2012). The number of hospitals that meet the definition of either a comprehensive or meaningful EMR system remains low. Critical access hospitals (CAH’s), small, public, or rural hospitals are further behind in EMR implementation (DesRoches et al., 2012). AHA (2011) staff reported that rural hospitals are providing their patients with the highest quality of care while resolving challenges associated with their remote geographic location, small size, limited workforce, and limited funding. The ability of rural hospitals to meet patient needs depends on obtaining additional funds for renovating or replacing aged facilities, acquiring new technologies, modernizing equipment and improving operational efficiency (AHA, 2011).

Small rural hospitals face more challenges in establishing the infrastructure needed to operate complex IT systems when compared to large health organizations. Challenges include lack of connectivity to the Internet, outdated hardware, and lack of robust privacy and security protection (HealthIT, 2011). Rural areas lack the infrastructure to support high-speed Internet, thereby limiting the ability to promote exchange of health information with satellite clinics (HealthIT, 2011).

Until introducing EMR systems, hospital executives and managers need to strengthen their financial position and establish strategic IT priorities. Most leaders and managers of rural hospitals have difficulty in getting sufficient capital for ongoing upgrades (AHA, 2011). Recognizing the benefits and challenges associated with the expanded use of EMRs, the United States Congress included legislation and funding in the 2009 American Recovery and Reinvestment Act (ARRA) to encourage the widespread adoption and practical use of HIT, but laws and regulations remain insufficient to support meaningful use of small rural hospitals (AHA, 2011). Although introducing EMRs in small rural hospitals is a feasible initiative, a complete understanding of the whole process requires more explanation. Rural regulatory policies contain confusing rules for making meaningful use of challenging operational structures of the EMRs. AHA staff continue to clarify requirements and reduce the registration burden and attest to meaningful use, but concerns have emerged about the impact of the incentive program designed to close the existing digital divide on small and rural providers, not widen it (AHA, 2013b). Needless to say, research has not produced enough evidence of the benefits associated with meaningful use. The application of computerized physician order entry systems (CPOE) for electronic medication orders meeting a meaningful use standard after 2011 coincided with decreased cardiovascular mortality rates (Appari et al, 2012).

## Usage and Challenges in Iowa

Fifteen CEOs and CIOs of rural critical access hospitals were interviewed to better understand the barriers and needs to implement EMRs in those hospitals. The aim of the interviews was to assess the needs for successful implementation within resource restricted areas as well as how much the expectations of the CEOs and CIOs on electronic medical records overlap with each other (Mills et al, 2010). The themes emerging from the interviews revealed an interesting pattern regarding the extent to which the CEOs and CIOs expressed the same or different views at a given hospital. The CEOs have often shared a broader perspective covering the different facets of the finances and efficiency of their hospital, plus their role in comparison to other hospitals. Conversely, the CIOs were more likely to be concerned with maintaining end-user satisfaction with the HIT systems’ daily operations (Mills et al, 2010).

With regard to reasons for adopting electronic medical records, most members of small rural healthcare organizations regarded EMRs as a resource for minimizing healthcare costs and improving the quality of care, patient safety, coordination between agencies, monitoring /collection of required reports and accountability of staff through accurate reporting, similar to findings from large hospitals. CEOs and CIOs expected benefits often included improving efficiency, communication, quality of care and patient safety (Mills et al, 2010). In terms of improved quality and safety, the CEOs and CIOs mentioned that they expected improved compliance with clinical guidelines and reduced medication, transcription, and order handling errors. They also articulated better data processing, bar coding and timely use of data in terms of improving efficiency, reducing lost charges by improving the accuracy and efficiency of capturing and processing charges, and reducing the need for document storage space by transitioning to a paperless environment (Mills et al, 2010).

A major trend drawn from these interviews was that the rationale for acquiring EMRs and the anticipated benefits of EMRs are not yet aligned with the benefits achieved. Thus, a group of small rural hospitals have invested considerable time, money, and human resources in implementing EMRs but have very little empirical evidence of the benefits of commercial systems they have installed (Mills et al, 2010).

## Usage and Challenges in Appalachian Maryland, Virginia, and West Virginia

Most small rural U.S. hospital leaders and administrators in the Appalachian regions of Maryland, Virginia and West Virginia have implemented Electronic Health Records (EMR) systems, but EMR systems are introduced at a slower rate by individual and small group offices (Ramaiah et al, 2012). The Appalachian area only 5.1 percent of small rural critical access hospitals (CAHs) had primary EMR systems, compared to 10.8 percent for non-CAHs (Weinfield et al, 2012). US health care authorities face significant pressure to incorporate HIT programs with accredited EMR applications (Ford et al, 2010).

The level of adoption of the EMR program has increased over time in rural hospitals, but rural health organizations continue to show the lowest rate of any surveyed group: just 19.4 percent had a primary EMR system in 2011 (DesRoches et al, 2012). Amid broad agreement on the advantages of EMRs and other types of HIT, small rural health care practitioners have slowly moved to implement electronic health record systems (Ajami et al, 2013). Many leaders are experiencing conversion problems while implementing the EMRs; this lack of readiness makes their organizations vulnerable (Ajami et al, 2013). In order to achieve the goal of comprehensive record keeping and exchange of health information between providers and patients, hospital leaders and administrators must have multi-functional EMRs, including patient demographics, history of care, and laboratory results (DesRoches et al., 2012). Miscommunication, misinformation and misinterpretation among suppliers, hospital administrators, managers of information systems and practitioners lead to numerous problems in the advertisement, collection, implementation and operation of electronic health records systems (Ajami et al, 2013). This is especially exacerbated in a resource constrained setting.

The challenges faced by these Appalachian healthcare organizations during the introduction of electronic medical records include (a) costs, (b) alignment with existing infrastructure, and (c) the reluctance of some workers to use the new technology. Providers of rural hospitals face cost difficulties, technical challenges, resistance from medical professionals and frontline workers who are unconvinced of visible returns from using electronic medical record systems (Mirani et al, 2013). Operational issues include (a) reduced system integration, (b) cultural factors involving inexperience of users with information technology, (c) resistance of staff to change, and (d) insufficient resources required for training, all likely to affect the implementation of electronic health records (Ser et al, 2014).

# Discussion

When analyzing implementation methods and challenges in resource constrained settings, it is evident that health care organizations in both developing countries and rural U.S. regions face analogous challenges, however, healthcare organizations in rural U.S. organization do have some advantages over those in developing countries. One apparent advantage of rural U.S. organizations are the policies in place aiming to address disparities in electronic medical record implementation and use. The federal government is actively trying to close the digital divide that exists by implementing policies that restructure the cost burden with incentivization. Within developing countries, there are very few established policies in place to address electronic medical records. There are many countries within the developing world that are implementing electronic medical records, however, they are doing so without governmental guidance. This makes it difficult to make the use of electronic medical records the standard since the burden of vendor selection, cost of implementation, and training of health IT staff, as well as having access to suitable health IT staff, takes a toll on an already resource constrained health care organization.

The challenge of cost was a common theme across all resource constrained healthcare environments analyzed. Many healthcare leaders do not see the payoff for the cost, since it entails them pouring in several other resources that may be better allocated elsewhere where immediate benefits may be realized. Not only are costs heavy up-front, but there is a cost burden every time the system needs an upgrade as well. Rural hospitals and clinics sometimes have the option of being absorbed into a larger health system or utilize funds from governmental incentivization which can help offset some of the financial burden, in developing countries that usually is not the case. Hospitals and clinics in developing countries bear most of the cost burden as not many funds are allocated toward electronic medical records, or information technology in general. The cloud-based electronic medical record system that is being utilized in Kenya may be a good alternate for many developing countries as it does not require many resources, and is lower cost when compared to the alternative.

The last challenge that came up across several of the resource constrained healthcare environments that were analyzed was the lack of properly trained IT people to manage electronic medical records. In some instances, this burden was put on hospital administrators who had no formal education in information technology. This is an inefficient use of hospital administrators time and resources should be allocated to have a minimum of one to two IT professionals to shift the responsibility away from administrators. Having one to two IT professionals allocated to each area, as opposed to every hospital or healthcare organization, was demonstrated to be successful in Kenya so it is something that may be applicable to other resource constrained healthcare environments.

A unique problem that arose within healthcare environments in developing countries was the language issue. Many electronic medical records were presented in English which is a challenge in a place like Morocco where the primary language is French or Arabic but not a challenge in a place like Kenya where English and Swahili are spoken equally. This further exemplifies the lack of governmental involvement in electronic medical records. The barrier can easily be addressed with the implementation of translation software or creating a market for country specific electronic medical record vendors.

# Conclusion

Electronic medical records are being used and implemented in rural U.S. health facilities and health facilities in developing countries, despite resource constraints. There is significantly more governmental involvement and assistance in the U.S. compared to developing countries. However, both healthcare environments will benefit from further policies put into place to address the barriers to implementation and use of electronic medical records. Additionally, stakeholders need to be engaged early and often to allow for the sustainability of electronic medical records in resource constrained settings. These stakeholders include the government of respective countries, ministries of health, hospital leadership, information technology professionals, and clinicians.

Governmental engagement alongside is imperative in order to implement policies and procedures regarding EMR implementation and use so it can be standardized across the board. This eliminates any room for inconsistency, especially in developing countries. Engaging ministries of health is equally important in developing countries due to their role in controlling funds toward health information technology. Hospital leadership should be engaged regarding the decision-making process alongside IT staff in order to ensure that vendors and resources used align with the overall healthcare organizations mission, vision, and values. Ultimately, clinicians are one of the most important stakeholders, since they will be using the EMR selected, so it is important that they are engaged to ensure usability of the technology being implemented. Engaging these key players throughout the selection and implementation process will allow for operational success and overall efficiency of healthcare organizations in resource constrained settings, whether that is in the rural U.S. or a developing country abroad.

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