
ICT knowledge, utilization and perception among healthcare providers at National Hospital Abuja, Nigeria

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Abstract: *Background:* Healthcare system in Nigeria is moving towards digitalization especially in the management of patients' health information, with a view to harmonizing medical care practice for improved healthcare quality. Information and communication technology (ICT) has transformed the way people collaborate, identify potential collaborators or friends, communicate with each other, and identify information that is relevant to their practice. *Rationale:* Thus, ICT has been identified as one measure to ensure these emerging trends in the Nation's healthcare systems. *Design/objectives:* This study deployed a cross-sectional structured questionnaire to determine ICT knowledge and utilization among healthcare providers at National Hospital Abuja ($n=271$). *Methods:* We devised stratified random sampling in the recruitment of participants. *Result:* It was found that profession, possession of a laptop computer, age and sex were associated with knowledge, utilization and perception of ICT. Most participants were advanced in the use of electronic mail (51.8%) and the Internet (47.1%) mostly acquired through self-efforts (46.5%). However, a greater portion of the participants exhibited poor knowledge of database management (47.8%) and statistical analysis package (46.3%). The vast majority have used computer (95.0%) and the Internet (93.6%) for more than 3 years and many (86.2 percent) expressed a desire for further ICT training. Virtually, all participants in this study opined that ICT will improve medical care quality but some anticipated concerns over medical confidentiality as ICT becomes widely adopted in the country's healthcare systems. Aside their poor skill in database design and statistical analysis software, healthcare providers at National Hospital, Abuja possessed good knowledge and disposition towards ICT especially for the enhancement of their professional practice and for public health quality improvement. They indicated interest in further ICT training in order to enhance their information sources for an improved practice. It would be worthwhile to enrich their sources of information in order to improve public health.

Keywords: Healthcare Providers, Healthcare Systems, Health Information, Health Information Technology, ICT, Nigeria

1. Introduction

Information and communication technology (ICT) is often used as an extended synonym for information technology [1]. It is a more specific term that stresses the role of unified communications and the integration of communications. It comprises of computing technology, the Internet and other accessories which enable users to access, store, transmit, and

manipulate information. Cruickshank [2] established that peoples' attitude towards computer and computerization becomes more favourable as their experience of computers and computer technologies increases. In line with this assertion, Fairley [3] opined that the rapid advances in *user-friendly* interfaces of the computer have lessened the need to know the intricacies of how the machines work. Similarly, the Internet is a global system of interconnected computer

networks that uses the standard Internet protocol suite to serve billions of users worldwide [4]. It shares its history with the development of electronic computers in the 1950s and was first introduced to the public by the University of California, Los Angeles [5].

The increasing processing power of ICT especially, in portable devices has led to the development and linking together of services that would have been hard to imagine only a few years back. Asangansi et al [6] reported that computer as the major information technology tool has transformed information and data handling processes in all fields of endeavours. ICT has been described as an invaluable tool to good healthcare information management [7-9] especially, with the reported data quality problems [10] in the paper-based systems. It is a panacea for improved healthcare quality [7-9], and it has the potential to transform the current healthcare systems to the benefit of both the provider and consumer and for an improved public health [7-9]. ICT infrastructures are not a vaccine, food or a drug. They therefore do nothing directly themselves to prevent or treat diseases or poverty. They are a tool for conveying information. This may be directly to individuals such as patients/clients; or by sharing between healthcare professionals i.e. training and management, or as a form of policy directives. Computer technology has been adjudged by both healthcare experts and healthcare consumers as having critical roles to play in the transformation of healthcare services [11].

Generally, the field of medicine and medical practice require the use of ICT for support in information processing, decision making and records keeping [6]. In 2013, Wheatley [12] reported that the deployment of information technology in healthcare management has provided a mechanism for promoting greater reliability in healthcare quality. The

evolution and rapid advancement of ICT products has transformed modern healthcare system in the areas of interaction and communication with colleagues and consumers, training and retraining of healthcare providers, storage and retrieval of up-to-date health information and it has impacted patient management[13]. Wheatley [12] also reported that the computer supports the practice of high quality evidence-based medicine, as well as continuous learning and improved experience. Dee [14] and Edwards et al [15] suggested that healthcare providers require immediate access to high quality answers to patients' care questions at every contact. Lack of such quality information may hinder knowledge-based healthcare services delivery [16]. A study [6] reported that ICT has been used to manage patients at a distance (telemedicine) and was used to manage hospitals and their patients' health records (electronic health records).

Similarly, the availability of ICT has provided the possibility of immediate and unprecedented access to the most recent and reliable results of clinical research and health information in everyday medical practice in developed countries [17-18]. Widespread adoption of ICT is a key strategy to meet the challenges facing health systems internationally of increasing demands, rising costs, limited resources and workforce shortages. Despite the rapid increase in ICT investment, uptake and acceptance has been slow and the benefits fewer than expected. For example, Kale [19] established that most healthcare professionals in developing countries had inadequate access to information and that the little information available to them was often unreliable and irrelevant. Similarly, Dorsch [20] submitted that rural healthcare providers were constrained by stemming barriers in spite of the fact that they needed basic information like their colleagues in the urban centres.



Fig. 1. L-R: A typical Nigerian paper-based health records system, manual filing in developed nation and a glimpse into an electronic health records system aided by ICT.

1.1. Aim of the Study

Access to healthcare information has become a key international development issue especially among healthcare professionals and the need to implement health information technology (HIT) has become a paramount issue in healthcare systems in Nigeria. However, very few studies

exist that illustrate the utilization assessment of ICT among healthcare professionals in Nigeria and there is need to determine the extent especially, at National Hospital, Abuja which is one of the apex centres of possible implementations of HIT. Therefore, this study determined knowledge, utilization and perceptions of ICT among healthcare professionals at National Hospital Abuja, Nigeria.

2. Methods

2.1. Background to the Study Area

The study was carried out at National Hospital Abuja, Nigeria. The hospital was originally designed in 1999 to cater for women and children in the West-African sub-region before the expansion of its scope to accommodate men in May 2000. The hospital though with 200 beds, has capacity for 500beds. The hospital has staff strength of 1,850 as at the time of the study.

2.2. Study Design

This is a cross-sectional study of five key information-driven and information-intensive professional groups in the hospital.

2.3. Study Population

Relevant stakeholders eligible for this study include 452 nurses, 304 doctors, 63 HIM professionals, 54 medical laboratory scientists and 47 pharmacists.

2.4. Data Collection Tools

The questionnaire was developed by the authors from review of relevant literatures. The tool is divided into five basic sections that delineate knowledge and skills in ICT, the use of computers and the Internet, perceived effects of ICT on health, participants' demographic parameters and possession of laptop, email and the use of social media. Data collection exercise took place between 24th January and 5th March 2014.

2.5. Sampling Technique and Sample Size

The study deployed stratified random sampling method. From the study population above, the total number of professionals targeted were 920 which include; 452 nurses, 304 doctors, 63 HIM professionals, 54 medical laboratory scientists and 47 pharmacists. Online sample size calculation software (www.surveysystem.com/sscalc.htm) was used to compute the sample size. The computed sample size was 271 which formed the number of recruited participants. As such, each group sample size is calculated as a ratio of the total population. An attrition rate of 10% was applied. In effects, we recruited 133 nurses, 90 doctors, 19 HIM professionals, 16 medical laboratory scientists and 14 pharmacists.

2.6. Inclusion and Exclusion Criteria

All healthcare professionals who fall into the target groups irrespective of their ranks were given equal opportunities to participate.

2.7. Data Analysis and Management

The statistical software SPSS V16.0 (2007) was used to analyze the data. Categorical data was expressed as

proportions and percentages while continuous variables, were expressed as mean± standard deviation. Association between categorical variables was expressed using Chi square (χ^2) and test of statistical significance (p -value) was set at $p=0.05$.

2.8. Ethics

Informed consent was explained in writing and obtained from all participants.

3. Results

3.1. Participants' Characteristics

Of the 271 questionnaires distributed, 260 (95.9%) were returned. Among these participants, 143, (55.0%) were females and 187 (71.9%) of them were forty years old or below, with a Mean age of 35 ± 9 years. Nurses alone constituted nearly half, 121 (46.5%) of the participants, with 90 (34.6%) doctors, 19 (7.3%) health information management professionals, 16 (6.2%) medical laboratory scientists and 14 (5.4%) pharmacists.

3.2. ICT Knowledge, Skills and Utilization among Participants

Tables 1 and 2 illustrate knowledge and utilization of ICT among the diverse professional participants. Of all the participants, 129 (51.8%) were advance in the use of electronic mail with HIM professionals and medical laboratory scientists leading (100%). This was closely followed by those who have ability to search the Internet (121, 47.1%) with HIM professionals leading (100%) followed by doctors (98.9%). The majority possess considerably average knowledge and skills in the use of word processor i.e. Microsoft Word (111, 42.9%), with HIM professionals and medical laboratory scientists in the lead. However, many of the participants reported that they could not design (setting database criteria) database management i.e. Microsoft Access (122, 47.8%) and that they could not use statistical analysis software package (118, 46.3%). This poor knowledge and skills in database design and statistical analysis was high (21.4) among the pharmacists. Participants mostly obtained their skills through self-efforts (46.5%) and from school (37.9%), and they overwhelmingly indicated interests for further training in computer (86.2%) and the Internet (83.1%). Profession had statistical significance on knowledge ($\chi^2= 75.54$; $p=.001$) in word processing and sex had significance on skill ($\chi^2= 32.48$; $p=.000$) to use word processor. On ICT utilization, the vast majority of participants have used computer (95.0%) and the Internet (93.6%) for more than three years. Profession was associated with participants' perception of ICT ($\chi^2= 33.26$; $p=.032$) and possession of laptop had significance on utilization of the Internet ($\chi^2= 107.8$; $p=.000$). All doctors possessed a laptop computer, all HIM professionals have used social media and 28.6% of pharmacists have never used the Internet.

Table 1. ICT knowledge, skills and utilization among participants

	N	Advanced n (%)	Average n (%)	Basic n (%)	No knowledge n (%)
ICT knowledge and skills					
Word processing (Microsoft Word)	259	72 (27.8)	111 (42.9)	69 (26.6)	7 (2.7)
Spread sheet (Microsoft Excel)	258	30 (11.6)	96 (37.2)	114 (44.2)	18 (7.0)
PowerPoint presentation (Microsoft PowerPoint)	259	67 (25.9)	82 (31.7)	84 (32.4)	26 (10.0)
Database management (Microsoft Access)	255	22 (8.6)	49 (19.2)	102 (40.0)	82 (32.2)
Database design using Microsoft Access	255	15 (5.9)	36 (14.1)	82 (32.2)	122 (47.8)
Internet search	257	121 (47.1)	90 (35.0)	38 (14.8)	8 (3.1)
Electronic mailing	249	129 (51.8)	81 (32.5)	30 (12.0)	9 (3.6)
Statistical analysis (e.g. SPSS, STATA, EpiInfo)	255	11 (4.3)	38 (14.9)	88 (34.5)	118 (46.3)
Computer file management (e.g. save, delete, copy, edit, paste, merge, find etc.)	258	86 (33.3)	97 (37.6)	60 (23.3)	15 (5.8)
Setting up computer system and install software	258	48 (18.6)	54 (20.9)	76 (29.5)	80 (31.0)
Utilization of ICT among participants					
	<i>N</i>	<i>Yes</i>	<i>%</i>	<i>No/unsure</i>	<i>%</i>
Have used computer for more than three years	259	246	95	13	5.0
Have used the Internet for more than three years	250	234	93.6	16	6.4
Used computer for more than three times in the last one month	243	211	86.8	32	13.2
Used the Internet for more than three times in the last one month	232	198	85.3	34	14.7
Never used computer	216	19	8.8	197	91.2
Never used the Internet	206	20	9.7	186	90.3
Possess email	259	254	98.1	5	1.9
Possess a laptop computer	259	234	90.3	25	9.7
Have used social media	256	245	95.7	11	4.3

Table 2. ICT knowledge and utilization among professionals

	<i>Nursing (n=121) n (%)</i>	<i>Medicine/Surgery (n=90) n (%)</i>	<i>HIM profession (n=19) n (%)</i>	<i>Medical laboratory science (n=16) n (%)</i>	<i>Pharmacy (n=14) n (%)</i>
ICT knowledge and skills					
Word processing (Microsoft Word)	116(95.9)	89 (98.9)	19 (100)	16 (100)	12 (85.7)
Spread sheet (Microsoft Excel)	106(87.6)	88 (97.8)	18 (94.7)	16 (100)	12 (85.7)
PowerPoint presentation (Microsoft PowerPoint)	101(83.5)	87 (96.7)	17 (89.5)	16 (100)	12 (85.7)
Database management (Microsoft Access)	76 (62.8)	64 (71.1)	16 (84.2)	11 (68.7)	6 (42.9)
Database design	54 (44.6)	52 (57.8)	13 (68.4)	11 (68.7)	3 (21.4)
Internet search	114(94.2)	89 (98.9)	19 (100)	15 (93.8)	12 (85.7)
Electronic mailing	105(86.6)	89 (98.9)	19 (100)	16 (100)	11 (78.6)
Statistical analysis (e.g. SPSS, STATA, EpiInfo)	48 (39.9)	69 (57.0)	9 (47.4)	8 (50.0)	3 (21.4)
Computer file management (e.g. save, delete, copy, edit, paste, merge, find etc.)	109(90.1)	89 (97.8)	19 (100)	16 (100)	10 (71.4)
Setting up computer system and install software	64 (52.9)	75 (83.3)	15 (78.9)	15 (93.8)	9 (64.3)
Utilization of ICT					
Possess email	116(95.9)	89 (98.9)	19 (100)	16 (100)	14 (100)
Possess a laptop computer	98 (81.0)	90 (100)	17 (89.5)	16 (100)	13 (92.9)
Have used social media before	111(91.7)	86 (95.6)	19 (100)	16 (100)	13 (92.9)
Have used computer for more than three years	111(91.7)	88 (97.8)	18 (94.7)	15 (93.8)	14 (100)
Have used the Internet for more than three years	101(83.5)	86 (95.6)	18 (94.7)	15 (93.8)	14 (100)
Never used computer	9 (7.4)	7 (7.8)	0 (0)	0 (0)	3 (21.4)
Never used the Internet	7 (5.8)	9 (10)	0 (0)	0 (0)	4 (28.6)

3.3. Perceived Effects of ICT on HIM Practice and Healthcare Service Delivery

Fig 2 below shows that virtually all the participants across professions (medical laboratory science, 100%; pharmacy, 100%; doctors, 97.8%; nursing, 95.9% and HIM, 94.7%) indicated that ICT will improve medical care quality. On whether ICT will enhance confidentiality of patients' health records, nearly all professionals in the study recorded higher responses with HIM professionals with the lowest (78.9%).

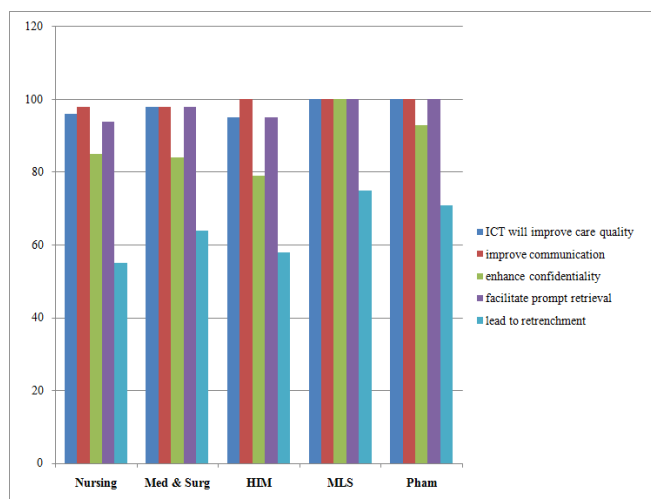


Fig 2. Perceive effects of ICT on healthcare

4. Discussion

Improving the health of individuals and communities, and strengthening health systems, disease detection and prevention are crucial to development and poverty reduction. This proposition requires evidence-base medicine (EBM) which demands appropriate and timely acquisition of the best available evidence often offered by ICT in order to answer clinical questions [21]. Widespread adoption of ICT is a key strategy to meet the challenges facing health systems internationally of increasing demands, rising costs, limited resources and workforce shortages. It has been said [22] that if ICTs are actively deployed, healthcare delivery becomes improved and the public health is better for it. In line with this, our study found that the majority of the participants had used ICT facilities with reasonable experience as between 94 and 95% have used computer and the Internet for more than three years. Our study coincides with other studies [6-9, 23-28] that reported good utilization of computer and the Internet. It however established improvement on studies [27] with moderate use and others [12, 29-34] with low utilization of computer and the Internet.

Participants in our study are considerably knowledgeable and skilled especially in the use of electronic mail (52%) and the Internet (47%) mostly through self-efforts. However, there was reported poor knowledge and skills in database design and statistical analysis as between 46 and 48% could not use the tools at all. These findings correlate with findings

by Adeleke et al [9] and Ajuwon & Rhine [34] where notable number of participants reported that they first learnt ICT through self-efforts. The report on good ICT skill coincides with a study [9] where the majority knew how to use basic ICT applications such as Microsoft Word. Major factors that contributed to the way healthcare professionals in this study utilized computer and the Internet were profession, age, sex and possession of a laptop computer. For instance, all pharmacists had used computer for more than three years and HIM professionals relatively indicated concerns over confidentiality in the wake of ICT application as they recorded the lowest response (78.9%) in this regards. Statistically, profession, possession of laptop computer systems, age and sex all had statistical significance ($p = .000$) on ICT knowledge, skills and perception. Virtually, all healthcare professionals in this study indicated that ICT will improve medical care quality. These findings agree with Adeleke et al [9] where most participants reported positive perceptions about the effects of IT on health information management and healthcare systems and decried the allusions that the emerging technology will dehumanize doctor-patient relationship. However, HIM professionals' relative low rating of ICT as regards confidentiality of patients' health records might mean that this category of participants who have the responsibility to promote the tenets of confidentiality still have some concerns over confidentiality as the country's healthcare systems embrace ICT applications. This is at variant with a study [35] where healthcare professionals including HIM professionals recommended ICT as a measure to ensure confidentiality.

Access to healthcare information has become a key international development issue [36] and improved proficiency in the use of computer and the Internet had been recommended [21] as one way to improve access to invaluable health information among healthcare professionals. It is quite interesting that this current study reveals general quest for further training in the use of computer (86%), and the Internet (83%). The findings on further training in computer and the Internet correspond with previous studies such as Adeleke et al [9] where participants wanted more training in electronic data analysis; Gour et al [37] with much demands on provision for computer training and Cullen [38] with training needs in the identification, use, and application of evidence in practice. Other corroborating reports are Ajayi [39] on how to enhance efficiency in academic pursuance; Yeung [21] on benefits of technology-enabled training; Ajayi [40] on the introduction of health informatics and Chan et al [41] reported that a group of primary care nurses with consensus required training with a view to improving their computer use.

4.1. Study Limitations

There was an industrial action at National Hospital Abuja during data collection. Therefore, we had to contend with various setbacks while trying to gather the raw data. In spite of the attrition rate, we could not retrieve all completed questionnaire from the nurses.

5. Conclusion

Healthcare providers at National Hospital, Abuja possess good knowledge, are considerably skilled with good disposition towards computer and use of the Internet especially for the enhancement of their professional practice and improvement of patient care quality. However, they presented poor knowledge in database design and statistical analysis. They massively indicated interests for further training in the use of computer and the Internet so as to boost their sources of information for better practice and improved public health. Any effort at enriching their sources of information and enhancing their usability of these technologies would be worthwhile.

Recommendations

1. As a step forward to evolve better electronic healthcare environments, which tend to evolve an improved healthcare quality, it is very important that the hospital and other healthcare facilities organize specific and intensive ICT training for their employees and make necessary infrastructures available for the implementations.
2. There is a need for advocacy on the need to embrace health IT among all healthcare professionals at National Hospital and in Nigeria healthcare system as a whole.

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