

Implementation Challenges Of Health Management Information Systems In Uganda: A Review

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Abstract—Uganda has shown success in the use of Health Management Information System (HMIS) in the areas of disease surveillance reporting and monitoring. The success however, is relative and has critical challenges confronting it. There is no gainsaying that a successfully implemented HMIS in the entire public healthcare has immense benefits: such as cost reduction, structured and integrated information processing and storage, enhanced decision making and research, etc. Having regard to the aforementioned benefits and more, this study has adopted a systematic review and desk approach to identify various challenges that had hindered the full implementation of HMIS in Uganda. Also presented are the potential solutions that can help overcome the attendant challenges. It is submitted that the adoption of these solutions would to a large extent enable and improve the cost-effective implementation of HMIS in various health facilities in Uganda especially the public health facilities.

Keywords—Health Management Information System, HMIS, Health Systems, Health Information Technology, Informatics

I. INTRODUCTION

Information collection, processing, management, and dissemination have tremendously led to improvements in all facets of life and living. The study and practice of creating, manipulating, storing and sharing information gave birth to informatics. In a broader view informatics is a field that studies the human interaction with information by building boundaries between organizations, technologies and systems. Informatics has a wider coverage in terms of domain because it provides a link between disciplines with their own methodologies and perspectives, bringing together a common scientific model, common engineering methods and a general spur from technological development.

Informatics cuts across disciplines which includes but not limited to healthcare, production, marketing, finance, legal, administration, to mention a few. However, this paper does not address the entire domain of informatics applied to the various domains listed above. This paper dwells on the challenges of Health management information system, an aspect of health informatics (HI).

HI is an interdisciplinary study of the design, development, adoption and application of Information Technology (IT)-based innovations in healthcare services delivery, management and planning [1]. HI has tremendously improved healthcare management, clinical decision making and planning. Health Systems have been developed and deployed in several areas for patient's management. HI has been applied to the areas of nursing, clinical medicine, dentistry, pharmacy, public health, occupational therapy, physical therapy, biomedical research, and alternative medicine [2] and has greatly enhanced the reporting of disease outbreaks, management of diseases, patient care and decision making.

Ngafeeson in [3] identified six different transitions/areas in the development of a health management information system. These areas are:

- Paper-based System to Computer-based System;
- Local health system to Global Health Information System (GHIS);
- Healthcare Professional-centered System to Patient-centered System;
- Use of evidence-based Patient care report for research;
- Electronic health systems developed from technical based to strategic information management; and
- Numeric data to Complex data forms.

This classification seemed to have boosted the development of several frameworks witnessed in the developing field of HMIS at different levels of healthcare for patient care, decision making and research.

A. Health Management Information System (HMIS)

HMIS is one of the essential components for strengthening any healthcare system whether public or private regardless of the climate. Though a typical HMIS may not be fully computerized, it is often designed to support planning, management, and decision making in health facilities and organizations through adequate data collection and analysis. HMIS has had a tortuous evolutionary cycle having developed from a manual arrangement organized around a conventional paper-based system to a complex fully electronic system integrating high-end databases for storage of evidence-based patient records. The major idea underlying HMIS is to have an automated system for patient information management, decision support and planning of health programs, etc. that would enhance effective and efficient healthcare delivery. According to World Health Organization: design and development of a HMIS must adhere to certain fundamental steps which include [4]:

- Review of the existing system
- Definition of the data needs of relevant units within the health system
- Determination of the most appropriate and effective data flow
- Designing of the data collection and reporting tools
- Development of the procedures and mechanisms for data processing
- Development and implementation of a training programme for data providers and data users
- Pre-test, and if necessary, redesign the system for data collection, data flow, data processing and data utilization
- Monitoring and evaluation of the deployed system
- Development of effective data dissemination and feedback mechanisms
- Enhancement of the HMIS

As simple as the steps defined sounds, it has been a difficult task implementing HMIS in developing countries owing to a myriad of factors ranging from poor socio-economic conditions, funding, governance, corruption, poor legal framework [5] among others. These challenges constitute the hallmark of this study.

B. Uganda Health System

Uganda is an east African country with an estimated population of 34.6 million people [6]. According to [6], Uganda runs a referral healthcare system which includes Health Centre at the lowest levels. Health Sub-Districts and District health Systems exist at District levels and National/Regional

Health System at Regional and National levels (Highest level) respectively [7]. The following findings reflect how the Ugandan health system is organized.

- Health Centres(HCs) III, II, I: These levels involve preventive and curative care with laboratory service diagnosis. They are the first level of interaction between patients and medical service providers and are basically outpatient-based;
- Health Sub-District System (HSD): At this level, planning, organization, budgeting and management of health facilities below the district are carried out. Cases that cannot be managed at the health centres are referred to the sub-district for further diagnosis and management.;
- District Health System (DHS): This is seen at the districts and its main function is to manage the public general hospitals and health centres within the districts. It also accepts referrals from sub-district facilities for further management and reporting to the national hospitals via the regions. Their services include: monitoring, supervision of health service activities within the district, coordination and management of public/private partnership at district level;
- National, Regional and General Hospitals: This level may be regarded as the highest level of care. It includes: Ministry of health saddled with the responsibility of policy formulation, Regional health systems and National General Hospitals. Training services, Policy formulation and monitoring, health record management, decision making, monitoring and supervision of all health activities, Specialist services, and consultancy services are some of the activities associated with this level.

C. HMIS in Uganda

Health Information Management (HIM) has progressively developed in Uganda from completely paper-based system to electronic or computer-based system. The formation of the Health Review Commission by the Ugandan government enhanced policy making and this accounted for the health sector strategic plans developed to span 3 years, 5 years and 10 years respectively. "SUSTAIN Uganda", a collaborative project by USAID and Ugandan Government for strengthening HIM from the lower level to the highest level in the area of reporting has shown tremendous improvement in timeliness and completeness of reports. This is evidenced in disease outbreak (HIV/AIDS and Tuberculosis, malaria) which has improved decision making and planning [8,9]. Ugandan Government has worked tremendously to ensure management of health records. This is seen in the deployment of "OpenMRS" at the district, and sub district levels and the adoption of District Health Information System 2 (DHIS2) as the National HMIS. This feat has improved timeliness, completeness and generation of list/reports that aids in clinical decision making, care and treatment in Uganda. It is submitted that timely reporting through the DHIS 2 improved 10% in 2014 with a dramatic reduction in report

inconsistency of about 39% in 2015 [9]. Table 1 reflects a report from the DHIS2 showing how disease outbreaks were monitored and managed. From the Table, there was improvement in the completeness of reporting based on the proportion of health facilities that reported during week 2 in 2017 compared to

same week in year 2016. There was 85% reflecting a 25.1% increase in reporting rate in comparison to the same week in 2016. Only 18% (21/116) districts had 100% of their health facilities reporting and 70% (81/116) of the districts achieved the national target of 80% [10].

Table 1: Summary of priority diseases and event in week 2 of 2017[Source: Weekly Epidemiology Bulletin (9th – 15th January 2017)]

Indicator	Week 2 2016	Week 1 2017	Week 2 2017
% of Districts reporting (n=116)	100	100	100
% of Health facilities reporting	73	82.6	85.0
Priority diseases	Cases (deaths)	Cases (deaths)	Cases (deaths)
AFP	4(0)	0(0)	1(0)
Animal bites	208(1)	287(0)	291(0)
Cholera	36(2)	2(0)	6(0)
Dysentery	909(1)	886(1)	871(0)
Guinea Worm	0(0)	0(0)	0(0)
Malaria	206777(43)	181750(28)	185423(47)
Measles	72(0)	50(0)	28(0)
Bacterial Meningitis	4(1)	4(1)	4(0)
NNT	0(0)	0(0)	3(1)
Plague	0(0)	0(0)	2(0)
Typhoid	1679(1)	1850(1)	1861(3)
MDR TB	13(0)	4(0)	12(0)
Human Influenza samples (lab confirmed/Samples tested)	-	-	-

II. MATERIALS AND METHODS

The Materials used in this study were secondary materials from the internet; it includes published articles, reports, from websites and databases. Search engines (Google, Bing, and yahoo) were used and together with keywords (health information systems, Challenges of Health Information System, HMIS in Uganda, Implementation of HMIS, Adoption of HMIS in East Africa) to identify relevant materials for this research. A total of 150 materials were discovered and a systematic review was done to identify most relevant materials using “step by step” procedures of title study, abstract study and full article review.

III. RESULTS

Uganda has gone through different levels of HMIS Implementation with varied level of successes in OpenMRS and District Health Information System version 2 (DHIS2) with some prevailing challenges which have hindered full implementation. These challenges are presented in the sub-sections below.

A. Complex Health System Structure

Ugandan Health system structure can be summarized into four different levels of HCs, HSDs, DHS, Regional and National system [7] as discussed above in section. Most levels are paper-based with partial electronic HMIS implementation. With different operations and technological development in the nation, it will be challenging to get a uniform HMIS based at all levels.

B. Funding

Funding is a necessity in the development of any sector, health inclusive. Funding of health projects has been done through collaboration effort between the government and other stakeholders with the Government contributing about 14.9%, partners 3.9%, households 9.7% and Non-Governmental Organizations (NGO) 0.9% [7]. In the report of the Ugandan Ministry of Health in 2015 the funding ratio was: households (37%), donors (45%) and government (15%) [11]. Projects sponsored by donor partners and NGO had always suffered setbacks if the funds dries up [12], and flow of funds depends on the viability of the organization hence, the life of any project funded by them. There needs to be more government participation as to ensure continuity and sustenance.

C. Inadequate Information and Communication Technology facilities

Relevant components of an active modern HMIS are Internet, Software and Computer hardware facilities. Internet services in Uganda is very poor and costly as compared to the cost of same in other parts of Africa such as Nigeria, Ghana, South Africa, etc. hence connectivity challenges abound. Access to state-of-the art hardware is highly limited due to insufficient funding and poor planning. Lack of access to these facilities has a multiplicity effect and limits health information dissemination, information sharing among experts, decision making, knowledge gaps, etc. that hinder effective and efficient patient care [13].

The huge information base generated in routine clinical care can enhance decision making in several respects especially on issues bordering on referrals, therapeutics, disease control forecasts, and infrastructure and capacity planning. In the absence of such computing facilities, the usefulness of such health information base becomes a paradox thus impacting negatively on decision making, patient care and management.

D. Knowledge Gap

Uganda has one of the most skewed social system in Eastern Africa and rates below neighboring countries like Tanzania and Kenya. The difference in the rate of acquisition of information among population of a given social system is widened by the differences in socioeconomic status and level of literacy of the Ugandan people. People with higher level of literacy and social status has been proven to acquire relevant information through media and other sources hence, increasing their knowledge and improving their wellbeing. The level acceptance depends on the level of information acquired which translates to knowledge and skill. A good proportion of the local population has little or no knowledge and skill of HMIS among professionals of medicine [14, 15]. Thus, this has made it difficult for acceptance as the perception of usefulness varies among the people who are to use the system. Relevant skills needed for implementation falls short hence, implementation is delayed in most districts of the country [15].

E. Lack of Trained Professionals

Training is often an organized activity that imparts knowledge (highly processed information) on the trainee so as to improve his performance/skill or to assist him in attaining the required skill set for a given profession. The success of any ICT project implementation to a large extent lies on the technical knowhow of the implementers. In developing countries such as Uganda, there are both shortages of trained health personnel and skilled ICT experts due to migration for search of greener pastures outside Uganda. Health care in Africa is continuously plagued with low ratio of doctors to patients in such an alarming order of 10:100,000. To worsen the matter, majority of the doctors are averse to the use of modern Information Technologies as powerful tools for enhancing their services [16], Uganda is not an exception. Thus, Processing of large data generated from the districts across Uganda even at the highest level of the health system has been a mirage [17].

F. Incompatibility Problems

Different levels of the healthcare system often require different tools some of which are available as hardware or software. Majority of these products are strongly attached to the level or organization using it. It must also be pointed that majority of the health management software and hardware products are developed by different vendors and in most cases there is no uniform standard to which these

manufacturers or vendors are accustomed to[8,]. The lack of standards for so many software and hardware tools is a recipe for incompatibility among myriads of devices applicable to health information technology.

G. System Interoperability

Interoperability is another arm of compatibility and portability. Development platforms, standards, incompatible syntax, and complex health domain are key determinants of interoperability among Information systems or devices [13]. With the adoption of OpenMRS, and DHIS 2 and other electronic health systems in different facilities and levels in Uganda, the issue of interoperability can at best be said to have worsened.

H. Resistance to Change

Ugandan health industry is made up of professionals like every other industry and they rely on vital data for patient care and decision making. Majority of healthcare officers including health records personnel appear to be at ease with paper records and would resist change from traditional paper-based system to electronic health system. Sometimes the negative disposition of such persons may be justified on critically examining the following factors:

- limited knowledge IT among personnel
- limited administrative support for IT
- Funding
- Privacy related issues
- Interoperability of different acquired systems.

I. User Engagement

During the design and development of Information system, the users of such systems are supposed to be carried along all through especially during the requirements engineering and system analysis phases. This often helps to avoid situations where the end product will drastically depart from the earlier predefined problems which the system is expected to solve. Engaging the very users (doctors, nurses, health record officers, etc.) is sine qua non to the success of such projects as their involvement makes them part and parcel of the problem-solving process and a sense of belonging and hence increases the acceptance rate of such systems [18]. Involving users has been a challenge in developing countries because of its demanding pre/post-development requirements.

IV. DISCUSSION

HMIS is no doubt a means to an end in the healthcare delivery system of any nation irrespective of the status of the country. This has been expressed to an extent by Ugandan Government, Donor organizations and the people in the area of management of disease outbreaks. Irrespective of the successes highlighted, there are prevalent challenges that have hindered adoption and implementation of a single system platform.

The identified challenges include: Complex health system structure, inadequate funding, Inadequate ICT

Facilities, Training, Knowledge gap, Incompatibility and Interoperability problems, user engagement problems, among others. It is our view that regardless of the complexity of these problems, a functional HMIS could be attained if the Government has a political will towards this project. Governments political will reflect in its commitment, funding, and effort to engage experts and collaborate actively with local and foreign institutions especially those institutions that are experienced in the development and implementation of relevant technologies. The Ugandan Government can make and execute health and technology-oriented policies as well as legislations that will create and sustain the enabling environment for public/private partnerships and collaborations needed to tackle attendant problems of funding, knowledge transfer, training, education, brain drain, etc.

The Government having done its part, the implementers of such a system also have a major role to play. In every case, the implementation of such a system must be preceded by a thorough and detailed analysis and documentation of the existing system(s), so as to expose all the vital problems. Since Uganda operates different healthcare levels, it follows that there should be critical analysis at such levels having regard to human capacity, infrastructural requirements, expected population of healthcare seekers at such levels, available technologies, among others.

V. CONCLUSION AND RECOMMENDATION

In this study, we have reviewed and identified the vital challenges that confront the successful implementation of HMIS across all levels of care in Uganda. We also highlighted pertinent directions that could be adopted towards resolving such challenges. In furtherance of this study, we recommend an in-depth evaluative study on the infrastructure at all levels of the healthcare delivery in Uganda as this would help place the policy makers and implementers in designing the appropriate policies that would support the realization of a National HMIS in Uganda.

VI. LIMITATION

This paper is limited to secondary materials downloaded from the relevant organizational websites, health databases and relevant articles from journals and the period of 13 years (2004 to 2017).

References:

[1] AHIMA (2016): Defining the Basics of Health Informatics for HIM Professionals,

Retrieved on 18 December 2016 from http://library.ahima.org/doc?oid=107443#.V9_2hc2Mu5l

[2] Mettler, T & Raptis, D A (2012), "What constitutes the field of health information systems? Fostering a systematic framework and research

agenda". Journal of Health Informatics. Vol. 18, No. 12

[3] Ngafeeson M. (2014). health Information Systems: Opportunities and Challenges. In Encyclopedia of Information Science and Technology (3rd ed., pp. 258-267). IGI-Globa. Retrieved January 30, 2017, from http://commons.nmu.edu/facwork_bookchapters/14

[4] Orphelia Mendoza, Chong YC (2004). Developing Health Management Information Systems: A Practical Guide for Developing Countries. Geneva: World Health Organisation. Retrieved May 2017, from http://www.wpro.who.int/health_services/documents/developing_health_management_information_systems.pdf

[5] Nwankwo W N(2017) "Harnessing E-healthcare Technologies for Equitable Healthcare Delivery in Nigeria: The Way Forward". International Journal of Science and Research. Volume 6, Issue 3, pp2-4

[6] Uganda Bureau of Statistics. (2014). National Population and Housing Census 2014. Retrieved June 12, 2017, from <http://www.ubos.org/onlinefiles/uploads/ubos/NPHC/NPHC%202014%20PROVISIONAL%20RESULTS%20REPORT.pdf>

[7] Ministry of Health. (2010). Health Sector Strategic Plan Iii. Kampala. Retrieved June 17, 2017, from http://www.health.go.ug/docs/HSSP_III_2010.pdf

[8] Howell K., Wakabi T., Stojanovic O. (2012). HMIS success Story 712: Strengthening Health Management Information Systems at Uganda's Public Hospitals: SUSTAIN Project's Experience. Retrieved May 20, 2017, from <http://sustainuganda.org/sites/sustainuganda.org/files/HMIS%20success%20story%20712.pdf>

[9] Alunguru E., Mbonye M. M., Tumwesigye P., Natukunda J and Tugume G. T. (2016). Strengthening Uganda's Systems For Treating Aids Nationally: Strengthening Uganda's Health Management Information Systems At Selected Public Healthcare Facilities. Sustain Tech. Retrieved February 10, 2017, from http://sustainuganda.org/sites/sustainuganda.org/files/SUSTAINTechBrief_HMIS_FINAL.pdf

[10] Ministry of Health. (2017). Highlights of the week: Weekly Epidemiological Bulletin. Epidemiological Surveillance Division. Kampala: Ministry of Health Uganda. Retrieved July 2017, from <http://reliefweb.int/sites/reliefweb.int/files/resources/Week%202%202017.pdf>

[11] Ministry of Health. (2015). Health Sector Development Plan 2015/16 - 2019/20. Retrieved June 17, 2017, from health.go.ug/download/file/fid/83

[12] Mandelli A. and Giusti D. (2005). Utilising The Health Management Information System (Hmis) For Monitoring Performance And Planning: Uganda Catholic Medical Bureau Experience. Kampala:

Ugandan Catholic Medical Bureau. Retrieved February 2, 2017, from <http://www.ucmb.co.ug/files/UCMBdocs/Reports/ARTICLES/Use%20of%20HMIS%20-%20UCMB%20experience.pdf>

[13] Iroju O., Gambo I., Ikono R., and Olaleke J (2013). Interoperability in Nigeria healthcare System: The Ways Forward. I.J. Information Engineering and Electronic Business Retrieved March 18, 2017 from <http://www.mecs-press.org/ijieeb/ijieeb-v5-n4/IJIEEB-V5-N4-3.pdf>

[14] Isabaliya S., Mayoka G.K., Rwashana A.S., and Mbarika V.W. (2011). Factors Affecting Adoption, Implementation and Sustainability of Telemedicine Information Systems in Uganda. Journal of Health Informatics in Developing Countries, 299 - 316. Retrieved March 18, 2017, from <http://www.jhidc.org/index.php/jhidc/article/view/72>

[15] Kiberu V.M., Matovu J.K.B., Makumbi F., Kyoziira C., Mukooyo E., and Wanyenze R. K. (2014). Strengthening district-based health reporting through the district health management information software system: the Ugandan experience. BMC medical Informatics and Decision making, 1--9. Retrieved June 12, 2017, from http://www.musphcdc.ac.ug/files/pdf/Strengthening_district_based_health_reporting_through_DHIS_Uganda.pdf

[16] Marfu W.A and Winter A. (2014). When Information Technology meets Healthcare in West Africa: A literature review. Journal of Health Informatics in Africa, 2(2), 29 - 35. Retrieved February 10, 2017, from <https://jhia-online.org/index.php/jhia/article/view/104>

[17] Kintu P., Nayunja M., Nzabanita A., Marjoola R. (2004). Development of HMIS in Least Developed Country Settings: The Case of Uganda. Retrieved May 17, 2017, from [ahima.org: www.library.ahima.org/doc?oid=58653](http://www.library.ahima.org/doc?oid=58653)

[18] Jawhari B., Ludwick D., Keenan L., Zakus D., and Hayward R. (2016). Benefits and challenges of EMR implementations in low resource settings: A state-of-the-art review. BMC Medical Informatics and Decision Making, 16(116). Retrieved March 30, 2017, from <https://bmcmmedinformdecismak.biomedcentral.com/articles/10.1186/s12911-016-0354-8>