

**RAISING AWARENESS
OF HEALTH INFORMATICS
AMONG NIGERIAN HEALTHCARE
PROFESSIONALS**

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A dissertation submitted to the University of Dublin,
in partial fulfilment of the requirements for the degree
of Master of Science in health informatics

Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university.

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To God is the glory.

Summary

In the last quarter of the 20th century, improvements in Information and Communications Technology (ICT) have ushered in the information era notable for great advancements in finance, industry and the society in general. If our world today becomes mostly computerized and networked, there would be a dramatic increase in the creation of jobs and production of goods and services. Most of all, even distribution of goods and services shall increase access to facilities thereby improving the quality of life all over the world. ICT is very crucial in all life's endeavours today. Healthcare administration, planning and budgeting would not be effective or possible today without the use of these innovations. In the health systems of developed countries, ICT has increased access to and the quality of care radicalized medical research and cut costs.

Management always faces many problems whenever it introduces new means of service provision into practice. However, e-Health will not succeed unless health professionals and the populace participate in choosing, operating and evaluating these new technologies. To do this they need the knowledge and information about the advantages of ICT to healthcare delivery.

Many ICT projects in India and other Asian countries have shown that ICT can enhance not only managerial and daily healthcare functions but also healthcare delivery itself. Though international agencies accept that ICT implementation in healthcare in the developing countries of Africa would improve the health sector, they also stress that available software should be adjusted to suit the particular needs of the continent. The adaptation of ICT in the health systems of Africa is hindered somewhat by the inadequacy of health informaticians to construct, develop, evaluate, manage and apply suitable IT strategies and infrastructures in their healthcare systems.

Nigerian healthcare professionals should therefore receive enough ICT training and skills to enable them to apply ICT to solving the data and knowledge issues that arise in Nigeria's health system. To saturate Nigeria's health system with ICT, entirely different mindsets, skills and behaviour are necessary.

This dissertation will investigate the Nigerian health professionals' competence in using ICT in healthcare delivery. Using a problem-based hyperlearning method, this dissertation explores scenarios typical to the Nigerian health system and how ICT implementation will help in solving most common problems in the Nigeria's health system. In addition, in spite of the abundance of ICT tools, the Nigerian healthcare system is not advocating for a broad implementation ICT in healthcare yet. There is computer illiteracy amongst some health workers and a general ignorance of the benefits of ICT in the health sector. Most colleges do not offer informatics and related courses. Many projects were abandoned in the past due to insufficient infrastructure and the skilled professionals to run them. Therefore, Nigerian health workers need to acquire the skills, attitudes and job ethics more suitable to both the modern workplace to satisfy the needs citizens in general.

Suggestions are made on how to apply ICT to decision making and care delivery in the Nigerian health sector. Firstly, Nigerian health service should adapt some available ICT tools to satisfy the professionals and patients' needs. In this vein, programmes can be adapted to mobile technologies that are available now. The government will later upgrade to more advanced technologies that will connect all the services in the country. Secondly, the development of an informatics curriculum suited to the Nigerian educational system and the introduction of health informatics as a major in all medical education will turn out ICT competent health professionals. Finally, those professionals already practicing should undergo obligatory in-service training to update their ICT skills.

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ACRONYMS

| | |
|--------|----------------------------------------------------|
| AAMC | Association of American Medical Colleges |
| ADEC | American Distance Education Consortium |
| AHIMA | American Health Information Management Association |
| ARV | Antiretroviral Vaccines |
| CAI | Computer Assisted Instruction |
| CAPD | Continuous Ambulatory Peritoneal Dialysis |
| CCS | Certified Coding Specialist |
| CCS-P | Certified Coding Specialist-Physician Based |
| CD4 | The Cluster Of differentiation 4 |
| CHPS | Certified in Healthcare Privacy and Security |
| DOT | Directly Observed Treatment |
| DSS | Decision Support system |
| DTH | Direct-To-Home television |
| ECDL | European Computer Driving License |
| ECOWAS | Economic Community of West African States |
| EHR | Electronic Healthcare Record |

| | |
|----------|-----------------------------------------------------------------------|
| EITS | Essential IT Skills |
| EPI | Expanded Programme on Immunization |
| ESRF | End Stage Renal Failure |
| EU | European Union |
| FCT | Federal Capital Territory |
| FGN | Federal Government of Nigeria |
| FMOH | Federal Ministry of Health |
| FOS | Federal Office of Statistics |
| GSM | Global System for Mobile Communications |
| HAART | Highly Active Antiretroviral Therapy |
| HELINA | Health Informatics in Africa |
| HERFON | Health Reform Foundation of Nigeria |
| HI | Health Informatics |
| HIMS | Health Information Management Systems |
| HIV/AIDS | Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome |
| HIV-EMR | Human Immune Virus -Electronic Medical Record |
| HSR | Health Sector Reform |
| HSRP | Health Sector Reform Plan for Action |

| | |
|-------------|--------------------------------------------------------------|
| IBM | International Business Machines Corporation |
| ICT | Information Technology (IT) |
| ICL | International Computers Ltd |
| IHCD | Institute of Health and Care Development |
| IMIA | International Medical Informatics association |
| IMF | International Monetary Fund |
| ISP | Internet service Provider's |
| LGAs | Local Government Areas |
| MCI | Management Charter Initiative |
| MIS | Management Information System |
| MOH | Ministry of Health |
| NAFDAC | National Agency for Food and Drug Administration and Control |
| NAPCA | National Action for Prevention and Control of AIDS |
| NHIMS | Nigerian Health Management Information System |
| NHIS | National Health Information System |
| NHS | National Health Service |
| NigComSat-1 | Nigerian Communications Satellite |
| NIMR | Nigerian Institute for Medical Research |

| | |
|--------|---------------------------------------------------|
| NITDA | Nigeria Information Technology Development Agency |
| NITEL | Nigerian Telecommunications Limited |
| NNPC | Nigerian National Petroleum Company |
| NPA | Nigerian Ports Authority |
| NPHCDA | National Primary Health Care Development Agency |
| NPI | National Programme on Immunization |
| OPEC | Organization of Petroleum Exporting Countries |
| ORT | Oral Rehydration Therapies |
| PBL | Problem-Based Learning |
| PDA | Personal Digital Assistant |
| PHC | Primary Health Care |
| RHIA | Registered Health Information Administrator |
| RHIT | Registered Health Information Technician |
| SMOH | State Ministries of Health |
| TB | Tuberculosis |
| TCO | Total Cost of Ownership |
| TV | Television |
| UK | United Kingdom |

| | |
|---------|-------------------------------------------------------------|
| UN | United Nations |
| UNDP | Human Development |
| UNFPA | World Bank, United Nations Population Fund |
| UNHCR | United Nations High Commissioner for Refugees |
| UNICEF | United Nations Children's Fund |
| UNODCCP | United Nations Office for Drug Control and Crime Prevention |
| U.S.A | United States of America |
| VHF | Very High Frequency |
| VLF | Virtual Learning Environments |
| WHO | World Health Organization |

“In attempting to arrive at the truth, I have applied everywhere for information but in scarcely an instance have I been able to obtain hospital records fit for any purpose of comparison. If they could be obtained, they would enable us to decide many other questions besides the one alluded to. They would show subscribers how their money was being spent, what amount of good was really being done with it or whether the money was not doing mischief rather than good”(Florence Nightingale, 1863).

CHAPTER I

1 Introduction

Advancements in Information Communication Technology (ICT) and their integration into the healthcare domain during the last quarter of the 20th century have dramatically changed medical practice resulting in the reconstruction of the traditional boundaries of medicine and its organizational structures in the developed world (Ojo 2006, Commonwealth Health Ministers Meeting 2008). This revolution created an information age that heralds a strong knowledge evident in the nature of interaction between healthcare professionals in their daily professional activities (Ojo 2006, Chandrasekhar and Gosh 2001). Most importantly the introduction of the internet and access to medical knowledge, has led to patients that are more assertive who use the information to challenge the providers decisions and credibility demanding better care with the use of these modern technologies (Gassert et al 1999). This uptake of ICT has made it impossible for workers in certain specialist areas to work without the aid of informatics applications (Lun 2002). This will transform the customary structures and organisation of the health system making a compulsory demand for healthcare professionals to be up to date with emerging technologies and the ever-expanding knowledge base (Lun 2002). Therefore, healthcare professionals are not only challenged with keeping track of this medical and biotechnological knowledge, but also are challenged with acquiring ICT skills and relevant competencies to access and use this knowledge and information (Grimson 2000). Therefore staying abreast with the emerging technologies and knowledge base and acquiring the necessary skills and competencies is an essential requirement of healthcare workers (Lun 2002).

However, the evolution of ICT is yet to transcend into the African healthcare systems. Participants of The 93 Proceedings First International Conference on Health Informatics in

Africa (HELINA), at Ile Ife in Nigeria in 1993, elaborated the importance of informatics applications in the African healthcare sectors (Mandil et al 1993). Furthermore, International development agencies argue that ICT is the only catalyst to accelerate African socio-economic development to bridge the digital divide between Africa and the industrialised world especially in the health sector leading to efficiency and effectiveness (Soriyan et al 2001). African countries do not invest enough to train workers and to develop infrastructure. Lack of adequate finance, mismanagement, and bad leadership has hindered improvement of literacy levels even after so many years of independence (Sahay 2001). Africa needs to train more informaticians to develop, build, and help formulate ICT policies and use ICT infrastructure (Korpela, 2000).

Inadequate number of computers and inconsistent training programs were among the contributing factors to this lack of knowledge (Bello et al 2005). Human resource development through appropriate education and training is a key factor in introducing new methods of work for healthcare service providers and in empowering citizens to use, ICT's to obtain medical information. The availability of an appropriate mix of competencies and skills is central to the wider diffusion and take up of e-health (Constantelou and Karounou 2001). The care provided by specialists requires adherence to evidence-based clinical protocols, nursing processes, clinical judgment, and skills or experience in communications, technology, and computers. Health systems in third world countries can apply ICT to develop healthcare delivery and the amount of interaction between all levels of the health establishment (Chandrasekhar and Gosh 2001, Braa and Blobel 2003). ICT can effect change only when backed by trained professionals and enough infrastructures. Most ICT ventures failed in Nigeria in the past after the skilled workers from abroad depart (Korpela et al 2000) and unskilled Nigerian ICT workers could not maintain the ventures (Heeks et al 1999).

Investment in any national infrastructure by the Nigerian government must match the educational needs of the healthcare professionals. For effective system implementation and usage, adequate education, training and knowledge of end users is essential. Only an informed and empowered professional can make a meaningful contribution towards the procurement of ICT but the majority of health care professionals in Nigeria lack the knowledge to appreciate ICT (Bellow et al 2004). Only informatics integration into the educational curricula of nursing, medicine and allied healthcare courses can create the knowledgebase for ICT within the healthcare system. Therefore, it is imperative to raise the awareness of Health Informatics as the emerging discipline of ICT education in healthcare.

Furthermore, to engage healthcare professionals actively in the reform of the healthcare system, the design of information systems and applying the use of ICT to the delivery of direct care, professionals will require technical and communication experience. They will also need managerial skills like the observance of evidence-based procedures, clinical judgement and experience (Constantelou and Karounou 2001). Since technology alone cannot deliver efficient and effective healthcare, the general introduction of and the successful use of ICT in healthcare requires new types of skills, knowledge and attitudes from professionals (Constantelou and Karounou 2001). Also medical professionals need ICT to learn the continuous innovations and methods in their daily duties (Grimson et al 2000).

1.1 Justification of the topic and motivation

Nigerian government is restructuring and reforming the healthcare system in various ways that include decentralisation, integration of different health programmes, strengthening of management practices and in some cases introducing information communication technology

to strengthen the health information system under the umbrella of Health Reform Foundation of Nigeria (HEFRON) (<http://www.herforn.org>). The most important objective of this foundation is the development of a National Health Information Management System (NHIMS) that will coordinate the activities of various arms of the health sector aiming at fostering global partnership and improving research and policy analysis. However, the involvement of healthcare professionals is essential in the design and implementation of this NHIMS and any other ICT-driven activity in the country. This entails the specification of end-user requirements, assessing the technological knowledge-how throughout the software engineering cycle of system design (Grimson et al 2000).

Currently, the Nigerian healthcare system is under a lot of pressure from chronic and communicable diseases. Maternal and infant mortality, other infectious diseases, trauma, rising levels of hypertension, diabetes and cardiovascular disease represent critical medical problems (Human Development Report 2006). Various viruses especially Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) have also reached epidemic proportions in Nigeria. Estimates of 2.86 Nigerians were living with HIV in 2005 the second largest number after South Africa (WHO 2007).

The availability of adequate information on the treatment of this disease will alleviate the strain these diseases are causing the health system (Adeyemi and Ayegboyin 2004). There is a need for appropriate ICT in health care to strengthen various activities such as knowledge exchange between health care managers, health organizations and the general populace in investing and combating HIV/AIDS and other parallel programmes. Awareness of new treatment modalities and management of new guidelines and protocols by the use of informatics applications to treat, trace and monitor patients care and adherence to medication administration are necessary (Adeyemi and Ayegboyin 2004).

The number of trained health workers in Africa has historically been inadequate, but in recent years, many African countries have suffered from serious scarcities of almost all cadres. Factors contributing to this include economic and fiscal difficulties and incomplete civil service reform (Geo-Jaja and Mangum 2003). According to the World Health Report (2006), Nigeria is among the countries with the lowest number of healthcare workers per capita. For instance, WHO recommended a minimum of 20 physicians per 100,000 populations and at least 100 nurses per 100,000 for the least developed countries (Physicians for Human Rights, 2004, p. 17) however, the physician patient ratio in Nigeria is 1:6000 (HDR 2007/2008).

Furthermore, the increasing migration of large numbers of highly qualified workers in a 'Brain Drain' to developed countries in search of better working conditions adds to this problem (Ojo 2006). The Nigerian healthcare system in order to function effectively needs a steady and increasing number of health professionals appropriate to the ever increasingly population (WHO 2007). However, the migration of Nigerian health workers has created understaffing of medical facilities and hindered the populace from accessing adequate care. Since innovations in ICT have cheapened ICT products, professionals in Sub-Saharan countries such as Nigeria could more readily access ICT related facilities such as Telemedicine and Personal Digital assistance (PDA) to assist the low number of healthcare professionals in discharging their duties effectively and efficiently.

In practice, the traditional structure of healthcare delivery requires the physical presence of both the client and healthcare professional. However, telemedicine, which is using telecommunications for the remote diagnosis and treatment of patients, will be useful in Nigeria especially in cases where the geographical distribution of the citizens is an issue, as majority of the Nigeria populace are living in the rural area with little or no access to health care. Implementing innovations such as this will help to increase the achievement of

equitable healthcare across the nation as proposed by the health policy and strategy of Nigeria (Federal Ministry of Health 1988). Telemedicine offers the solution for long distance consultation, thereby reducing the time to travel for consultation, emergency medical assistance, administration and logistics (using health care resources more effectively), and instruction of health professionals (Madanmohan 1999).

1.2 Purpose and research question

This dissertation seeks to investigate if Nigerian health workers really need Health Informatics awareness. Since awareness is crucial to contemporary clinicians, then it should apply with all its benefits and limitations to the Nigerian healthcare professional. Besides the insight that awareness brings, it also generates the interest to act. Health organisations can pressurise the government to develop the educational curricula and the discipline in general. Today there is inadequate awareness and understanding of Health Informatics amongst government officials, researchers, educators and those working in health informatics related fields in Nigeria (Bellow et al 2004). This ignorance of health informatics amongst the populace is hindering its development in the country. With awareness and understanding, the pioneers can canvass for finance, cooperation and the education of informaticians.

The question is

- Can health workers in Nigeria acquire enough skills to control successfully the HIV/AIDS and other serious diseases ravaging the country without intensive ICT input?
- Can ICT improve communication between clinics and patients or even help to match the competency of Nigerian health workers in accessing current medical data to that of professionals in the developed world?

This paper will study the applications of ICT in the Healthcare system, its usage to disseminate patient information/solving problems, education/knowledge required for effective introduction of ICT applications and the implications for the Nigerian health worker and its potential benefits for the Nigerian health system

1.4 Significance of the research

Health informatics could support the expansion of the health care system in developing countries like Nigeria. This dissertation will describe and evaluate scenarios of health intervention procedures in Nigeria. This evaluation will explain the different paths available to an organisation when introducing Health Informatics (HI) to a developing country such as Nigeria.

This dissertation will explore the relationship between policy, policy makers and informatics at the introductory stage in a developing country like Nigeria. If policy makers in the developing world can understand why ICT ventures derail in similar economies, they can map out strategies and plans to prevent the failure of future ICT projects. In Nigeria, many ICT projects failed in the past because managers lacked enough technical and interpersonal skills, a problem the country can easily correct by the introduction of computer skills and other relevant subjects into the managerial training courses of those working in the health sector. Moreover, managers can develop their organizations faster if they understand how the application of ICT relates to local and organizational development.

To create the necessary Health Informatics awareness, planners and managers should enable the training of health professionals in ICT competencies, before the project starts, which is not the case in Nigeria today. The generation of awareness and understanding of health

informatics and the innovations in it are essential in the Nigerian healthcare domain. Administrators and planners can evaluate ICT skills required of professionals and train them accordingly before the introduction of the system. This will ensure that a skilled and well-trained group is in place to operate the system during the implementation of project instead of starting this training after the completion of the system. This type of reactionary training of professionals, which is so common to Nigeria, will render the system redundant, as are many projects in the country today. Therefore, to generate awareness of Health Informatics (HI) the country should take the following steps:

- Mobilise creative people and programme coordinators to disseminate health informatics as a discipline. They should mobilise the finance, develop human resources and facilitate cooperation between the Federal Ministry of Health (FMOH), different health organisations and interest groups.
- Develop programs, curricula and other tools to encourage and maintain the development of health informatics as a discipline taking into account the specific needs of different groups and the time of convenience of individual members.
- Establish groups to organise workshops, courses and seminars.
- Appraise methods of using technology in care delivery and professional's competencies constantly to resolve identified problems and the continuously amend guidelines to adapt the systems to the local context.

Unwavering commitment to solving these issues will help to enlighten the Nigerian populace and create the understanding of health informatics amongst Nigerian healthcare professionals. To sum up, the purpose of this dissertation is to aid strategy planners, managers, professionals, educators, students and the public to evaluate the relationship between ICT application and national development, especially at the organisational or rural level.

1.3 Structure of the dissertation

This dissertation is organised into five chapters.

Chapter 1

This chapter introduces the scope of the dissertation. Following this is the justification for the topic and the motivation for studying the problem. There is also a discussion on the significance of this awareness programme to healthcare in general. Finally, it presents the structure of the dissertation.

Chapter 2

This chapter gives a general overview of Nigeria as a country. It comprises of five parts. The first part presents the geography of Nigeria and her socio-economic status. Following this is a discussion on the key health indicators and the economic demography of Nigeria. Furthermore, there is a description of the stages of the Nigerian health service since the colonial days until the present, and an outline of the contemporary structure of services and a description of the policies guiding this sector. The chapter concludes with an overview of Information communication in Nigeria and a project undertaken by the federal government so far.

Chapter 3

This chapter contains a general overview of Healthcare Informatics as a discipline. Additionally, it outlines relevant competencies, skills required for Informatics appreciation

and careers within the discipline. The chapter concludes with the direct relevance of Informatics to the Nigerian healthcare professional.

Chapter 4

This chapter gives the conceptual framework on which to create the awareness programme. There is also an introduction to the proposed module including the module plan and the scenarios used to create the awareness module for health informatics with the knowledge base outline at the end.

Chapter 5

This chapter outlines the steps in evaluation of the module. Limitations of the study and further enhancements to the module are discussed. Finally, the chapter ends with conclusions and future work.

CHAPTER 2

The Nigerian context

The author bases this chapter on practical research carried out on scholarly articles written on Nigeria and the researcher's experience while working in the healthcare sector in Nigeria between 1988 and 2000. Nigeria has had many "teething pains" since independence. Some of these problems include usurpation of political power by the military, absence of transparency in government, demoralised civil service, unproductive and bloated public service, endemic corruption, embezzlement, tribalism and favouritism (Nnamuchi 2008). Consequently, the Nigerian economy remains underdeveloped; the average citizens' quality of life is worsening progressively as the number of citizens living below the poverty line is increasing very rapidly. The poverty level in Nigeria is so high that the country is amongst the 13 poorest countries in the world (Bureau of Statistics 2005, Human Development Index 2007/2998).

This chapter is in four sections. The first section is the political and economic framework providing an all-round view of Nigeria. Section two in its three subsections shows how these factors affect the Nigerian health sector. Section three describes the Nigerian health sector as it is today and the governmental efforts to ensure the fair distribution of health services to the citizenry. Finally, section four gives an overview of ICT developments in Nigeria, the national Health Information System and concludes with the level of investment required in setting up ICT infrastructures in Nigeria.

2.1 Socio-political context

Nigeria lies on the west coast of Africa and occupies an area of about 923,768 square kilometres sharing borders with Cameroon, Niger Republic, Chad, the Republic of Benin and the Atlantic Ocean (Central Intelligence Agency (CIA), Nigerian fact sheet 2006). Figure 2.1

shows the map of Nigeria detailing some cities and boundary with other neighbouring countries.



Fig 2.1 Map of Nigeria source: <http://geology.com/world/nigeria-map.gif>.

Nigeria is a federated state and Africa's most populous country with about 140 million inhabitants that represent 20% of the people living in Sub-Saharan Africa (Mursu et al 2000). It is also the world's tenth most populated country (<http://www.internetworldstats.com/stats8.htm>). Nigeria's population is 141,356 (HDR 2007/2008) and could increase to 200 million by 2025 with the present annual growth rate of 2% according to some estimates (UNDP 2007/2008). Nigerians below the age of 15 make up 41.3% of the population whereas those over 65 make 2.9% of the population (UNDP 2007/2008). There are 36 states subdivided into 774 Local government areas (LGAs) with the seat of government at the Federal Capital Territory (FCT) in Abuja in Nigeria.

The National Gross National Product (GNP) is USD 36 billion which makes up 41% of West African GNP. According to the Federal Office of Statistics, the percentage of Nigerian families categorized as poor increased steeply nationwide from 28.1% in 1980 to 54.4% in 2004 (National bureau of statistics 2005). Nigeria had the per capita GNP of USD 560 in 2004 as about 70.8% Nigerians lived on less than a dollar a day (UNDP 2006).

Archaeological findings have shown that people have lived in Nigeria for more than 2000 years (<http://www.nigerianembassy-chile.org/nigeria/xculture.shtml>). The oldest, the Nok people, lived in the Jos plateau area, between the Niger and the Benue rivers as far back 300B.C. to 200 A.D. By 1500 A.D., some tribal nations or kingdoms similar to the present day tribes were already present. The Hausa formed the northern kingdoms, the Yoruba created the mini-states or kingdoms in the west, while the Ibos lived in quasi-democratic associations of towns in the east.

The slave trade that began in the late fifteenth century and tipped during the period of 1650 to 1850 devastated Nigeria. In 1807, British parliament passed the Slave Trade Act (http://en.wikipedia.org/wiki/Abolition_of_the_Slave_Trade_Act). In 1833, the British also enacted the Slavery Abolition Act but slavery continued in Nigeria prompting Britain to send its navy to the West African coastal waters to enforce this law, and ultimately colonizing Nigeria.

In 1914, the British joined the Northern and Southern Protectorates of Nigeria to form the entity we know today as Nigeria. The amalgamation of about 250 tribes into a political entity brought many problems as these fiercely independent tribes and nations started to jostle amongst themselves for power (Uzoigwe 2003). The British ruled Nigeria until independence in 1960 (<http://www.uiowa.edu/~africart/toc/countries/Nigeria.html>).

Because of stirrings of liberation movements across Africa in the 1950s, educated Nigerians and labour unions started demanding for an end to colonisation. This nationalism brought so many changes on the political front including, the introduction of two constitutions in 1946 and 1951, federalism with regional autonomy, and a “quota system” to reflect the composition of the majority tribes, in civil and public service recruitment. In 1957 and 1958 at Lancaster House in London, many prominent Nigerians met to create a new federal constitution. Nigeria gained independence on October 1st 1960 and became a republic three years later in 1963 (Metz 1991).

| YEAR | EVENT |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1860 | The Roman Catholic Church establishes the Sacred Heart Hospital in Abeokuta. |
| 1870 | The colonial government establishes clinics at Calabar, Lagos and other towns along Nigeria's coast. |
| 1912 | Due to the starting of the Tin mining in Jos and the advent of the First World War, the government built a hospital there. |
| 1914-1918 | Nigerian medical personnel serve in the First World War in Europe, but after the war, the Nigerian veterans were allowed to treat only African patients. |
| 1945 | Due to expansion, more Nigerians could avail of medical services. |
| 1946 | The establishment of the Ministry of Health to coordinate the activities and budget of all health services in Nigeria. |
| 1948 | The establishment of a ten-year plan to expand health services, which led to the institution of University College Hospital Ibadan. |
| 1960 | About 65 government-owned schools of nursing and midwifery established so far in Nigeria. |
| 1973 | This marks the start of the National Youth Service Corps, a compulsory service for graduates of third level institutions to serve mostly in rural areas. |
| 1987 | The federal government launched the primary healthcare plan (PHC). |
| 1994 | Nigeria has about 1170 general hospitals accounting for 46,544 numbers of beds. |

Table 2.1: Milestones of the development of the Nigerian healthcare system

Between 1967 and 1970, the country experienced the Biafra Civil War. The Ibos declared an independent Biafra state, after the massacre of over 100,000 Ibos in different parts of Nigeria. Nigeria entered the Organization of Petroleum Exporting Countries (OPEC) in 1971 and crude oil replaced traditional exports like palm oil, cocoa and groundnuts. The “oil boom” period began and farmers flocked to the cities to seek employment. The federal government increased workers salaries and embarked on a very ambitious development of Nigerian infrastructures. In the mid 1970’s the economy stagnated because of drought and neglect of the farming sector.

There were shortages of basic commodities and machinery parts, which hardened the maintenance of imported medical equipment. After the FGN’s structural adjustment programme and the devaluation of the Nigerian currency in 1986, the situation in the country worsened. Prices skyrocketed prompting the FGN to reduce its expenditure, worsening the situation further (http://www.uneca.org/aisi/NICI/country_profiles/Nigeria/nigeriab.htm). With reduced health expenditure, public health organisations could not fulfil demand prompting private clinics to fill the vacuum created.

The improvement of the Nigerian health sector suffered another setback. The Constituent Assembly in 1989, promulgated a law offering free health for all Nigerians children up to 18 years , the over 65 and the handicapped. The military government later removed this clause thereby delaying further improvement of the health sector.

2.1.1 Key Health indicators

Nigeria faces the problem of improving the health status of its population. It suffers from gross inequalities in the coverage of basic health services and nutrition between the rich and the poor. However, the existing medical care in government owned health organizations are more often than not too expensive for the average Nigerian. As in other developing countries,

communicable diseases in Nigeria affect mostly the poor. Though population related data are disputable and conflicting, general health is always getting worse (WHO 2002-2007).

| INDICATOR | NIGERIA | GHANA | CAMEROON | SOUTH AFRICA | IRELAND |
|--------------------------------------------------------------|-----------------|-----------------|-----------------|--------------------|-------------------------|
| GDP (US\$ billions),2004 | 72.1 | 8.9 | 14.4 | 212.8 | \$45,600 (2007 est.) |
| life expectancy at birth(years)2000-2005 | 43.3 | 56.7 | 45.8 | 49.0 | 77.7 years |
| Infant mortality rate (per 1,000 live births)2004 | 101 | 68 | 87 | 54 | 5 |
| Mortality rate under 5 years(per 1,000 live births) 2004 | 197 | 112 | 149 | 67 | 6 |
| Maternal mortality ratio (per 100,000 live births),1990-2004 | 704 | 210 | 430 | 150 | 6 |
| Low birth weight (LBW) (%),1996-2004 | 14 | 11 | 11 | 15 | 6 |
| HIV prevalence (% ages 15-49),2005 | 3.9 [2.3 – 5.6] | 2.3 [1.9 – 2.6] | 5.4 [4.9 – 5.9] | 18.8 [16.8 – 20.7] | 0.2 [0.1 – 0.4] |
| Tuberculosis case-prevalence(per 100,000 people),2004 | 531 | 376 | 227 | 670 | 9 |

Table2.2: Indicators of Nigeria compared with Sub-Saharan African countries and Ireland.

Sources: Human Development Report (2006); African Economic Outlook 2005-2006 (<http://www.oecd.org/dev/publications/africanoutlook>).

Figure 2.2 outlines some of the key health indicators in Nigeria. Nigeria's maternal mortality rate is amongst the highest on earth. This sad fact resulted from the combination of the general poor health of the citizenry, inadequate antenatal care, HIV/AIDS epidemic and illiteracy. Two hundred and nine thousand Nigerians died of AIDS in 2000 and this figure may rise to seven hundred thousand by 2010 (FMOH 2002).

2.2 The formation of the health sector

This section will discuss briefly the effects on the Nigerian health sector of such factors like the development of the Nigerian health system, the budget, resource distribution and human resources.

2.2.1 Development of the health system

The Roman Catholic Church established the first semblance of Western Medicine in Nigeria with the construction of the Sacred Heart Hospital at Abeokuta in 1860. As detailed in Table 2.2 below, the colonial (British) government became involved in the provision of health services to the public of Nigeria in 1870 by building clinics in cities along the Nigerian coast, like Calabar and Lagos. Their care services were basic in nature such as to combat malaria and other tropical diseases (Schram 1971). The colonists concentrated most facilities in the urban areas a tradition reflected in Nigeria today by the situation of about 75% of health facilities in the urban areas where only 44.3% of Nigerians live (UNDP 2007/2008).

The 1946 health plan established measures and means for the provision and management of health services in the country leading to the building of the University College Hospital Ibadan in 1948 and some Schools of Nursing. By 1960, there were 65 government-owned schools of nursing and midwifery. After independence, and the discovery of crude oil in Nigeria, the federal government invested heavily in the development of the health sector and

other areas of the economy. During this period of the 1970s and the earlier half 1980s, care in general hospitals was either free or paid for partly by the government.

In 1994 within the public health sector, there were 1170 general hospitals accounting for 46,544 beds, 14 teaching hospitals with 7652 beds, 3263 maternity hospitals with 18,111 beds, 47 infectious disease centres with 1692 beds and 10 orthopaedic hospitals amounting to 1426 beds. In addition, there are other medical health establishments with 15,921 beds. Under today's conditions, a 51.8% of the citizenry living in rural and poorer areas cannot access necessary specialist care (HDR 2007/2008).

2.2.2 Health services finance

Funding the health sector at the federal, state and local government levels is mainly from allocations by the federal, state and local government authorities. In addition, other sources of finance include aids, loans and grants, private contributions and savings. The percentage of GDP that the Nigerian government spent on health decreased from 2.2% in 2000 to 1.3% in 2002 (<http://www.afro.who.int/malaria/country-profile/nigeria.pdf>). The World Bank urges that public spending on health per capita should be USD 34 while the Nigerian government health spending on an average citizen ranges between USD 2 and USD 4 (WHO 2002-2007).

The poor development of the Nigerian health sector is because of reduced financing during the past two decades. Firstly, the Nigerian government drastically reduced its allocation for the health and social services in the late 1980s because of reduced oil revenue. In addition, most foreign donors stopped aiding Nigerian projects in the later part of 1980s and 1990s because the Nigerian military refused to hand power to civilians. For example, the total foreign aid to the Nigerian health system in 1998 was 3.0% compared to 19.8% a year later

with the restoration of civilian rule. The private health spending as a percentage of the GDP, in 2003 was 3.7% while the per capita health expenditure (PPP USD) was USD 51 in 2003 (UNDP 2006). With the level of corruption in Nigeria and the poor state of its health sector, there is a doubt that the health budget go into the health system (Federal Ministry of Health 2004).

2.2.3 International aid

Nigeria receives aid from some United Nations (UN) agencies like the WHO, United Nations Office for Drug Control and Crime Prevention (UNODCCP), World Bank, United Nations Population Fund (UNFPA), United Nations Children's Fund (UNICEF) and the UNDP. Other international bodies aiding Nigeria include the Global Fund to Fight AIDS, Tuberculosis and Malaria (http://www.theglobalfund.org/en/files/publications/brochure/gf_brochure_07_full_high_en.pdf). The European Union (EU) and the Nigerian government are jointly improving Primary Health Care (PHC) by optimizing immunization and investing in ventures to end Polio in Nigeria. The United Nations High Commissioner for Refugees (UNHCR) caters for the welfare of the refugees that are in Nigeria just as it does worldwide.

2.2.4 Human resources issue

The capacity of the Nigeria healthcare system is increasing over the years especially with the creation of new states. Each state strives to establish infrastructures that will suit the populace. In 2005, in the public healthcare service, there were 24,522 hospitals and 21,222 health centres and dispensaries with 85,523 hospital beds available, a tremendous increase from the 1994 number as stated in Table 2.2 (Nigeria Bureau of statistics 2006). Also in

2005, there were 212,486 medical personnel in Nigeria of whom 42,563 were physicians and 169,923 Nurses and Midwives (Nigeria Bureau of Statistics 2006).

One of the major drawbacks of the Nigerian health system today is that Nigerian professionals are leaving the country for better job conditions in other parts of the world. Between April 2000 and March 2001, about 432 Nigerian nurses out of 2000 African nurses immigrated to other continents (Stilwell et al 2003). In all, the United Kingdom attracted 1510 Nigerian medical professionals in 2003 (<http://news.bbc.co.uk/1/hi/health/4582283.stm>) alone.

Besides this brain drain, poor salaries and infrastructure have contributed to the poor state of the Nigerian health sector. In the rural areas and the local government areas, there are inadequate numbers of physicians due to rural-urban migration of healthcare professionals in search of better working conditions. Despite the high percentage of locally trained medical personnel, Nigeria still employs foreign physicians whom are better rewarded with better conditions of service than their Nigerian counterparts of the same qualification are. This has caused a lot of disagreement between unions and the government resulting to low morale among Nigeria graduates.

2.3 The status of health services

The situation in the Nigerian health sector today is chaotic. Healthcare delivery in the public sector is low in quality and essential supplies and equipment are scarce. This is mainly due to a shortage of required medicaments and an abundance of expired or fake drugs, meagre financial and human resources, overlapping of functions between the three tiers of government in the provision of healthcare, misappropriation of funds and serious failings in the allocation of resources. In addition, there is little or non-existent partnership between the

private and public health sectors, incoherent strategies for care delivery to the poor resulting in a wide gap between the health status and outcomes of the rich and poor.

2.3.1 Nigerian Healthcare System

The Nigerian healthcare started as a colonial legacy of the British government. Due to the reforms within the healthcare system in the late 1980's healthcare provision is now a combination of preventive, promoting and curative services from three parallel sources such as public, private and voluntary or missionary agencies. Each of these sources has different philosophies underlining their operations and the roles all of them continue to play. Besides these three major types of care providers, there are also traditional healers, spiritualists and traditional midwives whom the Nigerian government does not recognise formally because of the unorthodox nature of their care provision. They nonetheless play very active roles in care provision in the rural and remote areas of the country. Below is a brief description on how the healthcare bodies operate:

The public sector: The public health sector is the main provider of medical care in Nigeria. It has expanded much since the country's independence because of increased oil revenue and free medical care and food for inpatients at the height of the "oil boom" (Alubo 1987).

The private profit-making sector: The Nigerian private medical sector started from the modest beginning of colonial doctors vaccinating slaves and providing them with the minimal medical care aboard slave ships (Alubo 1987). In the early years of Nigerian independence, big corporations operated few private health clinics (Ityaryar 1987) but in the 1970s and 1980s, their numbers increased rapidly due to the introduction of user fees, shortage of drugs, equipment and personnel in the public sector (Alubo 1987). Most of the private health facilities are in urban areas of Lagos, Imo, Oyo, Anambra, Bendel and Kaduna states (Ityaryar 1987). The private health institutions generally charge high fees.

The private non-profit sector: Missionaries introduced Western medicine to Nigeria (Alubo 2001). With emphasis on religion, they expanded and distributed their care facilities both in the rural and urban areas and introduced user fees which most Nigerians could not afford. Recently, Islamic authorities in the northern states of Nigeria have also developed an extensive network of medical facilities in their areas of predominance (Alubo 1994a). Today these missionary-run facilities have even assumed more importance since the faithful prefer these facilities to that of the confusion in the Nigerian public health sector.

2.3.2 The Nigerian healthcare policies /Health policy context

The current Nigerian health policy is based on the Alma Alta Declaration (<http://www.righttohealthcare.org/Docs/DocumentsC.htm>) which aims at providing universal healthcare to all Nigerians. The Nigerian government introduced the health plan initially in 1988 and revised in 2004 to run a primary healthcare based system to provide every health need of all Nigerians enabling them to live productive lives (FMH 1988).

It envisages a three-tier health service: primary, secondary and tertiary with different stipulated duties for each level. It also calls for the establishment of an advisory National Council on Health with the state Commissioners of Health and the Minister of State in the Ministry Of health (MOH) as members and the Minister of Health as the Chairperson. The National Health Policy also recommends the establishment of State Advisory Committees and as well as Local Government Health Committees.

The policy presents the advancement of the health sector not only as an integral part and as a yardstick for social and economic advancement but also see it as pivotal to the attainment of social justice and national security in Nigeria. The current civilian administration has established the Health Sector Reform (HSR) Plan of Action to control and direct the financing and other activities in the Nigerian health service (FMOH 2004/2007). In the

medium term the Plan of Action aims to improve primary healthcare, sexual and reproductive health, secondary and tertiary care, drug control and production, control of epidemic and communicable diseases, coordination with investors, donors, and national health management (FMOH 2004/2007).

Another objective of the plan was accelerating healthcare personnel development, improved collection and monitoring of health data, ensuring the availability of essential drugs nationwide and implementation of an Expanded Programme on Immunization (EPI). Moreover, the plan includes the initiative of improving the nutritional status of the citizenry, promotion of health awareness, development of a national family health programme and widespread promotion of oral re-hydration therapy for the treatment of diarrhoea in infants and children.

In 1992, the Federal Government of Nigeria (FGN) formed the National Primary Health Care Development Agency (NPHCDA) to supervise PHC, establish hospitals and clinics in LGAs, and provide PHC strategies and technical knowhow. The agency also trains rural health workers, traditional midwives and ensuring that all interest groups achieved PHC goals with the least waste of money. Still inadequate finance and government support has prevented the NPHDCA from attaining its full potential (<http://academic.udayton.edu/health/06world/africa04.htm>). In reforming primary healthcare, the government issued a comprehensive primary healthcare policy that stressed the decentralisation of healthcare management and the importance of bringing health care closer to the people through local health providers. The PHC also emphasised the analysis and utilisation of information derived locally in making decisions in healthcare.

The unnecessary replication of duties and projects has brought about wastage of the country's meagre resources. To control this and formulate a more harmonized provision of health sector needs, the FGN instituted the Health Sector Reform Plan for Action (HSRP).

2.3.3 Organisation of Health Services

The organizational structure of the Nigerian health care system is a three-tier management namely primary, secondary and tertiary healthcare service. In spite of efforts to decentralise the system, the management remains central with the FMOH entirely responsible for the provision of care at all levels of the government.

The FMOH has nine departments and agencies that help it in setting up overall policy goals, coordination of activities, quality control, training and implementation of sector programmes such as the EPI. Despite these activities, the state manages the whole three-tier system, directly or indirectly which include the overall costs, consumables and capital investment.

The Federal Ministry of Health (FMOH) provides policy guidance and technical assistance to the 36 States and the Federal Capital Territory (Abuja), co-ordinates State efforts to achieve the goals set by the national health policy, and is responsible for establishing a management information system designed to improve both national and state-level planning. The FMOH also monitors and evaluates the implementation of the national health policy. Additionally, the FMOH handles the training of doctors, operating teaching, psychiatric and orthopaedic hospitals; monitoring and controlling contagious and communicable diseases. It also ensures adequate availability of vaccines and essential drugs. Formal linkage between FMOH and the State Ministries of Health (SMOH) is through the National Council of Health, with the Federal Minister of Health as chairperson and all State Commissioners of Health as members. The National Council of Health convenes to deliberate issues in this sector three times

http://www.afdb.org/pls/portal/docs/PAGE/ADB_ADMIN_PG/DOCUMENTS/OPERATION_INFORMATION/ADF_BD_WP_02_50_E.PDF) annually.

The Nigerian FMOH also through other bodies is indirectly is able to monitor and control important health matters in the nation. These include the National Primary Health Care Development Agency (NPHCDA), National Programme on Immunization (NPI), Nigerian Institute for Medical Research (NIMR), National Agency for Food and Drug Administration and Control (NAFDAC) and National Action for Prevention and Control of AIDS (NAPCA) (http://who.int/countries/nga/about/ccs_strategy02_07.pdf).

2.4 ICT status: The Nigerian perspective

Although there is a conception that ICT is a new endeavour in developing countries, the usage of telecommunication devices in Nigeria traces back to the colonial period to 1923 with the establishment of trunk telephone services between the two towns of Lagos and Ibadan (Ofulue 1980). This later expanded with the introduction of Very High Frequency (VHF) radio stations, 116 manual and 5 automatic telephone exchanges in 1950. The 1970s heralded the establishment of telecommunication facilities like the Lanlate Satellite Earth Station, an international communication gateway and the Nigerian Domestic Satellite System.

To improve their services, the Nigerian External Telecommunications limited and the Post and Telegraphic Department combined to form the Nigerian Telecommunications Limited (NITEL) 1984. The Nigerian National Petroleum Company (NNPC) established the first Nigerian digital communications network, the largest in Africa in the 1990's (Ogunsola and Abiyade 2005).

The Nigerian Federal Office of Statistics (FOS) traces the introduction of computers to the first computers bought by the Nigerian Ports Authority (NPA) from International Computers Ltd (ICL) in 1948 (United Nations University, 1994). However, the introduction of the first

digital computers into Nigeria was in 1962 (United Nations University 1994, Soriyan et al 2000). In 1963, the IBM set up IBM computers to raise awareness and train students at the University of Ibadan (Anyanwu 1978). During this early period of computer usage in Nigeria, only banks, multinational and oil, companies could afford to use computers. Poverty and ignorance further hindered the ICT dissemination in Nigeria (Tiamiyu 2000). In addition, the poor state of the Nigerian economy is restricting the implementation of ICT and its infrastructure though Nigerians own about 27% of all computers in Africa (Korpela 1994).

Many computer companies were set up in the period of 1977 to 1982 during the economic boom in Nigeria. By 1994, about 200 computer companies were operating in Nigeria. None of them manufactured computers. Today two indigenous companies, OMATEK and Zinox assemble computers both for the Nigerian market and for export. Other globally renowned computer companies also sell their computers through their Nigerian branches

With the return of democracy in 1999, a new dimension in ICT activities in Nigeria started. In 2000, with the enactment of the Nigerian Telecommunication Policy the populace witnessed an expansion in the diffusion and usage of ICT products. This included reactivation of the Communication Commission originally formed in 1992 and the creation of the Nigeria Information Technology Development Agency (NITDA) in 2001 to oversee and control IT expansion in Nigeria (<http://www.nitda.gov.ng/about.htm>). The mandate for NITDA was to administer the ICT policy formulated in 2001 (<http://www.nitda.gov.ng/about.htm>). Amongst their strategies is to establish broad based e-commerce services within the governmental organisations.

In addition, events in Nigeria in the last few years suggest the preparedness of the Nigerian government to embrace ICT in all sectors of the economy. For example in 2003, Nigeria launched its first satellite, Nigerian Satellite 1(NigerSat 1), an earth observation satellite built

in the United Kingdom (UK) and launched from Plesetsk Cosmodrome, Russia (Raufu, 2007). While in May 13, 2007 was the launch date of The Nigerian communications satellite (NigComSat-1), the first Nigerian communications satellite built in China and worth about \$400 million. This second satellite would broadcast high-definition Television (TV) and Direct-To-Home television (DTH) services and digital multimedia (Epia 2007). The NigComSat-1 will provide a reliable, more effective and cheaper satellite communication services to subscribers.

The Nigerian Telecommunications Limited (NITEL) was the only company supplying landlines in the past and dial-up internet. The 2000 National Telecommunication Policy saw the deregulation of the telecommunications sector in Nigeria that brought about the Global System of Mobile Communications (GSM). At present Nigeria, have two national providers and five GSM providers. The growth rate of the Nigerian GSM market and telecommunications has positioned the country amongst the fastest growing telecommunications market in the world.

The ICT Policy of Nigeria (2001), in recognising the importance of ICT to the health sector advocates the use of ICT in data processing and dissemination, channelling the data to other healthcare levels for informed decision-making and ICT education of healthcare professionals (<http://www.nitda.gov.ng/document/nigeriaitpolicy.pdf>). However, achieving most goals as stated in this policy document is still very elusive. The health information system is still paper based. In Nigeria, different agencies have undertaken ICT projects in the past, but the dream of an implemented National Health Information System is still at the planning stage. Below is an overview of the first ICT project funded by the federal government.

2.5 ICT in the health sector: The first Nigerian Health Information system (NHIS)

The federal government in collaboration with the Carnegie Corporation and the WHO in 1997 developed the first Nigerian Health Management Information System (NHIMS), which served as the routine data collection system for the first Nigerian Health Management Information System NHIMS (Lecky 2001). The World Bank funded the project. The overall aim of the project is to collect and report data for epidemiological and surveillance purposes within the three tiers of the health system. The system composed of 13 components that include a national population household census, event and disease registry, community survey.

There are three fundamental record systems. Patients keep their records at home with each family having a familial card though each adult or child has a Primary Health Care card. On the larger scale, each organisation records its data daily, keeping it on their premises while community health workers keep the community's data. The LGA headquarter gathers, evaluates and processes the data, finally forwarding them to the SMOH. The SMOH then forwards data to the FMOH biannually. Though its data storage capacity is huge, it is cumbersome and time wasting, of poor quality, disjointed, and requiring manual data input (Soriyan, et al. 2005).

2.5.1 Level of investment required for health informatics infrastructure in Nigeria

Given the problems associated with the Nigerian health sector, would it not be better for the country to invest its limited resources in Antiretroviral Vaccines (ARV's), Oral Rehydration Therapies (ORT's) or Yellow Fever Vaccines, rather than computers? Although computers

do not save lives, ceaseless demand for better healthcare delivery, ultimately influence the expenditure on healthcare and healthcare related projects.

The phenomenon of globalisation in recent years has an important impact on the uptake of ICT in healthcare and as a result has major implications for healthcare professionals (Avgerou and Walshan 2001). Local developments affect directly on activities in distant places, thousands of kilometres away and vice versa. The social and cultural dimension of globalization is one of increased interconnection with people and economic activities and social relations. These in turn shape people's health and lives.

In 1975, the Economic Community of West African States (ECOWAS) became a free trade, migration and tourism initiative between West African Countries (ECOWAS 1995). Nigeria the most populous and economically powerful country in the region absorbed thousands of immigrants from other member countries. Nigerian health professionals require modern technologies and facilities to cope adequately with the demands of refugees and migrants with specific physical and mental needs.

As the whole world is becoming one "information super highway", the health of the social and politico-economic dimensions of globalisation are affecting health and healthcare delivery in Nigeria. The FGN needs the accurate data that a good information system could provide to stem this brain drain instead of relying on inaccurate data (Stilwell et al 2003).

Investing to improve the poor health and communication infrastructure in Nigeria besides increasing the salaries of health professionals is essential to lure back Nigerian professionals abroad or to dissuade Nigerian professionals living in Nigeria from emigrating abroad.

With increased patient acuity especially through the internet, patients receive disease information, alternative therapeutic care and respective diagnostic information. Therefore, the

creation of a robust ICT infrastructure in Nigeria and developing applications that can address the basic priorities to support services in healthcare should form the basis of all information societies.

Accurate and quality data is essential to realise the full potential of any project in healthcare (Pakenham-Walsh et al 1997). The United Nations in its Millennium Development Goals of 2000 stated that “*Make available the benefits of new technologies especially information and communications technologies*”. Therefore, technology applications in the Nigerian health system and good management could make the health service better.

Organizational change is the way an organization undergoes transformation, reforming organizational structures, duties, job relations and traditions in its business dealings within the organization and with other outside entities (Murphy 2002). In today’s society, investing in ICT has favoured reforms in organizations. ICT also enables organizational improvements through increased productivity by increasing finance (Murphy 2002). Thereby introducing ICT into the Nigerian health service will modernise organizational practices and improve transparency, efficiency and accountability within the organisation and the health service as a whole.

ICT has changed organizational structures and healthcare delivery within the developed countries of Western Europe, America and Australia. ICT could apply likewise in Nigeria. Information systems have become crucial to health institutions (Al-Shorbaiji 2002) initiating improvements in the way organizations are managed (Muid 1994). Nowadays, shared care delivery by professionals of different specialities or even self-care by patients themselves in their homes is replacing the traditional doctor-patient care setup (Grimson 2001). In addition, interactions between external and internal factors that involve professionals like managerial procedures also bring organizational change (Slappendale 1996).

With the ever-increasing medical data and legal rights available to patients, organizations interact with patients to ensure their wellbeing while caring for them. Organizations therefore provide care that is specific to the patient and this improves competence and justifies the high medical costs that clients get these days from the health service sector (Grimson 2001)

The immediate problem facing the Nigerian health service is how to reform organizations to realise all the advantages of ICT and how to increase production from inputs of more infrastructure, research and education (Murphy 2002). Training is essential to improve communication, cooperation, competence and cost-effectiveness. However, these new technologies also have the potential to redefine the healthcare system by improving care procedures and organizations.

Organizations must be open to adjust to implement ICT inasmuch as ICT increases work flexibility (Murphy 2002). Reform of the Nigerian health system needs its acceptance and commitment by senior managers and their capacity to adapt to new work procedures. They should comprehend the extent and the effect of ICT implementation, advantages and disadvantages to be able to convince policy makers and donors alike. This will also include altering the organizations traditions, which would depend on the capacity of staff and workers unions to assume new roles and duties. The new roles could include more teamwork, decentralised decision making, improve data sharing and inducements to reward the changes.

The concept of development is multifaceted and encompasses various interconnected, social, economic and cultural aspects (Reddy 1987). Unlike in most developed countries with higher life expectancy, Nigeria to combat the effect of increased chronic diseases and geriatric multi morbidity requires more specialised care from and cooperation among health professionals. Moreover, advancements in medicine have ushered in an era of sophisticated diagnostics and therapeutic methods many of which cannot function without the use of computers (Haux et al

2002). In other words, no modern health system today can function without computers and ICT.

Though one may argue that ICT has no direct impact on certain prominent health issues in the country such as malnutrition and diarrhoea, however, ICT can directly influence some areas such as disease control and management. ICT's impact on health outcomes is always indirect. In addition, telemedicine reduces diagnostics and data collection costs, thereby improving the professionals' efficiency.

2.6 Conclusion

Nigeria like most developing countries faces many problems like political instability and corruption influencing both the private and public sectors of the society and the citizenry at large. All demographic data are poor and unreliable. The FGN should invest more funds on the health sector to implement all policies enacted in the country. ICT offers Nigeria the chance to maintain a sustainable health system. The country has made some progress to establish the ICT infrastructure that will sustain a computerised health system.

The next chapter discusses an ICT awareness programme among Nigerian healthcare workers through scenarios peculiar to Nigeria. Further, it explores how ICT can help to improve efficiency in the country.

CHAPTER 3

3 Health Informatics education

Introduction

Health care management nowadays encompasses the business aspect of health services and the information systems and the information generated is used in the analysis, planning, research and management of healthcare thereby paying more emphasis on the way that health data is gathered and handled (Al-Shorbaiji 2001). The term “Medical Informatics” initially used in the 1970’s from the French, word “Informatique Medicale” (Van der Ler 2002) is an academic discipline to manage data issues in the healthcare industry. What we know as Health Informatics in Europe, Americans refer to as Medical Informatics. Haux (2002) defines Healthcare Informatics as *the scientific discipline concerned with the systematic processing of data, information and knowledge in medicine and health care*. Health Informatics program provides the background for the understanding and gaining of skills necessary for the development of information tools and technologies. While this definition is valuable to information management, Hasman et al (1996) argues that Health Informatics aims at improving the health system, medical research and education through the methodical analysis and application of data. This reduces costs and improves efficiency and quality. Furthermore, with education, students will fully understand the use of information generated by health system encounters and develop a framework to formulate and answer questions relating to the use of information in health care. Haux (1997) stresses that health informatics would not only resolve information and knowledge processing.

This chapter of the dissertation introduces the Health Informatics education as a discipline. There are five sections in this chapter. The first presents an overview of Health Informatics.

The second section gives a general overview of Healthcare Informatics as an academic discipline. The third section justifies implementing health informatics education in Nigeria and steps to develop the curriculum. The fourth section discusses career opportunities of Informaticians followed by their roles and responsibilities. Lastly, the final section argues on the relevance of Health Informatics education among Nigerian healthcare professionals.

3.1 The need for Healthcare informatics education in Nigeria

Globally, there is no reconciliation of the knowledge and experience of healthcare workers in the use of ICT in information management and decision making against the trend of modern technological developments (Haux 2002). Lack of appreciation of ICT and the limited knowledge on its usage inhibits the practices of clinicians in patient management and better use of information resources. As Nigeria is preparing to introduce healthcare information systems applications into the healthcare system, this requires a more suitable informatics education for healthcare professionals. However, this is hampered by the absence of active management and participation of healthcare professionals in IT development within the country, which will lead to inefficient ICT implementation in the health sector (Soriyan et al 1999).

However, technological advancements have dramatically transformed the educational platform from the classroom-oriented concept to a more sophisticated on-line learning (Hovenga 2004). In place are new innovative ideas about healthcare education and modalities, which are shifting towards distant learning, telehealth, multimedia education and more emphasis on continuous learning through conferences, courses and workshops these contributing to alternative healthcare programmes, which Nigerian healthcare professionals can avail, from (Hasman and Haux 2004).

In medicine and allied healthcare today, Information technology has become a necessary subject and a core program to excel from before graduation (Chastian 2002). Nigerian students require official training to prepare them for their future roles in information management in healthcare system and for appropriate and judicious use of ICT applications in healthcare. This present need of Informaticians has highlighted the need for improved educational curriculum for those interested in specializing in this field. Only an improved education and increase in the number of Informaticians can eradicate this lack of knowledge.

The competencies required by Nigerian healthcare workers to fulfil the five care roles of their profession as clinicians, researchers, educators, managers and lifelong learners (Staggers et al 2000). To be able to acquire the necessary competencies Nigerian healthcare professionals need to be able to use basic computer applications such as the internet, databases and the use of e-mail and electronic library catalogues to locate information. It also includes better keyboard text-entry, editing and formatting documents (Ian and Kelsey (2004). Therefore, Health Informatics education should be more available with improved curricula to expand the scope of jobs available to the Nigerian health workers within the country and globally.

3.3 The development of Healthcare Informatics curriculum in Nigeria

Like every other discipline, the educational framework of Health Informatics acts as a road map detailing the learning opportunities and qualifications within the discipline. This includes the entry and exit points, routes of progression within health informatics education and opportunities for credit transfer from previous courses as a component of a chosen career pathway (Hovenga 2004). Globally, differences in healthcare delivery systems lead to the variety of educational programs offered and to different perspectives of Health Informatics

education. Nonetheless, most programs have similar aims and connections to the health structure of each country (<http://www.emro.who.int/HIS/ehealth/curriculum.htm>).

Changes in the curricula of the healthcare professionals in Nigeria with the introduction of Healthcare Informatics should give them the basic IT skills required for duties in entry-level to Healthcare Information Management Systems. However, the planning stage of Nigerian Health Informatics education must involve all stakeholders that include health professionals, educators, students and health organizations. To develop suitable Health Informatics curricula, requires methods that will meet students' needs considering their medical education workload. Therefore, only the necessary courses that teach skills sought by future possible employers and adjusting to meet the needs of industrial development should be in the curriculum (Valenta. 1993). This will require constant appraisal of the healthcare and labour market's skills needed in health informatics professionals and constantly mapping out programs to meet these needs.

Health education today deals more with problem solving and disease prevention in the community, leading to more attention on the socioeconomic and behavioural factors affecting the individual and the community. Because of this, there should be an inclusion of clinical, social and behavioural science courses in informatics curricula in Nigerian institutions. Therefore, teaching and learning methods within the curricula need regular appraisal so that the students will keep abreast with developments within the health service and international standards.

The International Medical Informatics Association recommended a pathway for health information training in 1999 further presenting a plan for informatics curricula worldwide in 2002(IMIA 2000).This plan ensures that health workers receive enough informatics competencies to enable them stay informed of the technological developments and changes in

care delivery. These recommendations aim at providing a framework for the establishment of courses and course tracks in countries where there are no existing informatics education or in those that do offer informatics. They also offer ways to further education and support international initiatives to enable virtual universities to function optimally.

Therefore, the incorporation of informatics into medicine, paramedical courses and further education of health professionals, requires adjustments to the curricula according to the needs of each organisation or institution. Since current informatics certifications have different origins, it is important to set a common educational pathway though this might be difficult to implement (Hovenga 2004). This could be resolved by appraising the needs of different specialities in Health Informatics and levels of career advancements in people who are not graduates of HI. Example can be taken from the National Health Service (NHS) used The Management Charter Initiative (MCI) standards, which stipulates compulsory ICT knowledge and skills for all managerial and essential staff in the course of in-service training Initiative of healthcare development (IHCD) (1998). The training targets each professional's skills and the skills required for their specific duties.

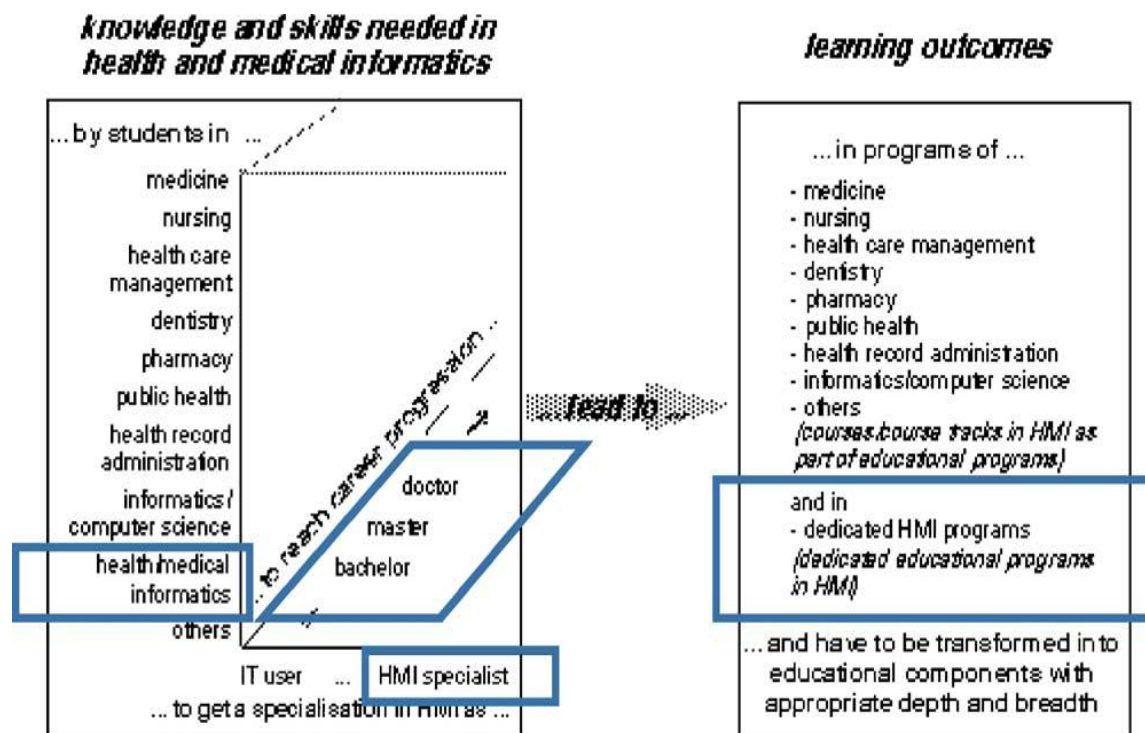


Figure 3.1: Recommendations of the International Medical Informatics Association (IMIA) on Education in Health and Medical Informatics.

Source: Methods of Information in Medicine (2000) 39, 267—277.

As represented in figure 3.1 above, the educational curriculum outlines healthcare informatics students' academic syllabus in progressing from the point of acquiring the basic knowledge to becoming informaticians. This entails both undergoing basic studies and mandatory courses to broaden their knowledge in ICT usage in the course of their work.

Nigerian educators can emulate the International standard as applied by the NHS whereby educators in the medical field learn how to use new educational technology and aids like videoconferencing, databases, interactive learning, internet, information technology and electronic information resources. In addition, they have to use new teaching methods like distance education, group and individualized teaching with emphasis on Problem-Based

Learning which entails learning through active involvement in the education process instead of learning only from the educator.

The adaptation of a health informatics curriculum in Nigeria, which is a developing country with inadequate ICT infrastructure, will be difficult. Factors like the state of the economy, culture, qualified educators, students and future job prospects will influence the choice of the curriculum. However, a well-defined approach like setting up a working group of ICT experts and educators in the exploratory stage, to evaluate these factors above before deciding on the curriculum will make a good start. Appendix 1 is a global list of schools offering informatics education.

However, the acute lack of basic IT knowledge and resources are the biggest obstacle hindering the implementation of ICT in Nigeria. This could be resolved by promoting more computer literacy training for healthcare professionals. They can get basic computer skills through independent learning by using programmes and internet websites such as the CLaSS Computer Literacy software (<http://website.lineone.net/~ianjohncole/class1.htm>). A competency assessment can be obtained by using this link (<http://www.nursinginformatics.com/niassess/competencies.html>). Through dedicated ICT investment, curriculum development and institutions of higher learning, Nigeria will produce great professionals of health informatics who will be able to compete with their international peers.

Curriculum development in Nigeria will involve attracting well-trained health informatics lecturers, which costs much. Nigeria's foreign exchange reserves have grown much in the last two years unlike the two decades before, when the country was heavily indebted to the International Monetary Fund (IMF) and World Bank (<http://www.cenbank.org/IntOps/ReserveMgmt.asp>).

In order to encourage cost efficiency, Nigeria shall:

- Maximize the few information technology experts and infrastructure it has.
- Co-ordinate with each department of computer science and medicine of teaching hospital to formulate a centralized curriculum and encouraging worldwide collaboration by taking the advantages of modern information technology and new development in the field such as issues in bioinformatics and all the new ones that will come.
- Ensure that each university manages only the resources at its disposal or forming a specialist unit within the domain.
- Coordinate the financing of regional curriculum between the Nigerian federal government and international donors.

Presently, Health informatics is not offered as an academic discipline in Nigeria though the emphasised the need of Health Informatics education in the ICT policy of 2001. In lieu of the IMIA's recommendation, the choice of a certain mode of educational approach should depend on the specific profile and possibilities at each Nigerian university.

Specialist courses in Health Informatics should cover a broad range of health and biomedical informatics content requiring students to acquire both theoretical knowledge from lectures and practical expertise within the healthcare institution (for example in hospitals). This will enable them to teach in colleges, work in hospitals or in industrial settings (Hovenga 2004). Nevertheless, Nigerian professionals lack the expertise to participate in ventures that will improve ICT knowledge amongst Nigerian health workers unlike their colleagues in Britain (Bello et al 2004, Ajuwon 2002). To achieve a higher ICT knowledge by the professionals

requires the integration of strong research content into the program with a link to the teaching hospitals for both the educators and the students as well so that educators will be able to give quality training to their students. This incorporation needs increased expenditure on infrastructure and tutors in place of modules. The Obafemi Awolowo University in collaboration with University of Kuopio in Finland established a great research unit of Healthcare Informatics for exchange students in Ile Ife, Nigeria (Korpela 2000). This unit can serve as a starting point in the initiative. However, whatever the course this takes, changes in educational strategies in the medical schools in Nigeria should aim for a higher quality level of education.

WHO (2005) recently in its report stresses the benefits of integrating health research, informatics and information management in health workers' curricula. In addition, health informatics professionals in Nigeria could improve the economy of Sub-Saharan countries like Nigeria if they bring about easier transfer of technology from developed nations just as is in India and China now. Therefore, the production of locally trained health informatics professionals in Nigeria requires awareness creation and the provision of a satisfactory curriculum. These Nigerian trained health informaticians shall in turn develop, manage and improve information technology in the country.

3.4 Roles and responsibilities of Informaticians

Healthcare informaticians in the course of their study acquire business and information knowledge, which will enable them to relate and communicate effectively within the multidisciplinary healthcare team as well as with the consumers of healthcare. Embedded in their training are managerial skills for them to function as lower level managers in all sectors of the healthcare industry.

The diversity of informatics education exposes the professional to work in a variety of organisations, businesses, government related settings within a multidisciplinary team such as the healthcare industry, vendors of health-related services like software, healthcare consulting firms, non-profit agencies and insurance or commercial companies. As the professional progresses and gains experience within the discipline, he/she can work in related professions.

Therefore, healthcare informaticians' roles include aiding in the development of programmes throughout the software cycle, management of existing programmes, installation of clinical information systems and its modifications, training users of the systems, conducting superior and supervised customer support as well as aiding in the procurement of systems. For instance, the use of the "Making information count" strategy is used in designating roles/responsibilities among workers in the service to ensure that comprehensive data management amongst workers and the identification of six-component staff group as in the table 3.1 below.

In table 3.2, the grouping of the staff is based on Informatics specialism, seniority and clinical background. The strategy identifies them with their core knowledge and skills in information management and the recognised area of practice as entrenched in the NHS human resources strategy.

| Specialist HI Group in NHS | Role description |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Information & communication Technology(ICT) staff | Run the internal and external electronic communications systems. Staff roles include network management, technology and help desk support, application and systems development, project management and implementation ,system security and staff training |
| Health records staff | Collate, store and retrieve the patient records used in diagnosis and treatment. Staff roles include health records staff, assistant manager of a medical records department and clinical coders. |
| Knowledge management staff | Support health professionals and management staff in their education, training, development and professional practice. Assist NHS employees to access information. Staff roles include administrative assistance, knowledge managers ,information specialists and librarians |
| Information management staff | Use statistics and other information in order to plan, monitor and develop the health service. Staff roles include research, clinical audit, data protection and confidentiality, planning and performance management. |
| Clinical informatics staff | Qualified health professionals who have moved into a part-time or full-time role in health informatics |
| Health informatics senior managers and directors of services | Run health informatics services and plan. Can come from any of the specialist HI areas. |

Table 3.1 NHS Health Informatics Careers and IM&T

Source: NHS Career, Health Informatics Careers in Information MG&T

<http://www.nhscareers.nhs.uk/careers/healthinformatics/carrers.html>

3.5 Career opportunities and salary structure

Due to the importance placed on data in this information era, the domain of Healthcare Informatics is growing expeditiously while the demand of Informaticians is increasing due to their specialist skills and expertise in data and information management thereby making them

indispensible in the healthcare system (Feldstein 2008). However, the prospect of advancing in Informatics profession is high but requires the professional to be a lifelong learner through in-service education and acquisition of experience through work.

3.5.1 Health Information Management Career Options

Depending on the entry level, designation in the organisation, job title for informaticians starts from an assistant or support level and progresses as the professional advances in the career ladder. Progression can be through specialisation in areas such as Coding or Cancer registry or gaining experience in management or supervisory roles, depending on the organisation.

The list below specifies some of the job titles with Bachelors and Associate degrees.

With a Bachelor's Degree:

- *HIM Department Director*
- *HIM System Manager*
- *Data Quality Manager*
- *Chief Privacy Officer*
- *HIM College Instructor*
- *Consultant*

With an Associate's Degree:

- *Health Data Analyst*
- *Insurance Claims Analyst*
- *Records Technician Specialist*
- *Clinical Coding Specialist*
- *Physician Practice Manager*
- *Patient Information Coordinator*

Professional

Certification

According to AllHealthdegree.com (http://www.allhealthdegrees.com/career/career_him.htm), graduate of Informatics can advance in their education by gaining certification exams as a Registered Health Information Administrator (RHIA) or Registered Health Information

Technician (RHIT) from the American Health Information Management Association (AHIMA). This requires two years to four years additional degree studies respectively.

More Advanced Certifications include:

- Certified Coding Specialist (CCS)
- Certified Coding Specialist-Physician Based (CCS-P)
- Certified in Healthcare Privacy and Security (CHPS)

(http://www.allhealthdegrees.com/career/career_him.htm),

(http://www.ahima.org/er/him_credentials.asp)

3.5.2 Salary and remuneration

Health Informaticians earn high wages, which is attractive to prospective specialists. Their annual salary ranges from \$32,000 - \$200,000 in 2008 (http://www.allhealthdegrees.com/career/career_him.htm). As in all fields, salaries can differ based on education, experience, internships, location, and employer. However, experienced Health Informatics professionals negotiate their salaries.

3.6 Relevance of health Informatics education to the Nigerian healthcare professionals

The effective and appropriate use of communication and information technologies is one of the essential competencies expected of all health care professionals in this century (Staggers et al 2000). Information systems not only support financial and administration transactions

but assist in clinical and logistic processes. Participants at the Sixth International Conference of Health and Medical Informatics Education (1999) noted that the trend of technological development affects the society especially in the healthcare sector where medical knowledge has surpassed the traditional data processing power. Information communication technology has improved healthcare quality and brought many advantages to healthcare (Staggers et al 2000). This pattern of improvement will extend into the near future (Staggers et al 2000). Information systems relevant for healthcare professionals include hospital information system, order entry and reporting systems, decision support systems, surveillance support systems and so many others. Therefore, implementation of evidence-based medicine requires clinicians to be computer literate to meet up with their organisational obligation as well as to satisfy their clients and justify their professional decisions.

Therefore, there is a need to develop appropriate and well-trained local health Informaticians in Nigeria who will be able to model, develop as well as choose and manage the local information technology infrastructure the government is proposing in the health sector. Moreover, the report for the World Summit on the Information Society (WHO 2005) points out the importance for institutional training of health professionals to include courses on health research, knowledge management, and informatics and data management in their programmes. Furthermore, in our high-tech global world today, well-trained health informaticians will strongly enhance Nigeria's economy by acting as a pulling factor for ICT outsourcing from the developed countries and aiding in steering ICT tools to the country.

Since health information is dependent on ICT developments, Nigerian policy makers must recognize that healthcare professionals need additional training in this area to allow them to contribute to the development of health information systems a view also expressed by the Committee of Ministers of the Council of Europe in 1990 (Grimson et al 2000). However,

there is a lack of knowledge, skills and attitude in the use of ICT in Nigeria. Through computer and information literacy, Nigerian healthcare workers will be able to acquire the minimum competencies identified by the Association of American Medical Colleges (AAMC, 1986) which are:

- Demonstrate skills in the use of bibliographic retrieval systems.
- Variant approaches in the use of computer-stored clinical and research information.
- Familiarization and knowledge of clinical databases and decision support.
- Acquire the ability to work independently and competently in problem solving and decision making techniques in their course of work.

To ensure that all the staff achieve information and computer literacy, the mandatory establishment of a standard reference model like the European Computer Driving License (ECDL) for basic IT skills as applied by the NHS which has now been replaced with Essential IT Skill (EITS) (<http://www.ecdl.nhs.uk/>). This would provide a baseline for assessment of their computer and information technology skills that is tune with the aim of IMIA to ensure that professionals in their IT user role use ICT efficiently and effectively.

Paper documentation is the only mode of documentation in the Nigerian healthcare system with attendant limitations of this medium like illegibility, disjointed and bulkiness, difficulty with recycling information and incomplete leading to medical errors in most cases resulting to death (Kohn 1999). In existence are ICT systems that can aid to improve healthcare practice and prevent fatal medical errors. Systems such as EHR order entry systems that are more eligible and in the presence of standard terminology can provide decision support. These systems through their inbuilt medical dictionary, propose diagnostic hypothesis while explaining, justifying interpretations made, reducing both the time required to reach therapeutic control, and the occurrence of negative side effects of medications. They also

generate reminders and prompts in the form of guidelines and protocols for prescriptions leading to disease management.

Moreover, they provide audit trail, support research and can help in eradicating the issues of inefficient coding of data with its attendant problems. Therefore, with the escalating rate of medical knowledge, Nigerian healthcare professionals cannot stay up-to-date without the help of a health information system.

Logistics plays an important role in the health service of today, as the ability of every health service to meet clients' needs rates its efficiency and effectiveness (Haux and Hasman 2004). In Nigeria, there is a lack of collaboration among all the multidisciplinary groups with the multifaceted care providers working as separate entities leading to duplication of care, high-waiting times for ambulatory patients, poor resource allocation and unaccountability. In practice today are planning systems that if put in place, can fasten all these services and ensure accountability. Among professionals, there are scheduling systems that can ensure that all the projections of multidisciplinary groups are presented even months ahead. With this, the healthcare system can easily project on things required and how they will work out in the near future. However, the usage of these resources requires proper training, education and dedication.

Knowledge of information systems is an important requirement for its operation and usage. Education will foster insight into the functionality of many of the systems in use today and their applicability in work since experts develop systems or do so in conjunction with healthcare professionals. A professional's general knowledge of Medicine and Computer Science is an advantage, which is what health Informatics education is all about. They will understand the principles, concepts and methods behind these information systems so that in case of any system procurement. With informatics education, Nigerian healthcare

professionals will be able to aid in designing terminology servers, coding systems, interfaces that are peculiar to Nigeria, work effectively with other experts in cases of intricate systems formulation and be able to educate other professionals on the usage of the system in information representation, capture, storage and retrieval where applicable. This shall ensure that the country will not procure a system that will be redundant in the end because of not meeting up with the user's needs.

Nigeria has inadequate number of health workers (Human Resources in Africa 2002). Most professionals work in urban centres where the amenities are. This situation leaves the countryside with little or no health care. With Telemedicine, professionals could consult from the distance, give care in an emergency and educate medical workers.

The ability to reach out to remote areas to deliver both health care and provide professional development and training has been the prime objective of many health authorities, international agencies and medical education institutions. E-learning can help educate people in inaccessible parts of Nigerian using cheap wireless technologies.

Furthermore, continued education of special groups in the health care community is possible using e learning. Many public health workers never have the chance to improve their medical qualifications and update their knowledge because of the limitations of their service or environment. Since these professionals have no chance of attending formal training sessions, e learning could enable them upgrade their capabilities and realize their potential.

Health care professionals in general and physicians in particular in Nigeria graduated from different local universities and from different countries with different medical education philosophies. This means that they see health care delivery in different ways, which might not be in line with the national health policies. However, Nigeria can standardise the training of

health professionals by using electronic learning. It would also be possible to unify certain components of the curriculum common to all institutions for the undergraduate students, and evaluate them in the same manner.

The adoption of health informatics education in Nigeria will enrich local healthcare workers with all the benefits that informatics bring to medicine and care in general. The adoption will help create the awareness for and help the development of an integrated national health information system. It will educate professionals on the use of local and international databases, how to search medical and medicine related literature and related bibliographic systems. Education would lead to the expertise of health data storage, management, analysis and application for clinical and statistical needs. Furthermore, health informatics education in Nigeria will lead to competencies in computer usage, informatics applications, information technology and networking amongst health professionals. An information culture will be cultivated, in which the comprehension of the socio-economic, legal and ethical issues related to the adaptation of ICT in healthcare will be in place. Moreover, it will bring about the appreciation of other issues like, coding, classification, quality control of data, security in networking, development and design of clinical research applications, international standards in health information management, competence in needs procurement and evaluation, and the skill in other ICT applications in healthcare like Telemedicine, Tele-nursing, Tele-radiology, Tele-pathology and so on .

3.7 Conclusion

Education of healthcare professionals on the use of ICT is imperative for modern healthcare delivery. Informatics curricula centre on the use of computers and ICT programmes in offering an equitable, evidence-based and accountable service to the populace. Though the IMIA made recommendations on developing a health informatics curriculum, the educational

content must consider the individual country's peculiarities and circumstance to which the content will apply.

As informatics specialists work in teams, effective communication and leadership skills are essential for their successful integration into the teams. This is essential as they work within and outside the healthcare industry as liaison officers across different professions.

Finally, the changing of most traditional structures of education to PBL and subdivision of the healthcare informatics programme into units ensures the integration of all the aspects of ICT into the course. PBL will then allow the students to set specific learning goals in line with the academic unit. This will accelerate their learning by simulating their experience into the structures of the course in the use of ICT to solving the problems in the country's healthcare system. The professionals will be able to cover most spectra of Healthcare Informatics that include information systems in medicine and paramedical fields and the related ethical issues. With this exposure to the light of intensive practical experience, they can confidently work in any setting within and outside Nigeria.

Though Healthcare Informatics program is intensive and challenging from bachelors' degree to certification however, specialists in this field are highly sought after and receive high wages and they are faced with positive career prospects especially if the professional is zealous enough to continue improving his/her informatics education.

CHAPTER 4

4 Proposed programme

Recently, the educational trends in the higher institutions have shifted from the traditional way of demonstrating skills fostered by teachers to a more self directed and interactive learning whereby students can observe the results of their actions without consequences (Urlick and Bond 1994). This change altered instructors duties from aiding understanding to coordinating education (Skiba 1997).

Learners these days can use education practices and settings formulated by educators in the educators' absence either alone or in joint efforts with colleagues. This change has assured learning outcomes that do not compromise the quality of education by encouraging students to be more intuitive, responsive and responsible for their education, a concept termed as Problem-Based Learning (PBL). Therefore, Problem-Based Learning is *an instructional strategy in which students confront contextualized, ill-structured problems and strive to find meaningful solutions* (Rhem 1998). Simulated real life situations in such instances through thorough investigation and research in a safe and convenient educational environment can result to the development of real and lasting knowledge/skills.

The principles underlying this are adequate student / faculty contact, cooperation among students, active learning, prompt feedback on tasks, high expectations and respect for diverse talents and learning ways. Interactive materials, which are problem-oriented, relevant to real world issues and motivating to learners, will replace didactic materials.

Therefore, the discussion in this chapter will detail the characteristics of the module proposed for this learning concept. This chapter has four sections. The first section discusses the background and the outline of the module. The second section details the course materials, including four scenarios, which focus on the actual work environment in the Nigerian health

system. The scenarios are subdivided into four subsections as thus: description, a problem, questions and an analysis of the whole situation. The design of the scenarios correlates with existing systems in the developing world. Finally, the chapter ends with an informal evaluation of the whole module and a conclusion.

4.1. Description of the proposed module

The discussion on this module aims to bring a practical knowledge of health informatics as a discipline and information management to the knowledge and understanding of healthcare professionals in the Nigerian healthcare system. This can be achieved by using practical examples of their working environment to create a link to the new methodologies that follow the introduction of ICT in the clinical setting. The creation of visual images through multimedia while linking these new concepts to their clinical experience will lead to an achievable goal within a specific period for the module.

4.1.1 Aims of the module

A multimedia approach is preferable in the delivery of this model to stimulate the controlling centre in the brain to translate the information within the content into appropriate situation model. However, because of costs and time constraints it is impossible within the scope of this dissertation therefore it shall be for future work. The pattern could be in video, graphics, verbal or animation reducing the complexity of information, augment cognitive processing and facilitate comprehension (Moreno and Mayer 2004). Therefore, this will enhance the participants analysing capabilities leading to improved decision-making, promote computer self-efficiency that in turn will lead to increased performance in computer-based training.

The summary of the training objectives of this module is as follows:

- Explain the concept of information in the healthcare system using ICT.
- Enhance the visibility of healthcare informatics among healthcare professionals in Nigeria by highlighting benefits associated with individual systems in different countries.
- Increase the awareness levels, general understanding of and the utilisation of ICT in healthcare.
- Examine the use of ICT in healthcare.
- Identify possible problems relating to ICT implementation in the health system.

The scope of this module is to familiarise healthcare professionals with the concepts of health information and its management. Within this awareness are computer skills assessment and links to self-directed ICT training skills. Educating healthcare professionals on modern information systems and their requirements and training needs will enable these professionals improve their judgements and contributions to the development of the proposed National Health Information System and other ICT applications in the healthcare by the federal government. Though no educational curriculum offers informatics education currently, an awareness of its career prospects will motivate professionals into specialising in this area through distant education. These professionals will then be assets to the nation when the curriculum is finally introduced to the nation.

4.1.2. Module prerequisites

Although the Nigerian healthcare system does not have enough computers, the establishment of private cybercafés has introduced most clinicians to the use of computers for personal purposes. In this technology age, most clinicians should have a minimal level of computer literacy that includes the ability to do most of these:

- Log on to the computer system.
- Use pointing devices such as the mouse.
- Have a clear knowledge of the components of a computer.
- Possess keyboard skills and a basic knowledge of computer usage.
- Use basic IT terminology from help desk queries.
- Use the internet to access information and download or upload materials.
- Be able to read or send electronic mails.

4.1.3. Module design

The design process of this module is addressed to the final year undergraduates' students in the medical and allied healthcare studies. This module targets a mixed group audience and emphasises on an integrated approach / nature of modern healthcare delivery. Since these students are in the classroom atmosphere, choosing the sample for the study will not be difficult. Moreover, the students will find it easier to integrate the knowledge gained in their placements and through the lectures in their courses. While it would be very desirable to introduce this to the healthcare professionals working in the system already, certain issues need be considered such as change management, while relevant in the scenarios and in actual practice, have not been included in the learning objectives of this module. These issues have to be analysed by all the stakeholders that will be responsible for the curriculum development and introducing Healthcare Informatics in the Nigerian healthcare sector. As the groups involved in this awareness represent different sectors of the healthcare system, proper delivery of this module will generate interest in some of the practitioners especially the innovators and academicians amongst them. These might expand their research interest in this field through training and education leading to a wider scope of this awareness of health

informatics within the organizations up to the federal level while demanding change management. Therefore, the assumption is that this will:

- Create a general awareness of ICT and health informatics to the Nigerian healthcare professionals who have not encountered informatics applications within their clinical practice.

Module framework

The concept used in this module is the Problem-Based Learning (PBL) methodology. Hmelo-Silver and Barrows (2006) describes PBL as a method of education that is student-centred or learner-centred while the teacher/lecture acts as a facilitator, guiding and monitoring the entire learning process. The design of the curriculum is such that specific objectives are set by the lectures/teachers with the students actively solving problems to meet the desired objectives.

PBL starts with student being self-directed in solving problems by application of experience of previous knowledge then digress into receiving help from peers and become increasingly independent of the lecture over time, ending up as a long life learner.

Students should receive learning aids like easy access to academic staff and reading lists in order to achieve independence. However, the realisation of the student's educational goals depends only on her learning style and level of commitment to her studies.

PBL presents students of medicine and medicine related courses with actual world clinical situations to help the students acquire crucial decision-making skills in emergencies and analytical capability required for their studies and duties at the clinics.

PBL methods are useful in designing curricula, teaching single courses or in programmes with non-clinical material that the teacher wants to present in course of clinical practice. They can also help to acquire knowledge, competence and behaviours as a part of mixed courses over a short period.

Figure 4.1 outlines the process of the module design. This is applicable to healthcare education (Woods, 2003). However, due the setting of the study and unavailability of the target group, only the first seven steps of this diagram were followed. This remains as future work.

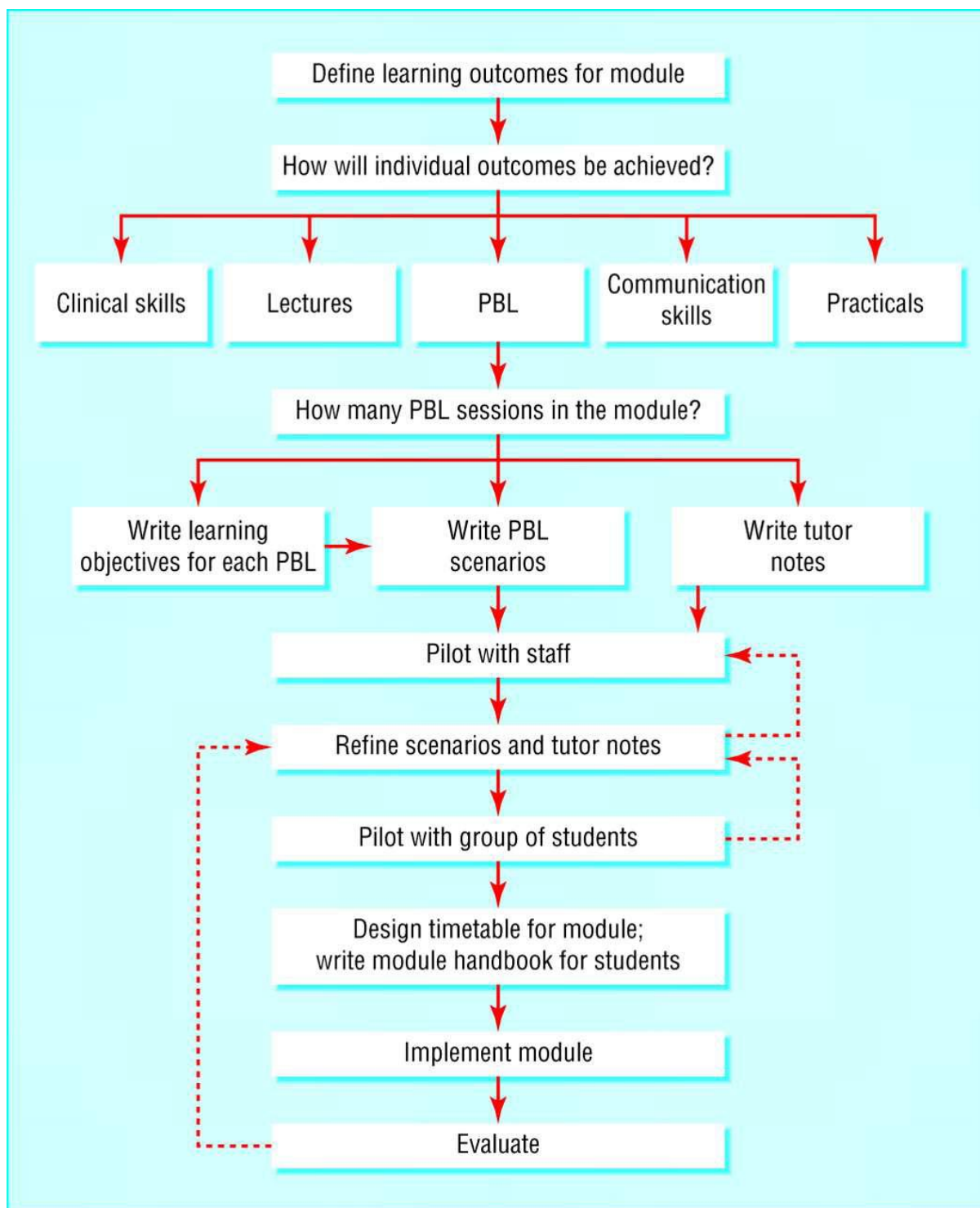


Figure 4.1: Designing and implementing a curriculum module using PBL supported by other teaching methods (Woods, 2003). Source: Woods, (2003) www.bmj.com/cgi/content-nw/full/326/7384/328/Fu6

However, the design of the programme uses values of good practice in education as Chickering and Gamson (1987) formulated to address all dimensions in teaching and learning in healthcare. The application of these principles of good practice in developing learning tool aids in achieving a high quality educational programme as thus:

| | |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Adequate learning | Active learning helps to make professionals reflect on content, develop new questions, formulate theories and envisage outcomes. |
| Prompt feedback | Prompt feedback enables professionals to evaluate their knowledge by assessing their current knowledge and technical expertise and obtaining a response / results in return pointing out errors or areas that need further learning. |
| Time on task | Time spent on learning can be optimised by the introduction of new technology like will enable professionals to learn at any opportunity both at home and even at work. |
| Diverse Talents and Ways of Learning | Since professionals, the target audience here originate from different backgrounds, with different levels of experience talents and education their diverse needs are provided for by using various means like video, audio, practice questions, animations in the production of the CD-ROMs. |
| Collaborative Learning | Collaborative learning involves active participation by professionals by studying the stuff from the awareness CD-ROM in groups. This improves communication, proficiency in problem solving and easier learning and acceptance of a project. |
| High Expectations | High expectations involve raising minimal competency level, knowledge or proficiency for a specific skill. Introducing and setting high but achievable levels to professionals at the beginning like incorporating them into the CD-ROM will make them invest more time and energy to succeed. |

Table.4.1 Seven principles of good Practice in undergraduate education. Source: Chickering, A., & Gamson, Z. (1987, March). AAHE Bulletin, 3-6

Health informatics is a new area to professionals and some of the concepts are new to them too. These concepts will be analysed during the delivery of the programme and practitioners could make further enquiries about them at their own private time. The author will fully introduce acronyms used here without their prior introduction.

The design of the module will incorporate concepts from Hyperlearning, which are educational techniques that encourage the development of analytical and critical skills will enabling the students to acquire knowledge in-action and organizational knowledge through the development of interactive network (McGraw-Hill Concise Dictionary of Modern Medicine 2002). Hypermedia, which incorporates virtual and auditory information represented as texts, images, sounds, animations or movie clips in the design. The students will be empowered and is in charge of the level of their educational pursuit. This environment provides individualised instruction, whereby the students controls the pace and cycle of learning subject on knowledge gained and professional experience.

Using Virtual Learning Environments (VLE) learners become creative by applying concrete experiences to arrive at learning outcomes, which relate to real life experiences through simulation and application (American Distance Education Consortium (ADEC) 2002). This embodies five learning methods, which are:

- Using modified lectures or discussions using video demonstrations, lectures and tests.
- Applying tutorial teachings (instructor-led) which are highly directive, whereby learning and hands-on activities are integrated (Here entails the use of professional development classes equipped with electronic classes with campuses networked with student machines and instructor machine.
- Use of self directed tutorial teachings.
- Apply group recollections.

- Utilise student feedback.

The author uses a non-academic language level and slangs like “ok” to describe scenarios. This aims at keeping the clarity and the simplicity of the scenario presentation and its proximity and perceived relevance.

Health informatics is a new area to the professionals and some of the concepts are new to them too. These concepts will be analysed during the delivery of the programme and practitioners could make further enquiries about them at their own private time. The author will fully introduce acronyms used here since they are quite new to these practitioners.

The subdivisions of this model are in three stages namely learning outcomes, design programme and informal evaluation of the designs made for the model.

The design of this model is to allow great flexibility in learning with steps in the instructional development model used in a sequential manner though the author can revise or edit this.

Levels of learning

The work of Benjamin Bloom and his colleagues in 1948 in the development of the levels of intellectual behaviour in learning into three distinct domains namely cognitive, psychomotor and effective is a major development in understanding knowledge abstraction (Kearsley 1994).

The cognitive domain and its related skills are crucial in writing learning outcome as they relate to an individual’s perceptions on the knowledge gained to make decisions at a specific period (Mbarika et al 2003). This entails the ability to identify, integrate, evaluate and relate concepts within the case study to enable decision making in a problem-solving situation. Blooms (1956) identified six core levels of abstraction of questions within the cognitive

domain within the educational settings. However, Kearsley (1994) expanded these into specific behaviours at each level and the descriptive verbs used. These are as shown in figure 4.2



Figure 4.2: Bloom's Taxonomy of the Cognitive Domain Source: Engelhart et al, (1956)
Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain.

Knowledge: Knowledge is the recalling of previously learned material. This may include memories of theories, language, experience, principles and concepts.

Comprehension: Comprehension is the ability to understand a material. The learner shows comprehension by explaining, translating and summarizing materials and the ability to predict future outcomes.

Application: Application is the capacity to utilize newly learned materials in new, practical or concrete ways. This may involve the use of things like methods, rules, principle, laws, theories and concepts

Analysis: Analysis is the breaking up a material into constituent parts to explain its organizational structure. This may be in the form of identifying the parts, explaining the connection between the parts or recognition of the organizational values involved. Here, the learning outcomes represent a higher intellectual level than comprehension and application because they require an understanding of both the content and the structural form of the material.

Synthesis: Synthesis is the capacity to assemble parts of a material to create a new material. This may take the form of the production of specific information, a procedure or concepts. Learning outcomes stresses creative behaviors with more emphasis on the formulation of new patterns of structures or integrating ideas from different areas to solve new problems.

Evaluation: Evaluation involves the capacity to assess the value of a material for a specific reason. There is always a definite criteria for this judgment determined either by students or given them. Knowledge gained here is much because of the use of standards and cognizant knowledge.

Applications of these cognitive skills increase the student's ability in problem solving and decision-making. These skills improve students' comprehension because they:

- Activate prior knowledge.
- Help students to learn in a context resembling their future context.
- Elaborate more fully on the information presented (Bridges and Hallinger 1991).

Increased explanation helps perception and recollection. Learning is optimal when the learner puts concepts, clarity and ethics together (Mandin et al 1997).

Desired learning outcomes

Concerning the above-enumerated guidelines, the author envisages that by the end of the delivery of this module the professionals will be able to:

- Describe health informatics as a discipline with the attendant structures
- Describe health information and its importance in health management
- Discuss the information requirements of an information system
- Discuss information flow within a health system
- Discuss the importance of security and confidentiality in the health system and its implications
- Discuss the importance of a unified patient identifier and the importance of The Electronic Healthcare Record (EHR)
- Summarize the importance of a Decision Support System (DSS) and the effect of guidelines and protocols in an information system
- Discuss the importance of information re-use and the problem of information duplication.
- Summarise the importance of user interfaces in health information systems
- Discuss the importance of standards in the healthcare

These learning outcomes though limited are adequate at this stage because of the level of knowledge of the professionals.

4.1.4. Scenarios: content and discussion

The author considers a PBL module as the educational strategy to attain the planned objectives. The author further applies PBL with scenarios to stress presented ideas. The use of scenarios is an essential element in information systems development as it presents a clear, meaningful and practical idea of issues thereby captivating the audience's attention to the materials presented (Grimson et al 2000). Moreover scenarios enforce interdisciplinary learning, reduces complexity while relating system functionality to the business process (Weidenhapt et al 1998). Therefore, for this module the use of scenarios is more appropriate as it draws from knowledge of real life experience for the understanding of this new discipline. The following sections detail the design of the module.

Module macro-structure: Problem flow

Assuming that these professionals are not yet familiar with informatics applications in the clinical settings and the cycle involved in developing them, the author believes that this educational material should start with the basic information of health informatics and its attendant benefits. To aid comprehension of this new discipline, the presentation of scenarios is in a sequence of the simplest to the most complex. This starts from "How do I make them comply with their treatment" to "I need a better recording system".

With complete system development life cycle and recurrent engineering, the scenarios will help in developing progressive learning and the introduction of the concepts in health informatics application to the professionals.

The use of this life cycle will be of immense benefit to the clinicians as it will be concentrated on real and realistic situations. This will in turn aid in introducing them to their

different roles in an informatics situation while laying much emphasis on collaborative healthcare delivery.

This cycle consists of seven steps (Douglas 2000)

1. Requirement definition
2. Analysis
3. Preliminary design
4. Detached design
5. Coding
6. Testing
7. Implementation

The author will introduce these steps gradually, in a more detailed, and defined form to enable a better understanding of the issues involved. This detailed description will go beyond their clinical characteristics, including technical, legal and financial aspects since these will affect them in their future roles in system procurement and implementation.

Module microstructure: Problem structure

In developing this multidisciplinary scenario, the author faced certain challenges. How does module foster collaborative practice and ensure the meaningful contribution of all participants? How does she maintain mutual respect and understanding throughout the learning process?

Uys and Lee (2005) argue that scenarios should be centred on real world situations which can easily attract the learner leading to hypothesis generation, identification of knowledge gaps directed to a more realistic and achievable learning objective.

Findings have shown that there is no integration of health informatics as a discipline into the curriculum of the educational system of Nigerian healthcare professionals so far. In addition, the professionals do not work with informatics applications. They are not therefore aware of the attendant benefits associated with ICT applications. Scenarios are developed within this module using, the following guidelines according to the recommendations made by Lee and Uys (2005):

1) Intentional design of the problem:

Within these scenarios are the reflections of the projected aims and terminal objectives of the module leading to more opportunities for the practitioner to assimilate the essential concepts at his /her level of education. The duration should enable the practitioner to acquire related essential skills and concepts within the discipline by the use of actual cases that include these issues.

2) Realistic problem situation:

The basis of the scenarios is on the day-to-day problems faced by the professionals in the course of their practice. Doing this gives the professional an opportunity to move from being reflective (abstract) to the actual application of the concepts thereby bridging the theory-practice gap. Development of realistic scenarios exposes professionals to adapt knowledge gained to future similar situations leading to increased engagement and the motivation to learn.

3) Adequate information:

The informational needs of the professional are essential. Prompt correction of identified information / knowledge gap is necessary because these scenarios stimulate artificial thinking and the use of previous knowledge in solving problems.

4) Provision of a facilitator guide:

The role of this guide is to supervise, assist the professionals through the course of their study. It does not necessarily mean that the facilitator should be an expert in this field.

The problems within the content of this chapter are developed in accordance with the aforementioned principles using the experience of the author as a staff nurse / midwife in various hospitals in Nigeria. The names used in these scenarios are fictional and the scenarios are not the descriptions of any encounter in Nigeria rather a combination of experiences gathered at work.

4.1.5. Other teaching/awareness strategies

The introduction of this awareness programme will be in stages. This will provide a medium for the proper analysis of all the concepts, relation to the Nigerian health system enabling the achievement of the objectives, assimilation of educational content and a better change in work practices desired.

As a result, there is a plan for a mutual workshop involving all sectors of the healthcare system. Discussion on this workshop will centre on issues such as:

- The Nigerian healthcare system and the general issues involved within its management.

- The analysis of the new concept of care and the contribution of ICT in this new model drawing from examples in developed countries like the United States of America United Kingdom and Australia.
- Nature of health information with emphasis on the volume of information, types of information (subjective and objective).
- Types of information requirements of different disciplines and specialities.
- Data quality.
- The role of healthcare professionals in health information.
- The impact of technology in clinical practice.
- The need for collaborative care and the integration of health information from different levels and arms of care in the country.

Tutorials and discussions with clinicians and others in health management shall follow the delivery of this module in order to assess the impact of the module and further discussion on issues such as:

- From vision to action – the way forward for the Nigerian healthcare with regards to technological advancements.
- The development of a health informatics curriculum, in all health disciplines in the country.
- The integration of health data into all care levels in Nigeria and collaborative care.
- The ICT needs of the country's health system.

- Description of affordable technologies especially cost effective, accessibility and ease to implement mobile technologies within the country, which will be adaptable within the constraints of the health system / country.
- The importance of EHR with emphasis on a unified patient identifier.

The use of the computers as an educational medium

Since the invention of modern computers in 1946 as an electronic digital device for the storage and processing of data, many experiments and innovations have been made to optimise computer use. Among these experiments is the effect of computers in education. Researchers in the field of educational effects of Computer Assisted Instruction (CAI) agree that:

- Good CAI generally has positive reaction among students with lower grades and ability (Reinking, 1987, Balajthy1989).
- Using the computer as a medium of transferring knowledge could be user friendly,
- It is personalized, non-judgemental and non-emotional however giving undivided attention to the user and
- It offers immediate, continuous and positive reinforcement to the students (Pilla, 1987) as well as serving as an excellent medium for delivering “drill and practice” programmes (Suppes, 1996).

In the light of these, many colleges in the developed world have formulated On-line courses and training programmes to expand their academic outreach to students within their country and globally.

4.1.6. Session planning

The delivery timetable of the programme to Nigerian healthcare students will be in agreement with their institutions and organizations. In addition, healthcare workers throughout the country will receive this programme in the form of workshops, conferences and symposiums in line with an agreement with their respective organisations. The author proposes delivering this awareness programme to the healthcare professionals with the attendance of a manageable number within a participatory style atmosphere. The medium will encourage question and answer sessions overseen by healthcare informaticians of different disciplines. These sessions will result in a clearer and better understanding of the concepts and competencies requirements and the generation of better emotion and simulation for champions who will carry on with the next step.

4.1.7. Scenario and facilitator guide writing

The development of these scenarios is in accordance with the perceived learning objectives outlined in the section above. The design of these scenarios is to familiarise the interdisciplinary groups with the applications in use in the modern health paradigm to facilitate better care and accountability. The design of the progression of these scenarios is to accommodate the comprehension of these healthcare workers of stand-alone systems and systems that encourage shared care.

4.2.: Scenario 1

4.2.1 “How do I make them comply with their treatment?”

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|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description | Dr Charles Opia, a cardiopulmonary specialist and the head of the Chest Unit managing patient with Pulmonary Tuberculosis in the Port Harcourt General Hospital has about 2000 patients suffering from Tuberculosis (TB) from riverside areas. There are not enough public health workers caring for the local populace. Oil extraction and exploration activities have polluted these areas immensely. Dr Opia is noticing a dramatic rise in the number of new cases and the number of patients resistant to first line treatment. Home visits by public health workers are restricted in the rainy seasons because travel is only by boat. Doctor Opia’s biggest worry now is to bring the rate of infection under control and to impress on his older patients to maintain their doses of anti-tuberculin medication to avoid drug resistance. |
| 4.2.2 Problem | How can the inadequate number of healthcare workers use ICT to limit the spread of Tuberculosis or to impress on his patients to conform to their anti-tuberculin medication? Can he check his patient’s compliance with ICT? |

Table 4.2: “How do I make them comply with their treatment?”

a) User needs

Questions

- From Dr Opia’s point of view, what is the system supposed to do? Prepare a checklist of things Dr Opia would need to see in the system, which he must ensure will be present.
- What will be the concerns of the staff regarding the system? Analyse these, and assess whether they are realistic or not. Discuss how to proceed with each concern, realistic or not. Is there anything that staffs do not mention as a concern, but that Dr Opia should consider? If so, name the concern/s, and analyse how to deal with it/them.

b) Analysis

- What are the current practices on paper?
- Analyse the information requirements. What kind of information does it handle?
- Analyse the information flow related to the scheduling record, regardless of the medium, which holds it. What information does this introduce? What information is extract from it? Where does the information come in from and where does it go?
- Who are the users of the record? For what purpose do they use it?
- Who does the introduction of the new system affect?

c) Requirements

What are the requirements for a computerized system to support this application?

4.2.3: Facilitator's guide:

Implementing such a project that involves a multidisciplinary group is difficult. Proper involvement of each group is necessary to meet the needs of different groups.

1. Support of clinical and administrative decisions

- How much time does each review require?
- What preparation does the hospital make before a patient comes for a check-up?
- Tests which includes laboratory and other physiological investigations should be taken into account by the system
- Drug prescription should include a check for incompatibility of different drugs administered together or consecutively.
- Changes made in orders should be automatically processed

2. Usability

- Entry of orders must be simple and straightforward, as well as changes.
- Information must be visible without excessive clutter.
- Patient location must map the current layout in the community.
- Patient's medical history and evaluations by other clinicians should be displayed.

3. Information reuse

- There is a deliberation on existing information systems and the functions of this particular system.
- A discussion on the nature of the information required for this particular system.
- Information may be introduced by people (nurses, doctors, ward clerks, nutritionists etc.), or obtained from systems currently in place.
- Information about each patient must be available from current information found already in the system.
- Drug information and prescription should be available from the system, including chemotherapy and other treatments/procedures due at any particular time.
- Generation of discharge prescription from inpatient drug chart should also be available in the automatically generated discharge letter.

4. Confidentiality

- System must make it possible to keep patient confidentiality, and lead nurses and other users of the system to maintain it.
- Control of access to the information contained in the prescription

4. Security

- System must ensure security of patient information.

6. *Functionality*

- The system must provide the functionality that end-users require, in a way that adapts to staff workflows.

7. *Information sharing across professionals*

- Medication prescribed by doctor, is accessible to nurses, doctors and other professionals.
- The prescription has to be accessible to staff other than the person prescribing it.

8. *Automatic generation of information*

- The system should contemplate a direct link with pharmacies, Nursing ,laboratory and Hospital information systems once a link system is put in place
- Changes in laboratory tests should be made available to all staff
- Suggestions from pharmacy on medication adjustments
- Acknowledgement of updates of actions by the nursing staff
- Re-evaluation of medication and creation of new administration schedule for order
- Upon discharge, the pharmacist should receive a notification of discharge medication. The generation of this prescription should be automatic.
- A feedback mechanism to physicians, showing how each patient is performing on their chronic illness.
- Data for patients with a Tuberculin -related International registry from the group of patients with similar disease incorporated to the *Classification of Diseases, Ninth Revision (ICD-9)* code, in this case Tuberculosis prescription, or laboratory test result indicating Tuberculosis are entered electronically into the Tuberculosis registry.
- Prompt on the electronic medical record, which signals tests and health checks not done on time.

- Registry data sorted out electronically identifying and contacting patients with abnormal laboratory readings or lack of up-to date examination results.

Summary: Drug prescription and administration record system

- Medication
- Prescription
- Retrieval
- Incompatibility check
- Medical Formula
- Fluids
- Tests and other investigation results
- List patients per medication, with dosage
- Medication prescribed by doctors (although it may change in some instances), and administered by nurses and doctors.

4.2.4 Analysis of the Scenario 1: "How do I make them comply with their treatment"?

Tuberculosis and many other diseases are ravaging African countries such as Nigeria. The spread of tuberculosis in 2006 in every 100,000 Nigerians was 311 while the number of deaths in every 100,000 was 81 (WHO 2006). Tuberculosis is controllable by following the therapy rigorously but multi-drug resistance and reduced cure rate is result of poor observation of the therapy course. Using Directly Observed Treatment (DOT) on the patients for most of or all of their treatment on the long and short term shall encourage adherence to medication. The treatment period is an average of six years and four months. There are increased Tuberculosis incidences since the start of this treatment. Although suitable

treatment schedule has brought some success, patients still die from either from inappropriate observation of the regimen like skipping doses or during disease management stage.

In its efforts to control this disease, the MOH has established DOTS in 701 LGAs at the rate of two health centres in each local government area. The MOH plans to make DOTS available in all the 774 LGAs of the nation by the end of 2008. Treating tuberculosis with DOTS is tasking to Nigerian health professionals due to issues relating to the insufficient number of health professionals and migration from rural areas to the cities.

ICT could be used to observe patients and their adherence to medication in Dr Opia's instance by means of mobile telephones. Many Nigerians own mobile telephones now and with more Internet Service Providers (ISP) and a better network infrastructure, Nigerian health professionals could use this simple and cheap method to monitor patients.

Cell Phone Self-administered Therapy is cheap and flexible technology running on a publicly developed operating system, a web server, applications, mail transport agent and a database. Under some standard condition, professionals could use text messaging of the GSM (Global System for Mobile Communications) to make patients take their daily prescription instead of direct inspection of adherence (http://mednet2.who.int/edmonitor/33/EDM33_8_TB_e.pdf)

The database of the system receives queries from the system about a patient's data, which it replies as text messages to the patient reminding him/her to take their medication. The prompts could come as jokes, alerts or lifestyle tips transmitted from a station in the hospital to the patients' cell phones to tell them to take their medication. With the extra time gained from this, professionals could attend to patients with poor compliance thereby increasing compliance amongst TB patients generally. This would decrease the general workload of the health workers and encourage best practice.

4.3 Scenario 2

4.3.1 How do we meet our schedule?

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|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description | <p>Mr Daniel Yakubu a public health worker from Kano State is working with a Cholera Control Unit at Okpuala in Imo State to contain a Cholera outbreak due to the contamination of the town's only source of water. The outbreak has already claimed the lives of thirty indigenes and over two hundred people are hospitalised in the regional hospital about two hundred kilometres outside the town. The concern is that the epidemic will spread to nearby towns and villages so Mr Yakubu's team are educating the local populace on proper waste disposal, water purification methods. They are also gathering health data to help the federal government in resource allocation. Mr Yakubu's team has to complete its work in three months with the limited resources at their disposal. Mr Yakubu had enrolled at a university without choosing his research topic before leaving for the Cholera assignment. He wants to use this assignment as his research proposal eventually. However, this assignment has isolated him from his family and educational peers with whom he would have shared ideas during his research.</p> |
| 4.3.2 Problem 2 | <p>In view of the problems associated with data gathering and evaluation in developing countries, discuss how the health team can finish their assignment within the limited time and present accurate data to the government.</p> <p>How can the health team create awareness amongst the illiterate populace educating them about the disease and leave a lasting impression on them with data?</p> <p>How can Mr Yakubu continue his education, as he is isolated from his peers in remote Okpuala?</p> |

Table 4.3: "How do we meet our schedule?"

a) User needs

Questions

- From Mr Yakubu point of view, what is the system supposed to do? Prepare a checklist of features Mr Yakubu would need to see in the system, and items he must ensure to be present.
- What are the main risks in this situation? How would you address them?
- In health education awareness, is there any method that can present real life situation to any group to help them understand what is been taught?

b) Analysis

- What are the current practices on paper?
- What are the current practices in collecting data?
- Analyse the information requirements: what kind of information does it handle and what information does it require?
- Analyse the information flows related to the record analysed, regardless of the medium that holds it: what information does this introduce? What information is extracted from it? Where does the information come from and where does it go?
- Who are the users of the record? For what purpose do they use it?

c) Requirements

- What are the requirements for a computerized system to support this application?
- What are the requirements in eLearning?

Facilitator's guide

Formation of a working group to control the system requirements and the overall running of the project is necessary. Mr Yakubu's team should have the ability to measure the suitability of the system to the needs of the project and that of the professionals running it.

a) Current information workflow analysis

- Analyse the information requirements, what kind of information does it handle?
- Analyse the information flow related to the record: what information comes in, what information goes out, and where does the information come in from and go?
- Who are the users of the record, what do they use it for?

b) What are the requirements for a computerized system to support this application?

- What are the existing technology in this area in the form of fax machines, telephones and postal systems?
- What are the official health-care hierarchy, reporting system and data flow in the ministry?
- What are the official functions of the team as set out in the healthcare system and the formal practices and roles of healthcare staff within the town?
- How can the system be used to trace data origins and contact potential sponsors of the venture.

c). Development and licensing models

- What is the influence that licenses have on end-users?
- What are the major and minor changes in the software, and the influence this may have in clinical practice?
- What are the direct and indirect costs of software? What is the Total Cost of Ownership (TCO)?

d). *Installation and support*

- Comparison of the support by the software developer with the support available by third parties. Concept of support market vs. support monopoly.
- Installation and maintenance support.
- Usefulness of developing in-house expertise.
- Customization of software to adapt to local practices.

e). Integration of functionality

- Modularity, and integration of these modules
- Integration of external sources of information, mimicking current practices

f). Software design and Legislation

- Do both products conform to Health Insurance Portability and Accountability Act (HIPPA) 1996, recommendations regarding on privacy and confidentiality of client's information?
- The device must be interoperable with any existing information system within the country.

g). Information sharing across professionals

- How will other health professionals in other sectors access information in this device?
- The data on this device has to be accessible to staff other than the public healthcare staff

i). Information re-use

- Generation of discharge prescription from inpatient drug chart: This information should also be available in the automatically generated discharge letter.
- Summarize and remove nonessential information. The system shall regularly run self-

scans storing only essential data.

j). Automatic generation of information

- Provide ad hoc, focused data analysis possible
- Provide an on-demand information system to consult or enable the healthcare officer on the current condition within the town.
- The device can update the database at the federal ministry of health
- Where ever connectivity is available, the device can update the FMOH computer in real time after data collection by the healthcare worker, reducing the time for data collection and data compilation at the FMOH
- The device shall contain information outlines and instructive resources connected to known situations. access

k). Confidentiality

- Restrict the number of individuals that can see or use data stored in the device.
- Coding of patients personal information

Summary: Electronic Support for Rural Health-care Workers

- Patient demographics(Birth & death)
- Data types such as assessment and clinical history in descriptive wording.
- Surveillance
- Immunization
- Health programme
- Communicable diseases
- Non-communicable diseases
- Work plan

- Birth & death Social circumstances, housing, occupation
- Data quality

4.3.2 Analysis of Scenario 2: How do we meet our schedule?

The Primary Health Centre is the main part of the public health system that controls primary patient care, management of public health programmes and management information system reporting.

It is best suited for patient demographics enquiries while health professionals at the sub centre levels are not competent in creating healthcare awareness and education programmes. In addition, data management, dissemination and evaluation are manual with a lot of time wastage.

ICT could improve the management of public health programmes and inventories at the PHC.

Healthcare Management Information Systems especially the Government Health Care Systems should incorporate PHC, medical consultation and treatment by using Telemedicine.

ICT Solution

Hand held computer devices could improve information gathering by replacing existing manual registers or books. They could produce work and health data to upgrade the PHC in no time thereby saving enough time in data gathering and evaluation at the PHC. Hand held devices used in rural and remote areas should have lasting battery power and ability to interface with computers and laptops for data upload and download. Finally, they should network with other devices in available networks.

Mr Yakubu can continue with his education without any interruption despite the remoteness of Okpuala through an e-community based education and services. E-community is a platform that facilitates access to up-to-date information and knowledge especially for workers living in remote areas with the aim of eliminating their sense of isolation. Besides having access to up-to-date information for his project, Mr Yakubu can also interact with his peers and experts, thereby making him feel committed to be part of the overall health system.

4.4 Scenario 3

4.4.1 "My frequent visit to the hospital is getting at me; I wish I could avoid it for sometime"

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| Description | <p>Ms Maduekwe a 34-year-old teacher is a known sickle cell anaemic patient. She had a transfusion error ten years ago, that resulted to renal failure. Ms Madueke's condition has regressed since then. She needs regular dialysis until a renal replacement to sustain her life. Ms Maduekwe attends the specialist hospital, situated 400 kilometres away on a weekly basis for dialysis.</p> <p>Recently, Ms Maduekwe came to the private hospital with the complaint of fatigue and muscle cramps, which started four days before. On examination, her blood pressure was 180/116mm Hg. After a repeat measurement of the blood pressure and some other investigations that included urine analysis and blood examination six hours later she went home. The hospital asked her to come back the next day for the results of the tests, as they had to send the specimens to a private laboratory.</p> <p>The results of the tests were sent to the hospital the next day through a dispatch rider. The results showed an increased level of Calcium and Potassium. Because of her previous medical history, she was referred to a specialist hospital for more examination and treatment. Ms Maduekwe could not travel to the specialist hospital on the scheduled day because there was nobody to accompany her in case the hospital decides to admit her.</p> <p>The following morning she went off with her sister and on getting there, she realised that she forgot the referral letter. The hospital authorities asked her either to wait until the doctor attends to all the patients with referral letters or to return home and bring the letter. Because her home was far she waited for nine hours before the doctor examined her. After her assessment, she received treatment for hypertension and referral to the nephrologists and a dietician.</p> <p>On different occasions, she saw these specialists and they recommended more frequent dialysis, daily weight measurement dietary regulation and blood pressure checks. Due to the distance, Ms Maduekwe found it impossible to attend all these appointments and was anxious about her condition and not having enough information on her ailment. The doctor had promised to photocopy a section on her illness from a health book to enable her to understand her illness better.</p> |
| 4.4.2 Problem 3 | <p>Patients that are going through an end stage system Failure are irritable without the will to continue with living. However, the new paradigm of healthcare is patient centred, requiring full involvement of patients in all aspects of their care. Therefore, is there ICT application that can involve Ms Maduekwe at least take some responsibility in her care? If yes, how can they decrease her frequent visit to the hospital for monitoring?</p> |

Table.4.4: "My frequent visit to the hospital is getting at me; I wish I can avoid it for sometime"

a) Users needs

Questions

- In Ms Maduekwe's case, what is the system supposed to do? Prepare a checklist of things Ms Maduekwe would need to see in the system, which she must ensure will be present.
- What will be the concerns of the staff regarding the system? Analyse these, and assess whether they are realistic or not. Discuss how to proceed with each concern, realistic or not.

b) Analysis

- What are the current practices?
- Analyse the information requirements. What kind of information is being handled?
- Analyse the information flows related to patient monitoring, and information flow within the healthcare. What information does this introduce? What information is extracted from it? Where does the information come in from and where does it go?
- Who are the users of the record? For what purpose do they use it?
- How will this new system affect the care of patients and work flow of the practitioners?

c) Requirements

- What are the requirements for a computerized system to support this application?

4.4.4 Facilitator's guide

It may be required to have more than one single person to ensure that the system meets all the requirements. This may mean the creation of a steering/working group to oversee the project implementation process. Nevertheless, Ms Maduekwe should still be able to assess whether the system meets her requirements and those of the staff attending to her, from her point of

view, in order to become an active part of the implementation process, rather than depending on others.

Since patient involvement is compulsory, the hospital should plan thoroughly, choose literate patients, and finally ensure that the system remains functional.

1. User's needs

- The system must provide the functionality that end-users require, in a way that adapts to staff workflow.

2. Information sharing across professionals

- Physiological monitoring by patient, but accessed by nurses ,doctors and other professionals.

3. Information reuse

- Generation of data from web-technology based service software. This information should also be available in the automatically generated data

4. Automatic generation from information

- The pharmacist should receive a notification of any medication patient is on. This prescription should be generated automatically

4. Privacy, Security and Confidentiality

- No external access to the server in the physicians' office is possible

Summary: Home Tele-monitoring system

- Assign location
- Assign time
- Integrate background information on the patient

- Integrate drug information (including allergies) on the patient
- Integrate activities to be performed on the patient in appointment (i.e. give blood/Haemodialysis/fluids, electrolytes).
- Detect drug prescription and retrieval
- Schedule blood order reminders
- Schedule Dialysis
- Incompatibility check
- Medical Formulary
- Fluids
- List patients per medication, with dosage
- Medication prescribed by doctors (although it may change in some instances), and administered by nurses and doctors.

4.4.5 Analysis of the Scenario 3: "My frequent visit to the hospital is getting at me; I wish I could avoid it for sometime"

Advances in medicine and the new approach in healthcare, which encourages collaboration, has created a multifaceted approach to care management emphasizing on preventive medicine followed by curative. Within this new paradigm of patient-centred, seamless healthcare process requires the full involvement of citizens in all aspect of their care, which goes from health information, prevention, through rehabilitation and long-term care. Patients are now more informed about their chronic diseases and are well informed about their optimal treatment plans and interventions appropriate for their ailment. With the aid of the internet, patients can access information on their illnesses and can even chat freely with people suffering from the same disease.

With reference to this scenario in the Nigerian context, there are an increasing number of people suffering from chronic diseases. With a large number of old people joining this group, this will result to an additional strain on our over stretched healthcare system and overworked healthcare professionals. Therefore, Telemedicine and e-health applications could help in dealing with the challenges our society faces by aiding in the provision of better care and support independent living.

This scenario is about a patient suffering from End Stage Renal Failure (ESRF) complicated with high blood pressure. End-stage renal disease is the stage in chronic renal disease of which renal transplant therapy, dialysis or kidney transplantation is required in order to sustain the life of the patient. This stage is irreversible and management aims at maintaining the optimal function of the kidney through mechanical means.

In a healthcare service where ICT is in use, Ms Maduekwe would have been managed in a different dimension involving her active participation in her overall management. Her disease management will include home care; that shows the new idea of combined organisation of healthcare.

Being a patient waiting for a renal replacement entails adequate monitoring and evaluation to prevent complications. When being treated by Continuous Ambulatory Peritoneal Dialysis (CAPD), Mrs Maduekwe needs to empty a fresh bag of dialysate into the abdomen every four to six hours daily. Management of this disease involves continuous dialysis, blood pressure and weight measurement. These measurements could be done with equipments, which are private home friendly. Automatic transfers of these data are made via the home hub through a telephone line to the server at the nephrologists' office or at any hospital setting. Immediately, the server updates and integrates it to Mrs Maduekwe's EHR. Data and information collected from Mrs Maduekwe's visits are manually added to her records. At the

Nephrologists' office, through web-technology based service software, Mrs Maduekwe's medical condition can be easily reviewed. Most of these data can be graphically represented on a standard interface highlighting the trends of the measurements. Access to medical files, Laboratory results and medication regimen and other important information regarding to her management can be stored and retrieved through this treatment tool.

Instead of travelling to make appointments for other services, through the internet, the nephrologists can refer Mrs Maduekwe's and book for her appointments, which can be scheduled without her presence. The nephrologists can provide her information regarding her ailment through handouts and direct her on websites that contains information on Renal failure .Mrs Maduekwe can also join support groups On-line with people suffering from renal failure.

This mode of management saves costs, improves communication between patients and healthcare staff fostering higher satisfaction and compliance with treatment. By actively participating in her own treatment, Mrs Maduekwe will recall and understand more about her illness which will advertently bring about a favourable clinical outcome. This also will enable her to remain in a familiar and comfortable environment leading to better medical outcome as well as improving her quality of life.

The problem here is commonplace in Nigeria. Deaths from medical workers errors, adverse drug interactions and allergic reactions are numerous. With the very low doctor patient ratio, most clinicians are overworked and overstressed. The use of ICT and prompt adherence to protocols and procedure will correct these errors.

4.5 Scenario 4

4.5.1: "I need a better recording system"

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| Description | <p>Mr Idris is a senior manager in the health management board of Benue state. He assumed the position of the states programme officer to assist the national HIV/Aids programme officer in the management of HIV/AIDS and Sexually Transmitted Diseases Programme initiated by the government in 2004. This is because of the epidemic level of HIV/AIDS since the diagnosis of the first case. This state has the highest number of infected people in Nigeria, totalling about 14-19.9% of the state's population.</p> <p>This programme started in 2000 with funds donated by the Global fund to fight AIDS, Tuberculosis and Malaria, The United states Presidents' Emergency Plan for Relief and the Worlds' Bank Multi-country HIV/AIDS programme for Africa. Within this programme, 31,694 people are receiving antiretroviral therapy both in the private and public sectors. Under the government's programme' the cost of the first-line regimen is estimated to be about \$300 per year where 14% of it goes to logistics the private sector, the cost of the first- line regimen is estimated to be \$3000 per person per year.</p> <p>The antiretroviral therapy involves the giving three retroviral drugs to patients, everyday to check the spread of disease and reduce any resistance. Caring for many HIV/AIDS patients involves being able to know each patient, establish contact with him/her, observing the patients health closely and regularly, keeping essential medicines readily available and transmitting all test results to doctors.</p> <p>In developing countries, with poor communication networks, very bad roads, little or no electricity and very few doctors, the treatment of HIV/AIDS becomes an uphill task. To tackle HIV or other chronic diseases in Nigeria, essential is a steady supply of the necessary medicines from the manufacturers outside the country to the patient in Nigeria. This channel will include importing, shipping, storing and administering the drugs to the patients in Nigeria before their expiry date. Correct estimates of present stockpiles and future procurements are important to maintain treatment levels and expiration of drugs in stock. These estimates are next to impossible in Nigeria at present leading to drug wastage and unnecessary patient deaths.</p> <p>Benue state runs a central hospital housing the laboratory and main drug warehouse, with a second laboratory recently set up in Makurdi and smaller pharmacies and laboratories in the other sites. Within this state, 7000 people are currently receiving treatment of which 64% of whom are living in the remote part of the state. There are about 140 new cases recorded monthly.</p> <p>Mr Idris's duties include the following:</p> <ul style="list-style-type: none"> ➤ Overseeing the development and finalization of antiretroviral scale-up plan in the state. ➤ Providing assistance for harmonizing state level surveillance |
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| | <p>analysis reports into one national surveillance analysis reports.</p> <ul style="list-style-type: none"> ➤ Developing a procurement and supply management system within the state ➤ Supporting the review of service delivery in the centres ➤ Providing support for the development of the HIV/AIDS service availability mapping ➤ Overseeing a streamlined monitoring system for the antiretroviral therapy programme ➤ Providing support for scaling-up voluntary counselling and testing and community and home based care services. <p>Six months ago during inventory, it was discovered that a huge amount of drugs have expired. Therefore, a documentation system with the use of WHO stock cards to calculate the amount of drugs that enter and leave the warehouse each month was established. Moreover, Mr Idris has always faced the problem of coordinating the activities of these centres especially the issue of patients' tracking has proven irresolvable.</p> <p>Nevertheless, the events of the past month have necessitated the institution of an enquiry into the overall management of the HIV/AIDS programme. A phenomenon called the "out of stock" syndrome is in place. An ongoing allegation that the staffs in this programme are siphoning the antiretroviral drugs into the private sector mainly owned by them entails the patients paying a huge amount. Patients were told that their drugs were out of stock but were redirected to private pharmacies and clinics within the state. As a result, most of these patients have stopped the treatment regimen while others are not following their orders strictly. A preliminary investigation into this discovered that the rate of resistance to drugs is so high while there is a decline in the number of patients coming up for treatment. The incident of drug reaction was high with so many losses of lives.</p> <p>Therefore as the head of this sector, Mr Idris is required to present to the board a detailed report on drug procurement and distribution within the state, detailed information on each patient's treatment, which includes laboratory tests, medication counselling. Finally, a quotation of drugs needed quarterly based on individual's requirement.</p> |
| <p>4.5.2 Problem</p> | <p>In a Health Informatics environment, help Mr Idris prepare his report for the meeting with the members of enquiry, so that he can let them know the information flow within the programme. In this, you should keep in mind how the different professionals interact with the information in the system, and how to maximize the usefulness of the information contained in the system, trying to minimize duplication of any piece of information. In addition, it should lead the clinical staff to maintain their duty of confidentiality towards the patients.</p> |

Table 4.5: "I need a better recording system"

a) User needs

Questions

- From Mr Idris's point of view, what is the system supposed to do? Prepare a checklist of features Mr Idris would need to see in the system, and items he must ensure are present.
- What are the main risks in this situation? How would you address them?

b) Analysis

- What are the current practices on paper?
- Analyse the information requirements: what kind of information is being handled?
- Analyse the information flows related to the record analysed, regardless of the medium in which this is held: what information is introduced in this? What information is extracted from it? Where does the information come from and where does it go?
- Who are the users of the record? What do they use it for?

c) Requirements

- What are the requirements for a computerized system to support this application?

4.5.3 Facilitator's guide

A working group could be formed to control the system requirements and the overall running of the project. Mr Idris should have the ability to measure the suitability of the system to the needs of the project and that of the professionals running it.

a) Current information workflow analysis

- Analyse the information requirements, what kind of information is being handled
- Analyse the information flow related to the record: what information comes in, and what information goes out, and where does the information come in from and go to?
- Who are the users of the record, what do they use it for

b) What are the requirements for a computerized system to support this application?

c). Development and licensing models

- What is the influence that licenses have on end-users
- Major and minor changes in the software, and the influence this may have in clinical practice
- Direct and indirect costs of software. Total Cost of Ownership (TCO)

d). *Installation and support*

- Comparison between support by the software developer, and support available by third parties. Concept of support market vs. support monopoly.
- Installation and maintenance support.
- Usefulness of developing in-house expertise.
- Customization of software to adapt to local practices.

e). *Integration of functionality*

- Modularity, and integration of these modules
- Integration of external sources of information, mimicking current practices

F). *Software design and Legislation*

- Do both products conform to the FMOH's guideline regarding the traceability of blood products?

g). Information sharing across professionals

- Medication is prescribed by doctor, but accessed by nurses and other professionals, as well as doctors
- The prescription has to be accessible to staff other than the person prescribing.

i). Information re-uses

- Generation of discharge prescription from inpatient drug chart. This information should also be available in the automatically generated discharge letter.

j). Automatic generation of information

- Upon discharge, the pharmacist should receive a notification of any medication that requires a high-tech prescription. This prescription should be generated automatically
- The system should contemplate a direct link with pharmacies, to be used once a link system is put in place

k). Confidentiality

- Control of access to the information contained in the prescription

Summary: HIV/AIDS electronic medical record

- Patient demographics
- Narrative text is also allowed in some categories such as clinical history and assessment
- History of presenting complaint
- Symptoms
- Medication

- Prescription
- Retrieval
- Incompatibility check
- Medical Formulary
- Physical examination
- Laboratory investigations
- Social circumstances, housing, occupation
- Fluids
- List of sexual cohorts
- List patients per medication, with dosage
- Medication prescribed by doctors (although it may change in some instances), and administered by nurses and doctors
- Patient identification
- Data quality

4.5.4 Analysis of the Scenario 4: "I need a better recording system"

Mr Idris needs Information Management System to coordinate all services in his organization. In designing the information management system, full participation of all the workers, a detailed preparation and frequent assessment will be required. In the last decade in Nigeria, the number of ISP's entering the market and competing with each other to offer broadband and mobile services has mushroomed. In light of this, organizations have internet access or could network by means of satellite thereby prevailing over the inadequate internet network. Newer technologies could help also in bringing together patient management, electronic health records and public health programmes , like doctors consulting and

communicating with patients through digital camera images in “store and forward” medicine. The organisation could use electronic medical record to monitor and improve patients’ care.

Initially, this system could monitor patients with HIV/AIDS, Highly Active Antiretroviral Therapy (HAART) regimen and their laboratory results thereby helping the health professionals observe and report precisely and on time about these patients to their donors. The database generated by the compilation of this group, professionals could observe patients individually or follow the group’s care together such as in monitoring The Cluster Of differentiation four (CD4) counts in laboratory results.

The appropriate HIV - Electronic Medical Record (HIV-EMR) for Mr Idris’ would depend on the user group and the organisational activities. It would require both a drug regimen record and stock card interfaces so that professionals could monitor stored drugs. The drug regimen data could be shared later with the drug procurement team or with other organisations in their network.

Recording the use and drug regimens in a network helps to evaluate both methods and encourages data analysis and data sharing amongst distant drug procurement teams. Doctors could re-evaluate prescribed drugs, dosage and their administration intervals. The user could even print a prescription while submitting this form. While entering the drugs’ information, the system searches for allergies, improper doses and the incompatibility of any group of drugs. The system delivers a warning if it finds any problem. The laboratory results analysis employs decision support as in a program checking for patients with low CD4 cell counts who are not receiving enough drugs in the data from all sites recorded in the system. If the program detects such patient’s data, it sends a warning e-mail to all professionals involved with a link to the electronic medical record of such patient that additional care is needed

The program could use reminders to inform professionals about patients that require more drugs or tests. In addition, if pages containing tables or graphs were in the record system, then downloading statistical analytical data would be possible. Pharmacists can apply web based stock cards to frequently record drug stockpile in the warehouse. The system will encourage precise and frequent analysis of current stock level and projected future demand, help to avoid drug depletion or the expiration of drugs in stock thereby ensuring optimal drug prices. It is possible then, to estimate total needs of a patient group for any given time. This estimate is very crucial while treating a speedily increasing large patient group of one disease type, for example in an epidemic. Another approach is the estimation of drug usage using the WHO stock cards to compare quantity of drugs received and those sent out of the warehouse monthly.

To ensure security and confidentiality, users would use complex passwords to have limited access to the site. To monitor and control unauthorised access, an event log will be in place that will be reviewed frequently, and counter measures put into effect. The database is centralised, physically protected and would be backed up frequently. Finally, viewing patient information is done safely in the electronic medical record and the transmission of encrypted data is possible thereby replacing sending patient data by insecure electronic mail.

4.6 Informal evaluation of the problems designed for this module

Informal pre-test evaluation on the module was carried out amongst course mates and some Nigerians resident in Ireland. They made some suggestions, which the author incorporated into the module.

4.7. Summary

This chapter talks about the module designed for creating awareness for health informatics using multimedia and problem related approaches common to the Nigerian health system.

The next chapter details steps in evaluating the module and conclusion of the dissertation while pointing out the limitations of the study and future work.

CHAPTER FIVE

Conclusion

This dissertation utilized the approach of problem-based learning in highlighting the usual work situations as scenarios for the adaptation of Health Informatics by Nigerian health professionals. Assessing the module forms an integral part of the awareness programme and the learning process of the students as this will be the only way to have an insight into the knowledge gained throughout the process. Regrettably, a formal evaluation is not possible within the scope of this study due to the setting of the dissertation. Because of these issues, an overview of the aspects of the assessment relevant to the prepared module will be discussed here. However, while a full module was produced for this work, the number of students and facilitators will influence the actual design of the module.

If an evaluation had taken place in this study, the following steps would have been followed to ensure that the content and concept were fully communicated to the students. The evaluation would have been in two phases thus; an initial assessment to know the knowledge gained by the students followed by “a portfolio” based evaluation, which revolves around the standard of the course, group, knowledge, competence and behaviour of the students throughout the process.

The professionals would have been divided into teams. Each team shall receive a form, a Self Reflection report, and an instruction to write a biweekly report on milestones and problems encountered in their daily duties. This report is about professionals assessing themselves truthfully and submitting the assessments to the team leaders for vetting and confirmation of the task done. The team leader finally notes on the reports and the state of completion of each task.

The team leader besides overseeing and directing the team's assessments also reviews the development of each specific duty in the assessments as the Peer Evaluation Report. Eventually the team leader gives the Peer's Evaluation Report and the Self Reflection Report to a facilitator. In the Task Completion Report, students detail how all duties were finished during the last week with the team leaders supervising, of course. These reports as the backbone of students' feedback are crucial in estimating the level of knowledge, learning and teaching. Data will be gathered at the beginning, the middle and the finish of the whole project. Eventually the team leader gives the Peer's Evaluation Report and the Self Reflection Report to a facilitator. Communication will be fostered verbally through face-to face assessment. The facilitator also engages in open and frank discussions with the students, targeting to improve the student's body language, voice tones, gestures and facial expressions instead of the student's personality leading to self-confidence. To produce better result, a written questionnaire will be administered.

A good evaluation shows how far a course went in meeting its aims and how good the presentation of the course is. Evaluating every part of PBL is very hard and it will seem even harder to make all the necessary and suitable changes with each observation.

A pre test will be conducted whereby the knowledge of the students on healthcare Informatics will be established, while a Post-test will be done after using the module to evaluate any knowledge and improvement made because of the exposure to the module. The validity of any testing is very essential therefore, external validity will be used to examines adaptability of results and to which groups while internal validity will examines if the learning intervention affects the outcome. Statistical data will be used to create awareness and recognize developments therefore; confidentiality will be preserved in records keeping.

The students will be evaluated on the information on the module. In most cases, students cannot be accurate in their assessments therefore extra information derived from discussion with them will be used in evaluating them besides the rating to arrive at an accurate evaluation.

The choice instrument in this evaluation is a questionnaire. Though a questionnaire is one of the easiest tools used in information gathering, creating a questionnaire requires more care therefore; the questionnaire used here will be short and precise on the specific areas addressed. Trying to cover all areas of the module, would make the questionnaire too cumbersome and boring for the students. Moreover, in the questionnaire, few open-ended questions will be given as they are essential, affording enough space for responses from the students. The questions and potential answers will be kept short and when an explanation is required, a space will be given. Other issues to consider while formulating this questionnaire are:

- The data volume will be minimal
- Maintain anonymity of respondents in order to encourage freer and truthful answers.
- Questionnaires too often as this might make respondents less forthcoming.
- The questionnaires will be on a piloted on a group before using it on the students

Above all, a checklist will be used. This involves making a list of intended aspects or levels of a task and checking off each task on completion. It will assist in the formation and development of the evaluation. Moreover, the students will use a checklist to check off useful resources at their disposal on completion of the programme. This will show in time which resources are most essential to students.

The objective of this dissertation was to develop a module on health Informatics aimed at raising awareness of the potentials of ICT to the Nigerian healthcare system. The target group for this module are doctors, nurses, pharmacists and those in the allied healthcare services. Ideally, the module should be a part of the curriculum of healthcare professionals or delivered as a stand-alone self-learning module.

The introduction of ICT to the healthcare sector has dramatically transformed the way data is handled or exchanged, the composition of organisations and staff association in the health system. ICT has improved health outcomes, collaboration amongst different medical teams and even transcends distance in care delivery. In developed nations, these technologies provide huge data; requiring healthcare professionals to constantly update or learn new skills to enable them compete.

Data quality in Nigeria is poor because of crude data management. However, the Nigerian health sector is now turning to community-based care managed by different groups of professionals instead of institutional care. With the decentralised PHC, the echelon uses data and feedback from lower levels of the health system to monitor, coordinate and decide on healthcare management and delivery throughout Nigeria. ICT adaptation in Nigeria will improve health structures, prioritise informed decision-making and help provide health care to all Nigerians. This means bringing together paper-based and computer-based systems from diverse projects and organisations across Nigeria to understand the situation of, and thereby plan better interventions in the healthcare sector.

Many countries and donor agencies prioritise the development of human resources and improvement of healthcare systems. The priority now is on professionals acquiring the adequate skills and the provision of structural support, incentives, facilities and ICT applications to health workers. With the conflicting reports on the role of ICT in improving

care delivery, it is difficult to health managers and policy makers in deciding how to distribute the meagre finances available to the health sector. Since the healthcare sector sees data as a resource, it sees ICT as a vital means to improve the effectiveness of the health system and provide data necessary for planning and budgeting. Furthermore, ICT could help resolve the global health force crisis and the dearth of health data.

This shall involve giving health professionals access to every required data and ensuring that professionals in remote areas connect to and receive all necessary support from the healthcare system. Since more Nigerians live in rural than in urban areas, the Nigerian health system must focus more on the rural communities. Maintaining health workers in rural health facilities is hard so inducements should be used in recruiting and retaining professionals in these areas. Since, internet access in rural Nigeria is either scarce today or nonexistent the integration of wireless technologies into the health system could provide access to health workers and establishments in rural areas.

Different developing countries use wireless technologies such as Personal Digital Assistance's (PDA), mobile telephones and hand held PCs increasingly in to overcome the problems relating to ICT introduction though their data dissemination capacity need improvement. These ICT tools have also been used to monitor patients in their homes as in some scenarios in this dissertation. In order to improve on some qualities of these tools like portability and long battery life, health workers need further training on suitable ICT tools.

The ever-increasing number of mobile phone subscribers and service providers has encouraged competition amongst all providers leading to improved services. Low cost technologies are bridging the gaps left by inadequate or nonexistent ICT infrastructure in rural areas of Nigeria. Nigeria is currently investing strongly in satellite technology to provide satellite broadband services and telephones as a fast and suitable alternative to the

nonexistent telephone landlines. Satellite technologies would usher in a more efficient care delivery system and a more modern healthcare sector. Besides the high maintenance costs of mobile phones and some limitations in data transfer, using mobile phones for ICT is desirable, as most Nigerians own cell phones. Nigeria is investing in both solar and nuclear energy currently and this would help alleviate the lack of constant electricity supply in the country.

Nigeria lacks health informaticians today. This has hindered the development of ICT in the health sector. Few projects started by foreign professionals were later discontinued as there were no home grown professionals to maintain them. Hence training Nigerians in ICT is as essential as the provision of resources. The WHO states that the number of health professionals in any country reflects that country's preparedness to meet its health targets as well as the Millennium Development Goals and that rural areas often bear the brunt of any worker shortages. In this vein, Nigeria should develop the curricula of health informatics for undergraduates of medicine and health related courses. Nigerian workers in the health sector should serially undergo in-service training to acquire the IT skills that will enable them fulfil the country's informatics requirements.

The conditions in the rural areas discourage Nigerian health graduates to work in these areas that lack basic amenities. A curriculum that is community based and the adaptation of ICT in rural Nigeria could help connect the workers in rural areas with colleagues nationally and worldwide. This ICT access should give rural professionals latest medical data, knowledge, a medium for pre-service training, further training and education. With awareness, cooperation and communication this will eventually create a learning culture in the rural areas for professionals and students to encourage best practice.

Education would therefore improve the professional's computer and health informatics knowledge especially in the use of communication tools. Professionals shall also receive certificates as official acknowledgment for informatics skills.

Initially, Nigeria has to create a general awareness of informatics, e-Health technologies, software and applications before any successful health informatics introduction. Further, Nigerian health workers should grasp the legal, ethical and socio-economic implications of these technologies to the health system in order to choose which ones to adapt. Finally, cooperation, good management and creativity are essential to see the implementation of health informatics through the early difficult stages.

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Appendix

Appendix 1

Academic & Training Programs

International Academic Training Programs

The following is a list of formal academic and training programs outside North America in medical, nursing, and health care informatics.

AUSTRALIA

Monash University

Melbourne, Australia

Graduate Certificate and Graduate Diploma in Health Informatics

Graduate Certificate

Graduate Diploma in Health Informatics

Short and Long courses

*All courses are off campus distance learning

University of New South Wales

Sydney, Australia

Master of Health Informatics

Degrees Available:

Masters (available from 2004)

PhD in Health Informatics

University of New South Wales

Sydney, Australia

Master of Health Informatics

Degrees Available:

Masters (available from 2004)

PhD in Health Informatics

The University of Sydney

Sydney, Australia

University of Wollongong

Wollongong NSW, Australia

Master of Health Informatics

AUSTRIA

University for Health Informatics and Technology Tyrol (UMIT)

Innsbruck, Austria

Medical Informatics

Degrees Available:

BSc in Medical Informatics

MSc in Medical Informatics

PhD in Medical Informatics

BRAZIL

Federal University of São Paulo

São Paulo, Brazil
Master of Health Informatics
PhD in Health Informatics

Marilia Medical School

Marilia, Estate of Sao Paulo, Brazil
Medical Course
undergraduate medical course

Universidade Federal de Pernambuco (UFPE)

(Federal University of Pernambuco)
Grupo de Tecnologias da Informação em Saúde (TIS)
(Health Information Technology Group)
Recife-PE, Brazil
Undergraduation:
1. Lessons for the Medical Course and others health courses
Posgraduation:
1. Internal Medicine Master Program
2. Informatics Master Program

CANADA**Dalhousie University**

Halifax, Nova Scotia, Canada
Degrees Available:
Master of Science - MSc
PhD

Queen's University

Kingston, Ontario, Canada
Degrees Available:
Honours Bachelor of Computing in Biomedical Computing

University of Victoria

Victoria, British Columbia, Canada
Health Information Science
Degrees Available:
Bachelor of Science - BSc
Master of Science - MSc (Online or On-campus)
PhD (by Special Arrangement)

University of Waterloo

Waterloo, Ontario, Canada
Education Program for Health Informatics Professionals (EPHIP)
Certificate Program - Online/distance education programs

CUBA**Instituto Superior de Ciencias Médicas de La Habana (ISCM-H)**

La Habana, Cuba
Master in Health Informatics
Degree Available:
Masters

GERMANY**Georg-August-University Goettingen**

Applied Informatics / Health Information Officer
Goettingen, Germany
BSc

MSc in Medical Informatics

University of Essen

Essen, Germany
Medizin-Management with Informatics specialization
Degrees Available:
Bachelor of Arts - BA
(soon to offer MA)

University at Leipzig/Germany

Leipzig, Germany
Institute for Formal Ontology and Medical Informationscience (IFOMIS)

GREECE

National and Kapodistrian University of Athens

Athens, Greece
Health Informatics
Degrees Available:
Master of Science - MSc
Doctorate - PhD

IRELAND

Trinity College Dublin

Dublin, Ireland
MSc in Health Informatics
Degree Available:
MSc

THE NETHERLANDS

Erasmus University Rotterdam

Rotterdam, The Netherlands
Erasmus Medical Center Rotterdam
Degrees Available:
Master of Health Information Management

University of Amsterdam

Amsterdam, The Netherlands
Medical Information Sciences
Degrees Available:
Bachelor and Master Degree

PERU

Instituto de Medicina Tropical Alexander Von Humboldt

Universidad Peruana Cayetano Heredia
Lima, Peru
Specialized programs:
Health Informatics
Telemedicine
Artificial Intelligence

SOUTH AFRICA

Stanford-South Africa Biomedical Informatics Program

Program Name: Stanford-South Africa Biomedical Informatics Program
Participating institutions: South African National Bioinformatics Institute, University of the Western Cape, Bellville, South Africa University of Cape Town, Cape Town, South Africa

National Institute for Communicable Diseases, Johannesburg, South Africa
Stanford University, Stanford, USA

Degrees offered:

MSc or PhD biomedical informatics or bioinformatics

URLs:

<http://stanford.sanbi.ac.za/>

<http://southafrica.stanford.edu/>

UNITED KINGDOM

Centre for Health Informatics & Multiprofessional Education (CHIME)

London, United Kingdom

Degrees Available:

MPhil, PhD available by research in this area

Imperial College

London, United Kingdom

Degrees Available:

MSc in Health Informatics and Management

King Alfred's Winchester

Winchester, United Kingdom

Degrees Available:

Master of Science - MSc

St George's, University of London

London, United Kingdom

Degrees Available:

BSc Biomedical Informatics

University College London

London, England, United Kingdom

Degrees Available:

Master of Science - MSc

Diploma & Certificate Programmes in Health Informatics

Graduate Programme - 3 exit points

PG Certificate

PG Diploma

MSc

University of Edinburgh

Edinburgh, United Kingdom

School of Informatics

Specialism in Bioinformatics

Degrees Available:

Master of Science - MSc

Master Degree - Mres

Doctorate - PhD

University of Sheffield

Sheffield, United Kingdom

Degrees Available:

Certificate Diploma

Master of Science - MSc

(also MPhil, PhD available by research in this area)

University of Wales Swansea

Swansea, Wales, United Kingdom
School of Health Science
Centre for eHealth & Learning

SWEDEN**Uppsala University**

Uppsala, Sweden
Degrees Available:
MS