AN ASSESSMENT OF THE APPROPRIATENESS OF SMARTCARE ELECTRONIC MEDICAL RECORD SYSTEM IN THE DELIVERY OF HIV/AIDS SERVICES: A CASE STUDY OF SIX (6) HEALTH FACILITIES IN LUSAKA DISTRICT OF ZAMBIA

BY

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DECLARATION

I, **Lovemore Mwanza**, declare that this dissertation submitted to the University of Zambia as partial fulfilment of the award of the degree of Master of Public Health (Health Promotion and Education) is my own work and has not been submitted either wholly or in part for another degree to this University or any other Institute of Higher Education.

Signed (Candidate)…………………………..   Date………………………………

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APPROVAL

This dissertation by **Lovemore Mwanza** is approved as a partial fulfillment for the requirements for the award of the degree of Masters in Public Health (MPH) by the University of Zambia.

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Supervisor………………………………………..Signature…………………. ..…..Date…………

DEDICATION

This dissertation is dedicated to three people who made an enormous contribution to my academic life. Firstly, I dedicate this work to my parents; my mother, Mrs. Violet Lungu and my late father, Mr. Dryford Musapenda Mwanza, who against all odds, sacrificed so much to ensure that I made it through my academic journey. Lastly, my late brother, Dr. Brighton Musapenda Mwanza, my role model, the person who always provided encouragement and mentorship during my formative years.

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TABLE OF CONTENTS

iii

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ART	Antiretroviral Therapy
CDC	Centres for Disease Control and Prevention
CDSS	Computerised Decision Support System
EMR	Electronic Medical Records
HIV	Human Immune Deficiency Virus
HMIS	Health Management Information System
ICT	Information Communication Technology
IDI	In-Depth Interviews
LTFU	Lost to Follow Up
MCH	Maternal and Child Health
MMRS	Mosoriot Medical Records System
MOH	Ministry of Health
PEPFAR	Presidential Emergency Plan for AIDS Relief
PMS	Performance Monitoring System
SC	SmartCare
UNAIDS	United Nations Programme on HIV and AIDS
USG	United States Government
WHO	World Health Organisation
ZAMPHIA	Zambia Population Based HIV Impact Assessment

ABSTRACT

Background: Human Immune Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) situation in Zambia remains a challenge. Pevalence of HIV among adults 15-59 years is 12.3 percent. Due to this high burden of disease, the Government of Zambia, through support from CDC, introduced SmartCare, an electronic health records system to help link up services and improve information availability for management of patients. Using an implementation research approach, this study assessed the appropriateness of using SmartCare electronic health records system in the delivery of antiretroviral therapy services for HIV infected individuals.

Methods: This was a qualitative case study based on perceptions and experiences of healthcare workers who had been using SmartCare. Using In-depth interviews, a total of 17 healthcare workers were interviewed across six sampled sites from a wide range of environments where SmartCare has been implemented. A purposive sampling approach using maximum variation and critical case criteria was used. Qualitative data was collected across Lusaka District between December, 2017 and January, 2018.

Results: findings demonstrated that SmartCare electronic health records has contributed to patient tracking and follow up, particularly better monitoring of CD4 counts, adherence to treatment and monitoring missed appointments. Pre-defined reports and automatically generated notifications have been critical in providing this information. SmartCare has also contributed to improving retention of patients in care through reduced patient's waiting time, helped in the provision of uninterrupted care across health facilities using care cards and has enhanced ongoing monitoring of possible indications of drugs resistance and loss of patients from care. However, from a planning point of view, there is no structured way of using information from SmartCare to support planning of ART services. Lastly, there is no evidence that data from SmartCare were aggregated and used at the national level for policy making and analysis. This is mainly attributed to the notion that SC is a donor driven system and that the traditional HMIS is the recommended system for the government and is therefore the preferred system.

Conclusion: To a great extent, SmartCare produced desired outcomes in line with its vision. Improvements in access to patient information to support clinical decisions and enhanced patient tracking for better monitoring of CD4 counts and adherence to treatment were key. However, there are gaps that impact its optimal use which require a framework to be developed to guide proper use of SC at different levels.

Key terms: SmartCare, Implementation Research, CD4, HIV/AIDS

CHAPTER ONE
INTRODUCTION

1.1 Background
1.1.1 Global HIV/AIDS burden

Since the beginning of the epidemic, more than 70 million people have been infected with the HIV virus and about 35 million people have died of HIV. Globally, 36.9 million people were living with HIV at the end of 2017. An estimated 0.8% of adults aged 15–49 years worldwide are living with HIV, although the burden of the epidemic continues to vary considerably between countries and regions (World Health Organization, 2017).

1.1.2 HIV/AIDS situation Sub-Saharan Africa

The African region remains most severely affected with HIV/AIDS, with nearly 1 in every 25 adults (4.1%) living with HIV and accounting for nearly two-thirds of the people living with HIV worldwide. Sub-Saharan Africa carries a disproportionate burden of HIV, accounting for more than 70% of the global burden of infection. Notwithstanding substantial progress in scaling up antiretroviral therapy (ART), sub-Saharan Africa accounted for 74% of the 1.5 million AIDS related deaths in 2013. Of the estimated 6,000 new infections that occur globally each day, two out of three are in sub-Saharan Africa (Kharsany et al., 2016).

1.1.3 HIV/AIDS Situation in Zambia

Despite a reduction in HIV prevalence over time, the HIV/AIDS situation in Zambia remains a huge challenge. Prevalence of HIV among adults aged 15-59 years in Zambia is 12.3 percent; 14.9 percent among females and 9.5 percent among males. This corresponds to approximately 980,000 people living with HIV between the ages of 15-59 years. Furthermore, annual incidence of HIV among adults 15-59 years stands at 0.66 percent: 1 percent among females and 0.33 percent among males. This corresponds to approximately 46,000 new cases of HIV annually among adults aged 15-59 years in Zambia (Phia.icap.columbia.edu, 2016).

This has continued to pose a challenge on the health system as more people are increasingly in need of care and treatment services.

As HIV services began to scale-up in many sub-Saharan countries, health systems were weak and faced challenges to expand HIV care and treatment programs. To support scale-up of HIV services, international donors including the US Government PEPFAR program, the Global Fund to Fight AIDS, Tuberculosis and Malaria, and others prioritized financial and technical assistance to the MOH to strengthen human resources, laboratory and diagnostic systems, patient care/service delivery, commodities and health information systems. This resulted in the development of EMR systems as a response to increased demand to effectively manage many HIV infected individuals presenting to the health centers. The landscape of electronic health records use around the world is highlighted below.

1.1.4 Use of EMR in healthcare

Clinicians face a slew of health problems that threaten the lives of millions of people each day. However, without a proper system of organization, these problems are amplified by the fact that the doctors must waste their time and resources finding and organizing patient information in often chaotic, difficult to manage, paper-based systems (Weihua Chen and Akay ., 2011). A solution to this challenge is the use of EMR systems. An EMR system is defined as a repository of patient data in digital form, stored and exchanged securely, and accessible by multiple authorized users. It contains retrospective, concurrent, and prospective information and its primary purpose is to support continuing, efficient and quality integrated health care (Hayrinen et al., 2006)

However, despite the many benefits of having EMRs in place, there are still several downsides, especially when systems are first implemented. Further, EMRs can be quite difficult to establish and maintain (N.A. Kalogriopoulos., 2009).

1.1.5 EMR systems in the Western World

The growing use of EMR systems in Europe and the United States has been driven by the belief that these systems can help to improve the quality of health care. However, the development and use of EMR systems is still an uncertain and challenging task, calling for a sensitive matching of local needs to available technologies and resources (Williams & Boren, 2008).

1.1.6 Selected use of EMRs in Sub Saharan Africa

Developing countries, particularly in sub-Saharan Africa, bear the brunt of the world's deadliest epidemics, which include HIV/AIDS, malaria and tuberculosis and most of these countries have adopted EMR systems to help manage data generated through provision of care to huge volumes of patients.

For example in rural Kenya, a comparison of an HIV/AIDS clinic before and after adoption of an EMR system demonstrated that patient visits were 22% shorter, provider time per patient was reduced by 58%, and patients spent 38% less time waiting in the clinic; clinic personnel spent 50% less time interacting with patients, two-thirds less time interacting with each other, and more time in personal activities (HSF Fraser, et al., 2010).

Similarly, in Lilongwe, a study demonstrated that the EMR system could efficiently and accurately guide low-skilled health care workers through the diagnosis and treatment of patients. The system captured and presented clinical data that supplemented clinical decision-making. Additionally, the systems were used for patient registration, HIV care, Pediatric patient management, radiology, pharmaceutical and laboratory work. The success of this programme was demonstrated by improved quality of care and a high level of acceptance by clinical workers (HSF Fraser, et al., 2010).

In South Africa, an assessment of the effects of EMR in four (4) ART clinics concluded that EMR greatly benefited HIV patient management (Sophonia, 2011).

1.1.7 The SmartCare (SC) System in Zambia

SmartCare is being implemented in the health sector to improve continuity of care and provide timely data on maternal and child health, HIV/AIDS, tuberculosis and malaria interventions for public health purposes, including Health Management Information System (HMIS) trend reporting and analysis for health officials and clinicians. SC is now also required for any facility in Zambia desiring accreditation to dispense antiretroviral (ARV) drugs for HIV clients.

The vision of the SC program is that each person in Zambia has a complete electronic medical record that is used to ensure the continuity of high quality, confidential care by providing timely information to caregivers at the point of service. As of November, 2017, SC was deployed in 856 clinics and hospitals in 10 Provinces and 103 Districts. These facilities include public, private and military health facilities. Where SC is fully implemented, sites are expected to benefit in the following ways;

- Improved access to patient information
- Improved availability of timely and accurate information
- Improved ongoing patient care
- Improved follow up and retention of patients in care and;
- Enhanced use of information for planning HIV/AIDS services

Since inception, heavy financial investment has gone into the implementation of SC. However, there is lack of solid evidence based on empirical research which adequately documents the benefits of implementing the SC system. Furthermore, there have also been frequent reports from different stakeholders that use the SC system of challenges affecting the smooth implementation of the SC system. These issues range from software and hardware glitches, gaps in knowledge and skills of end users, staff attrition, and questions around who actually who should provide oversight of the system between MOH and the US Centers for Disease and Control (CDC).

This study therefore attempted to assess the appropriateness of SC in the delivery of HIV/AIDS services in Lusaka district of Zambia. It is anticipated that findings from the study will be used to inform policy decision regarding the roll-out of SC to all health centers that provide HIV/AIDS services. Further, the findings will also be used to inform the MOH concerning areas the need improvement for the SC system to effectively support day to day clinical management of HIV infected individuals, and how the rich HIV data which is collected and stored in SC could be used to inform policy decisions.

1.2 Statement of the Problem

Zambia is one of the countries that has been hardest hit by the HIV/AIDS epidemic. As of 2016, prevalence of HIV among adults aged 15-59 years in Zambia was 12.3 percent with annual rate of new HIVinfections among adults 15-59 years standing at 0.66 percent (Phia.icap.columbia.edu, 2016). Based on the above statistics, it is clear that there is a lot of pressure on the health system to provide care for all HIV infected individuals. As a result, the need for a robust EMR system to help healthcare workers provide continuity of care for patients in an efficient manner is of paramount importance.

In response to this need, the SC electronic medical records system was developed to help link up services and improve access to health information by providing a reliable way to collect, store, retrieve and analyze health data in an efficient, systematic and secure way. Health facilities with fully functioning SC were expected to have efficient patient management systems. SC was also supposed to help with the HIV/AIDS monitoring and evaluation function of the sites which is a requirement from the perspective of donors providing funds for these services.

Nonetheless, despite being in existence since 2005, there is little documented evidence that has been generated to meaningfully conclude whether SC is a relevant tool in the delivery of HIV/AIDS services.

Therefore, this study used an implementation research approach to get insights into the relevance of SC in the delivery of HIV/AIDS services through a combination of two models; the DeLone & McLean Information Systems success model developed by DeLone & McLean (2003) provided insights on what defines the success of an information system like SC. Conversely, the Conceptual Framework for Implementation Outcomes by Proctor et al (2009) provided the definition of implementation outcomes of interest as defined by the study. The link between outcome variable - Appropriateness in the Conceptual Framework for Implementation Outcomes and the success dimension - user Satisfaction in the DeLone and McLean model provided the analytical base for the study.

This above mentioned approach provided insights on whether the implementation of the SC system is perceived as relevant in improving continuity of care, follow up and retention of patients, including promoting use of data for planning, monitoring and evaluation. Based on the results, gaps were identified and solutions recommended for consideration at both implementation and policy levels.

1.3 Justification of the study

SC has been in existence since 2005. However, as alluded to earlier, very limited studies have been done to meaningfully conclude on the usefulness of SC on the delivery of ART services in Zambia.

This study provided detailed information regarding the relevance of SC in the delivery of ART services in Zambia from the point of view of the end users. The major outcome variable in this study was "appropriateness" which, by definition, is the perceived fit, relevance, or compatibility of the innovation or evidence-based practice for a given practice setting, provider, or consumer; and/or perceived fit of the innovation to address an issue or problem (Proctor et al., 2009).

Furthermore, this study was designed so that it could provide additional information regarding challenges encountered during day to day utilisation of SC by healthcare providers. It is envisioned that findings from this study will be used to inform the status of implementing SC at different levels of the service delivery chain. From the hardware and software development perspective, this study provided information regarding what modifications should made to the system to make it user friendly as a tool for providing continuity of care for HIV infected patients. At policy level, findings might be used to influence policy change regarding the utilisation of SC at different levels, including the need to develop and implement legislation specific to electronic health record implementation and continued use, including encouraging participation of all stakeholders in the development process of such a system.

Of importance to note is that this study was conducted amidst ongoing efforts by MOH to harmonize existing systems, strengthen national governance and ownership of patient-level electronic systems, and improve the quality and use of data. Therefore, its importance cannot be over-emphasized.

1.4 General Objective

To assess the relevance of SC in the provision of health services for people receiving antiretroviral therapy for HIV infection.

1.5 Specific Objectives:

i.   To explore clinicians' experiences in using SC to provide continuity of care for patients on ART

ii.   To explore whether the use of SC by the health facility has helped to improve follow-up and retention of patients who on treatment

iii. To explore the usefulness of SC data in planning HIV/AIDS services within a health facility

1.6 Organisation of Dissertation

Chapter 1 provides the contextual picture under which this study was conducted. It also provides a picture of the burden of HIV/AIDS around the world.

Chapter 2 comprises of a critical review of literature related to electronic health records use in different settings around the world. It highlights the relevance of such systems in healthcare including the bottlenecks of implementing such systems

Chapter 3 describes the frameworks and models used to inform this study. The frameworks focus on implementation outcomes of interest and methods for measuring information system success.

Chapter 4 illustrates the methodological approach underpinning this study. It includes an outline of the study design, sampling techniques and data collection and analysis

Chapter 5 discusses the findings from the In-depth Interviews in relation to the literature.

CHAPTER TWO
LITERATURE REVIEW

In reviewing related works in the area of the relevance of electronic medical records in the delivery of HIV/AIDS services, the following topics were relevant to the study: continuity of care, follow up and retention of patients in care and planning, monitoring and evaluation. Using an implementation research perspective, different approaches to assessing information system success like that of SmartCare have also been reviewed. This includes the Conceptual Framework for Evaluating Implementation Outcomes developed by Proctor et al. (2009) and the DeLone and MacLean Information System Success model developed by DeLone & McLean (2003).

2.1 Electronic Medical Records in Healthcare

EMRs have been described as computerized health information systems where healthcare workers record detailed encounter information such as patient demographics, encounter summaries, medical history, and lab test histories. Some of the EMRs may support order entry, results management and decision support, whereas others contain features such as appointment scheduling, billing, and report generation (Ludwick & Doucette, 2009). The World Health Organization defines an ideal EMR as one that contains all personal medical information of an individual patient from the patient's first admission or attendance at the hospital. The medical records should also be entered electronically by healthcare providers at the point of care over the patient's lifetime and that information should be readily available and accessed by all healthcare providers attending to the patient. Likewise, an EMR system should offer support in medical decision making, promote use of guidelines, increase coordination between different healthcare providers and improve the overall quality of care (WHO, 2007).

2.2 Comparison of Paper - Based and EMR

In most parts of the world, paper-based records are still predominant despite the disadvantages associated with them. Poor availability, illegibility, poor organisation and incompleteness are some of the weaknesses found with paper-based records (Van der Meijden et al., 2001).

However, the ease of data entry made paper-based reports often more extensive than necessary. Consequently, tracing relevant information often became difficult (Van der Meijden et al 2001). Meinert (2005) observed that paper medical records or charts are by nature data rich, but information poor. A few studies found that, in general, the users were relatively satisfied with their paper clinical records and that users were more positive about the data entry aspects of both the paper medical and the paper nursing record than about the data retrieval aspects (Van der Meijden et al., 2001).

Enrico W (2003) states several disadvantages with the paper-based patient record: a paper record can only be used for one task at a time; it can be unavailable or lost; the time required for these notes to be requested and delivered can be unacceptably long; paper records consume space; large records can be difficult to search; and paper is fragile and susceptible to damage. With regard to information entry, (Coiera, 2003) notes that the information might be illegible and have unclear meaning. Errors are common, for example omission of relevant data. During information retrieval Coiera (2003: 113) further notes that clinical workers routinely fail to find pieces of information during consultation, e.g. laboratory results, procedures ordered, medications and history. This leads to duplication of tests and procedures. Tang et al. (2006) found that inaccessibility is a common drawback of paper records. In some settings both paper and electronic records are used, with paper acting as backup in case the electronic record is not available due to power failures. However, Ndira, Rosenberger and Wetter (2008) note that paper-based and electronic systems if used on a parallel basis could result in inconsistencies in the record systems. Compared to paper, electronically compiled reports are generally easier to retrieve and analyze than paper-based reports (Ndira, Rosenberger and Wetter, 2008). In a study by Van der Meijden et al., (2001) the respondents indicated that an EMR should give them a greater overview than the paper records. However, the EMR has its own shortcomings in that the structured nature of electronic interactions takes longer than paper-based interactions.

2.3 Relevance of EMR in HIV care

Continuity of Care

Were et al. (2010) demonstrated that even in settings where paperless EMR systems have not been realized, it is possible to provide well-organized, relevant, and up-to-date EMR-based

clinical information to assist in patient care. In a resource-poor setting in Uganda, an EMR generating clinical summaries improved the efficiency of care for healthcare providers, allowing them to spend more time directly interacting with and examining the patient. Availability of clinical summaries for providers was also associated with shorter clinic visits for patients. Providers also strongly expressed an association of clinical summaries with improved quality of care and reduction in mistakes while providing healthcare to patients.

Williams et al. (2008) also found that introducing electronic medical records systems in a health facility resulted in improvement in patient management - comparing the clinic before and after adoption of an electronic medical records system showed that patient visits were 22% shorter, provider time per patient was reduced by 58%, and patients spent 38% less time waiting in the clinic; clinic personnel spent 50% less time interacting with patients, two-thirds less time interacting with each other, and more time in personal activities .

Furthermore, a study in Ethiopia by Gebre-Mariam et al (2016) found that the attitude of ART clinicians toward the implementation of EMR systems was overwhelmingly positive. Clinician-perceived benefits associated with EMR use included improved continuity of care; timely access to a complete medical record; improved efficiency of patient care; fewer medication errors; improved patient confidentiality, integration of HIV programs and decision-support timelines; and increased overall job motivation. However, identified drawbacks to EMR implementation included productivity loss and negative impacts on interactions and relationships between clinicians and their patients.

Retention and follow up of patients

Egger, (2008) described the electronic medical databases used in antiretroviral therapy programs in lower-income countries and assessed the measures such programs employ to maintain and improve data quality and reduce the loss of patients to follow up. They found out that EMR systems could play an important role in the scale-up of ART in lower-income countries by providing the necessary data elements for the longitudinal follow up of patients and to ensure that patients are retained in treatment programmes.

In addition, Alamo et al. (2011) concluded that EMR and same day patient tracing can significantly reduce missed appointments, and LTFU and improve clinic efficiency.

Conversely, Swanzy (2015) concluded that the benefits realised from the implementation of an EMR system in Effia Nkwata Regional Hospital in Ghana included; reduced errors and missing files, reduced work task, reduced expenditure on paper logistics and the retrieval of absconded bills. However, there were also some challenges to the system which included; poor network connections, illegible handwriting of some doctors, unstable power supply and increased work task. Similarly, Muhammed (2018) also concluded that EMR made it easier for the users to retrieve patients past medical records. However, some of the observed bottlenecks of using EMR included the perception that transition from paper-base to EMR was not beneficial to daily work of clinic staff and that the system went off most times coupled with internet fluctuations which affected provider patient interaction. Lastly, an assessment of the effects of EMR in four (4) ART clinics in South Africa by Sophonia (2011) observed that 90% of respondents used the EMR daily, 93% preferred EMR to paper. 17% used EMR to capture clinical data. 87% perceived EMR to have more benefits; most felt doctor-patient relationship was not interfered with and 89% were satisfied with the EMR's overall performance. The study concluded that from the operational point of view EMR greatly benefited HIV patient management.

Information Gap

Blaya, Fraser and Holt (2010) acknowledge that while it is essential to evaluate the impact of EMRs in resource constrained countries in terms of safety, benefits and cost effectiveness, there is still a huge gap in this process with limited evidence on the actual impact of EMR systems on patient care. Most studies have been small and tend to focus on process indicators rather than patient outcomes; attitudes of users and patients; and are mostly performed by academic groups. Therefore, more rigorous evaluations that include long-term follow-up probably by independent evaluators are needed to accurately document the actual benefits and in turn justify allocation of limited resources for implementation of EMR systems.

CHAPTER THREE
FRAMEWORKS AND MODELS

3.1 Overview

This study used two frameworks to effectively investigate the relevance of SmartCare in the delivery of HIV/AIDS services. The DeLone and McLean Information System success framework and the Conceptual Framework for Implementation Outcomes were juxtaposed to effectively inform the study about the relevance of SC from an implementation perspective.

3.2 The DeLone and MacLean Information System Success Model – A Ten Year Update

Six dimensions of evaluating the success of an information system have been described by DeLone and McLean (DeLone & McLean, 2003). These dimensions include information quality, system quality, and service quality intention to use and net benefit (Figure 1). System quality refers to the perceived ease of use of an information system, information quality refers to the quality of information a system uses. Service quality represents the quality of support that users receive from the information system department, intention to use represents the degree and manner in which information system is utilised the user. Finally user satisfaction describes the user's level of approval of the system, while net benefits refer to the extent to which an information system contributes to the success of different stakeholders. This study focused on user satisfaction as it closely maps with the implementation outcome of interest - appropriateness.
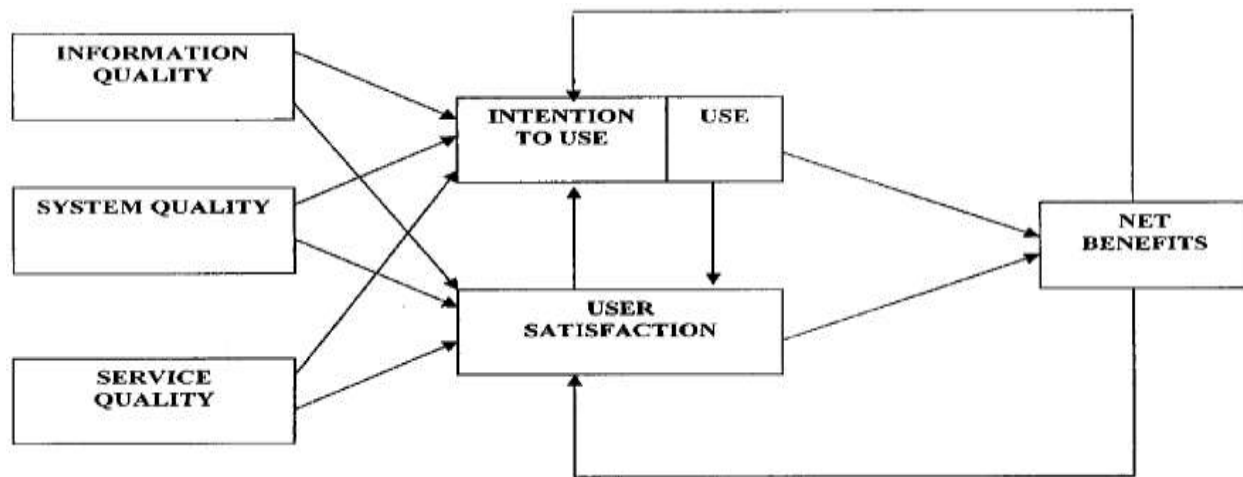
Figure 1: DeLone and McLean Information System Success Model (D&M IS)- A Ten Year Update

3.3 Conceptual Framework for Implementation Outcomes

This framework distinguishes between three distinct but interrelated types of outcomes—implementation, service, and client outcomes (Figure 2). However, the focus of this study was at implementation level with special focus on appropriateness as our outcome variable. In this framework, Proctor et al. (2009) defined appropriateness as the perceived relevance of an innovation to address an issue or problem.

Further, (Proctor et al., 2010) positioned implementation outcomes as preceding both service outcomes and client outcomes, with the latter sets of outcomes being impacted by the implementation outcomes. This approach ensured that the relevance of SmartCare system was adequately investigated.
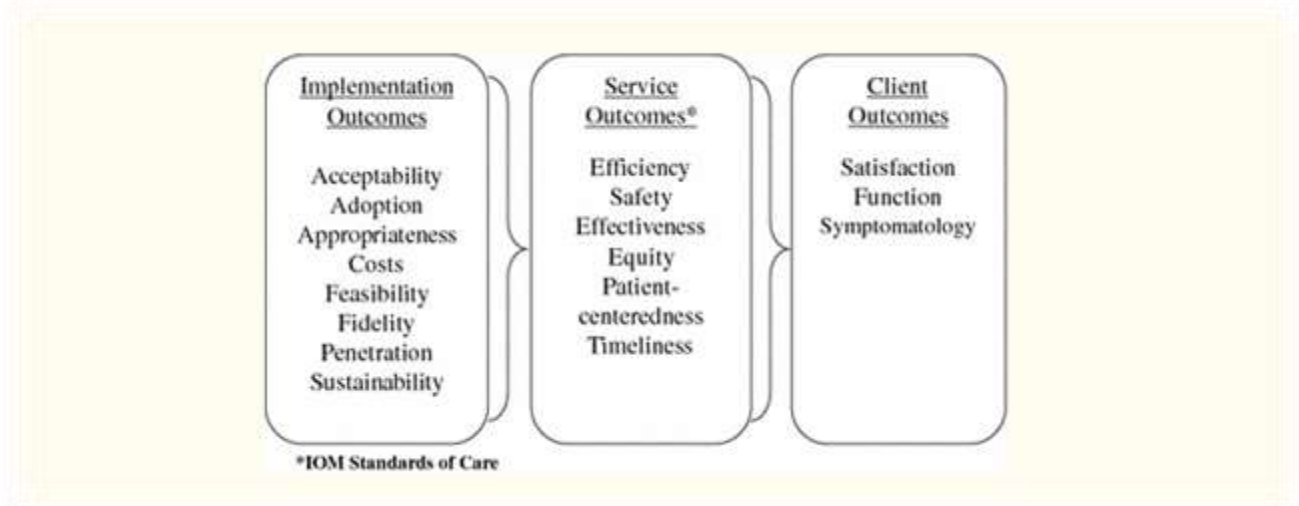
Figure 2: Conceptual Framework for implementation Outcomes

3.4 Application of the two frameworks to the study

Given the complexity of the issue under investigation, an evaluation based approach was used to account for all factors that would inform our findings. Therefore, this study applied part of the evaluation framework developed by Proctor et al., (2009) to help understand issues from an implementation outcomes perspective, and a component of the D&M IS model to fully understanding results from an information system assessment perspective. Linking the two frameworks provided a holistic view of the research questions under study.

CHAPTER FOUR

METHODOLOGY

4.1 Study Design

This was a qualitative case study based on perceptions and experiences of healthcare workers who had been using SmartCare. In order to identify patterns across the dataset that were important in answering the research questions, a thematic analysis method was used.

4.2   Study Setting

The study was conducted in Lusaka District of Zambia with a focus public health facilities where SmartCare has been in use for more than 12 months. The district was selected purposefully since it met all the sampling criteria required for the study.

4.3   Sampling technique

The study used a non-probability purpose sampling technique. In order to ensure diverse views and select information rich cases owing to limited resources resulting in small size of the sample, maximum variation and critical case purposive sampling strategies were considered. Maximum variation sampling strategy ensure variation in the sample while critical case sampling takes into account cases that are likely to yield the most information and have the greatest impact on the development of knowledge especially when resources may limit the study to one site (Patton, 2001). Additionally, knowledge, availability, willingness to participate, and the ability to communicate experiences and opinions in an articulate, expressive, and reflective manner were also considered. Therefore, selection of sites used the maximum variation sampling criteria, while selection of study participants was based on the critical case criteria.

4.4   Study Participants and Sites

    i.   *Step 1: Selecting Health facilities*

The first step in the selection of sites was the determination of patient volume per site. To ensure maximum variation in the sampled sites, ART sites with functioning SmartCare were ranked by ART patient volume and then clustered into low, medium and high volume. To ensure variation per cluster, two sites representing the upper limit and lower limit were selected. A total of six (6) sites from the three clusters were then sampled (Table 1).

The clusters were defined as outlined below. Further details about these clusters are highlighted in Table 1.

i.   High volume – SC sites with more than 10,000 patients on ART
ii.   Medium Volume – SC sites with between 5,000 – 9,000 patients on ART
iii. Low volume – SC sites with less than 5,000 patients on ART

Table 1: Patient volume by site and cluster

Cluster Name	Criteria	Number of Patients	Site Name
High Volume			
	Lower limit	10,269	Matero Clinic
	Upper limit	11,009	Chipata Clinic
Medium Volume			
	Lower limit	5,238	Chreso Ministries
	Upper limit	7,998	Chawama Clinic
Low Volume			
	Lower limit	2,264	Mtendere Clinic
	Upper limit	4,723	Kanyama West

ii.   *Step 2: Selecting study participants*

The selection criteria for the participants took into account critical cases, in this case, staff that have consistently been using SmartCare for a minimum of 12 months. Based on this criteria, a sample size of twenty one (21) was considered adequate to give a comprehensive picture of the relevance of SmartCare in the provision of ART services. This decision was informed by existing staffing levels at a typical ART site that consistently use SC across different service points. Therefore, seven (7) healthcare staff per site were chosen. On the day of the visit, participants that met the inclusion criteria were conveniently selected to ensure there was no

disruption in service delivery. Table 2 below provides a detailed analysis of which cadre were selected under the different clusters.

Table 2: Sampling Matrix for In-depth Interviews

Cluster	Doctors	Clinical Officers	Nurses	Data Associates	Total
High	2	2	2	1	7
Medium	2	2	2	1	7
Low	2	2	2	1	7
Total IDIs	**6**	**6**	**6**	**4**	**21**

4.5   Inclusion Criteria

Health care providers who have been regularly involved in the provision of ART services for **at least 12 months** were included in the study. This could have been within the current sampled site or any other site that uses SC for patient management.

4.6   Data collection

4.6.1 Study Instruments

   a) *In-Depth Interview Guides*

In-Depth Interviews (IDI) guides were used to gather data from different categories of health care providers. These included Clinical Officers, Doctors, Nurses and Data Management Officers. A total of 17 IDIs were conducted during the study.

b) *Screening tools*

Demographic and other information on work history was collected prior to commencing the study, this included information on: age, sex, occupation, years of service, and experience with

SC use. This form was used as a screening protocol to guide the recruitment of suitable participants for the study

4.6.2 Data collectors

b) Moderators

Three (2) moderators including the principal investigator facilitated the IDIs. Before commencement of data collection, they were trained in conducting open-ended interviews and were ably equipped with an in-depth understanding of the purpose of the topics of discussion.

(c)Note takers

Three (3) trained note takers were engaged to write down important themes and observations of behaviors during the discussions.

4.6.3 Data Management and Analysis

a) *Transcription and Translation*

All interviews were transcribed verbatim. The transcription of data and data collection were conducted simultaneously. Digital recorders were used record the data, and, after the interview, the audio data was secured in readiness for transcription. All data was stored electronically (using Microsoft Word format) and analysed using Atlas ti software.

b) *Coding*

The first two transcripts per target audience were reviewed together with the moderators. As the text was reviewed, a coding dictionary was developed.

Data analysis strategy

The data analysis strategy followed the phenomenological inquiry approach. The following steps were followed:

a. *Data analysis*

The following steps were followed:

- Read the interview transcript in its entirety to get a sense of the whole.

- Read the interview transcript a second time - this time more slowly - to divide the data into meaningful sections or units.

- Integrated those sections/units that have a similar focus or content and make sense of them.

- Elaborated findings - this included description of the essential meanings that were discovered

- Revisited the raw data descriptions again to justify interpretations of both the essential meanings and the general structure in order substantiate the accuracy of all findings by referencing the raw data.

b. Critical analysis of results

The critical analysis process included verification to ascertain that:

a) Concrete, detailed descriptions have been obtained from the participants

b) The phenomenological reduction has been maintained throughout the analysis

c) Essential meanings have been discovered

d) A structure has been articulated

e) The raw data has verified the results.

4.6.3 Quality Control Procedures

Quality assurance and control was conducted at several levels which included;

- Adequate training of field staff to ensure they are knowledgeable on the administration of the questionnaire.

- Attention was made to proper handling and protection of the data and consent forms, as well as appropriate management of the participants.

- Recorders were used to ensure that captured information was verified.

4.6.4   Ethical Considerations

The study ensured that study participants were adequately protected by confirming that principles and guidelines governing research that involve human beings were adhered to. The following principles were followed:

i.   Respect for Persons

This study ensured that participants are treated in an autonomous manner and that individuals with diminished autonomy were entitled to additional protections. Furthermore, the study participants were provided with sufficient information so that they could understand the objectives of the study, and voluntarily accept to participate. A written informed consent process was used.

ii.   Beneficence

The study team ensured that benefits for the individual participants were maximized while minimizing possible risks.

iii.   Justice

The study ensured an equitable selection of participants and that marginalized populations were not unfairly coerced into participating and that those who undertook the burdens of research benefited from this study. Ethical approval for the study was obtained from the local research review committee called ERES Converge and the National Health Research Authority. Further clearance to access the study sites was obtained from the MOH who the custodians of all the sites in Lusaka District.

4.6.5 Limitation of the study

- Due to limited resources, the study was conducted in one location with a small sample of
- respondents drawn from one district. Therefore, the findings of the study may not be representative of other settings.
- The study focused on the end users of SC at facility level and did not get perspectives from
- Policy makers and other stakeholder which limits our analysis on this front.
- The study did not include patients as they were perceived to be beneficiaries of the system rather than end users. Therefore their perceptions of SC were not included

CHAPTER FIVE

FINDINGS

5.1 Overview

This chapter presents a qualitative perspective on the experiences of health care providers on the relevance of SmartCare electronic health records in the delivery of ART services. It attempts to answer key questions on clinician's experiences in using SC to provide continuity of care for patients on ART, whether the use of SC has helped improve follow-up and retention of patients in care and also explore whether SC is regarded as a useful tool in planning, monitoring and evaluation of HIV/AIDS services.

Furthermore, a brief description of the participants is also highlighted, followed a presentation of major and sub themes. Verbatim quotations have been used to illustrate sub-themes. To ensure anonymity and confidentiality of the participants, relevant demographic characteristics have been used.

Finally, the analysis of these findings was guided by the different elements that underpin the Delone &Maclean Information System Success model with special focus on the user satisfaction dimension. This was later mapped to the outcome variable of interest, appropriateness as described by (Proctor et al., 2009) in the Conceptual Framework for Implementation Outcomes. From an information systems perspective, this approached adequately provided insights from the end user's perspective whether SC electronic health records system was viewed as a relevant tool in the delivery of HIV/AIDS services. This approach also provided insights on which aspects of implementing the SC system were working and which ones were not, including recommendations for remediation.

5.2   Demographic characteristics of the respondents

The average number of years of SmartCare use for all categories of respondents was 3.1 years. Nurses were at 1.6 years while the Doctors were the highest standing at 5.2 years. Data Associates and Clinical Officers stood at 3.7 and 2.3 years respectively (Table 3).

Table 3: Characteristics of the respondents

Designation	Number Interviewed	Average Number of Years of SmartCare Use
Nurse	5	1.6
Doctor	4	5.2
Data Associate	4	3.7
Clinical Officer	4	2.3
Total	**17**	**3.1**

As no new information was coming forth from conducting additional interviews due to possible saturation, the study concluded data collection with seventeen (17) interviews as displayed above (Table 3).

Table 4: Themes and sub themes

Major Theme	Sub Theme
Continuity of Care	• System reliability • Client reviews • Data entry • Backlog • Patient flow • Early notification • Uninterrupted care • Monitoring drug resistance • Shortage of staff
Patient follow up	• Monitoring patients • Enhanced retention
Facility Planning	• Data repository • Use of data

5. 3 Detailed Findings

5.3.1 Continuity of Care

System reliability and client clinical reviews: Despite appreciating the contribution of SC in client clinical reviews in health facilities where SC is fully functional, some health workers still felt that SC cannot be relied on entirely. This was attributed to its unreliability in providing uninterrupted interaction between the healthcare provider and patient. Most of the physician indicated that there are periods when the system does not function properly, forcing the health provider to wait for the system to respond, which resulted in frustration for both the patient and the healthcare provider. This is what some respondents had so say:

> *"It is easy to use the system but it hang-ups 4-5 times a day and I must restart the system, then I have to ask the patient the questions again". (Doctor FS 002).*

> *"The system is sometimes not working properly, you cannot enter patient data as required. We end up ignoring the system and using paper charts." (Clinical Officer FS 004)*

System reliability and data entry: The majority of respondents responsible for data entry indicated that SC is sometimes unreliable and makes data entry extremely difficult affecting the completeness of health records and subsequent reports within SC. It was reported that this is mainly due to outdated computers that fail to synchronize with upgrades made to the software running SC. This is what some respondents had to say:

"Some old computers become extremely slow once an upgrade has been made, this also slows down data entry. In some cases it takes more than 10 minutes to update one interaction" (Data Associate, 004)
"For some reasons, once the site is networked, data entry became extremely slow. It takes a long time to finish entering all interactions, this results in backlog" (Data Associate, 006)

Backlog of patient files: Some of the respondents indicated that SC has not optimally helped patients get the complete services due to gaps in patient history as a result of incomplete entries. This was mainly attributed to a large number of interactions which are sometimes not entered in SC on time for processing as a result of having a small number of data entry clerks available at some sites compared to the volume of patients that pass through the facility.

Some of the respondents had this to say;

"….I remember we had a backlog so it was difficult to really know all the patients that came for care." (Nurse FS 003)

" if there is no backlog the information is very accurate but as long as you have backlog, you will not get accurate information from the system" (Clinical Officer FS 004)

" Sometimes there are too many records which are supposed to be entered in SC by one individual and with time they accumulate and this affects the reports generated by the system" (Clinical Officer FS 004)

Patient flow and security of information*:* Some respondents expressed happiness in the way SC has improved patient flow during clinic days. It was reported that compared to the days of using paper-based files, there has been an improvement in client flow as health providers are interacting with the patients owing to the introduction of SC in the facility. It was also reported that patients perceive records to be more secure and private using the current electronic system, and that is enough motivation for them to continue accessing ART services from the same health facility.

Some of the nurses said this;

> *"The system has really helped to manage patients during clinic days which would not be possible if we had to use paper registers and also note that registers are very cumbersome to use and sometimes they get lost." (Nurse, FS 001)*

"It's different now with SC, long queues are now a thing of the past, this makes patients very happy as they are sure they won't be here the whole day" (Nurse FS 006)

However, there are still concerns regarding patient flow in sites where SC is not deployed in all service delivery points. Some of the respondents expressed the need to have SC deployed in all service delivery points to make it more effective and help improve the flow of patients. It was also reported that in some sites SC is located in one room where data entry is done after clients have left the site, making it very difficult to run timely reports from the system. In such environments, it was stated that SC is used more of a data repository than a tool to support continuity of care for patients.

Here is what some respondents had to say;

"I think if SC was introduced at each service delivery point, it would be very important and would help with patient flow compared with having it in one place" (Nurse FS 005)

"The files are only taken to the data room once all the services have been provided. As the last point of service provision, the pharmacist takes the files to the data room for entry in SC, so on fast tracking of patients, I can't say it has done much…" (Nurse FS 006)

An early notification system*:* Most respondents perceived SC as an effective tool in alerting clinicians on the gaps in service provision for a particular patient. It was reported that the system can automatically prompts health care providers on the status of services provided to the different patients overtime, and that SC can provide clinicians with information on whether a patient received all the required services as scheduled. If not, initiate follow up action to ascertain why the patient did not receive the required services.
One of the clinical officers explained this finding in this way:

"From my experience, SC itself will help the patient get all the needed services, reason being that SmartCare is basically an electronic system of recording data, so you will find that if you have got challenges in the lab, for example, they don't have consumables, a report in SmartCare will flag it". (Clinical officer, FS 003).

Further, it was reported that SC generates notifications on patients that have been enrolled in care but have not been initiated on treatment for the clinician to follow up.

Some clinical officers had this to say;

> *"SmartCare will generate a report to say so many patients are not having CD4, so many patients are not picking up drugs and so many patients have not been coming for clinical reviews as scheduled." (Clinical Officer, FS 002).*

> *"SmartCare will send an alert on patients who have been enrolled in care but not initiated on treatment so as a clinician, you will be able to quickly catch it and intervene." (Clinical Officer, FS 005).*

Un-interrupted provision of care*:* Technological advancements in information storage and transmission were also reported to be part of the SC system. Respondents indicated that the use of care cards has helped patients who for one reason or another were unable to get services from their usual health center. Owing to complete and up-to-date medical history stored on the care cards, it was reported that they are now able to get services at any site that uses SC. Additionally, it was reported that the use of unique identification numbers has contributed greatly to easily access and retrieve patient records especially for those patients who might have lost their care cards or have had their patient files misplaced by the registry. Further, it was reported that SC has greatly helped with obtaining lab results from the central hub using an online system which allows for lab results to be directly entered in SC and later viewed by the clinicians as they attend to patients.

Here is what some of the healthcare providers explained:

> *"For those patients who are being transferred from this facility, we have been giving them care cards, the information is on that card, when they go to another facility, and it is easy to access whatever has been done where they are coming from." (Clinical Officer, FS 006)*

"...it allows continuity of care in the sense of the care cards that is given, it allows a client to access services from any other facility that has SmartCare" (Data Associate, FS 004).

"Lab results are now being accessed easily through the online lab order system, this is different from relying on paper records which sometimes get misplaced" (Data Associate, FS 005)

However, challenges have been reported regarding the use of the care card. Some of the respondents indicated that once the Microsoft version of SC is updated, the card readers that are used to read the cards are affected resulting in interrupted provision of care.
One of the data personnel had this say:

"….Some sites are still using old computers with outdated software, when an upgrade to the system is made, the card readers stop to function "(Data Associate, 003)

Monitoring drug resistance: Most of the physicians that were interviewed expressed happiness regarding the role SC plays in monitoring drug resistance. They indicated that drug resistance is more likely to happen when a person is unable to, or does not take their medicine regularly as prescribed and that once resistance has developed, the resistant strain of the virus can be transmitted from one person to another and that resistance to medicines can lead to treatment failure, where the medicines no longer keep the virus in check.

In this regard, they indicated that SC as a very useful tool in monitoring what drug regimens patients are on, including monitoring how many people are moving from first- line to second line therapy. It was explained that this is critical for clinicians as a way of monitoring possible trends in drug resistance cases within the site. A physician put it this way:

"We are now able to generate reports, say I want to know out of the 5,200 patients, how many of those are on second line treatment or how many of those are on first line

treatment. As you might be aware, second line treatment is an initial indication of possible drug resistance" (Medical Doctor, FS 006).

Shortage of staff and inadequate computers

Staff shortage were also reported as affecting maximum use of SC to support service provision. In some instances, it was reported that some sites only have one computer that is used to support entry of data provided in different service points within the facility. In other cases, it was reported that there was only one data personnel dedicated to entering data from a range of service delivery points which resulted in having partial information entered in SC and not having a full medical history of some the patients which affected prompt provision of comprehensive care to patients.

Some healthcare providers had this to say:

"…Yes, in terms of challenges, we only have one computer which is being used for antenatal, family planning, ART, post-natal mothers and children's clinic" (Nurse FS 005)

"So we have stopped entering postnatal because only one person is entering data, what we are entering now is just antenatal and ART, the other information is not entered because the person is overwhelmed." (Nurse FS 005)

5.3.2 Follow up and retention of patients in care

Monitoring patient in care: Some respondents reported that for ongoing patient tracking, SC can now generate cohort specific reports which would be extremely difficult to generate using paper-based registers. It was further reported that previously, it was virtually impossible to generate such reports due to incomplete documentation of patient history in the files, and the laborious nature of tracking patients on a longitudinal basis using the paper system. Some Medical Doctors explained this view as follows;

"It has made it easier because since we are looking at cohorts, it keeps track, say for example you initiate 20 or just say five people in the month of January, SmartCare will actually help us track, and say, at 12 months, it will be easy to get back to SmartCare and tell us that for example of these five, how many are still on treatment" (Medical Doctor, FS 003).

"SC makes work easy for me, I am now able to see services provided to my patients over a long period of time…" (Medical Doctor, FS 006)

Further, it was stated that SC improved patient tracking and follow up, especially better monitoring of CD4 counts, adherence to treatment, and monitoring missed appointments. Participants reported that SC able to monitor patient losses from care and also establish the actual status of the clients in terms of whether they have died, been transferred out or stopped treatment altogether. It was also reported that this greatly helped the facility to institute remedial measures.

This is what some of the respondents had to say:

"At one point we noticed that we had so many lost to follow up and late drug pick- ups based on the report from SmartCare. So, we instituted measures to see if we could trace those people, and so we bought bikes, bicycles, we also engaged some community volunteers, gave them stipends and a few incentives and I can tell you that our lost to follow up has reduced from about 15% and now it's 7%". (Nurse, FS 001)

"We print out the late list and give them to Community Health Workers. When there is money for transportation, they visit the patients and try to get them to come for their medicines". (Data Associate, FS 0046).

"We run a late list to check how many people have not come for clinical appointments in a particular month, which is extremely difficult using a paper system especially when you have thousands files" (Data Associate, FS 004).

Enhanced retention of patients in care*:* It was explained that the introduction of SC in patient management has drastically improved retention of patients in care. This was mainly attributed to the efficiency with which patients are attended to as compared to the time when only paper based registers were in use since clients registered in SC now have a more complete, accurate, legible and accessible medical records compared to the old paper-based systems. It was also reported that where SC is fully functioning, patients returning for appointments do not have to worry about long queues on clinic days. A clinical officer asserted:

> *"It's like other patients feel discouraged when they spend the whole day at the facility." (Clinical Officer, FS 001).*

> *"The system is now time serving because you can be able to just go to the system and ask the system to tell you how many patients you expect in a day, also just looking at the pharmacy pick-ups, that you expect on that day, so it's easy as opposed to the paper based where you do appointments and then you have to go back to the registers and start counting manually" (Nurse, FS 001).*

5.3.3 Planning, Monitoring and Evaluation

Repository of important data for program monitoring*:* For purposes of following up patients, it was indicated that SC collects information regarding where the patient lives, including contact details of other family members which vital to help with follow up of patients in case they default. Overall, it was reported that information in SC was useful in planning health services including ordering of drugs, supplies and commodities among other things.

Some respondents had this to say:

> *…You need to gather information that will help not only to manage the patient but if you are able to use that information as a facility, then you will be able to make informed decisions regarding program delivery, so I think it's quite important that this information is collected in a systematic and logical manner" (Medical Doctor, FS 002).*

"Most times, we generate reports based on what an individual wants. Sometimes days by before someone comes to ask for data" (Data Associate, FS 003).

"We use SC to generate numbers to help with ordering drugs" (Nurse FS 001)

Lastly, it was reported that monitoring different aspects of the HIV/AIDS program at the facility has been enhanced using information generated from SmartCare. Respondents reported that SC data is useful in monitoring the number of patients retained in care over time. One of the respondents had this to say;

...We run monthly reports and these reports consist of people that are currently in care, this helps the facility to know how many people come into care, how many new clients have been enrolled into care, so it helps them in planning and decision making, in case the number of people that are currently on treatment drops, it helps them understand where people are going, so it helps the ART department make decisions regarding the care for their clients (Data Associate, FS 003).

Use of data for planning: It was reported that consistent and systematic use of SmartCare data for planning and decision making, beyond day to day management of patients, remains a challenge. Furthermore, it was also reported that the existence of other data management systems like the government owned Health Management Information System have affected its optimal use. The study found that some health workers still perceive SmartCare as a donor driven system rather than a government system. It was explained that this bottleneck is entrenched in the history of the SmartCare system where the issue regarding who actually owns it hampers usability of SC in some health facilities.

Some nurses had this to say;

"I don't really see any planning taking place with the use of information in SC"
(Nurse 006)

"….People don't take advantage of information in SC. Maybe people in higher offices at CDC and MOH use this information… (Nurse, FS 005)

CHAPTER SIX
DISCUSSION

6.1 Discussion

The study on appropriateness of SC electronic health records in the delivery of HIV/AIDS services identified important factors that point to its relevance. These included improvement in the availability of patient information, ease-of-use of the SC system in patient management, improved follow up, and enhanced retention of patients in care. Some challenges that were pronounced included issues around system reliability, shortage of human resources to manage SC resulting in data backlog and lack of consistent use of SC data for planning. From these general findings, the following insights can be deciphered.

The study found that certainly, clinicians perceived SC to be an effective tool in supporting ongoing efforts to provide care for HIV/AIDS patients. Comparing the implementation outcome of interest – appropriateness, with the D&M IS success dimension of importance - user satisfaction, it can be argued that SC is indeed perceived as a very relevant tool in the delivery of ART services. To substantiate this assertion, the following sections compare and contrast existing evidence with what this study found, including implications of these findings on SC implementation and future research.

While the system has generally been appreciated by end users, the study found some dissatisfied users. Comparable to other electronic data management systems, the study found that SC has its own challenges regarding reliability. This includes periods when the system does not respond timely to allow for efficient interaction between the healthcare provider and the patient, which resulted in frustration on both sides. This finding is in line with the conclusion by (Muhammed, 2018) that the EMR was adversely affected by internet fluctuations and intermittent performance which impacted provider - patient interaction. However, some studies also reported that EMR system did not interfere with doctor-patient relationship (Swanzy, 2015). It can therefore be argued that ICT issues that affect the smooth use of the SC during provider – patient interaction should be taken into serious consideration during implementation of such a system.

Further, findings from the study also pointed to the usefulness of care cards in the delivery of ART services. Compared to the paper-based system, the care card carries an entire patient's entire medical history which implies that clients with this card do not have to provide full medical history for their return visits or when transferring to another facility. From a clinical point of view, the value this card adds to ongoing care of HIV infected patients is of paramount importance in that the mobile nature of human beings requires that they access health service at any time, in any location. This augments the finding by Gebre-Mariam et al (2016) that clinicians perceived benefits associated with EMR use included improved continuity of care; timely access to a complete medical record; improved efficiency of patient care; fewer medication errors and improved patient confidentiality. Nguyeni et al. (2014) also argues that better health information systems that allow patients to be tracked between service points are needed to properly evaluate patients in care. However, from implementing the care card, findings also suggest that upgrades to the SC software system negatively affects the usability of the care card. This implies that the success of the card will only be fully realised if the two components are synchronized.

From the point of view of implementing SC, the care card has been found to be an important piece of equipment which must be seriously planned for to ensure that all patients are provided with a card for uninterrupted services provision.

The study also found that the system is very effective in scheduling appointments for patients. For example, the system can provide a list for scheduled drug pick up appointments for clients as opposed to the paper registers which are arduous and time consuming. This is in line with the conclusion put forward by Alamo et al (2011) that using EMR for same day patient tracing can significantly reduce missed appointments and lost to follow up.

The study further confirmed that the use of EMR systems reduces waiting time for patients since SmartCare can provide full patient history at a glance and records can easily be retrieved. This is line with the finding by William et al (2008) that introducing electronic medical records systems in healthcare showed reduced length of patient visits.

To get the desired outcomes in terms of continuity of care, patient follow up and retention, the study has demonstrated that smooth implementation of the SC system requires thorough planning in terms the roll out process, ownerships and ICT technical oversight. Further, the challenges of fully implementing the SC system for optimal use has been affected by the existence of other data management systems. Therefore, to ensure full use of SC, there is need to have a plan for integrating SC with other information systems so that it can fully be appreciated by all stakeholders providing HIV/AIDS services.

6.2 Implication of the study and future research

This study assessed the appropriateness of SC is the delivery of HIV/AID services. It focused on how end users perceived SC in terms supporting continuity of care, follow up and retention of patients in care and whether information from SC is used for planning and monitoring of HIV/AIDS services. The main finding indicated that SC is perceived as a very useful tool, and users are generally satisfied with it. However, the study focused only on one aspect of the D&M IS model – user satisfaction. It would be imperative for future studies to conduct a detailed assessment by looking at all levels at which information systems success is assessed. This approach would provide a holistic picture of the relevance of SC in the delivery HIV/AIDS services from an implementation research perspective.

Since this study assessed a system which is being implemented, the information from this study might be used to influence improvements at both implementation and policy level, particularly around system reliability and data use.

CHAPTER SEVEN
CONCLUSION

7.1   Overview

Interfacing the D&M IS success model and the conceptual framework for evaluating implementation outcomes, the study found that the majority of users were satisfied with the SC system and mentioned many aspects of SC that made the system relevant in the provision of HIV/AIDS service. In this regard, despite problems of reliability and sub optimal use of SC data beyond routine tasks, this study can meaningfully conclude that users perceive SC as an important tool in supporting continuing patient care, follow up and retention. However, the main challenge with the system is the implementation aspect particularly ICT related issues.

7.2   Recommendations

- MOH to develop a framework to guide users of SC to optimally use data for clinical management of patients including planning, monitoring and evaluation of HIV/AIDS services.

- Policy guidance should be provided on the need for SC to be treated as an integral part of healthcare delivery in Zambia rather than a donor driven system

- Develop and implement legislation specific to electronic health record implementation and continued use

- Planning for ICT infrastructure upgrades should be an integral part of the SC roll out plan, and should be adequately budgeted for during the planning phase.

- Increase staffing levels in sites that have staff shortages to ensure smooth implementation of SC

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APPENDICES

APPENDIX I: INFORMATION SHEET

Good morning/afternoon. My name is _____ I am a student from the University of Zambia. I would like to discuss with you, your experiences with SmartCare electronic medical records system. Before I can proceed, I am going to give you information regarding the purpose of the visit and to ask if you would like to participate in the interviews that I will be conducting.

PURPOSE OF THE VISIT:

The primary objective of this visit is to learn about the relevance of SmartCare in the delivery of antiretroviral therapy services. Findings from the interview will help provide the Ministry of Health (MOH) and its cooperating partners with information on the usefulness of SmartCare. This information will be also used by MOH to influence policy decision regarding the usefulness of this system in the delivery of ART services in Zambia. If you decide to participate in the study, we will ask you some questions about your experience in the usefulness of SmartCare. Each interview will take approximately 45 – 60 minutes.

DESCRIPTION OF THE STUDY:

Who will be in the study: I will be interviewing approximately 4 people in your facility. This will include Doctors, Nurses, Clinical Officers and Data Associates who are responsible for the day to day management of patient data.

Procedure: If you agree to participate in this interview, I will ask you questions about your experience using SmartCare in the provision of antiretroviral therapy services. This interview will last approximately 45 – 60 minutes.

Benefits & Risks: The information you give me will help the MOH and its cooperating partners to understand how health workers perceive the usefulness of SmartCare in the delivery antiretroviral therapy service. I would also like to state that there are no risks to participating in this interview. The benefit of your participation is that you will contribute useful information to MOH to help improve the SmartCare system.

Rights of Participants: Your participation is completely voluntary. You may ask me to stop the interview if you are uncomfortable, or you may also decline to answer any question(s) which you may not be comfortable with. Not participating in the interview will not result in any penalty.

Confidentiality: The interview is confidential, so your name and individual responses will not be shared with anyone or appear anywhere on the questionnaire or in the report. The information provided by all the participants in the study will be aggregated and shared with the MOH. At no time will your name be shared with anyone, nor will the information that you share be linked back to you.

Reimbursement: You will not receive any form of compensation for participating in this study. However, you will be refunded lunch allowance in the event that this interview is conducted during lunch time.

CONTACT FOR QUESTIONS:

1. Lovemore Mwanza, Principle Investigator, University of Zambia, School of Public Health, Lusaka. Tel: 0211-0977563528
2. The Chairperson, ERES Converge Ethics board, P/B 125, 33 Joseph Mwilwa Road, Rhodes Park, Lusaka. Tel: +260 955155633.

APPENDIX II: INFORMED CONSENT

You have been invited to participate in a 45-60 minute in- depth interview. This interview will gather your opinions on the usefulness of SmartCare in the delivery of antiretroviral therapy services within your health facility and will help us to better understand how to best improve the system so that we can better deliver health services for women and children receiving ART services.

Before you agree to join in this discussion, please review and consider the conditions listed below:

- Participation in this interview is completely voluntary.
- Any questions you have about this study will be answered before the interview begins.
- The interview will be audio-taped. The tapes will be used to help the leader to create a report.
- We ask you to avoid using your last name during the interview.
- The information you give will be confidential and your name will not be associated with your answers.
- You may choose not to answer questions that you do not want to answer.
- You may choose to leave at any time for any reason.
- The risks to you from participating in this research are minimal, and there are no direct benefits.
- You will receive ZMK 50,000 lunch allowance for your time.

Your signature below means that you understand the conditions stated above and agree to participate in this interview.

Respondent's Consent

Tick appropriately:

I confirm that I have, read/ or the study information has been read to me and I understood the information sheet for the above study. [Yes/No]

I have had the opportunity to consider the information; I asked questions and have had these answered satisfactorily. [Yes/No]

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason [Yes/No]

I agree to take part in a one on one interview. [Yes/No]

I agree to have the interview audio recorded [Yes/No]

I agree to take part in the study. [Yes/No]

_____	_____	_____
Name of Participant	Date	Signature *(mark)
_____	_____	_____
Name of Interviewer	Date	Signature

*In case the respondent is not able to sign this form, this attests that the consent form has been read and explained accurately by a member of the research staff, and that the respondent has fixed his/her thumbprint as consent.

Contact information: If you have any concerns about your participation in this interview or have any further questions about the project,

3. Lovemore Mwanza, Principle Investigator, University of Zambia, School of Public Health, Lusaka. Tel: 0211-0977563528
4. The Chairperson, ERES Converge Ethics board, P/B 125, 33 Joseph Mwilwa Road, Rhodes Park, Lusaka. Tel: +260 955155633

Study Team Member's Statement

I, the undersigned interviewer, have explained to the participant in a language he/she understands, and he/she understands the procedures to be followed in the study and the risks and benefits involved.

_____   _____

Signature of interviewer   Date

APPENDIX III: In –Depth Interview guides - Health Workers

INTRODUCTION

Good morning/afternoon. My name is _____ and I will be the interviewer for this session. I am from the University of Zambia, School of Public Health.

Today, we're going to discuss your opinions on the relevance of SmartCare in the delivery of ART Services. We hope that this information will help us to better understand how to improve the utilization of SmartCare in providing continuity of care for people on treatment from HIV infection.

I want to let you know that I'm not a medical professional, and I am not an expert on the subject matter we are going to discuss today. I am a trained interviewer. I want to hear your honest opinions about the topics we will discuss today. There is no right or wrong answer to the questions I'm going to ask. Please just relax and enjoy the discussion.

Please keep in mind that your participation in this discussion is completely voluntary. If for any reason you wish to leave the discussion, you may do so.

Kindly state whether it is okay to continue with the discussion.

Any questions before we start?

SECTION I. Use of SmartCare in providing continuity of care for patients

I would like to start talking about the use of SmartCare in providing continuity of care for patients.

Question SC 1: For how long have you been working with SmartCare? (within or outside this facility)

Question SC 2. What kind of patient information is collected by SmartCare?

     Probe:

- Do you think this information is important in the provision of ART services within the facility?
- How different is this information from that collected through paper registers?

Question **SC 3.** In your view, has SmartCare been useful in the provision of ongoing patient care in this facility?

Probe

- If so, how has this information helped with ongoing patient management?
- If not, what do you think should be done to ensure SmartCare provides necessary information to support patient management
-
- How different is the use of SmartCare in the provision of ongoing patient care as compared the use of paper based system?
-
- Has SmartCare helped ensure that all patients get all the needed services?
- In your opinion, do you think SmartCare has improved the delivery of ART services? If so, kindly explain how SmartCare has helped

SECTION II. Use of SmartCare to improve follow-up and retention in care

We are now going to talk about SmartCare as it relates to follow-up and retention of patients in care

Question **SC 5**: In your view, has SC improved follow- up of patients who are on treatment?

Probe:

- If so, how has SC helped improve follow- up of patients?

- If not, what should be done to ensure that SmartCare improves follow up of patients?
- How different is the use of SmartCare in the follow-up of patients as compared to the paper-based system?
- In your opinion are there other factors within the facility that have helped improve follow-up of patients?

Question SC 6: In your view what role has SmartCare played in monitoring retention (continuous engagement of patients in care) of patients in Care?

    Probe:

- In your view, do you think SmartCare has contributed to improving retention of patients in care?
- What other factors within the facility have contributed to this improved retention of patients?
- If not, what should be done to ensure that SmartCare plays a big role in ensuring patients are retained in care

SECTION III. Use of SmartCare in planning

We are now going to talk about the role of SmartCare in planning and reporting of HIV/AIDS services.

Question SC 7: In your opinion, to what extent does this facility utilise SmartCare data in planning HIV/AIDS services in this facility?

    Probe:

- In your view, has there been any change in the availability of information for planning and decision making which can be attributed to SmartCare within this facility?

- In your view, how is SmartCare data used in planning HIV/AIDS services in this facility?

Question SC 6. Is SmartCare data used to compile service uptake statistics to MOH and CDC?

Probe:

- Has this data been used to timely report these service statistics?

- In your view is this data been accurate?

- In your opinion, has this data meaningfully helped the facility understand how various program areas are performing in line with donor requirements?
- If so, how has SmartCare helped?

Closing

Thank you very much for coming and for sharing your ideas with us—we really appreciate your time.

APPENDIX IV

In –Depth Interview guides - Data Management Officers

INTRODUCTION

Good morning/afternoon. My name is _____ and I will be the interviewer for this session. I am from the University of Zambia, School of Public Health.

Today, we're going to discuss your opinions on the relevance of SmartCare in the delivery of ART Services. We hope that this information will help us to better understand how to improve the utilization of SmartCare in providing continuity of care for people on treatment from HIV infection.

I want to let you know that I'm not a medical professional, and I am not an expert on the subject matter we are going to discuss today. I am a trained interviewer. I want to hear your honest opinions about the topics we will discuss today. There is no right or wrong answer to the questions I'm going to ask. Please just relax and enjoy the discussion.

Please keep in mind that your participation in this discussion is completely voluntary. If for any reason you wish to leave the discussion, you may do so.

Kindly state whether it is okay to continue with the discussion.

Any questions before we start?

SECTION III. Use of SmartCare in planning

We are now going to talk about the role of SmartCare in planning and reporting of HIV/AIDS services.

Question SC 1: For how long have you been working with SmartCare? (within or outside this facility)

Question SC 2:   In your opinion, to what extent does this facility utilise SmartCare data in planning HIV/AIDS services in this facility?

Probe:

- In your view, has there been any change in the availability of information for planning and decision making which can be attributed to SmartCare within this facility?

- How is SmartCare data used in planning of HIV/AIDS services in this facility?

Question SC 3. Is SmartCare data used to compile service uptake statistics to MOH and CDC?

Probe:

- Has this data been used to timely report these service statistics?
- In your view is this data been accurate?
- In your opinion, has this data meaningfully helped the facility understand how various program areas are performing in line with donor requirements?
- If so, how has SmartCare helped?

Closing

Thank you very much for coming and for sharing your ideas with us—we really appreciate your time.