

Research Article

Factors Influencing Information and Communication Technology Utilization in Healthcare: A Perspective from Federal Medical Centre, Asaba

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Abstract

The extensive integration of information and communication technologies (ICTs) within the healthcare sector, particularly in advanced nations, has significantly improved the delivery of patient care by medical professionals. Despite the potential benefits, healthcare workers in developing countries encounter significant challenges that hinder the seamless integration of ICT into patient care. Hence, the study was aimed to determine the factors influencing ICT utilization among healthcare professionals at Federal Medical Centre Asaba, Delta State Nigeria. In this cross-sectional study, a total of three hundred and sixteen (316) participants were recruited using stratified random sampling procedure. Data were collected using validated researchers-developed questionnaire. Data were subjected to descriptive statistics of frequencies, percentages, mean and standard deviation for continuous variables while Chi square (χ^2) was used to test the association between categorical variables. Probability value less than 0.05 was considered statistically significant. All analyses were done with the aid of SPSS V26 statistical software. Results of major findings revealed that poor availability of internet services (69.6%), epileptic power supply (67.7%) and inadequate ICT infrastructure (60.1%) were major factors identified by the participants to influence their use of ICT. Most participants own computers (92.7%) and had been using the Internet (98.1%) for more than three years. There was a significant association between ICT usage and possession of a personal laptop ($p = .000$). All (100%) expressed the belief that ICT would simplify research processes and facilitate data entry. Thus, provision of adequate ICT infrastructures, power supply and continuous mandatory training and retraining on ICT is critical to enhance the implementation of more effective practices using ICT among healthcare professionals.

Keywords: Healthcare professionals, Factors, Utilization of ICT, Federal Medical Centre Asaba

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Introduction

The healthcare delivery system of a nation is constantly changing and evolving. These changes depend on how well her healthcare professionals can provide quality and budget-friendly healthcare to the citizens. Health records are important for effective and high-quality healthcare as data obtained play a vital role in the planning, development, and maintenance of optimal healthcare (Adeleke, et al., 2014). The norm in the healthcare industry has always been to record and store patients' health information in hard copies, but this practice has been found to have numerous deficiencies, including poor documentation due to illegible handwriting, document loss from improper or inadequate storage, delays in document access, and ineffective patient information transfer among others. The Information and Communication Technologies (ICTs) era has brought forth the need to alter how information is exchanged and maintained among healthcare professionals. Health ICT however, is based on the development of digital technologies, databases, and other applications that seek to prevent illness, treat diseases, manage chronic illness while improving healthcare for individuals and communities, and also provide capacity for system efficiencies and prevent medical errors. Health ICT affords new and more efficient ways to access, communicate, process, and store information. It also allows for remote care, interdisciplinary clinical support, and knowledge support that is intended to bridge the gap that emerged in the health sector in both developing and new industrial countries (Talking HealthTech, 2020).

The implementation of ICTs in the healthcare delivery has had a significant impact in the way medical personnel treat patients. The use of ICT in clinics and hospitals has gained pace in developed countries, among them include computerizing medical records, electronic appointment booking and internet use for doctor-patient communication, in addition to other activities taken by healthcare professionals such as teleconferences, webinars, and emails (Mwangi, 2017). For managing data and healthcare resources, ICT has been investigated and proven to be advantageous to the majority of healthcare facilities (ITU, 2016). In order to coordinate patient care procedures, offer patients with a plan of treatment, and maintain good clinician-to-clinician contact, electronic documentation is used. In contrast to other industries, the healthcare industry has not fully utilized ICT's potential (Cucciniello, 2015) as its adoption and utilization among healthcare practitioners remain a challenge, particularly in developing countries such as Nigeria. It is noteworthy to acknowledge that the Federal Medical Center (FMC) Asaba still use A4 paper and clinical notes for consultations, and nurses/other healthcare professionals' documentations which carry the dangers of being lost along the line. Therefore, enhancing patients' satisfaction, cutting costs, and improving service quality are all possible outcomes of integrating information and communication technology (ICT) into healthcare delivery. However, there is dearth of documented

studies on factors that influence the use of ICTs among healthcare professionals in South-south Nigeria. Hence the need to determine factors that might influence the usage of ICTs among healthcare professionals in FMC Asaba, Delta State Nigeria.

Materials and Methods

Research design: This study adopted a cross-sectional study design.

Area of Study: The research was conducted at the Federal Medical Centre Asaba, Oshimili South Local Government Area of Delta State, Nigeria. This tertiary healthcare facility was established in 1998 with a bed capacity of 322 and an occupancy rate ranging from 50% to 55%. On a weekly basis, the hospital provides outpatient clinics for consultation, covering thirty-two specialist and subspecialty areas. At the time of the study, the hospital had a staff of 1,771. Moreover, health professionals use a range of ICT equipment, such as closed user group cell phones for interprofessional and interdepartmental communication, televisions with DSTV subscriptions. Additionally, many health professionals own personal computers for learning and research, and smartphones for various purposes.

Participants: A sample size of two hundred and eighty-seven (287) was calculated from a total population of 1016 professionals using Slovin's formula [$n = N / (1 + Ne^2)$] where n: Sample size needed; N: Population size and e: Acceptable margin of error (0.05). A 10% attrition rate was added making a total of 316. The participants were stratified according to their profession and finally recruited using simple random procedure. They included: Doctors (95); Nurses (175); Medical laboratory scientists (20); Pharmacists (15) and Health information managers (11).

Data Collection: Researchers-developed questionnaire validated by three professionals with expertise in Measurement and Evaluation, and Health Information Manager, was used for data collection. The questionnaire comprised four main sections viz: participants' sociodemographic characteristics, ICT utilization among health care professionals, perceived benefits of ICT use in healthcare delivery system and factors influencing their use of ICT. A test-retest method was used to establish the reliability of the instrument among 32 health professionals in Federal Medical Centre Onitsha. Data obtained were analyzed using the Cronbach alpha test, which yielded a reliability coefficient of 0.89. Ethical approval was obtained from the Ethics and Research Committee of FMC Asaba (Ref: FMC/ASB/A81 VOL.X11/329). Informed consent was sought from the participants before administration of the questionnaire. The principles of voluntary participation, anonymity and confidentiality were upheld throughout the study. An explanation of the purpose of the study and necessary instructions on how to complete the questionnaire were provided on the section of instruction on the goggle form sent to the participants. The questionnaire was administered via goggle form and the exercise lasted from 10th July to 19th of

August, 2023. Data were analyzed using both descriptive (frequencies, percentages, means and standard deviations) and inferential statistics (Chi-square (χ^2). Test of association between categorical variables was set at 0.05 level of significance. All analysis were done with the aid of statistical software SPSS V26.

Results

Socio-demographic characteristics of participants

Out of the 316 questionnaires that were distributed using goggle form, all were correctly filled and return rate was 100%.

Table 1 shows the sociodemographic characteristics of the participants. Their mean and standard deviation age was 38 ± 10 years. Majority of the participants, 225(71.2%) were females, and 91(28.8%) males. More than half of the participants were nurses 175(55.4%), doctors 95(30.1%), medical laboratory scientists 20(6.3%), pharmacists 15(4.7%), and health information managers (HIM) 11(3.5%). The mean and standard deviation years of experience was 10.4 ± 6.2 years.

ICT utilization among participants

Table 2 shows the participants' ICT utilization. Findings revealed that majority have been using computers (92.7%) and the Internet (98.1%) for over three years. When examining the association between ownership of a personal computer/laptop and its utilization a significant association was found ($\chi^2 = 26.7$; $p = .000$). Professional background demonstrated statistical significance in the utilization of ICT tools such as internet use ($\chi^2 = 31.4$; $p = .000$), PowerPoint for presentations ($\chi^2 = 46.9$; $p = .000$), electronic mailing ($\chi^2 = 26.4$; $p = .011$), and proficiency in computer management tasks like saving, deleting, copying, editing, pasting, and emerging ($\chi^2 = 28.6$; $p = 0.005$).

Aspects of healthcare where ICT can be used

Table 3 delineates the domains within healthcare professions where ICT can be used. Major areas identified by the participants include: Research (3.9 ± 1.4); communication with other health professionals in the hospital using mobile phone (3.8 ± 1.4) and patients' history taking (3.1 ± 1.6).

Perceived benefits of ICT use in healthcare delivery system

Figure 1 reveals a high level of consensus across various vocations that ICT makes research process easy, with 100% agreement among the pharmacists and health information managers, nurses (97.1%), medical laboratory scientists (95%), and doctors (94.7%). Regarding its potential to facilitate data entry, the response rates were generally high among all professionals, with health information management professionals having the lowest rate at 75%.

Factors influencing the use of ICT among health care professionals

Table 4 shows the factors influencing healthcare professionals' use of ICT. Major factors identified by the participants were: inadequate availability of internet services (4.62 ± 0.58), epileptic power supply (4.62 ± 0.63) and inadequate ICT infrastructure (4.52 ± 0.63).

Discussion

The adoption of ICT in healthcare has markedly improved patient care and fostered global collaboration among medical professionals. An essential approach to the challenges encountered by the healthcare systems worldwide—including escalating costs, increasing demand, resource constraints, and workforce shortages—is the extensive integration of ICT. As noted earlier (Trivedi & Joshi, 2008), the proactive deployment of ICT contributes to enhanced healthcare delivery, ultimately benefiting public health. Consequently, the study found that between 93% and 98% of participants had been using computers and the Internet for over three years, highlighting the substantial experience of most individuals with ICT facilities. This finding is consistent with previous research reports (Bennett, et al., 2004; Inamdar, 2004; Bennett, et al., 2005; Ajayi, 2005; McKnight., 2006; Asangansi, et al., 2008; Adeleke, et al., 2014; Adeleke, et al., 2015; Adeleke, et al., 2015) that documented the effectiveness of computer and Internet use. Hence, the study revealed improvements in computer ownership and its use in assessing information from the internet compared to studies showing moderate computer and Internet usage (Schoenberg & Safran, 2000; Ajuwon, 2003; Samuel, et al., 2004; Ajuwon & Rhine, 2008; Ameh, et al., 2008; Adeleke, et al., 2011), indicating minimal use.

More so, the study showed an association between possession and utilization of a laptop or personal computer. Hence, possession of a laptop significantly influenced computer utilization ($p = .000$) especially in this digital era. This result aligns with the findings of Adeleke, et al., (2015), that showed how participants' ownership of a laptop and perceptions of ICT is related to its usage in assessing internet facility to keep one updated with current information about patient's managements. In addition, participants' socio-demographic characteristics such as years of experience was linked to internet system usage, ($p = .03$) as the higher the years of experience, the higher the individual is proficient in the use of ICT for patient's care.

Furthermore, as regards the perceived benefits of ICT, the vast majority of participants expressed its usefulness in research, aiding data entry, generating accurate reports, and streamlining workflow—all contributing to an elevated standard of care. This finding is in line with research conducted in 2017 by Mwangi who reported that ICT was helpful for computerizing medical data, electronic appointment booking, and internet-based communication. These results are further supported by report of Handayani, et al., (2018), which asserted that ICT can be applied in healthcare practices across instructional programs, clinical research, and management systems. Handayani, et al., further posited that the use of ICT in healthcare was perceived as having many benefits because it enhances performance levels, minimizes errors, improves accessibility, promotes increased patient participation, and fosters closer relationships with various professional groups. This acknowledgment underscores the profound impact of the ICT era in advancing patient care, especially in industrialized nations where full integration has been successfully implemented.

Three major challenges identified as factors affecting the use of ICT in FMC Asaba were: inadequate availability of internet services, insufficient electricity supply and inadequate ICT infrastructure. Others are insufficient skills and training in

computer use, high cost of equipment, inconvenient data entry processes, disinterest by the management, incompetent ICT personnel, and lack of privacy and security. These results align with the findings of a study conducted in 2016 by Afolayan and Oyekunle, which identified insufficient computer equipment, inadequate electrical supply, limited computer skills, high computer costs, cultural and environmental issues, and the attitudes of health professionals as the primary obstacles to the adoption of ICT. Moreover, the outcomes of this study are consistent with findings from other studies (Idowu, et al., 2008; Irinoye, et al., 2013; Mutula, 2015; Yehualashet, et al., 2015), which highlighted several factors influencing the utilization of ICT in the healthcare delivery system. These factors encompass the availability of electric power, the cost associated with ICT equipment, a shortage of technical support, inadequate understanding of ICT, lack of confidence in using computers, poor internet connectivity, and resistance to embracing new technology. To foster the effective utilization of ICT in healthcare, proactive measures need to be taken to address the identified factors. Therefore, it is important to take necessary steps to overcome these challenges that impede ICT utilization in FMC Asaba. This effort will improve hospital-based services and prioritize the provision of essential communication devices in healthcare settings, ensuring seamless and efficient information sharing. While healthcare professionals are increasingly leveraging ICT for information dissemination, it is imperative to overcome any hindrances to its use. This approach would expedite information storage and dissemination, thereby enhancing patient care and satisfaction.

In terms of healthcare applications, participants predominantly expressed that ICT could be useful in research, communicating with other healthcare professionals, and recording patient histories. These findings align with the outcomes of Mwangi (2017) study, which identified the effectiveness of ICT in tasks such as computerizing medical records, conducting research in clinical practice, facilitating electronic appointment scheduling, and utilizing the internet for communication purposes.

Recommendations: To advance the electronic healthcare environment and enhance healthcare quality at Federal Medical Centre Asaba, it is imperative for the hospital management team to take strategic actions in ensuring a stable internet service, conducting specialized and comprehensive ICT training for staff, and providing the necessary infrastructure for effective implementation. Additionally, integrating alternative power sources such as solar panels in each unit is crucial to ensure uninterrupted operation. Maintaining a consistent software infrastructure for the electronic health records system is equally essential.

Authors' contributions: All the authors were actively involved in the formulation of this study. ONJ and CNI designed the study and drafted the manuscript. ONN, ISO, UFC and UDN participated in the collection of the data, analysis and interpretation of the data. OAO, ICN, JCN, EPO, EEO and OSI drafted the manuscript, contributed to the design of the study. ONJ and ICN drafted the final report. All authors read and agreed to the final version of this manuscript.

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Table 1: Socio-demographic characteristics of participants

Variables	Nurses (n=175)	Medical doctors (n=95)	Medical Laboratory Scientists (n=20)	Pharmacists (n=15)	Health Information Managers (n=11)
Age (years)					
20-29	37(21.1%)	28(29.5%)	11(55%)	5(33.3%)	0
30-39	62(35.4%)	32(33.7%)	4(20%)	4(26.7%)	3(27.3%)

40-49	43(24.6%)	20(21.1%)	5(25%)	3(20%)	6(54.5%)
50 &above	33(18.9%)	15(15.9%)	0	3(20%)	2(18.2%)
M±SD = 38±10yrs					
Gender					
Male	16(9%)	59(62.1%)	7(35%)	5(33.3%)	4(36.4%)
Female	159(91%)	36(37.9%)	13(65%)	10(66.7%)	7(63.6%)
Years of experience					
1-5	58(33.1%)	40(42.1%)	12(60%)	6(40%)	0
6-10	35(20%)	12(12.6%)	2(10%)	3(20%)	1(9.1%)
11-15	37(21.1%)	23(24.2%)	5(25%)	1(6.6%)	6(54.5%)
16-20	17(9.7%)	9(9.5%)	0	1(6.6%)	2(18.2%)
>20	28(16%)	11(11.6%)	1(5%)	4(26.7%)	2(18.2%)
M±SD = 10.4±6.2yrs					

Table2: ICT use among participants (n=316)

ICT skills and use among participates	Nurses (n=175)	Medical doctors (n=95)	Medical laboratory scientists (n=20)	Pharmacists (n=15)	HIM (n=11)	X ²	P-value
Do you have personal laptop							
Yes	117(66.9%)	90(94.7%)	16(80%)	11(73.3%)	4(36.4%)		
No	58(33.1%)	5(5.3%)	4(20%)	4(26.7%)	7(63.6%)	35.2	0.000*
Have used computer for more than three years							
Yes	158(90.3%)	92(96.8%)	19(95%)	13(86.7%)	11(100%)		
No	17(9.7%)	3(3.2%)	1(5%)	2(13.3%)	0	5.7	0.83
Have you used Internet for more three years							
Yes	170(97.1%)	94(98.9%)	20(100%)	15(100%)	11(100%)		
No	5(2.9%)	1(1.1%)	0	0	0	31.4	0.000*
Have you ever used word processing							
Yes	169(96.6%)	95(100%)	20(100%)	14(93.3%)	11(100%)		
No	6(3.4%)	0	0	1(6.7%)	0	20.9	0.05
Have you used spread sheet for documentation							
Yes	151(86.3%)	87(91.6%)	17(85%)	14(93.3%)	10(90.9%)		
No	24(13.7%)	8(8.4%)	3(15%)	1(6.7%)	1(9.1%)	9.1	0.69
Have you used power point for presentation							
Yes	143(81.7%)	94(98.9%)	20(100%)	14(93.3%)	10(90.9%)		
No	32(18.3%)	1(1.1%)	0	1(6.7%)	1(9.1%)	46.9	0.000*
Electronic mailing							
Yes	156(89.1%)	92(96.8%)	18(90%)	15(100%)	8(72.7%)		
No	19(10.9%)	3(3.2%)	2(10%)	0	3(27.3%)	26.4	0.011*
Have you used computer management file like save, delete,							

copy, edit, paste and emerge							
Yes	160(91.4%)	94(98.9%)	20(100%)	15(100%)	9(81.8%)		
No	15(8.6%)	1(1.1%)	0	0	2(18.2%)	28.6	0.005*
Variables		YES	%	NO	%		
For more than three years I have been using computer	293	92.70%	23	7.30%			
For more than three years I have been using internet	310	98.10%	6	1.90%			
I own a laptop or computer	238	75.30%	78	24.70%			
Association between possession of personal laptop and ICT utilization in patient care management							
Variable	Yes	%	NO	%	X²	P-value	
Possession of personal laptop	238	75.30%	78	24.70%			
Utilization of ICT via computer in patient care management	293	92.70%	23	7.30%	26.7	0.000*	
Association between socio-demographic factors and utilization of internet system							
Variables	Yes	%	NO	%	X²	P-value	
Age							
20-29	80	25.30%	1	0.30%			
30-39	104	32.90%	1	0.30%			
40-49	77	24.40%	0	0			
50& above	50	15.80%	3	0.90%	7.2	0.06	
Gender							
Male	91	28.80%	0	0			
Female	220	69.60%	5	1.60%	2.1	0.2	
Years of experience							
1-5	116	36.70%	0	0			
6-10	52	16.50%	1	0.30%			
11-15	72	22.80%	0	0			
16-20	28	8.90%	1	0.30%			
>20	43	13.60%	3	0.90%	10.9	0.03*	
Professional groups							
Nurses	171	54.10%	4	1.30%			
Doctors	95	30%	0	0			
Medical Lab. Scientists	19	6%	1	0.30%			
Pharmacists	15	4.70%	0	0			
Health. Infor. Managers	11	3.50%	0	0	4.2	0.4	

Index: * = Significant values

Table 3: Aspect of healthcare where ICT can be adopted or used (n=316)

Variables	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean ± SD
Patient history taking	90(28.5%)	70(22.2%)	9(2.8%)	69(21.8%)	78(24.7%)	3.1±1.6
Electronic appointment booking	75(23.7%)	56(17.7%)	18(5.7%)	80(25.3%)	87(27.5%)	2.9±1.6
Research	143(45.3%)	99(31.3%)	12(3.8%)	20(6.3%)	42(13.3%)	3.9±1.4
Treatment, medication and documentation	69(21.8%)	54(17.1%)	21(6.6%)	68(21.5%)	104(32.9%)	2.7±1.6

Communication with fellow healthcare professionals using hospital mobile phone	123(38.9%)	114(36.1%)	16(15.1%)	24(7.6%)	39(12.3%)	3.8±1.4
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Index: Score: Strongly disagree: 1, Disagree: 2, Neutral: 3, Agree: 4, Strongly Agree: 5

Table 4: Factors influencing the use of ICT among participates (n=316)

Variables	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean±SD
Inadequate availability of internet services	220(69.9%)	87(27.5%)	6(1.9%)	2(0.6%)	1(0.3%)	4.66± 0.58
Insufficient electricity supply	214(67.7%)	90(28.5%)	8(2.5%)	2(0.6%)	2(0.6%)	4.62± 0.63
Inadequate ICT infrastructure	190(60.1%)	106(33.5%)	18(5.7%)	2(0.6%)	0	4.52± 0.63
Insufficient skills & training in computer use	133(42.1%)	131(41.5%)	30(9.55%)	14(4.4%)	8(2.5%)	4.16± 0.95
High cost of equipment	108(34.2%)	133(42.1%)	56(17.7%)	14(4.4%)	5(1.6%)	4.03± 0.92
Lack of management interest	83(26.3%)	120(38.0%)	64(20.3%)	38(12.0%)	11(3.5%)	3.72± 1.09
Inconvenient data entry process	72(22.8%)	128(40.5%)	64(20.3%)	37(11.7%)	15(4.7%)	3.65± 1.10
Incompetent ICT personnel	61(19.3%)	119(37.7%)	65(20.6%)	54(17.1%)	17(5.4%)	3.48± 1.14
Lack of privacy and security	42(13.3%)	98(31.0%)	74(23.4%)	71(22.5%)	31(9.8%)	3.16±1.20

Index: Score: Strongly disagree: 1, Disagree: 2, Neutral: 3, Agree: 4, Strongly Agree: 5

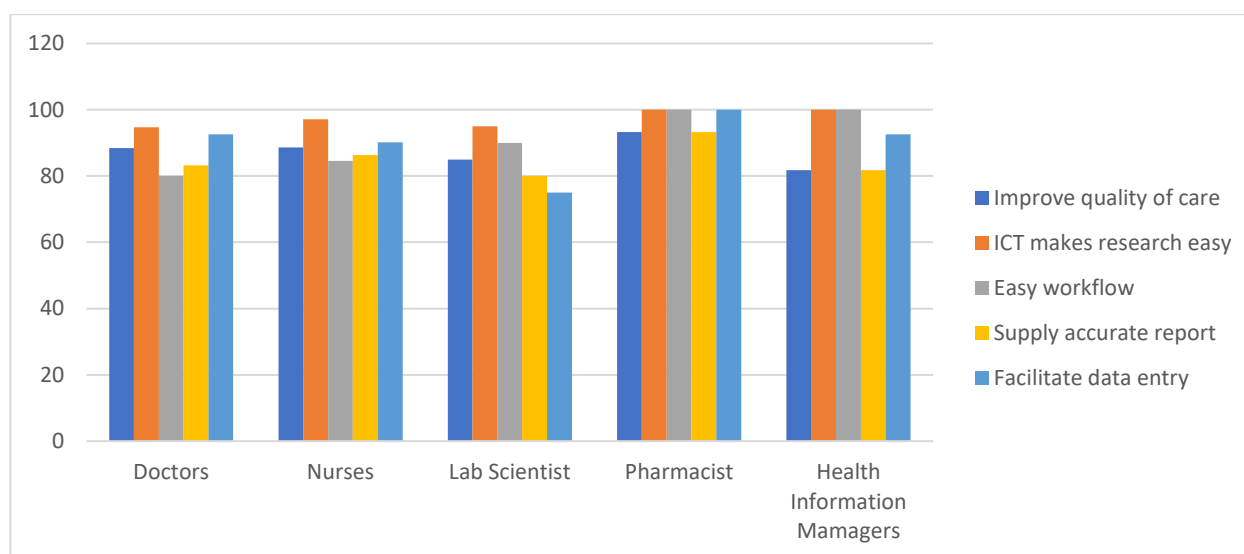


Figure 1: Perceived benefits of ICT use in healthcare system