

Knowledge and utilization of health informatics among medical doctors in Ahmadu Bello University Teaching Hospital, Shika-Zaria

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ABSTRACT

The strategic vision in the health care system now underpins application of information communication technology for effective health care delivery. Recognising the potentials of Information and communications technology (ICT) for health, the Nigerian government as part of its policy derive towards achieving effective health care delivery by the year 2020, adopted use of ICT. This study assessed the level of knowledge and utilization of health informatics among medical doctors in Ahmadu Bello University Teaching Hospital (ABUTH), Shika-Zaria. This study adopted descriptive survey method and structured questionnaire as its instrument of data collection. Findings revealed that 68% (n=150) of the 220 sampled medical doctors in ABUTH are aware of health informatics and that 68.2% (n=120) have knowledge of how to use it. The most prominent areas of health informatics among the medical doctors are 'management information system', 'electronic health record system' and 'electronic medical record'. However, only 58.6% (n=120) of the medical doctors in BUTH Shika-Zaria are utilizing health informatics. Internet (n=120, 60.5%) and interpersonal sources (n= 71, 32.3%) were found to be the major sources of information of knowledge and utilization of health informatics among the medical doctors. The study therefore recommends that ABUTH, Shika-Zaria should put in place more mechanisms for creating awareness on use of health informatics varieties and a strong need for time-series research to examine future development in respect to knowledge and utilization of health informatics in Nigerian health institutions.

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1. INTRODUCTION

Information is a generic term which has been described as the livewire of any enterprise. information and communication technology (ICT) has become a tool in service delivery and has a revolutionary impact on how people live and perceive the world [1]. Scholars [2] state that ICT has touched every aspect of life, giving birth to the contemporary "Es": e-learning, e-commerce, e-governance, e-banking, e-shopping and e-health. The healthcare environment is increasingly adopting the use of technology for its everyday delivery. Technological transformation is now among the major hitch and one of the measures used in rating the advancements of health care delivery across the globe [3].

Health informatics involve the use of information and communication technology in support of health and health-related fields including, healthcare services, health surveillance, health literature, and health education, knowledge, and research [4]. In practical term, it entails a means of ensuring that correct health information is provided in a timely and secure manner via electronic devices for the purpose of improving the quality and efficiency of healthcare delivery, prevention programmes in healthcare delivery, solving critical data management and clinical communication challenges especially in developing countries given the high burden of diseases and low number of skilled medical personnel [5].

A health system that utilises health informatics therefore, enjoys benefits such as, a transformed health care delivery, access to well-defined health strategies, reduced healthcare cost, improved disease management, improved patient safety and decision support for practitioners, reduced clerical works required of professionals, reduced printed forms to minimize redundancy, centralized patient care data to aid delivery of health research and teaching, and fostered communication for effective service delivery. It is applied in the areas of nursing, clinical care, dentistry, pharmacy, public health, occupational therapy, and (bio) health research [6]-[8].

Review of ICT for health tools for frontline health workers as part of the United Nations Commodities Commission indicates that governments in sub-Saharan Africa, such as South Africa, Ethiopia, Ghana, Uganda, Kenya, and Nigeria, are interested in developing an enabling environment for such tools and their implementation. These developing countries have invested immensely in equipping their health workforce with the right ICT for health tools, skills and knowledge and mechanisms in place for standards and interoperability through setting up national health information systems.

The Nigerian government in its effort to harness those benefits holds that ICTs are important enablers and key drivers in achieving strategic goals and vision for a healthy nation. This is portrayed in its 'Vision 2020' drive to meet the then 'Millennium Development Goals (MDG's)', the 'national health strategic development plan (NHSDP)', and the push for 'Universal Health Coverage (UHC)' in the country. All these strategic visions in the health system underpin application of ICTs for healthcare delivery hence, Health information management system units were established in Nigerian teaching hospitals for an improved healthcare delivery.

Ahmadu Bello University Teaching Hospital (ABUTH) Shika-Zaria is one of the university teaching hospitals in the country equipped with the Health Information Management unit was established towards enhancing use of IT for health. It started as Institute of Health in 1967 in accordance with statute 15 of the University ABU Law (Amendment Act, Schedule, 16) by the then interim common services agency to provide broad range of tertiary services to meet the healthcare needs of people from the catchment area and the country at large; provide technical support to primary and secondary health facilities within its area of operation, provide facilities for the training of different cadre of health workers and conduct relevant research on prevalent health related problems. [9].

The information management unit (IMU) in the hospital underscores use of health information technologies in the hospital. The unit was introduced in 2014 under the federal government's policy for e-health strategy and is responsible for advising, managing, and maintaining all information and communication technology related issues in the hospital. It is also the responsibility of the unit to ensure and enhance connectivity of computers and internet in the hospital as well as handling of all the necessary information record and communication in the computers within the hospital.

In essence, Ahmadu Bello University Teaching Hospital Shika-Zaria is equipped with an ICT unit that handles all health-related information record and manages it for effective delivery. Observations however show that despite these efforts, medical records and other clinical services are still conveyed in paper files in the hospital. Could it be that the health personnel are not aware of the potential uses of the technology or that there is lack of knowledge of its utilization? Or could there be other factors that are limiting effective use of health informatics in the teaching hospital?

Existing literatures on health informatics such as [10]-[13] have also been largely prescriptive of the technology, focusing on ICT for health policies and benefits, but leaving little empirical studies available on knowledge and utilization of health informatics. Most studies focused on other parts of the country such as Ile-Ife, Niger, Ibadan, and Lagos; or other healthcare personnel such as nurses and health information record officers but leaving the Northern part of the country and medical doctors who are also part of the workforce in the utilization of health informatics. It is in recognition of these therefore that the study concerned to fill these gaps by examining the knowledge and utilization of health informatics among medical doctors of Ahmadu Bello University Teaching Hospital, Shika-Zaria. The study is guided by the following research objectives: a) To assess knowledge of health informatics among medical doctors in ABUTH Shika-Zaria, b) To determine the level of utilization of health informatics among medical doctors in the study area, c) To examine the sources of information of knowledge and utilization of health informatics among the medical doctors in the study area.

2. CONCEPTUALIZING AND LITERATURE REVIEW

The word health informatics is used interchangeably with e-Health, nursing informatics, medical informatics, and bioinformatics. It was coined in 1957 to correct the view of some health officers that it had to do with physicians only [14]. Health informatics is broadly defined as the intersection of information and communication management in medicine and healthcare dealing with resources, devices and methods required to optimize acquisition, storage, retrieval and use of information and communication in health and biomedicine [4].

It is also defined as the use of information and communication technology (ICT) in support of health and health-related fields, including health care services; health surveillance; health literature; and health education, knowledge, and research [15]. Health informatics is the science that deals with the use of computers and communication technology to acquire, store, analyze, communicate, and display health information and knowledge to facilitate understanding and improve the accuracy, timeliness, and reliability of decision making [16]. Although his definition is more inclined to computerization, the communication aspect is also spelled out.

The Nigerian government implemented a national strategic health development plan (NSHDP) 2010- 2015 towards transforming its health sector into an efficient one, ensure sustainability and achieve the country's target of universal health coverage by 2020 as well as to complement the universal world health organization's guideline on e-Health strategy development plan. The priority areas include national health management information system (NHIMS) of which Health Informatics is a part [10]-[13]. The recent economic policy also stated under section seven (7), the aim to strategies e-Health to effectively link specialized hospitals with the rural health care units via telemedicine and mobile health. The national information technology development agency (NITDA) where in its ICT policy for development called ICT4D Strategic Action Plan include ICT for health towards achieving national development via adoption and use of technologies in the country.

Knowing how to use computerized health records, retrieving patient data at a distant and accessing health journals and literatures electronically is vital towards improving access to health facilities for effective healthcare delivery [17]. Hence, acquiring basic knowledge of computer and understanding the basics of the internet among physicians was found to be crucial for health care delivery. A baseline survey was conducted [18] to assess the overall computer literacy among health professionals in Ethiopia. The study found 39% computer literacy among the respondents with no visible differences between Addis Ababa and regional towns. Personal effort (67%) was found to be the main method of acquiring ICT skill followed by short-term computer training (33%). Formal college or university ICT training was reported by only 2% of the respondents as the sources of acquiring computer skills. The baseline study adopts similar method of research (survey) but a cross sectional rather than a baseline study, and where the study focused on computer literacy only, this study went further to include health information technology usage for health purposes.

Another study survey study [7] conducted in India found that all the nurses had a positive attitude towards computer with the majority (75%) of them having good computer knowledge and 21% having average computer knowledge in a clinical care setting. The survey study [7] focused on attitude and nurses while this study shift focusses to knowledge and medical doctors use of health information technologies for health care.

In another survey study among health students in Ile-Ife [11], it was found that only 19% and 40% of the health students and health workers demonstrated good knowledge of computers and positive attitude towards IT respectively. The gap between those study and that of Bello *et al.*, is based on location (Southern Nigeria) and the focus of their research (computer knowledge and attitude).

Similarly, a survey study [19] conducted on knowledge and utilization of Information Technology among 180 health care professionals and students of University Teaching Hospital Ile-Ife Nigeria, found that 80 respondents (54%) reportedly had received some form of computer training and 77.7% of the respondents demonstrated knowledge of computers even though majority of them revealed that they do not own a computer. There was also good attitude (39.9%) and utilization of computers (33.8%) among the respondents. The study [19] also found variation in the knowledge and attitude of computers among different departments with doctors being better than record officers. In contrary, this study focused on Northern part of Nigeria, medical doctors as the study population and more specific to health informatics.

Furthermore, a survey research [20] on knowledge and perception of health workers towards telemedicine application in a Lagos teaching hospital found that majority of the respondents (60.9%) were familiar with the new emerging concepts of telemedicine/telehealth. Identified factors weighing down usage of telemedicine in the study area were lack of knowledge of application (28.1%) and perception of telehealth benefits (14.1%). The findings [20] also revealed that most respondents believed telehealth can enhance access to health care services (23.4%) and can improve quality of care (14.1%).

Also a quantitative cross-sectional study [21] was conducted in Addis Ababa to test the health workers knowledge and utilization of computers for health care delivery. The study [21] found that computer knowledge

and utilization habit of health workers is very low and access to computers and delivering training on the use of computers for workers to facilitate the rate of diffusion of the technology to the health sector is necessary. Significant predictor variables were average monthly income, job satisfaction index and computer possession. The study also [21] indicated an association between computer knowledge/skill and health care delivery competence. In line with [21], this study also tests knowledge and utilization though theirs is to ICT in general. Like their method this study used cross sectional design stratified sampling technique. Although the location of [21] study differs from Nigeria in terms of technology advancement, its findings are a strong indication of the potential benefits of using technologies for health care delivery in terms of communication and information and that knowledge and utilization of those technologies are significant for effective work delivery.

Similarly, a cross-sectional study on knowledge and utilization of computers in Ethiopia [5] was conducted among 554 health professionals working in 7 hospitals, 19 primary health centers, and 10 private clinics to determine the level of knowledge and identify determinants of utilization of information communication technology. The findings of the study [5] revealed that, out of 482 (87.0%) of the response rate, 90 (18.7%) demonstrated good knowledge of computers while 142 (29.5%) demonstrated good utilization habits. Health professionals who work in the primary health centers were found to have lower knowledge (3.4%) and utilization (18.4%). Age, field of study, level of education and previous computer training participation were found to be significantly associated with computer utilization habits of health professionals. Thus, the study [5] identifies that computer knowledge and utilization habits of health professionals, especially those who work in primary health centers are low, thus the need for training and continuous follow-up as necessary measures to increase the likelihood of the success of implemented e-Health systems in those settings. What is interesting in this finding is the demographic aspect signifying that they have an impact on knowledge and utilization habits of medical workers towards the use of computers in support of this study.

Furthermore, a cross sectional survey [22] was conducted to assess physician's use of internet for health information for patients care in Ibadan Nigeria, using anonymous standardized questionnaire. The study [22] found that 98% of the respondents had used internet, 76% access it on cyber cape. Email was the most used (64%) and that 90% of the respondent's obtained information from the internet for patients care while 76.2 % of them had searched database for health information. Medline/PubMed was found to be the most searched database among 99% of the respondents, while only 7% of the respondents had ever searched for Cochrane library. Also, the study [22] found that 58.1% of the respondents perceived that they had no confidence to download full text articles from online sources such as health internet access to research initiative (HINARI). Barriers to use of internet among the respondents were poor availability of broadband internet access, lack of information for search skills, costs of access and information overload. The study [22] was more on use of IT in relations to patient care whereas this study was on general use of IT for an effective health service delivery.

Similarly, a survey [23] was conducted to assess the use of electronic health records among medical practice in Massachusetts in 2005. The study [23] was aimed at determining the rate of health electronic record (HER) adoption, perceived barriers to adoption and satisfaction with HER systems. Findings of the study [23] revealed more than 40% black or Hispanic physicians had comparable level of HER adoption than other physicians (27.9%) and that 21.8% physicians from minority practices identified financial and other barriers to implement HER systems such as privacy and securing of HER. The study [23] also found that the physicians from high minority practices had similar perceptions about the positive impact of EHR's on quality (73.7% vs 96.69%, $P = 0.43$) and cost of care (46.9% vs 51.5%, $P = 0.17$). This study adopted a similar method of sampling [23] and similarly checked on perception but in terms of usefulness and ease of use of health informatics.

A similar survey research [24] on the use of internet-based and mobile e-health tools to increase information access among cervical cancer patients in Kenya, found low-level use of the internet by cervical cancer clients attending public referral facilities. The low-level use of the internet was attributed to lack of knowledge on how to use computers and lack of access to a computer. However, a high level of access to mobile phones was reported in the findings and thus the study [24] concluded that there is a greater potential for internet use through web access via mobile phones. Unlike the other research reviewed in this study where majority studied the service providers such as the health personnel, the study [24] assessed patient's knowledge.

In the same vein, [25] assessed the knowledge and usage pattern of health internet access to research initiative (HINARI), specifically information on demographics profile pattern of usage and constraints to use of HINARI in 12 tertiary institutions in South-western Nigeria using a descriptive cross - sectional survey among 1150 clinicians and researchers that had access to it. The findings of the study [25] show that majority of the respondents (72.05) are aware of it however, only 35.1% had formal training on how to use it. 68.05 had used it and the most frequently used are Medlin, Pub Med (53.2%), full text journal articles (55.5%), and reference materials (28.5%). Previous users encountered problems in accessing HINARI and lack of password. The study [25] recommends for learner – centred training among the clinicians and researchers and its wide distribution of its username and password within the library. By focusing on a local IT platform (HINARI), the study [25] indicates is a strong access, use and acceptance, of health informatics in the country for health care delivery.

The literatures reviewed therefore revealed that use of health communication technologies for effective healthcare delivery among health students as well as healthcare providers especially in Africa is gaining grounds, though there is room for improvement. These findings also predispose the need to ascertain if the same scenario or otherwise can be found in the northern Nigerian university teaching hospitals which this study filled the gap.

3. THEORETICAL FRAMEWORK AND RESEARCH METHOD

The study is premised on unified theory of acceptance and use of technology (UTAUT) which relates to technology acceptance and use. UTAUT has also been proven to be a theoretical framework widely used to explain and predict user behavior, acceptance and use of information technology [26]. UTAUT posits that there are variables related to the behavioral intention to use information technology or to the actual use of information technology. These variables could be grouped into four categories: performance expectancy, effort expectancy, social influence and facilitating condition. Performance expectancy is from an individual context, represents the extent to which using a technology will enable users to improve their job performance. Effort expectancy, which is from the system context, represents the degree

of ease associated with the individual's use of the system/technology. This is regarded to be of great concern to users during their initial use of the system. Social influence has to do with the level of influence exerted by the individual's social settings which could influence his/her intention towards using the technology; and facilitating condition is about organizational context which emphasizes any organization's influence or support on one's information technology use. Further, the theory posits variables including gender, age, experience, and voluntariness can moderate the impact of the four key constructs on usage intention and behavior. These additional demographics are said to also have impact in the way a user accepts and use a new technology [27]-[29].

The UTAUT is adopted for this research being it relevant in explaining the reasons of the increasing adoption and integration of technology into all sectors such as business, education, and health. Despite efforts by the government to ensure availability and implementation of health informatics in the health sector, it was observed that it has not been effectively utilized. This research, therefore, will try to establish whether constructs such as performance expectancy, effort expectancy, social influence and facilitating conditions are related to lack of or otherwise of knowledge and utilization of health informatics among the medical doctors in ABUTH.

Other variables such as age, gender, working experience, and specialization will also be explored to see if they have any bearing on the way medical doctors in ABUTH accepts and use Health Informatics. In order words, the research will try to grasp if individual, system, organizational and social factors play a role in the knowledge and utilization of health informatics and whether demographics such as age, gender, working experience, area of specialization and voluntariness play a role in knowledge and utilization of health informatics among the medical doctors.

According to this research, performance expectancy is the extent to which medical doctors in ABUTH believe that using health informatics will boost their work performance. While Effort Expectancy is the extent to which medical doctors in ABUTH believe that using health informatics will be free of cognitive effort (is easy to use). Social influence and Facilitating Conditions here refer to the level of influence and support (health informatics infrastructures present in the hospitals) exerted by the important stakeholders such as the management of the hospital to the medical doctors' knowledge and usage of health informatics.

Specifically, the study adopted descriptive survey method to picture the condition of knowledge and usage of health informatics among medical doctors in the study area. 246 medical doctors from a population of 624 medical in ABUTH constituted the sample size of this research. Multi-stage sampling procedure was employed in determining the respondents. Stratified random sampling technique was used in the first stage to group the research population into subgroups (strata) according to their specializations/departments. Proportion of each subgroup was calculated to arrive at the sample size required for the research. The proportional distribution of the research sample presented in Table 1.

In the second stage of sampling, the study employed simple random sampling technique. The samples were randomly picked using raffle draw across the stratified specializations going by the number arrived at from the calculated. Structured questionnaire was used as the instrument for data collection and the data gathered were analyzed using descriptive method of data analysis such as frequency distribution tables and percentages.

Table 1. Proportional distribution of respondents

Specialization/Departments	No of Doctors	Proportion	%
Orthopaedic	25	9	3.7
Paediatrics	83	30	12
Dentistry	25	9	3.7
Gynaecology	85	31	12.6
Surgery	90	32	13
Ophthalmology	29	10	4.1
Psychiatry	15	5	2.1
Haematology	26	9	3.7
Community/family/internal medicine	173	62	25
Chemical pathology	15	5	2.1
Anesthesiology	24	9	3.7
Pathology	21	8	3.3
Radiology	55	20	8.1
Microbiology	15	5	2.1
Otorhinolaryngology	5	2	0.8
Total	686	246	100

4. RESULTS AND DISCUSSION

The result of this study is analyzed according to the research objectives as sub-headings. The study also retrieved 220 (89.4%) out of the 246 copies of questionnaires administered, hence 220 were used in the analysis.

4.1. Level of knowledge of health informatics among medical doctors in ABUTH

With regards to level of knowledge of health informatics among the respondents, the analysis begins with a test of their awareness. This is presented in Table 2.

Table 2. Distribution of respondents' awareness of health informatics

Response	N	%
Aware of health informatics	150	68.2
Not aware of health informatics	59	26.8
No response	11	5
Total	220	100

Table 2 reveals that majority (n=150, 68.2%) of the medical doctors are aware of health informatics, while 59 (26.8%) reported that they are unaware of it. The medical doctors that are not aware of health informatics gave reasons as 'not relevant to their specialty or that is unavailable in their hospital/department (14 = 6.4%) while others didn't specify.

Data was also sought for the specific areas of health informatics that the respondents have knowledge of. This is presented in Table 3 and only considered only the doctors that reported to be aware of health informatics. The question is also a multiple choice which the respondents choose many that they know. Table 3 reveals that "management information system (MIS)" is the most known area of health informatics among the respondents with 135 (90%). This is closely followed by "Telemedicine" with 134 (89.3%). This may be because they are also the available health informatics areas provided by the hospital management.

Still on knowledge of health informatics, the study sought to know if the respondents that know about health informatics know how to use it and which of the health informatics they know how to use. This is presented on Table 4 and Table 5 and it also only focus on 150 respondents that are aware of the health informatics. Table 4 reveals that only 120 (68.2%) out of the 150 medical doctors that are aware of health informatics know how to use it. This means that 30 (20 %) of the total respondents reported that they don't know how to use health informatics even though they are aware of it. Reasons for not knowing how to use health informatics as given by those respondents were "not relevant to specialization" "not available in the department", and "other reasons". The specific areas of health informatics that the respondents know how to use are presented in Table 5. This was also given in a multiple response question.

Table 5 shows that majority (n=78, 52%) of the medical doctors know how to use both "Management Information System" and "Electronic Health Record System". This is closely followed by "Electronic Medical Record" 74 (49.3%). *m*-health (n=19, 12.7%) was found to be the least area of health informatics that the medical doctors in ABUTH Shika –Zaria know how to use.

Table 3. Areas of health informatics the respondents are aware of

Areas of Health Informatics	$\Sigma n=150$ (100%)	Percentage (%)
Telemedicine	134	89.3
Management information system	135	90
<i>m</i> -health	33	22
<i>e</i> -health	94	62.7
Health Information Transfer	91	60.6
Electronic health record	125	83.3
Electronic medical record	125	83.3
Others	3	2

Table 4. Respondents' knowledge of how to use health informatics

Response	N	%
Know how to use	120	80
Do not know how to use	20	13.3
No response	10	6.7
Total	150	100

Table 5. Areas of health informatics the respondents know how to use

Areas of health informatics	N	$\Sigma n=150$ (100%)
Telemedicine	68	45.3
Management information system	78	52
<i>m</i> -health	19	12.7
<i>e</i> -health	46	30.7
Health information transfer	47	31.3
Electronic health record	78	52.0
Electronic medical record	74	49.3
Others	3	2.0

4.2. Utilization of health informatics among medical doctors in ABUTH Shika-Zaria

With regards to testing the level of utilization of health informatics in ABUTH, the study asked the respondents that said they know about health informatics ($\Sigma n=150$) if they are using health informatics. This is presented in Table 6. Table 6 distributes actual utilization of health informatics by the medical doctors in ABUTH Shika-Zaria. Majority ($n=120$, 80%) out of the 150 medical doctors that are aware of health informatics are using it while about 30 (20%) respondents reported that they don't utilize or there is no response as to if they use health informatics even though they are aware of it. Reasons for not utilizing health informatics given by the respondents include "not relevant to specialty", "not available in the hospital", and "difficult to use". Furthermore, the areas of health informatics that the respondents utilize are represented in Table 7.

Table 6. Distribution of respondents' actual utilization of health informatics

Response	N	%
Use health informatics	120	80
Do not use health informatics	20	13.3
No response	10	7.7
Total	150	100

Table 7. Areas of health informatics utilized by the respondents

Areas of health informatics	N	%
Telemedicine	52	34.6
Management information system	48	32
<i>m</i> -health	15	10
<i>e</i> -health	41	27.3
Health information transfer	40	26.7
Electronic health record	57	38
Electronic medical record	50	33.3
Others	1	0.7

Table 7 shows that "Electronic Health Record" is mostly utilized among 57 (38%) respondents followed by "Electronic Medical Record" ($n=50$, 33.3%), unlike the result on awareness of health informatics

which reveals that health information management system is the area that most of the respondents know about and know how to use. This may be because there are computers and internet access in virtually all the departments in the hospital. Even though use of mobile internet is becoming widespread and is part of the Economic policy plan by the govt. *m-health* was found to be the least ($n=15$, 10%) area of health informatics that is being utilized among the medical doctors in ABUTH.

The reasons for *m-health*'s underutilization may also be because mobile phones are mostly used for personal dealings such as socialization than for official use. It can also be because the health informatics packages are heavy and thus are commonly found on computers which have more memory and capacity than mobile phones. To further determine the level of utilization of health informatics, data was sought for, to know the areas of health care service that the medical doctors in ABUTH Shika- Zaria use Health informatics for. This only considered the respondents that reported actual use of health informatics ($\Sigma n=120$). This is presented on Table 8.

Table 8. Services the respondents use health informatics for

Usage	N	%
Patient information/data record	120	100
Consultation with patients	108	14.7
Consultation with colleagues	115	15.6
Hospital management	109	14.8
Research and training	120	100
Seeking for information on diagnosis/treatment	112	15.2
Others	3	0.4

Table 8 shows that all the respondents that said they use health informatics are using for “patients’ information/data record” and “research and training”. Majority also used informatics for “consultation with colleagues ($n=115$, 15.6%)” and “treatment/diagnosing patients ($n=112$, 15.2%)”. This finding compliments with the usage of “electronic health record and electronic medical record” which are mostly for patients used. The result also implies that the doctors use health informatics to also develop themselves on new ways of treatment.

4.3. Sources of information on knowledge and utilization of health informatics

Data was sought for on the respondents’ sources of information of health informatics and how to use it. This also only consider the respondents that said they know how to use health informatics ($\Sigma n=120$) and is presented on Table 9. Table 9 shows that the major sources of knowledge about Health Informatics among the medical doctors in ABUTH Shika-Zaria is “internet ($n=120$, 100%), However the respondents also get informed about how to use health informatics through “Interpersonal sources ($n=71$, 52.5%)”. As the data also reveals, the source of knowledge with the lowest selection is “Health Advocacy Program”. This implies that there is low level of knowledge creation on health informatics through health advocacy plan which was part of governments’ health policy plan. Workshops and seminars, though very common in the hospital (as witnessed during the research by the researcher) were among the least sources of information on the use of health informatics among the respondents. Only 53 and 48 respondents mentioned ‘school’ and ‘workplace’ as sources of information on how to use health informatics.

Table 9. Respondents’ sources of information on knowledge of health informatics

Sources	N	%
Health advocacy program	5	4.2
National strategic health development plan	21	17.5
International health development plan	9	7.5
Workplace	36	30
Research	48	40
School	53	44.2
Workshop	51	42.5
Seminar	63	52.5
Interpersonal communication	71	59.2
Media	17	14.2
Radio	10	8.3
Television	45	37.5
Internet	120	100
Hospital	63	52.5
Others	5	4.16

This study found that majority of the doctors in ABUTH Shika- Zaria that are aware of health informatics, have knowledge of health it (n=150, 68.2%) and that they are mostly aware of management information system (MIS) and telemedicine as Table 2 than the other areas of health informatics. Furthermore, the knowledge of how to use health informatics among the medical doctors was too good. This study found that majority of the medical doctors in the study area know how to use health informatics (n=120, 80%). The specific areas of health informatics that the doctors in ABUTH Shika-Zaria know how to use are “Management Information System”, “Electronic Health Record System” and “Electronic Medical Record” which is slightly different from what was found on awareness of health informatics. On both awareness and knowledge of how to use health informatics, the study found that only few medical doctors in ABUTH Shika-Zaria are aware of and know how to use “m-health” as an area of health informatics as Table 5. These findings are similar to what was found in a survey study [20] in Lagos Teaching Hospital that majority of the respondents (60.9%) are familiar with the new emerging concepts of telemedicine/telehealth. The findings are also consistent with the theory used in this research (UTAUT) that social demographics can have impact on user behavior towards technology acceptance and use. In the context of ABUTH this was found to be true when age and specialization was taken into consideration. Also, utilization of health informatics among the medical doctors in ABUTH was found to be fair as a good number of medical doctors in ABUTH, Shika-Zaria are utilizing health informatics (n=120, 80%). The reasons given for not using health informatics by those that reported not using were that it is not relevance to their specialization and that it is difficult to use. Electronic health record and electronic medical record were found to be the most utilized areas of health informatics among the medical doctors as Table 7.

The finding on utilization of health informatics among the medical doctors in ABUTH is in line with what was found in a study [5] where majority of the respondents demonstrated good knowledge of computers but with variation in utilization habits (n=142, 29.5%). Furthermore, this finding corroborates with the a study [20] in Ile-Ife University Teaching Hospital, Nigeria where health care professionals and students have good knowledge, attitude and utilization habit of computers. A similar studies [29] and [11] also found factors weighing down utilization of telemedicine/telehealth among their respondents to be; lack of knowledge of application, perception of telehealth benefits, perceived ease of use and usefulness, non -availability, average monthly income, job satisfaction index and computer possession. These findings are consistent with the findings of this research on the reasons why some medical doctors in ABUTH Shika-Zaria do not utilize health informatics. However, the study found that the major sources of information of health informatics among the medical doctors in ABUTH get information on health informatics are internet (n = 120, 100%) and interpersonal sources (n= 71, 59.2%), while advocacy, seminars, workshop, and media were the least sources of information on health informatics among the respondents (See Table 9). Availability of internet facilities in all the departments in ABUTH Shika-Zaria and use of smart phones can be the reasons why internet was mostly chosen as a source of information among all the medical doctors that know and use health informatics. The study also found that even though internet was the major source of information of health informatics and that it is used by most of the medical doctors, only a few of the medical doctors use it for research. This finding is in line with what was found in the study in Nigeria [30] that computer and internet use by first year clinical and final year nursing students though fair, is frequently used for computer games than for health purposes or research.

Still on sources of information about health informatics, the study also found that the medical doctors in ABUTH get information about health informatics through training and workshops. However, ‘seminar’ was found to be among the least sources of information about health informatics among the medical doctors in ABUTH. This confirms the observation by the researcher that though there were many seminars conducted in the hospital as witnessed during the study, none of those were found to relate to informatics. This finding also suggested why ‘workplace’ was also only mentioned among very few of respondents as a source of information on health informatics. Overall, the findings on sources of information about health informatics revealed that there is little awareness creation on health informatics in ABUTH. This may portray inadequacy in the aspect of awareness creation by the system (ABUTH or The Federal Government through the Federal Ministry of Health) which according to the theory (UTAUT) adopted for this research can facilitate individual’s adoption and use of technology.

The study also found that only few (n=52, 13.2%) medical doctors in ABUTH have school as their source of information on how to use health informatics. Interestingly, a cross tabulation revealed that majority of the medical doctors with higher qualification have knowledge of health informatics and are using it. The fact that majority of the respondents didn’t attribute their source of information about health informatics to school also confirms the claim that there is low level of training about health information technologies or computers at college. The preceding finding confirms the findings of a baseline survey [31] in Ethiopia who found personal effort (67%) and short-term computer training (33%) as the major sources of

knowledge of computers for health. Formal college or university ICT training as sources of information is reported by only 2% of their respondents.

National strategic health development plan (NSHDP) which is a Nigerian health policy document or the International health development policy document such as that by world health organization (WHO) and united nation development program (UNDP) or International health organization website such as radiology.com were also supposed to be official documents and sites about information on health informatics, but this study found that very few of the medical doctors in ABUTH actually get information on health informatics through those documents. National health development plan specifically National strategic health development plan (NSHDP) which is a Nigerian health policy document was mentioned as a source of information among only few medical doctors while the international health development policy document such as that by world health organization (WHO) and united nation development program (UNDP) as well as international health organization website such as radiology.com. were only mentioned by very few of the medical doctors as source of information for health informatics. The medical doctors mentioned advocacy group/organizations such as NMA, MDCAN and MEDS, CAPE as sources of information on health informatics as Table 9. In addition, only few (n=17, 14.2%) of the medical doctors accorded media (Television, Radio, Newspaper, Magazine, and social media) as their source of information about health informatics. Interestingly, none of the research reviewed in this study attributed media as a source of information of health information technology.

5. CONCLUSION AND RECOMMENDATIONS

This study concludes that majority of medical doctors in ABUTH Shika- Zaria are aware of health informatics as they have knowledge of how to use *health information management system* and *health medical record*. That the medical doctors in ABUTH, Shika-Zaria are utilizing health informatics for research, consultation, diagnosis, and treatment, mostly among themselves and patients than with the hospital management. It also concluded that the medical doctors get informed about health informatics through personal effort (internet or inter-personal sources). The study therefore recommends: 1). The need to address the issues of awareness of health informatics varieties in the national ICT for health framework. A new strategy should be designed to help strengthen awareness and use of health informatics among medical doctors for greater impact. This should be informed of in-house training and workshops as well as provision of self-study modules for the staff and students to learn health informatics and upgrade their health care delivery. 2). There is also need for awareness creation on health informatics varieties among the medical doctors in the study area. This owes to the finding that most of the doctors do not utilize *mhealth*, *ehealth* which can be easily used via mobile phones which is almost available to all the medical doctors. The management of ABUTH, Shika-Zaria should not just provide training but provide the medicals with the gadgets for actual use. 3). The federal government should strengthen effort to ensuring that the health informatics centers established in all the teaching hospitals are well equipped and are provided the necessary attention for sustainability. Health informatics training should be provided to all the health personnel of the hospitals as mandatory to encourage use of it for healthcare delivery. 4). Finally, there is a need for further research on health informatics in the study area using qualitative method of research to assess more in-depth, the situation of health in formatics in the study area. This would help get more information on the solving the situation of utilization of health informatics in the hospital and designing best strategies to adopt in enhancing utilization of health informatics for health care delivery.

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