HEALTH INFORMATION SYSTEMS (HIS), THE INTERNET AND TELEMEDICINE IN THE DELIVERY OF HEALTH CARE IN UGANDA

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Abstract

Recent advances in the field of Information and Communication Technologies (ICT) and the capability of these ICT facilities to process, store, retrieve and disseminate ·data and information is dramatically changing the ways in which the health sector operates. In order to bring about improvement in the performance of the health sector in a developing country like Uganda, there is need to have access to appropriate and timely information on all aspects of health. This can only be achieved if there is an efficient and well functioning health information system (HIS) based on the new ICT. This paper explains and highlights some of the roles that HIS, including the Internet and telemedicine, can play in the delivery of health care as well as initiatives being undertaken to promote access to Internet-based information resources needed to carry out effective healthcare services in Uganda.

1.0 Introduction

Recent developments in the field of Information and Communication Technologies (ICTs) and the capability of these ICT facilities to process, store, retrieve and disseminate data and information is dramatically changing the ways in which the government and the health sector in particular operate. One of the major factors that influence the translation of what is done in the health sector is access to appropriate and timely information on all aspects of health such as patient care, research and teaching, management, decision making and planning. This can only take place if there is an efficient and well functioning health information system (HIS) to provide the necessary information support. Currently the center of any well functioning HIS are computer-based ICT resources such as the Internet, World Wide Web (WWW) and telemedicine.

The application of ICT provides new tools for improving access to information and sharing of knowledge. At the same time, the competitiveness of the health sector depends on the quality of research and the transforming of the results of research into better health care services. These require easier access to up-to-date biomedical information and

opportunities to communicate and exchange information with other researchers (Mansell and Wehn, (1998). This can only be achieved through effective use and application of HIS based on the use of ICT.

Africa Information Society Initiatives (AISI) (1994) points out some of the key areas for the application and use of HIS based on the new ICT in the health sector. These include enhancing of health administration and management through medical information system and decision support; access to and dissemination of health information for medical education and research; linking of health centers, delivery services and medical transport to enhance patient access to these facilities and hence provide more efficient services; and improving access to skilled diagnosis through telemedicine.

1.1 Health Information Systems (HIS) in Uganda

HIS is defined as a set of components and procedures organized with the objective of generating information which will improve health care management decisions at all level of the health system. It, therefore, integrates data collection, processing, reporting and use of information necessary for improving health service effectiveness and efficiency through better management at the different levels of health services (Lipperveld, Sauerborn, and Bodart, 2000). Good management is a prerequisite for increasing the effectiveness and efficiency of the health sector. Information can only influence management in an optimum way if decision-makers at each point of the management hierarchy utilize the information.

In Uganda, the government has been involved in a programme to reform the health sector based on a five years Health Sector Strategic Plan (HSSP), 2000/1 to 2004/5, and one of the key components included in the plan is strengthening the HIS (Ministry of Health, 2000). This is supposed to be attained through: -

• Establishment of the national health databank by strengthening and utilizing the information system through the use of a comprehensive recording and reporting mechanism.
• Establishing a unified and operational surveillance system.
• Compiling district monthly reports on key health indicators.
• Increasing the use of data in decision-making in all health centers.

A closer look at the situation on the ground, however, shows that very few institutions and organizations working in the health sector in Uganda are implementing the adoption of HIS technology and practices. Under the Ministry of Health, for example, HIS has been operational since 1996 and is supposed to be functional in all districts in Uganda. The system is

however, predominantly paper-based and manual especially at health unit levels. The computerization process, however, increases as one moves to higher levels - at district and ministry levels.

Though functional, the operation of the system is faced with problems of weakness in timeliness, incomplete information, and lack of rapid and accurate analysis of data for epidemic response as well as planning and evaluation of health services (Talisuna, 2001). The collection and collation of data have further been hindered by lack of logistics, lack of funds as well as lack of well-equipped personnel. All these have resulted into a system of data and information management that is not as effective as users would have liked it to be. Urgent computerization of the entire health data and information system in Uganda to facilitate quick exchanges and sharing of information between the different users and stakeholders is the only way forward.

1.2   Review of Related Literature

Although HIS have long been recognized as necessary for the operation, control, planning and evaluation of interventions in the health sector, it was the advent of cheaper data processing and data communication technology that galvanized renewed interest in HIS as solutions to the efficient and effective implementation, operation, and use of health systems. The current increased application of ICT in the health sector is being brought about by the many opportunities resulting from the increased capacity and speed of modern computers to process information, the increased range of available ICT services, and the convergence of multiple digital technologies (Pan-American Health Organization, 1998).

HIS technology based on ICTs are currently transforming decision-making in health institutions and organizations by bringing data and information to the desk-tops of health care practitioners and managers, policy makers, and all other interested parties. As a result, many people now consider HIS to be one of the most promising means for implementing reform in the health sector and to bring about improvements in the quality of life of our people.

Campbell (1997) points out that although many factors contribute to the gap between health policy and implementation, one of the most critical is the availability of timely and relevant information to support effective decision-making. It is for this reason that interventions in the area of HIS design and implementation using the new ICT are now looked at as a very cost effective technical and financial investment for improved performances of the health sector. A lot, however, remains to be learnt about the most appropriate design, implementation and utilization of HIS using the new ICT in a country like Uganda where the performance of the

22

health sector is faced by other numerous challenges.

In order to be able to design an effective and well functioning HIS, Lipperveld, Sauerborn, and Bodart (2000) propose the following six key steps that must be followed: -

Step 1:   Identifying health information needs and variable indicators that measure changes taking into consideration available resources.
Step 2:   Defining health data sources and developing data collection instruments for each of the health indicators selected.
Step 3:   Developing a health data/information transmission and processing system.
Step 4:   Ensuring use of the health information generated.
Step 5:   Planning for health information resources.
Step 6:   Developing a set of organizational rules for HIS management.

It is important to note that an HIS cannot exist by itself. It is a functional entity within the framework of a comprehensive health systems that offers integrated health services such as curative care, rehabilitative care, disease prevention and health promotion services. An effective HIS structure should therefore generate information required for making rational decisions at the different levels of health service systems: top, bottom, center and the periphery; each with different functions, services provision and resource availability.

1.3 The Internet and World Wide Web (WWW)

The Internet refers to a worldwide network of computers connected by landlines (copper and fibres), microwave and/or satellites. All these computers use a common language, which allow them to exchange data and information regardless of their hardware or operating systems. By its nature therefore, the Internet is used for communication as well as for accessing and exchanging information. In most cases the internet is not regulated by any government or institutional body.

Closely connected to the Internet is the WWW, which refers to a kind of protocol that runs on the Internet. Protocols here refer to standardized rules governing the exchange of information in computers. The exchanges involve the use of hypertext (clickable links between documents) and the Internet file transfer protocol (FTP) that facilitates the exchange of files between networked computers. The WWW computers called servers run software programs that receive requests from other computers usually by means of WWW browsers such as Internet Explorer or Netscape Navigator and supply the requested files to another computer connected to the network. Through the Internet and WWW, therefore, health practitioners,

researchers, students, patients and the public can now access vast quantities of information on health and diseases of varying quality and relevance. As a result, accessing and providing information on health is no longer restricted to the health care professionals alone.

The mushrooming of large numbers of Cybercafes or Internet Cafes in Uganda have led to reduction in the cost of accessing information from the Internet and WWW. However, these costs are still beyond the reach of majority of the population who are poor and living on less than a dollar per day. The Internet cafes are also still mainly concentrated in urban centers even though deliberate attempts are being made by government and non-governmental organizations to take these services to rural areas through the setting up of telecenters and promoting investments in ICT in rural areas through tax incentives and government subsidy. On the other hand, the speed of accessing or downloading information from the Internet and WWW is still generally slow because the majority of Internet subscribers are connected to narrow bandwidth, which often lead to traffic congestions hence reducing the speed at which information can be accessed or downloaded from the Internet and WWW.

1.4   Program for the Enhancement of Research Information (PERI)

In September 2001, the International Network for the Availability of Scientific Publication (INASP) announced the commencement of a Program for the Enhancement of Research Information (PERI). The programme came about as a response to needs as expressed by faculties, researchers and librarians in universities and research institutions in Africa and is being implemented in each country through a Country Consortia Coordinator. In Uganda, Makerere University Library is currently the coordinating center. The immediate objectives of the programme are to:

- facilitate the acquisition of international information and knowledge through electronic ICT.
- strengthen and develop national and regional journals as a medium for the dissemination of local information and knowledge.
- provide awareness or training in the use/or evaluation of electronic ICT.
- enhance skills in the preparation, production and management of journals.

The program aims at widening access and dissemination of scientific and scholarly information and knowledge within and between developing and transitional countries. Through this program, professionals, researchers, academicians, librarians etc. working in selected developing countries, Uganda included, can now access current awareness databases, full-text
24

online journals and document delivery from a number of publishers and libraries at no cost (INASP, 2002). The full details on how to access these services can be obtained from Makerere University Main Library as well as from Albert Cook Medical Library in the Medical School. All these have been made possible through funding from SIDA/SAREC and DANIDA. The funding which has been renewed after a thorough review of the programme will last up to end of 2007.

1.5 Health InterNetwork Access to Research Initiatives (HINARI)

In the beginning of 2001, major awards for electronic communication in science were approved for four centers in Africa and Makerere University Medical School in Uganda was one of the centers chosen to carry out the pilot study. This was the first phase of a public/private initiative – the Health InterNetwork Programme – which aimed at boosting access by researchers and health workers to reliable information via the Internet and to improve global public health by facilitating the flow of information worldwide. The pilot trial tested whether online delivery of high quality information and international connectivity addresses the information and communication needs of developing country researchers.

In July 2001, after the pilot trial, World Health Organization (WHO) and six of the biggest publishers of medical journals announced an important initiative in which medical schools and research institutions in low income countries were to get free (or at low cost, depending on GNP per capita) full text access to now over 2000 titles of top international medical journals. The initiative does not only aim at access to information but also envision that better and timely information will increase the capacity of scientists and health care workers from low-income countries to participate in the global research agenda; to better set national research and health care priorities; and to increase countries self reliance in developing evidence-based strategies and tools for the prevention, control and treatment of diseases (Aronson and Waylings, 2002).

The Health InterNetwork Initiative finally became operational in January 2002 and institutions in Uganda that qualify to access these free online journals such as Medical libraries, teaching and ordinary hospitals, universities, research institutions, Ministry of Health, and any other kind of related institutions, should all by now be accessing these services. Each institution is entitled to a "Username" and "Password" and preference are given to libraries/resource centers based in these institutions. Passwords are not given to individuals.

1.6 Other Important Free Internet-based Health Information Initiatives

A number of other initiatives have come up and are offering free online access to full text health information. These include Freemedicaljournals (www.freemedicaljournals.com), which offers links to over 500 journals covering areas such as epidemiology, infectious diseases, pharmacology, public health and tropical diseases; Pubmed (www.pubmedcentral.nih.gov), which provides a web-based archive of full text life science journals; BioMed Central which is an online initiative that provides free full text access to its electronic medical journals via "open access publishing", and where authors of papers, not the readers, bear the cost.; the British Medical Journal (BMJ) which provides free full text access to its journals directly via its website; Medscape which is an information gateway that provides access to medical literature via free individualized registration and password.; and finally the Cochrane Library which consists of a regularly updated collection of evidence-based medicine databases including a database of systematic reviews.

1.7 Telemedicine

According to Bashshur (1995: 19), telemedicine refers to an integrated system of health care delivery that employs ICT as a substitute to face-to-face contacts between health care providers and health information consumers or clients. Telemedicine is therefore, sometimes referred to as "medicine practiced at a distance" and involves delivery of health care services to rural areas and remote places using ICTs for the exchange of valid information for diagnosis, treatment and prevention of diseases, research and evaluation, and for the continuing medical education of health care providers, all in the interests of advancing the health of individuals and their communities. It attempts to bridge the gaps that are created by the lack of enough qualified health manpower as well as inadequate health facilities and infrastructure that is common in health centers found in rural and remote areas in many developing countries, Uganda inclusive. It therefore, involves the use of advanced ICTs for the purpose of making diagnosis, conducting researches, transferring patient data and improving disease management and treatment from centers of excellence, such as referral hospitals usually situated in urban areas to health centers in rural and remote areas.

The advancement in the practice of telemedicine occurred in the 1990's with the development of medical devices suited to capturing images and other data in digital electronic form and the development and installation of high speed, high bandwidth telecommunication systems around the world. Today, clinical application of telemedicine are found in virtually all aspects

26

of medicine such as radiology, cardiology, psychiatry, emergency medicine, pathology and home healthcare.

In many developing countries like Uganda where majority of the population live in rural and remote areas served by poorly equipped health centers both in term of facilities and human resources, telemedicine is now looked at as the most immediate solution to improved health care service deliveries. A number of telemedicine projects have been initiated in Uganda since the 1980's with donor's assistance although their impacts are yet to be felt. These include:

- Telemedicine based on audio systems for sharing lectures and patients information between Makerere Medical School, Nairobi University and the University of Newfoundland, Canada in the 1980's.
- Healthnet based on improving communication and exchanges of medical information between developing countries and the developed world initiated in the early 1990's.
- Teleradiology project based on ultrasound, which was to link Makerere Medical School to Portugal and Khazakstan initiated in the late 1990's.
- Linkage between the Institute of Public Health in Makerere Medical School, Mbarara University, Nsambya Hospital, Lacor Hospital and other field stations. This is still going on.
- The Ministry of Health Telemedicine Pilot Project, which is one of the latest, was launched in 2000 and is based in Makerere University Medical School/Mulago Hospital. It is a pilot project under the Ministry of Health, Makerere University Medical School, Mulago Hospital and Mengo Hospital, and is coordinated by the National Telemedicine Committee. Under the project, these centers will be linked internally and incrementally to all facilities in the country and externally to international centers of excellence (Omaswa, 2001: 42).

It is worth noting that most of the telemedicine projects identified above were initiated and depended entirely on donor funding and therefore their lifespan could not extend beyond the time the donors stopped their funding because local capacities within the country have always not been created to ensure sustainability of these projects after donors withdrew or stopped their funding.

1.8 Roles of ICT-related Services (Internet, Telemedicine and Online Journals) in the Delivery of Health Care

There is no doubt that given the right conditions, the use of ICT in the health sector would go a long way in addressing the many health challenges that face Uganda. This is because the use of ICT enhances and facilitates communication and sharing of information and knowledge among institutional and individual participants at national and global levels. Transforming results of research into better health care services require easier access to up-to-date health information as well as opportunities to communicate and exchange information with other researchers, which can best be achieved through application and use of ICT. This would in turn help in promoting effective decision-making at all levels of health service deliveries from top to bottom and from the center to the periphery. Moreover, through telemedicine, ICT is now being increasingly used as delivery mechanism, to upcountry and rural hospitals and health centers, of a wide range of health services such as diagnosis and treatment of diseases and disease outbreaks, public health education, and emergency advices such as dealing with and mitigating the consequences of natural disasters such as famine, earthquakes, flooding and accidents.

Other roles include improving access to information needed for medical education and research as well as distance learning especially in institutions of higher learning. This is through availing medical textbooks, journals and documents electronically to all those who may be interested. Distance learning has also been enhanced through computer and video conferencing as well as through the use of discussion groups on the Internet. Medical records can also now be set up electronically thus enhancing health administration and management through medical information and decision support systems. Finally, the use of ICT in the health sector has the potential to increase transparency and efficiency of governance of a country in terms of accountability, which would in turn, improve the availability and delivery of publicly provided health services. This is because the information on accountability can now be availed as soon as they are produced and should be accessible to all online.

1.9 Challenges Faced in the Use of ICT in the Delivery of Health Care

A closer look at the current use of ICT in the delivery of improved health care across the globe highlights a number of challenges that must be addressed by a country like Uganda for its full benefit to be realized. In the first instance, the high cost involved in providing and maintaining ICT services makes it impossible for a very large section of the population who are poor and living in poverty to access information services from the Internet and WWW as they have to pay before being offered the services.

28

The problem of high cost is further compounded by the high level of computer illiteracy, leave alone illiteracy, among the majority of the population. The operation and management of ICT services also requires skilled and qualified manpower, which tend to be generally lacking.

Other challenges worth mentioning include poor and underdeveloped ICT infrastructure such as power supplies needed to run ICT services and telephone network needed to facilitate communication. Lack of control over the information that is made available over the Internet and WWW have often resulted into too much information being available resulting into the problem of what to choose and use as well as access to information that corrupts the morals of the population such as pornographies. The lack of information resource sharing and exchanges which would result into reduction of cost through avoidance of duplication as well as lack of capacity to sustain implementation of ICT services are further challenges that must be addressed for the full benefit of ICT in the delivery of improved health care to be realized in a country like Uganda.

1.10   The Way Forward

By their nature, ICT systems in the health sector are intimately linked with the health service structure and how they perform. In order to achieve all these, however, a holistic approach at national and local levels is required. The government needs to come out with a clear national ICT policy and plan, which promotes establishment, operation and extension of ICT and ICT-associated services that operates within a clear policy framework that takes full cognizance of the overall strategic goals of the country. Standards in the operation of ICT services must be defined and the necessary infrastructures developed for promoting it. The government should also promote and finance investments in ICT in the heath sector through reduction of tax rates on ICT equipment and services, introduce affordable rates for rural areas, and set up telecenters. This is because market mechanisms alone are unlikely to be sufficient to generate adequate investment in ICT services since most of them will be profit driven.

There is also the need for improved research, education and networking in the application and use of ICT services in the health sector. This will ensure that more knowledge is generated which will help in improving the effectiveness of ICT in the health sector as well as informing application, design, implementation and development of an appropriate policy for telehealth. Carrying out research on ICT in the health sector will further lead to the development of national health data repositories, maintaining standards and uniformity, confidentiality and security of patient care data while providing access to appropriate users. Government's intervention through the introduction of medical informatics study in higher institution

29

of learning so as to produce a crop of highly skilled personnel that can champion the application and use of ICT in the health sector, and carry out ICT research based on local needs are further measures that would help in addressing ICT challenges in the delivery of health care. This is in addition to reducing over-dependence on donor-driven ICT initiatives by developing local capacity to sustain donor-initiated ICT projects and starting new ones

1.11 Conclusion

The uses of ICT in the management of information have very many revolutionary implications as far as the delivery of healthcare to any country is concerned. But in order to achieve their potential benefits, it is important that we focus on user oriented and cost effective HIS rather than on technology driven one. The analysis of users' need is essential as is consideration of the factors that may exclude them from participating in the design and implementation of the system. The range of ICT skills among users must be taken into consideration when implementing new HIS technology. Resources must also be available to assess and evaluate the benefits of the new HIS technology and local capacity must be developed to generate funds so as to ensure sustainability of ICT operations and functioning if Uganda was to realize the full benefits of HIS based on ICT in the delivery of healthcare.

As Chandrashekhar and Ghosh (2001: 17) point out, the analysis of the constraints associated with the potential of ICTs in improving health conditions of people especially in a developing country like Uganda is very important. There is therefore a need for careful and cautious approach to the integration and development of the use of ICT for information access and dissemination in the health sector. While it is true that ICTs offer an opportunity to introduce many improvements in health service delivery and overall developmental goals which have an impact on health by making it possible for the right information to be accessed by the right person at the right time, it is important to remember that despite its rapid growth, the ICT sector in most developing countries, Uganda inclusive, is still very small and the overall effect of its growth on the rest of the economy will continue to remain limited for sometime to come.

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