



Barriers and facilitators to Electronic Medical Record (EMR) use in an urban slum



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ABSTRACT

Objective: Rapid urbanization has led to the growth of urban slums and increased healthcare burdens for vulnerable populations. Electronic Medical Records (EMRs) have the potential to improve continuity of care for slum residents, but their implementation is complicated by technical and non-technical limitations. This study sought practical insights about facilitators and barriers to EMR implementation in urban slum environments.

Method: Descriptive qualitative method was used to explore staff perceptions about a recent open-source EMR deployment in two primary care clinics in Kibera, Nairobi. Participants were interviewed using open-ended, semi-structured questions. Content analysis was used when exploring transcribed data.

Results: Three major themes – systems, software, and social considerations – emerged from content analysis, with sustainability concerns prevailing. Although participants reported many systems (e.g., power, network, Internet, hardware, interoperability) and software (e.g., data integrity, confidentiality, function) challenges, social factors (e.g., identity management, training, use incentives) appeared the most important impediments to sustainability.

Discussion: These findings are consistent with what others have reported, especially the importance of practical barriers to EMR deployments in resource-constrained settings. Other findings contribute unique insights about social determinants of EMR impact in slum settings, including the challenge of multiple-identity management and development of meaningful incentives to staff compliance.

Conclusions: This study exposes front-line experiences with opportunities and shortcomings of EMR implementations in urban slum primary care clinics. Although the promise is great, there are a number of unique system, software and social challenges that EMR advocates should address before expecting sustainable EMR use in resource-constrained settings.

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1. Introduction

Rapid urbanization is associated with growth in the number and size of urban slums, mostly as marginalized populations bearing a large burden of health problems [1–6]. Within these environments, increased health care needs coincide with a decreased capacity for health care delivery due to financial barriers, poor communication systems, fragmented services, and minimal continuity of care [6–11].

E-health, the application of information and communication technologies to health care, is a rapidly expanding domain in both developed and developing countries. Given the promise of information technologies to improve communication, sharing and tracking of health care, policy-makers have begun to promote the adoption of Health Information Systems (HIS) to facilitate the coordination of medical care. A HIS is defined as a system that captures, analyzes, processes and uses health information to inform decisions and improve quality of care [12]. A particular form of HIS are Electronic Medical Records (EMR). These are patient centric health systems [13], which have been extolled for their ability to address the storage, transport, exchange and upkeep problems associated with paper records [14–16].

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The World Health Organization (WHO) encourages developing countries to invest in HIS, citing evidence that they improve patient management, clinic efficiency and health outcomes in Sub-Saharan Africa. [17] According to UN-Habitat, slums form when rapidly increasing migration is associated with urban poverty, income inequality and unrecognized resident status [18]. Access to insurance is rare and continuity of care almost non-existent. At a community level, poor documentation of risks, diseases and deaths impedes effective health surveillance and planning [19–21]. With the number and size of urban slums growing, it is no surprise that EMR systems are offered up as a possible remedy for complex health information problems [4,22]. EMR use in slums has the potential to improve patient identification, information capture, disease tracking and drug distribution among a largely undocumented and transient population.

In Nairobi, Kenya's capital, 60% of the population resides in slums [23]. Kibera is the largest of these, with a vulnerable population subject to all expected impediments to health care access. Innovative Canadians for Change has been working to facilitate EMR implementations in Kibera clinics since 2011, deploying a primary care EMR derived from OpenMRS software [22,24,25]. This study explores the perceptions of clinic staff exposed to this EMR, focusing on benefits and harms to the community, and how EMRs should be deployed in slum settings to maximize impact.

2. Methods

2.1. Design

Descriptive qualitative method was used to explore the perceptions of primary care staff about both the challenges and benefits of an EMR introduced into two different clinics in Kibera, Nairobi. The intent was to expose the essence of participant's opinions, experiences and perceptions by understanding the how, what, where and why of the participants' EMR experience [26,27]. In-depth one-on-one interviews were conducted.

2.2. Setting

Kibera's population is estimated at close to one million persons [28–31]. Life-long residents describe it as a safe place, whereas outsiders regard it as unhygienic, disease-ridden and high-risk [28]. Officially, its residents are "illegal settlers" without entitlement to publicly funded health care or human services [32,33]. Kibera operates through countless private enterprises, with an entrepreneurial spirit extending to over 100 isolated clinics [34,35]. To the extent that it has been documented, Kibera's health care infrastructure is fragmented and inefficient, resulting in poor health outcomes and lack of continuity of care [36].

Some Kibera health clinics have adopted EMRs to improve health information management. The two clinics (Clinic 1 and Clinic 2) selected for this study adapted and adopted the same open-source EMR. Both clinics see over 25 patients per day, offer primary care services and exclusively attend to marginalized populations living in slum environments.

2.3. Sample

Study participants were consenting adults working at study clinics fulltime for at least a year prior to the commencement of the study. Purposeful sampling focused on nurses, physicians and support staff, and included "knowledge rich" persons identified by management [26,27]. All reported using a computer on a daily basis and most (8/10) rated their computer skills as "intermediate" with keyboarding skills using three or more fingers. Participants were informed about the study, were reassured that non-participation

would have no consequences, and provided written consent to be interviewed. Observation saturation was reached with 10 participants (Table 1).

2.4. Data collection

An interview guide was developed using open-ended and semi-structured questions. The interview guide was pre-tested at an inner-city low-income family medicine clinic in Edmonton, Canada, and revised prior to use in the field study to reflect cultural nuances in Nairobi.

Data collection occurred in two stages. First, an introductory encounter was arranged with clinic managers to explain the study and establish rapport with potential participants. Second, interviews were arranged at a location of the participant's choosing.

Participants were asked to share any observations that might come to mind about the use of the EMR as part of their daily work at the clinic. Probing questions were used to express genuine curiosity about the participants' experiences and explore observations.

2.5. Data analysis

Audio-recorded interview were transcribed verbatim, then replayed at least once to verify accuracy and authenticity [37]. All participant identifiers were stripped from the data. Finalized, anonymized and validated transcripts constituted data for analysis.

Content analysis methods were used to explore observations while staying close to the data without undue interpretation [26,27,37]. Codes were generated to help categorize observations. Through an inductive process, common themes linking codes to categories emerged. Illustrative quotations were abstracted to ground categories, subcategories and themes while being attentive to credibility, transferability, dependability and confirmability [38].

3. Results

3.1. Themes

Eight categories and four themes emerged during iterative content analysis. Themes included: 1) System, 2) Software and 3) Social influences. A fourth overarching theme, Sustainability, traversed all categories (Fig. 1).

3.2. Systems

The systems category includes considerations of infrastructure and infostructure; all things and utilities needed for an EMR to be present and working in Kibera clinics. Important system subcategories include reliability, power, networks, Internet, workstations and component interoperability (Table 2).

3.2.1. Reliability

System reliability challenges were emphasized, with many examples of common and impactful deficiencies in slum settings. Unreliable infrastructure appeared to trump all other problems: when needed system supports went down, the EMR either could not function or would not function as intended. Network and Internet glitches often resulted in operational slow-downs, with major impacts on user confidence, EMR adoption and the need to revert to paper-based workflows.

3.2.2. Power and internet

Lack of reliable electrical power proved a major barrier to successful EMR transitions. Kibera's power could go down at any time and could be out for as long as 12 h. Independently, Internet services

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