Availability and Utilization of Health Informatics System among Health Workers in Niger State, Nigeria

Eucharia Hauwa, Umoru Ph.D[1], Dr. A. H. Ibrahim[2], Dr. Abdulrahman M. Sani[3]

[1]Department of Nursing, Maryam Abacha American University of Niger, Maradi, Niger

[2]Bayero University, Kano, Nigeria

[3]Sokoto State University, Sokoto, Nigeria

ABSTRACT

With a clear flow of information across many medical subsystems, the adoption and utility of electronic health record systems (EHRs) improve the healthcare system going forward. The study is about the availability and utilization of health informatics systems among health Workers in Niger State, Nigeria. In this study, the channel model was used to describe how the information is flow in the health sectors. The study adopts quantitative approaches to investigate the availability and utility of health informatics among health workers in Niger state, Nigeria. The population of the study comprised all the health workers working in public health hospitals and clinics in Niger State totalling about 3,599 health workers out of which 400 were sampled using appropriate sample size determination. The returned rate of 320 instruments was used for the analysis. The study revealed that the health informatics system was not available and as such the utilisation was relatively very low in Niger state. The study recommends among others that there is a need for the Nigerian government and health managers to make use of health informatics to improve the delivery of the healthcare system.

KEYWORDS: Availability, Utilization, Health informatics, Health workers, Niger state

INTRODUCTION

Health informatics has become an inevitable part of modern healthcare. Due to the volumes of health data being generated, it is inevitable to deploy computers to manage patient data to offer better healthcare delivery. In health informatics systems around the world, massive amounts of data are being collected, adopted and utilised for better patient diagnosis and treatment, improving public health systems and assisting government agencies in designing and implementing public health policies, instilling confidence in future generations who want to utilise better public health systems (Sood, & McNeil, 2017).

The history of health informatics in Nigeria started in the late 80s when a collaborative research project between the Computing Centre of the University of Kuopio, Finland and Obafemi Awolowo University, and Obafemi Awolowo University Teaching Hospital (OAUTHC), Nigeria (Anderson, 2012) was initiated

and this initiative was part of INDEHELA Health informatics has several classes and sub-domains, Shortliffe & Blois (2001) classified health informatics into seven domains namely, Nursing Informatics, Veterinary Informatics, Dental Informatics, Bioinformatics, Imaging Informatics, public health informatics and clinical Informatics.

It is an objective reality that the world is changing with the development of technology and communication; meanwhile, changes in policies, economics, demographic and socio-environmental variables, have a significant influence on healthcare delivery systems. In support of the utilisation of health informatics technology, scholars such as Garde, Harrison, & Hovenga (2015), Watcharasriroj, &Tang,(2014), Hassan (2016), flora(2013), Toochukwu, Achadu & Asogwu (2021), Chaudhry, Wang, Wu, Maglione, Mojica,& Roth, (2016) have

agreed that the introduction of information technology has accompanied with different health informatics strategies adopted and utilised by healthcare workers specifically the to enhance accurate, efficient, effective and managerial data concerning the patients for appropriate action and decision. They opine that, if these health informatics are appropriately utilised, they can enhance effective health care delivery.

The concept of informatics means the use of computerized information systems to address questions, solve problems and make decisions (Kaushal, Shojania, Bates, 2015). Based on the results of past studies when informatics is used in nursing tasks and procedures such as financial, clinical, and other administrative transactions, it can help reduce costs and the time required to complete the process (Honey, & Procter, 2017).

The Internet is playing a useful function in almost all aspects of modern life. In the health sector, the Internet can be a useful way for accessing up-to-date information about health (Ajuwon, 2003). The use of the Internet for health care systems such as remote neonatal monitoring systems, teleradiology, electronic patient record system, and Internet-based patient information system (DG INFSO, 2006) is well documented, though uptake of such systems is variable; regrettably, access to the Internet system in Nigerian hospitals is rarely available. The Internet initiative in Nigeria started in 1994 with the efforts of the Nigerian Internet Group. At this time the only access to the Internet was provided by NITEL and it was extremely very expensive (Olayinka, 2000).

The first computer emerged in Nigeria in 1948 when the Nigerian Ports Authority bought a 'Visible Record Computer' from International Computer Limited (ICL). In 1963, IBM (International Business Machines) established the IBM African Education Centre at the University of Ibadan in Western Nigeria, enrolling fifty–two students from Nigeria and other English-speaking African countries (Buntin, Burke, Hoaglin, Blumenthal, 2018). Despite the 60-year history of computer use in Nigeria, the diffusion and usage of computers in Nigeria is still very low due to the cost of a Computer (PC) which is very high for an average Nigerian.

In Nigeria, most teaching hospitals have to generate money by billing patients for the services rendered to them, to augment the money received from the government to run the hospital and pay staff salaries. Meanwhile, it is believed that if the use of ICT is adopted the cost of running the hospital, in the long run, will be reduced and the healthcare delivery system may be as efficient and effective as it is in the developed world (Buntin, Burke, Hoaglin, Blumenthal, 2018).

The Electronic Health Record (EHR) has been the ultimate goal of the informatics system from its start. In the United States today, only 5% of doctors have access to a true HER (Mennemeyer, Menachemi, Rahurkar &Ford, 2016). Researchers have worked on the development of this for almost 50 years (Honey, Procter, 2017; Mennemeyer, Meacham, Rahurkar &Ford, 2016). Over the years "it" has been given many names. It has been called the Automated Medical Record (AMR), the Computerised Patient Record (CPR), the Computer-based Medical Record (CMR), the Electronic Medical Record (EMR), the electronic health care record (EHCR), the electronic patient record (EPR), the personal medical record information (PMRI) and others. Mennemeyer, Menachemi, Rahurkar &Ford, (2016) found that these health informatics are not accessible in Africa.

With a clear flow of information across many medical subsystems, the adoption and utility of electronic health record systems (EHRs) improve the healthcare system going forward (Sadeghei, 2018). The data is frequently employed in the sector of health informatics, as new data is constantly pouring into the system, requiring analysis and interpretation to make rational and effective decisions (Sadeghei, 2018; Piscotty, Kalisch, & Gracey-Thomas, 2015). This of course improves decision-making through the comprehensive integration of data from a range of sources, allowing for much faster and more effective decision-making (Imani, Khademi, Yusefi, Bahrami, & Naghizadeh, 2016). Within and outside of the medical business, computational health informatics is an emerging study field (Sadeghei, 2018; Imani, Khademi, Yusefi, Bahrami, & Naghizadeh, 2016).

The major purpose of Health Informatics is to improve the understanding of medicine and medical practice by using real-world medical data. In the subject of the medical system, health informatics is a blend of information science and computer science (Sadoughi, Kimiafar, Ahmadi, & Shakeri, 2015). Big data in healthcare is intimidating not only because of its sheer magnitude but also due to the variety of data types and the pace with which it must be managed and planned. To gain people's trust and give effective healthcare services, all health service providers are now adopting different strategies to utilise the most up-to-date technologies to provide health services and more advanced treatments. Various requirements drive innovation in this industry, such as finding appropriate accommodation with standardization and coordinating the acquisition and implementation of newer healthcare systems and services at all levels.

Similarly, Army et al (2017) in their study were of the view that the majority of the health workers were not properly trained in the area of health informatics systems and subsequently called for improved awareness among the health workers. It is evident that the research on the awareness of health informatics systems is bountiful elsewhere, however, there is lacking work on the availability and utility of health informatics among health workers in Niger state, Nigeria hence this study becomes relevant to fill the void.

Also, in Nigeria, due to the widespread utility of information technology in other areas, regrettably it was slower to develop in the health sector. While the use of these technologies will bring more health goals, provide better services and access information in the shortest time, increase patient satisfaction, increase system efficiency and reduce costs. As a result, Sood, McNeil, (2017), Hassan (2016), Hammond (2016) were of the view that using these technologies in the field of health will accelerate the transition towards a better future, and healthcare organizations should be prepared to accept these systems and to escape the challenges posed by their use. Despite the importance of informatics in the health sector, there has not been a specific study on the status of informatics used in health management. It has been observed that health informatics are available and have been utilised elsewhere, however, there is a felt need to know if health informatics systems are available and utilised by the health workers in Niger state, Nigeria for documentation. The study, therefore, was set up to investigate the availability and utility of health informatics systems in the area.
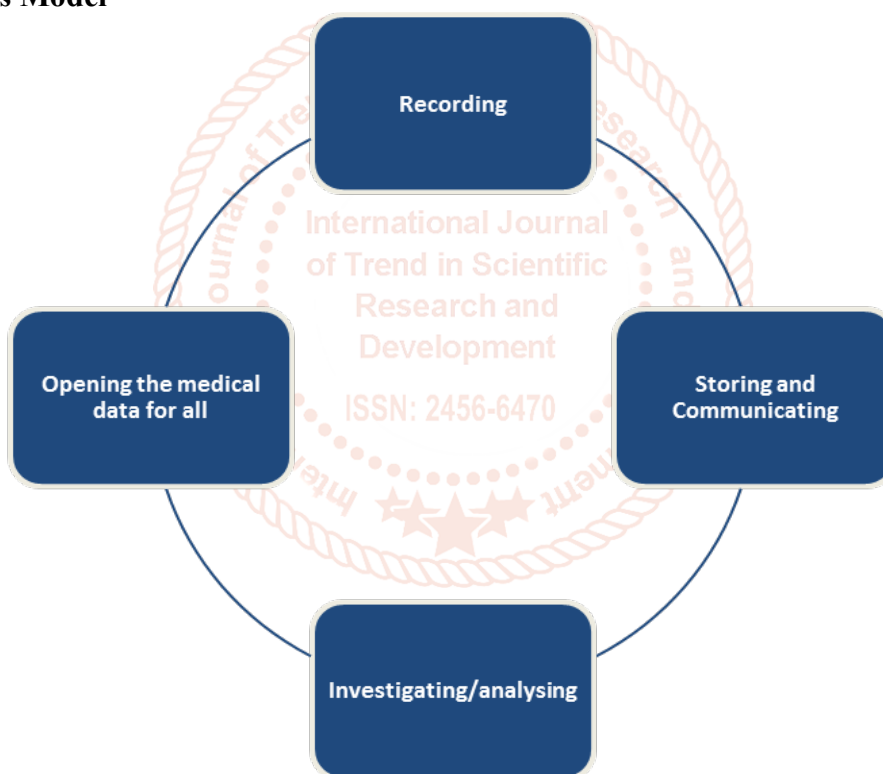
Health informatics Model

Figure 1: the process of the healthcare informatics system

Theoretical framework
Channel models
This model of the channel can be made to describe how the input (the transmitted signal) is mapped to the output (the received signal). There exist various types and uses of channel models specified in the field of information technology. In particular, some models are formulated to describe each part of a communication system. A channel can be modelled physically by trying to calculate the physical processes which modify the transmitted signal.

Communication channels are also studied in a discrete-alphabet setting. This corresponds to abstracting a real-world communication system in which the analogue → digital and digital → analogue blocks are out of the control of the designer. The communication channel model consists of a transition probability that specifies an output distribution for each possible sequence of channel inputs. In information theory, it is common to start with memory-less channels in which the output probability distribution only depends on the current channel

input. This theory is therefore relevant in this study in that the use of health informatics services by the nurses is borne out of the desire to keep accurate information bothering on the patients for effective and efficient service delivery. Recording involves documenting the symptoms of illness, which is used for communicating between doctors and everyone else in the healthcare process – further, the same can be utilized for the teaching and learning process. Storing and communicating entails that once the data is recorded with appropriate measures – the further stages such as storing, processing and analysing and communicating the data and synthesized information are carried out. Investigating/analysing recorded data and utilizing the same in a meaningful way to build the information systems which facilitate the execution of the healthcare process is carried out. This model explained the importance and various means through which information is passed from one person to another.

Method

The study uses a survey design with the application of quantitative research methods. This was employed to investigate the availability and utilisation of health informatics among health workers in Niger state, Nigeria. The population of the study comprised all the nurses working in public health hospitals and clinics in Niger State; this includes nurses in primary, secondary and tertiary healthcare facilities. They are about thirteen thousand, two hundred and twenty-five (3,599) health workers (Niger state ministry of health, 2022).

This was computed as follows:

Formula: $n = \dfrac{N}{1 + N(e)^2}$

Where: n= sample size sought
e = level of significance (0.05)
N = population size

Therefore: $n = \dfrac{3,599}{1 + 3,599 (0.05)^2}$

$n = \dfrac{3,599}{1 + 3,599 (0.0025)}$

$n = \dfrac{3,599}{9.9975}$

n =400 Approx

Furthermore, the sample size of 320 was distributed proportionally. The formula is presented and calculated as follows:

Formula: Prop. Sample $(Prop^S) = \dfrac{X}{N} \quad x \quad \dfrac{P_S}{1}$

Where: $Prop^S$=Proportional sample size
X=Population of Nurses in LGA
N=Total population of Nurses in selected LGA
Ps=Population sample size for the study

Using the formula above, the following sample size is proposed as shown in the table below:

Zone	Selected LGA/Population (HMB Minna, 2022)	Sample size
Zone A	Bida-66	46
	Mokwa-52	36
	Lapai -45	32
Zone B	Boso-52	36
	Rafi -42	29
	Suleja-63	45
Zone C	Kontagora-62	44
	Magama-38	27
	Mariga-36	25
TOTAL	9 LGA=456	320

Two instruments were used for data collection for the study. The instruments are a questionnaire and a Key Informant Interview (KII) Guide. The quantitative data analysis was done using Statistical Package for Social Sciences (SPSS) for Windows. Descriptive and inferential statistics were used for the interpretation of the table.

Result

Table 1: Distribution of respondents' department

Health workers	Frequency(N=233)	%=100
Nurses	52	22.3
Doctors	46	19.7
Pharmacists	34	14.6
Health information/record officers	67	28.8
Laboratory scientists	18	7.7
Physiotherapists	16	6.9

Source: fieldwork, 2022

The table shows the department of the respondents in the study area. The table indicates that 22.3% (52) were nurses, 19.7% (46) were doctors, 14.6% (34) were pharmacists, 28.8% (67) were health information/ record officers, 7.7% (18) were laboratory scientists and 6.9% (16) were physiotherapist. This implies that respondents from various departments provide information and participated in the study.

Table 2: Respondents' responses regarding the availability of health information systems in Niger state

Health informatics	Available	Not available	Total
Internet	28.8%(67)	71.2% (166)	233
LCD Screens	9% (21)	91% (212)	233
Intercoms	8.6% (20)	91.6% (213)	233
Electronic medical records (EMR)	18.5% (43)	81.5% (190)	233
Desktops/computers	32.2% (75)	67.8% (158)	233
Video/ teleconferencing facilities	6.0% (14)	94.0% (219)	233

Source: fieldwork, 2022

The table presents responses regarding the availability of health information systems in Niger state. The row data indicates that the majority of the respondents 71.2% (166) indicate non-availability of the internet system, 91% (212) indicate non-availability of LCD Screens, 91.6% (213) indicate non-availability of intercoms, 81.5% (190) said non-availability of electronic medical records (EMR), 67.8% (148) said desktops/computers were not available, and 94.0% (219) pointed out that video/ teleconferencing facilities were not available in their respective hospitals.

Table 3: Respondents' responses regarding the use of health information to improve service delivery

Items	Frequency N=233	Valid Percent %=100
We do use Intercoms technology here		
SD	144	61.8
D	54	23.2
A	6	2. 6
SA	29	12.4
I used a computer for more than three years and this improves service delivery		
SD	81	34.8
D	88	37.8
A	46	19.7
SA	18	7.7
We used the Internet and this improves service delivery		
SD	89	38.2
D	91	39.1
A	34	14.6

SA	19	8.2
used Video/ teleconferencing facilities here		
SD	104	44.6
D	118	50.6
A	4	1.7
SA	7	3.0
Never used the LCD Screens for service delivery here		
SD	12	5.2
D	38	16.3
A	72	30.9
SA	111	47.6
I Possess a laptop computer and it aids me in delivering effective services		
SD	80	34.3
D	110	47.2
A	26	11.2
SA	17	7.3
we do use Electronic medical records (EMR)		
SD	59	25.3
D	105	45.1
A	68	29.2
SA	1	0.4

Source: fieldwork, 2022

The data concerning the adoption and use of health informatics to improve service delivery shows that the majority of the respondents 61.8% (144) strongly disagree that the use of intercom technology. Also, 37.8% (88) disagreed, 34.8% (81) strongly disagreed, 19.7% (46) agreed and 7.7% (18) strongly agreed that they have used computers for more than three years and this improves their service delivery. In addition, the table indicates that 39.1% (91) disagreed, 38.2% (89) strongly disagreed, 14.6% (34) agreed and 8.2% (19) strongly agrees that they have used the internet and this improves their respective service delivery. The table adds that the majority of the respondents 50.6% (118) disagreed, 44.6% (104) strongly disagreed, 1.7% (4) agreed and 3.0% (7) strongly agreed that they never used Video/ teleconferencing facilities in their respective hospitals. The data indicates that the majority of the respondents 47.2% (110) disagreed, 34.3% (80) strongly disagreed, 11.2% (26) agreed and 7.3% (17) strongly agreed that Possessing a laptop computer aids them in delivering effective services. The table further indicates that the majority of the respondents 45.1% (105) disagreed, 25.5% (104) strongly disagreed, 29.2% (68) agreed and 0.4% (4) strongly agreed that they had they do use Electronic medical records (EMR) to improve their services delivery in their respective hospital.

Discussion of the findings

The study is set to investigate the availability of health informatics in Niger state hospitals. The study found that internet systems, LCD Screens, intercoms, electronic medical records (EMR), desktops/computers, and video/ teleconferencing facilities were not available in Niger state. This finding tally with Ajuwon, (2003), DG INFSO, (2006), Peter and Lucy (2008) who pointed out that the Internet is playing a useful function in almost all aspects of modern life. In the health sector, the Internet can be a useful way for accessing up-to-date health information. The use of the Internet for health care systems such as remote neonatal monitoring systems, teleradiology, electronic patient record system, and Internet-based patient information systems is well documented, though uptake of such systems is variable; regrettably, access to the Internet system in Nigerian hospitals is rarely available. In the United States today, only 5% of physicians have access to a true HER (Mennemeyer, Menachemi, Rahurkar &Ford, 2016).

Second, the responses regarding the use of health information to improve service delivery revealed that the usage of the health informatics systems in Niger state is relatively very low. This was because of the non-availability and adaptability of the health informatics system by the health managers. This study tallies with Garde, Harrison, & Hovenga (2015), Watcharasriroj, &Tang,(2014), Hassan (2016), flora (2013), Toochukwu, Achadu & Asogwu (2021), Chaudhry, Wang, Wu, Maglione, Mojica,& Roth, (2016) who have agreed that the introduction of information technology has accompanied with different health informatics strategies adopted and utilised by healthcare workers specifically the to

enhance accurate, efficient, effective and managerial data concerning the patients for appropriate action and decision. They opine that, if these health informatics are appropriately utilised, they can enhance effective health care delivery. However, there was low usage of health informatics in Africa.

Conclusion /Recommendations

In Nigeria, the health sector has suffered due to negligence. It can be said that keeping records of the health sector is important to the development of the sector as well as the patients. Generally, Nigeria's health sector has not fully utilized the dividend of health informatics in the health sector and can be seen as backward development for a country that is adopting health informatics speedily. In Nigeria, the patients' records are normally stored on paper which stands a chance of being misplaced or useless when visiting another healthcare facility. The utilisation of electronic health record systems (EHRs) improves the healthcare system.

There is the adage that "health is wealth", therefore there is every need for the Nigerian government and health managers to make use of ICT to improve the delivery of healthcare to get out of poverty. To coordinate this initiative and tackle some of the problems highlighted, the Nigerian government could establish an agency, different from the ministry of health and empower this agency financially to administer and fund ICT equipment and personnel in government hospitals, while also overseeing the deployment of ICT at different levels, from state hospitals to rural clinics, this, of course, will enhance efficient healthcare service delivery.

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