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Monitoring diseases across borders: African regional integrative information systems

Tungamirirai Simbini[a], Rosemary Foster[b], Paul Nesara[c], Carola Hullin Lucay Cossio[d]

[a] *Health Informatics Specialist, Center for the Evaluation of Public Health Interventions- OASIS, Department of Community Medicine, College of Health Sciences, University of Zimbabwe, Harare, Zimbabwe*
[b] *Senior Specialist Scientist: e-Health Research and Innovation Platform, Medical Research Council (MRC), South Africa*
[c] *Data Manager, Southern African Development Community (SADC)*
[d] *Senior Health Informatics Advisor, Victorian Department of Health, Australia & Co-Founder of eHealth Systems,Chile*

Abstract

In African countries, communicable diseases remain the chief cause of a heavy disease burden. Regional economic, political and social integration bring new challenges in the management of these diseases, many of which are treatable. Information Communication Technology (ICT) applied through electronic health systems has the potential to strengthen healthcare service delivery and disease surveillance within these countries. This paper discusses the importance of well-defined e-Health strategies within countries and, in addition, proposes that countries within regions collaborate in planning for health information exchange across borders. It is suggested that particular attention be paid to technical and data standards enabling interoperability, and also to issues of security, patient privacy and governance.

Keywords:

Health information systems, Electronic health records, Standards, Medical records.

Introduction

In many regions across the globe the 21st Century is witnessing an increase of economic, political, and social integration. Some refer to it as the Globalization of this century. In Africa, the regional organizations formed in response to this are guided by political and economic treaties and policies. These organizations include the Southern African Development Community (SADC) and the Common Market of East and Southern Africa (COMESA). A consequence of this economic and political integration is increased cross-border movement of people within the regions of the Member States (MS) included in these treaties. Besides sharing common social and cultural values, the MS also share common health challenges threatening the livelihood of the region's population. In most regions of Sub-Saharan Africa communicable diseases especially Human Immuno Deficiency Virus (HIV) and the resultant Acquired Immuno Deficiency Syndrome (AIDS), Tuberculosis (TB) and Malaria pose the greatest threat to the well-being of the population.

The increase of population movement across MS means changes in the dynamics of communicable diseases. A typical recent scenario was the deadly outbreak of cholera that started in Zimbabwe in the month of August 2008 [1]. By the end of 2008, the disease had been reported in four neighbouring countries: Botswana, South Africa, Mozambique and Zambia. Cases were also reported as far afield as Katanga, the southernmost province of the Democratic Republic of Congo [2]. This is an illustration of a classical case that clearly highlights the need for regional health information exchange of medical and health data between neighbouring countries or regional MS. Many neighbouring countries and regional MS collectively appreciate the scourge of communicable diseases and have pledged to actively participate in the control of these diseases through declarations and protocols at national, regional, continental and international levels. Fundamental to the control of these diseases has been the pledge to share health information for the common goal of controlling these diseases across MS. Real examples of these in Africa include:

- The Abuja Call (May 2006) for Accelerated Action Towards Universal Access to HIV and AIDS, Tuberculosis and Malaria Services in Africa in which African Union MS pledged, among other issues, to ***strengthen data management and surveillance systems*** of each of these diseases.
- SADC Protocol on Health in which MS pledged, among other issues, to ***standardize regional disease surveillance systems*** to facilitate collation of information which has a regional impact.

As cross-border movement increases and the ensuing spread of diseases presents more of a threat, it becomes critical that regionally integrative health information systems are made a core component of any regional economic and political initiatives. This will facilitate the flow of critical information and knowledge across borders to enable the delivery of safe healthcare services, the continuity of patient care and the effective monitoring of diseases across borders.

Health Information Systems & eHealth

At the fifty-eight session of the World Health Assembly (WHA) in May 2005, delegates adopted a resolution to establish an eHealth strategy for the World Health Organization (WHO), indicating that there is urgency for MS to have well-planned eHealth services for their respective countries. The main rationale for this strategy is derived from the potential for Information Communication Technology (ICT) to transform healthcare service delivery. ICT has had a profound impact on many aspects of human development such as banking, commerce and communication. ICTs enable information sharing across geo-political boundaries, providing opportunities for co-operative development in many areas, including healthcare. Despite this, the uptake of ICTs in healthcare has been relatively slow and less progressive than in other sectors of modern society. The use of ICTs in health is broad and diverse. It ranges from population based record systems that monitor disease trends, through electronic surveillance systems which capture patient related data for health care or administrative purposes, to patient-based electronic medical record systems. Electronic Medical Record (EMR) systems improve the quality of care by "improvement in legibility of clinical notes, decision support of drug ordering including allergy warning and drug incompatibilities, warning for abnormal laboratory results, support for program monitoring, including reporting outcomes, budgets and supplies, support clinical research and management of chronic diseases such as diabetes, hypertension and heart disease" [13] . Furthermore, the access to accurate and precise information by healthcare service providers reduces medical errors, reduces duplication of data entries, and strengthens decision support tools within a health system [14]. Electronic information systems within a specific area of health such as public health disease surveillance systems enhance the response intervention times to disease outbreaks such as cholera. Through disease surveillance systems, coupled with Geographic Information Systems (GIS), it is possible to effectively monitor disease spread spatially and implement coordinated and appropriate control measures based on real time data access.

Electronic health information systems, used either for patient care delivery or population based disease surveillance, have the potential to support the exchange and transfer of health information across borders. It can strengthen the cross-border continuation of patient care in chronic cases like antiretroviral therapy for HIV and AIDS patients. It can also strengthen regional capacity to mobilize resources and respond collectively to disease outbreaks, such as the outbreak of cholera experienced in Zimbabwe in 2008.

A collaborative regional eHealth Strategy can provide the framework for building and implementing health information systems in a coordinated way that allows for regional integration. It is vitally important that developing countries develop such a strategy as early as possible to avoid the risk of overspending and the heavy costs incurred in systems adoption and reengineering.

Challenges & Opportunities

Health care providers and policy makers in developing countries are daily faced with the challenge of making decisions that allow them to get the most out of scarce resources. The efficient resource utilization they seek is characterized by:

- Little or no wastage of resources.
- Provision of quality tools for healthcare providers despite limited market availability.
- Provision of real solutions addressing the health priorities of the population and communities.
- Delivery of healthcare services at the lowest cost while adhering to safe care protocols.
- Providing healthcare services to vulnerable communities despite time constraints and the shortage of healthcare professionals.

Meeting these requirements would have a positive impact on the quality of services that health systems can deliver to their communities in a timely manner. In reality, the healthcare needs of populations in developing countries remain actively unmet due the challenges faced in realizing these efficiencies. In addition, health care expenditure in these countries remains extremely low compared to the developed world. Developing countries account for 84 percent of world population, contributing 93 percent of the worldwide burden of disease. However, they account for only 18 percent of global income and 11 percent of global health spending [6].

Table 1- Global comparison on per capita total expenditure on health for the period 2005-2006 (International dollars per person).

Region	Year	
	2006	2005
World	163,301	155,880
Developed Countries	115,847	111,509
Developing Countries	47,448	44,346
Monaco	7,154	5,447
United States of America	6,714	6,347
South Africa	869	811
Burundi	15	17
Rwanda	210	136
Zimbabwe	147	146

Source: Available from URL: http://earthtrends.wri.org/text/population-health/variable-1264.html

Table 1 above compares the per capita expenditure on health in international dollars per person in the years 2005 and 2006, effectively demonstrating the global expenditure disparities. In 2006, the world per capita expenditure on health in international dollars per person was 163,301. Of this amount, the developed countries spent a cumulative amount of 115,847

compared to 47,448 spent in developing countries. Focusing on sub-Saharan Africa alone, the expenditure was 7,030 of the 47, 448. Even for the most developed country in Sub-Saharan Africa, i.e. South Africa, its per capita expenditure per person was 869 compared to 6, 714 of the United States [7].

The impact of inequality in health services expenditure on individuals begins in childhood. The world average life expectancy, less than 60 years towards the end of the 1970s, now surpasses 74 years [8]. This statistic does not reflect lack of progress in developing countries, especially in the Sub-Saharan Africa region. A girl child born today can expect to live for more than 80 years in Japan, but for less than 35 years if she lives in Swaziland [9]. The factors contributing to global variation in life expectancy are quite varied. However, one key determinant is the variation in disease burden. According to WHO, the main causes of illness and death in developed countries are cancer, respiratory diseases, cardiovascular disease and conditions of the nervous system. In the developing world, communicable diseases are the main causes of the disease burden. The principal causes of death, which correlated with WHO reporting, include respiratory infections, HIV and AIDS, infections at birth, diarrhoeal disease and tropical diseases such as malaria [10].

As the leading causes of death in developing countries are communicable diseases which are treatable, there is an enormous opportunity to lessen the burden of disease. Health care service providers and policy makers acknowledge the need to prioritise scarce resources for disease prevention and curative services rather than for auxiliary services. ICT can be an effective support in the delivery of these services by significantly strengthening information systems available to clinicians and personnel, e.g. through electronic patient records and decision support services. In addition, on the basis of benefits highlighted above through ICT tools, it is essential that the health authorities of these countries allocate reasonable resources towards ICT implementation. This would also be in line with an eHealth Strategy for MS as recommended by the World Health Assembly (WHA). It is strongly suggested that health information systems should be implemented - not as a nice-to-have tools - but as part of a comprehensive eHealth strategy.

ICT in Health: Implementation Challenges

The implementation of ICT in health is a high risk process for health systems, since these initiatives are not always successful, resulting in the waste of scarce financial resources that could better have been used in saving lives. Hard lessons have been learnt when ICTs in health fail due to implementation challenges. A documented case scenario is found in the electronic health information system for the Limpopo Province in South Africa [11]. The initial objectives of this system were noble, notably to:

- Make patient information available where the patient is currently being treated.
- Improve patient administration procedures, resulting in shorter waiting times and better service.
- Improve revenue collection.

This project was one of the biggest health informatics projects in Africa, at a cost of nearly £14m, it represented 2.5% of the province's annual health and welfare budget. For various reasons the system implementation failed, clearly demonstrating the need for prudence, caution and foresight in the implementation of ICT.

Despite such failures, ICT in health in the form of Electronic Medical Record Systems and Public Health Information Systems continue to be developed and implemented in Sub-Saharan Africa - albeit at a slow pace compared to the rest of the world. The benefits of these systems to health care delivery and quality of life to populations of developing countries are undisputed and profound, to the point that failure to adopt these systems would undermine human development and well-being. A number of systems have been successfully deployed into clinical workflows [13] for patient care and disease monitoring and evaluation [14]. Though these systems have been deployed at site level, none have been demonstrated to be scaled up to wide areas of implementation between different data sources and different health information systems. There is no demonstration that these systems are capable of exchanging health information for continuity of care (for patient level data) or for the co-monitoring of infectious diseases such as HIV and AIDS, and TB. There are currently no documented cases where two or more health systems in Sub-Saharan Africa can exchange health information data. As healthcare is interplay of various service providers, each requiring different aspects of the same data, the exchange of information should surely be a critical component of healthcare delivery.

Policies Recommendations

The business of healthcare is fundamentally a collaborative process, involving different healthcare service providers utilizing different components of the same global health data. Data generation and utilization for decision makers does not follow a linear process. The diversity of health information systems requirements has largely contributed to the development of disparate non-communicating systems. Current health systems have been motivated mostly by the need to report statistics (as secondary data) for government authorities and/or funding agencies [12]. The collection, storing, revising and delivering health data has become increasingly important to demonstrate the health status of its communities, vulnerable groups and society in general. It is an unnecessary wastage of scarce resources for developing countries south of the Sahara, currently with minimal penetration of electronic health information systems, to struggle through the same hard lessons learnt in developed countries. Developing countries have a unique opportunity to demonstrate the usefulness of ICT tools in addressing their health challenges.

Though various factors contribute to the successful implementation of ICT in health [11,13,15,16,19], we believe that an enabling environment that allows for multiple health information systems exchanging data securely is fundamental to meet health service challenges particularly in achieving continuity of care across the geo-political divide while significantly optimizing resource usage in resource limited settings.

It is critical that developing countries establish harmonized frameworks or policies around health information systems management for their respective countries. This approach will ensure an effective collaboration between all the entities requiring health data. Recommendations include:

1. Security Framework: Ensure secure sharing of health data between health service providers making use of the same health data [15-17].
2. Governance of Health Data: Ensure that data elements are aligned with healthcare delivery, i.e. the numbers and description of health data elements are consistent with the current workflow of healthcare delivery services [18].
3. Adherence to Available Standards: Establish a collective approach to health information systems implementation within countries, with standards adopted and maintained at the technical, practice and policies level, e.g. utilization of an Electronic Health Standards such as Archetypes [18].
4. Interoperability or Integration Platform: Ensure semantic interoperability in the exchange of data within the health information system. This is critical for ensuring that accurate communication occurs within a collaborative health groups. Avoid duplication of virtual data within the health system [18].

Regional Recommendations for Africa

In order to achieve regional health information exchange for patient or disease monitoring across geo-political boundaries, it is recommended that regional bodies such as the Southern African Development Community, World Health Organisation Inter-Country Support Teams, the respective Ministries of Health and other stakeholders etc. collaborate in harmonising the electronic health information systems frameworks/policies as they are developed in developing countries. Currently, there is minimal inter-country collaboration with the possible risk of incompatible information systems either for patient care or regional reporting needs between countries.

It is recommended that countries and regional bloc MS build their electronic systems with the foresight of regional information exchange. In summary, this can be done through the following minimal recommendations;

- Ministries of Health, regional organisations such as SADC, WHO, UNAIDS and funders regularly consult to formulate common standards and information security protocols for regions.
- The adoption of a common information exchange format e.g. HL7.
- Common legal and ethical considerations for electronic data transmission and usage across geographic borders.
- Common patient identifier properties across regions.
- Common de-identification (anonymisation) techniques.

Through addressing only the above minimum requirements, developing countries south of the Sahara can significantly revolutionize health service provision, thus producing outstanding returns on investments.

Discussion

Current authors' knowledge and experience within the discipline of Health Informatics strongly demonstrates that it is possible to build successful electronic health information systems that are capable of scaling from one healthcare facility to regional information systems requirements by following some of the recommendations described in this paper. Sub-Saharan Africa has a unique opportunity as it has so many examples to learn from. The technological implementation of ICT in health has matured to the level of fully utilising its potential.

However, lack of collaboration and consultation between all healthcare stakeholders puts Africa at risk of the disaster of vertical data silos that cannot benefit an already impoverished population.

Conclusions

Collaboration in the development of national eHealth strategies, ranging from the work of in-country stakeholders to inter-country consultation, facilitates a cost effective enabling environment for the exchange of health information between sites, scalable to inter-country information transfer.

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Address for correspondence

Tungamirirai Simbini

Email: simbinit@gmail.com