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An Assessment of Health Information Management Infrastructures for Communication in the Matabeleland South Region Border-line Health Institutions in Zimbabwe

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Background and Purpose: Developing countries face the challenge of providing quality healthcare to rapidly increasing populations without adequate infrastructure. Health information management infrastructures are important for the smooth flow of important health information required for efficient service delivery. They form the essential physical, logical and intellectual link that facilitates the provision of health care services for a country. This study was carried out to assess the health information management infrastructures for communication in the Matabeleland South Province of Zimbabwe, particularly focusing on border line health facilities that stretch from Southern boarders with Mozambique, South Africa and Botswana.
Methods: The researchers employed an exploratory survey research strategy through the use of observation and structured interviews. Elements from the eHealth Architecture Model (eHAM) developed by the International Organisation for Standardisation (ISO TR 14639) [1] as a roadmap tool for capacity based eHealth architecture were used as guiding principles.
Results: The researchers identified that there is a wide spread lack of health communication technology, particularly computers and related technology. Health staff capacity to process information and communication is low and information management infrastructures are dilapidated.
Conclusions: Health information management infrastructures for communication in the area studied are inadequate, and underserviced. This is coupled by a low quality in data and service delivery mainly due to lowly qualified staff and dilapidated information management infrastructure. Current researchers recommend the use of computers, related technology and improvement of communication connectivity solutions, staff capacity and servicing of information management infrastructure to improve health communication efficiency.

Keywords: Health information management infrastructures, Health communication infrastructures, Remote health centres

1 Introduction

Health information management infrastructures for communication are important in forming the essential physical and intellectual link between and within institutions and their related service providers and clients as they transact in health service delivery. These include but are not limited to:

(a) Computers hardware and software;
(b) Computer networks (Internet) / connectivity solutions
(c) Staff capacity (ICT Professionals and technical support)
(d) Emergency radio communication systems
(e) Telecommunication systems
(f) Mobile phone communication systems
(g) Data and records (information) management services

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The services requiring such infrastructures for communication in health institutions include: community-based services; primary care services; hospital/clinic/institutional services; public and health disease surveillance; emergency response; diagnostic services; healthcare supply chain; and health records and information management.

1.1 Focus and Area of the Study

This study focused on assessing Health information management infrastructures for communication in the Matabeleland South Province of Zimbabwe. The Province is divided into seven districts namely: Beitbridge, Bulilima, Mangwe, Gwanda, Matobo, Umzingwane and Insiza. Most of the health institutions in this area are in border line communities; remote and largely rural health centres are prevalent. They strive to serve larger communities because most of them are widely spaced.

Matabeleland South Province is situated in the South-Western part of Zimbabwe sharing boundaries with Botswana on the west, South Africa on the south, Masvingo Province on the South east, Midlands on the north and Matabeleland North on the North West. The Province is divided into seven districts namely: Beitbridge, Bulilima, Mangwe, Gwanda, Matobo, Umzingwane and Insiza. Of these urban councils are in the main towns: Beitbridge, Gwanda and Plumtree while the other 5 are rural district councils (See **Fig. 1**). The Province covers an area of 54 172km^2 with a population of 679 571 at an annual growth rate of 1, 1% based on the results of the Census of 2012 [2].

1.2 Theoretical Underpinning

From a theoretical concept point, this study was guided by the eHealth architecture model presented by ISO TR 14639 (A roadmap for capacity based eHealth architecture). The eHealth Architecture Model (eHAM) shown in **Fig. 1** provides a model structure for an effective health care service delivery system. It outlines the elements and structure of a model ideal healthcare service. Key to this study are elements on health information infrastructures for communication which are at the base as ICTs Foundation Infrastructure. These are: local access to equipment and facilities; electronic communications infrastructure; ICT processing and storage services; and ICT professional and technical support. Interestingly the model indicates that these should be bound by standards, guidelines and methods within the health facility as well as its policy sphere. It further stipulates that the elements need to be constantly financed and maintained.

1.3 Health Information and Communication Infrastructures

Most health care specialists, researchers and planners for health facilities [3]-[6] report in literature that information exchange is crucial to the delivery of care on all levels of the health care delivery system the patient, the care team, the health care organization, and the encompassing political-economic environment [3]. For instance, one researcher [4] indicates that, to diagnose and treat individual patients effectively, individual care providers and care teams must have access to at least three major types of clinical information—the patient's health record, the rapidly changing medical-evidence base, and provider orders guiding the process of patient care.

In a related paper [4] discusses from findings of his study that to integrate these critical information streams, there is a need for health staff capacity building through training/education, decision-support, information-management, and communications tools. Further points are given [4] that at the organisational level, hospitals and clinics “need to have free flowing” clinical, financial, and administrative data/information to measure, assess, control, and improve the quality and productivity of their operations. Similarly [5] adds that at the socio-environmental level, state funding and regulatory agencies and research institutions need information on the health status of populations and the quality and productivity/performance of care providers and organisations to execute regulatory oversight, protect and advance the public health (surveillance/monitoring), evaluate new forms of care, accelerate research, and disseminate new medical knowledge/evidence. As such health communication infrastructures for information management are the backbone of health care service delivery.

However, studies [6] have shown that most health care-related information/communications technologies investments to date have been concentrated on the administrative side of the business, rather

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than on clinical care. On the subject of health communication infrastructure, there are reports [6] that there has been a prolonged underinvestment and little overall progress toward meeting the information needs of patients, providers, hospitals, clinics, and the broad regulatory, financial, and research environment in which they operate. Reporting specifically from an empirical study in the US [7] significantly indicates that a number of localised efforts have been made to develop and implement electronic patient records and other clinical applications of information/communications technologies since the 1960s, but little progress has been made in closing the gap.

Many factors have contributed to the information/ communications technology deficit. One scholar [7] reports the following five reasons:

(a) the atomistic structure of the industry (the prevalence of relatively undercapitalized small businesses/provider groups);
(b) payment/reimbursement regimes and the lack of transparency in the market for health care services, both of which have discouraged private-sector investment in information/communications systems;
(c) historical weaknesses in the managerial culture for health care;
(d) cultural and organizational barriers related to the hierarchical nature and rigid division of labor in health professions; and
(e) the relative technical/functional immaturity (until very recently) of available commercial clinical information/communications systems.

However, in this paper, researchers propose that a seemingly overlooked reason is a lack of information by national health planners about the current state and capacities of health institutions in terms of health information management infrastructures for communication. We argue that the gravity of the situation can only be understood if empirical data is amassed and clearly presented to indicate all aspects of the nature of the deficit in particular places rather than a national generalisation. As such, we conduct an exploratory study reported in this paper with the notion to take it up further.

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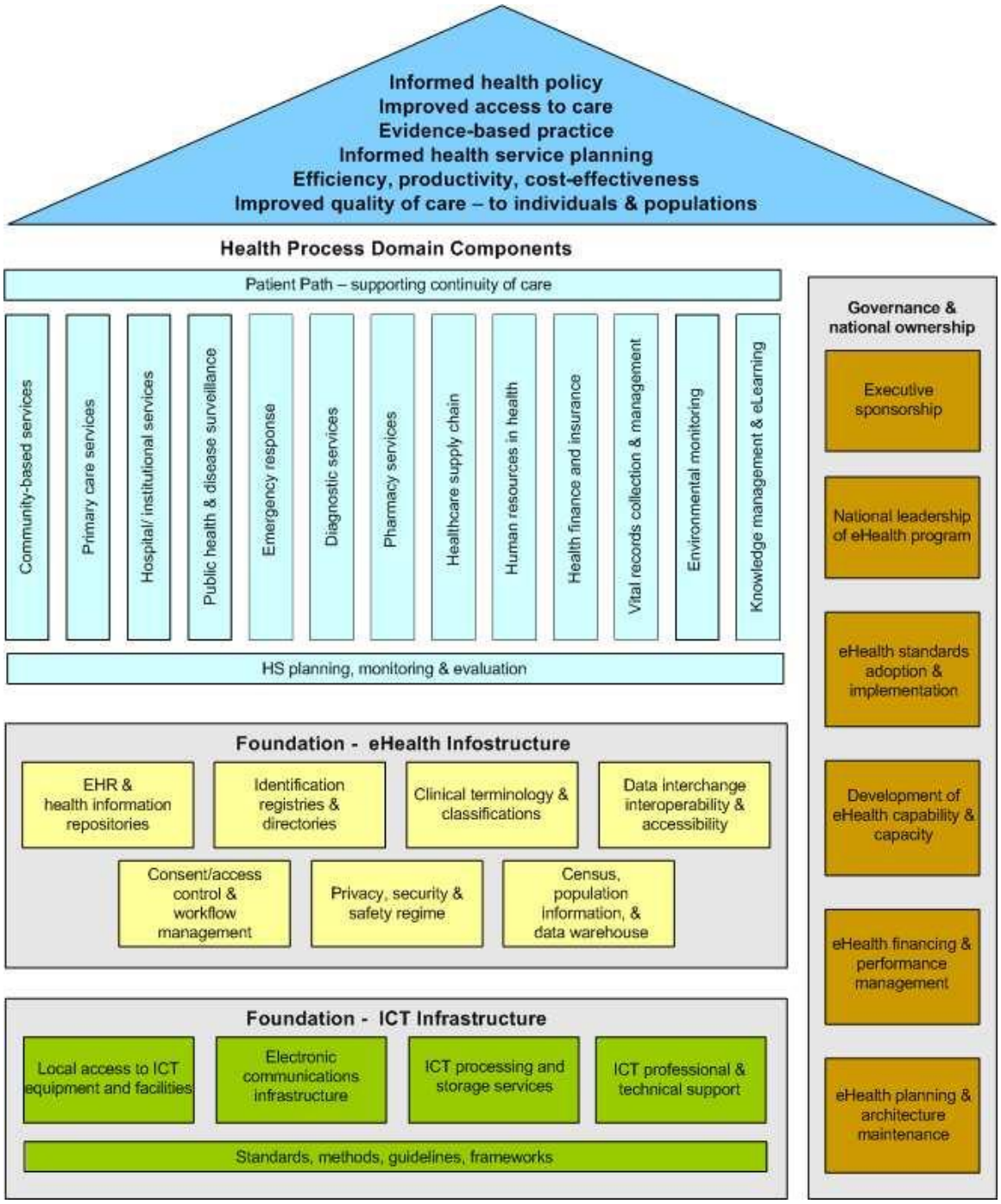

Fig. 1. eHealth Architecture Model (eHAM) according to ISO TR 14639 - Capacity Based eHealth Architecture Roadmap - Part 1

2 Materials and methods

Research Design

This study was a survey research of health institutions in the seven districts of Matabeleland South, most of which are in the border line areas.

Research Instruments and Techniques

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Observation and structured interviews were used to collect data from health institutions about the status of their health information management infrastructure for communication.

Study Population and Sampling

The population of the study comprised of all health centres and clinics in the Matabeleland South Province of Zimbabwe. These are structured according to districts as shown (**Table 1**).

Table 1. Study population: health centres and clinics in Matabeleland South Province. Data Source: Multiple Indicator Monitoring Survey [2]

District	Government	Council	Mission	Total
Beitbridge	1	6*	2	**9**
Gwanda	2	6*	2	**10**
Bulilima	2	5	0	**7**
Mangwe	1	5	0	**6**
Umzingwane	1	3	1	**5**
Matobo	1	3	0	**4**
Insiza	1	3	1	**5**
Total	**9**	**31**	**6**	**46**

A census survey of these health facilities was made and only three health facilities (in Beitbridge and Gwanda as indicated by a *) could not be visited as they were under refurbishment.

3 Results

3.1 Computer and Related Technology

The general overview of the results is that the province has an inadequate health communication infrastructure. Radio systems though installed are all not working. The researchers identified that there is a wide spread lack of communication infrastructure, particularly computers which could be used for electronic health information processing thus quickening decisions made on health information.

The use of computers and connectivity solutions which would improve communication efficiency through the use of electronic e-mail and online communication systems is very low with only two health institutions of the 41 visited recording the presence of computers. In these two cases, health personnel report that transmission technologies have been so unreliable that they have resorted to transporting data on memory sticks which costs heavily on their work efficiency. At one of the two health facilities with computers, they further report of intermittent interconnectivity affected constantly by lack of technology enhancers such as outers, connection hubs and power surge adapters. This has meant insufficient power and connectivity outlets meaning that users cannot connect and power up 3 to 4 computers simultaneously.

Related to this is a widespread poor network coverage by local communication firms such as Econet®, NetOne®, and Telecel®. This has meant that these boarder line health facilities rely on foreign networks filtering in from neighboring countries such as Orange® and MTN® from South Africa. Health workers, nurses and doctors indicate that these are however, unreliable and expensive and buying air time would require them to cross the border to South Africa or Botswana at are sporadic occasions. Of the 41 health facilities studied, a response rate was used to come up with the frequency of the availability of usable communication systems at health institutions (**Fig. 2**).

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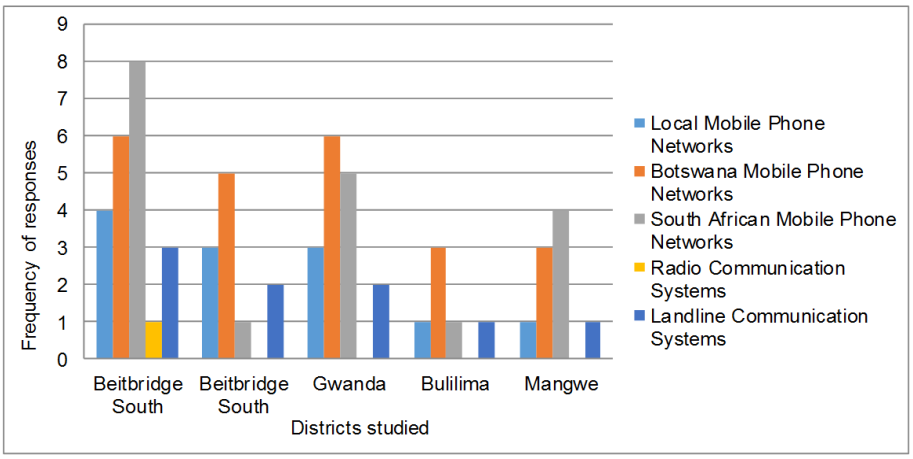

Fig. 2. Prevalence of communication infrastructure: available connectivity solutions

3.2 Radio Communication Systems

Of the 41 health facilities visited, only 1 government clinic in Beitbridge had a working radio system for emergency services whilst the rest (approx. 97.5%) were not working. This has also impacted on communication system of the health facilities. One respondent importantly indicated the predicament in the following words:

"it is difficult, sometimes we face critical emergencies, where we need to call nearby Health Technicians, ambulance services, or send urgent messages,...we have community health workers who were allocated with radios, but the radio systems have not been working for long now...we barely communicate"

3.3 Physical Transport Communication Problems

Apart from a poor logical link through Internet, radio and wireless communication, poor road networks also delay the physical link through road transport. Bridges are damaged and in rainfall season this they become practically impossible to cross, thus sealing off physical communication links with some remote places where urgent health issues may need to be addressed.

3.4 Computer Literacy Skills by Health Information Officers

In all the 41 visits made, it was only at two health facilities that the researchers identified computer systems for health services in client management and medical record-keeping. This was at a Mission and a Government Hospital. At these stations, the researchers carried out interviews with Health Information Officers to gather information about their computer literacy skills. The data indicates low staff capacity in terms of skills and knowledge to utilise computer resources for health information processing and communication (See **Table 2**).

3.5 Quality of Data and Service Delivery

Data quality and service delivery were also investigated thorough observation and interviews. From an observation point, physical files that feed into institutional health information are not properly maintained. A simple walkthrough observation in all rural health centres recorded overcrowding and accumulation of patient records, case notes and related medical records in a haphazard manner. The following elements were investigated and recorded as shown in

Table 3.

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Table 2. Staff capacity in utilising health communication technologies and computers

Item	Response
Health Information Management Training, Education or Relevant Experiential Appreciation	Did not attend any training Does not have any Health informatics or ICT qualification
Use of Office package (Word processing; Spread sheet Processing; Presentation Processing; Databases and E-mail)	Has working knowledge for word processing and spreadsheet only
Knowledge and use of any health informatics software	No knowledge
Knowledge and use of any health informatics hardware gadgets	No knowledge

Table 3. Records, data and information services at the health institutions

Elements Observed and investigated through interviews	Number of institutions		Researchers' Comments
	YES	NO	
Presence of a clear records classification and coding system	**12**	**29**	A generally unclear maintenance systems (not guided by any manual or classification system) was observed. This has a high implication of retrieval and usability of data and information stored in records which feeds directly into the health information system.
Utilisation of the stipulated Register and Tally System [8]	**39**	**2**	There is a notable high utilisation of the tally system for patient registration and tracking as well as disease surveillance which is commendable. However, the registers in which the data is recorded maintained within crumbling registry storage facilities, sometimes irretrievable. In all the 41 institutions visited there was no use of electronic registry systems for patient registration, tracking and disease surveillance which entails that data analysis is tedious.
Presence of fully utilised file cabinet systems	**5**	**36**	File cabinet systems for paper records are largely inadequate and prioritised for drug storage rather than medical and health records. This has resulted in paper files and records being strewn everywhere in a haphazard fashion such that the risk of information loss is real.
Effective retrieval time (Health information officers were asked to retrieve specific data of 2005. The standard used was 5 minutes)	**4**	**37**	A generally ineffective retrieval time ratio was noted. This is significantly caused by an unmonitored accumulation of paper files and documents. It also spells out the need for automation though this is a subject of contestation considering the background of ailing record-keeping systems.

4 Discussion

The way forward from the indicated results appears to be a comprehensive health information and communication infrastructure analysis in all health institutions. Following the eHAM model, this will generate specific data that can be used by health planners and policy makers as they budget to cater for the glaring deficit in computers, networks and related communication infrastructure critical for transmitting health information. Importantly, the current researchers recommend a follow up on this

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research and the employment of the Six Sigma method for process improvement to work together with the e-HAM model as a theoretical framework.

This was an exploratory survey, and its results on the health information management infrastructures for communication in the Matabeleland South Province of Zimbabwe indicate gaps, under servicing and poor coverage. The researchers expect that a more detailed investigation will decipher more intricate results. From the current results, the backbone of health information infrastructures for communication appear to be shaken by inadequate technologies compounded by low staff capacity and subsequent poor records, data and information service.

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