Journal of Health Informatics in Developing Countries
http://www.jhidc.org/
Vol. 15 No. 1, 2021

Submitted: April 10th, 2021 Accepted: June 12th, 2021

Poor Availability of Information Communication and Technology in Sub-Saharan Africa Health Sector: A Case Study of Nigerian Health Facilities

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Abstract

Background: The use of information communication and technology (ICT) in Nigeria has been proven to have changed how the treatment is provided for both in-patients and out-patients in health facilities. Yet, information about their availability is rare. This study aimed to determine the availability of ICTs in Nigerian healthcare facilities.

Methodology: This was a facility-based survey conducted in 872 healthcare facilities in 33 states of Nigeria with the Federal Capital Territory, Abuja, from May to July 2019. Data collection included individual interviews and site inspections. The data collected were analyzed with IBM-SPSS 25.0.

Results: The study comprised 113 private and 759 public health facilities. The proportion of private and public facilities that use log forms recording orders was 86.7% and 79.8%, respectively. Computer availability was 52.2% in private 24.6% in public healthcare facilities. Basic handsets were the most available ICT tool, with 79.6% in private and 74.6% in public health facilities, mainly acquired by staff members. Availability of Local area network *(*LAN*)* was (23.9% vs. 8.4%) and WiFi (13.3% vs. 3.7%)) in private and public health facilities, respectively ($p<0.001$). The primary use of the ICT was for routine communication, with 76.1% in private and 70.6% in public facilities ($p>0.05$). In contrast, the use of ICT for other medical functions such as patient records and supply chain management was very shallow.

Conclusion: There is a need for government and donor agencies such as the WHO and the United Nations to collaborate to ensure the provision of ICTs to Nigerian healthcare facilities.

Keywords: ICT, availability, healthcare facilities, Internet, Nigeria.

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1. Introduction

Today, the planet is becoming more technologically advanced. Information and communications technology (ICT) has a massive effect on healthcare as it raises the level of quality of care, secures patients' privacy, and lowers operational and administrative costs [1–3]. A wider user-based and the various forms of telecommunications devices have reduced the barrier of communication to zero [4]. People now have easy access to information through the ICT and, as a result, have easy access to medical services [5]. Information technology is important in healthcare advancement because ICT has been used in collecting data and provides opportunities to improve the quality and effectiveness of healthcare facilities. Access to ICT connections by one facility to another healthcare facility has become available across multiple lines, allowing for direct and centralized lines of interactions and the use of knowledge-based healthcare systems [6]. A valuable means of connection, training, and education has made health science, records, and related services readily accessible online [5]. Expert programs have been implemented to anticipate medical challenges and include prescription treatments. Telemedicine is an ICT technology that has existed in developing economies for several years and can be administered in real-time or sequentially [4,5]. Internet has been more widely accessible, and over the 21st century, ICT perforated the healthcare system and has increased rapidly [3].

ICT in Nigeria has changed how the treatment is provided for both in-patients and out-patients in health facilities [6–8]. As an example, ICT has helped improve the delivery of healthcare facilities. While knowledge and services are important in healthcare, they need technology to be accurate, efficient, and reliable [9,10]. Medical errors have dramatically decreased in Nigeria as well as the cost of healthcare delivery [7]. Additionally, it has strengthened the physician-patient relationship [6]. Thus, we may conclude that Nigeria is prioritizing attaining the UN's Sustainable Development Goal (SDG) ahead of the proposed 2030 deadline. How available are the ICTs in Nigerian health facilities is a question that is begging for an answer. Although the Nigerian health sector has benefited from the use of ICTs, fundamental problems with Nigeria's health system have hindered progress for health facilities and individuals in the industry [6]. There are studies conducted in various parts of the country that showed low availability and use of ICTs in public and private health facilities [1,7,11]. Therefore, this study aimed to determine the availability of ICT tools in both public and private healthcare facilities to determine the complementary efforts of these facilities to the government's step towards attaining the SDG by 2030.

2. Methodology

2.1.Study design

This study was a facility-based survey that employed both structured questionnaires and physical observation in data collection. The study was conducted in 872 primary and secondary

healthcare facilities in 33 states of Nigeria plus the Federal Capital Territory, Abuja, from May to July 2019. Three States, including Adamawa, Borno, and Yobe, were excluded from the study due to security challenges in the three states.

2.2.Data sources and collection

Data collection was done from two sources; individual interviews and site inspections. Each facility staff member was contacted via personal interviews to appraise ICT availability in their respective facility. Data was requested from the team members to calculate the performance metrics. A team of researchers applied quantitative research methods to analyze specific yet similar metrics. The inspection team was sent to the facilities to verify the availability of ICT tools and examined data from both sources to conclude.

2.3.Data collection tools

A standardized and validated survey tool by "the World-Bank and Federal Ministry of Health adapted Health Facility Assessment Tool was adopted and modified to address target respondents. This tool was a structured interviewer-administered questionnaire used to collect data from ICT managers and heads of record departments in the facilities after obtaining approval from the management. Availability of the ICT tools in each site was established through physical inventory observations.

2.4.Sample size

The total number of facilities included in the study was calculated using the formula

$$n = \frac{N}{1+Ne^2}$$

Where: n is the sample size, N is the population size, and *e* is the level of precision = 5% = 0.05 at 95% confidence level.

The Nigerian list of health facilities was used to obtain the sample size. The total number of operational, registered, and licensed health facilities were 14,522 public and 6,009 private facilities, excluding Adamawa, Borno, and Yobe States [12]. When the formula above was applied, the minimum sample size was 389 primaries and 375 secondaries, making 761 facilities. The targeted number of facilities per state was 23, comprising 19 public and four private, making 646 public and 136 private facilities in 34 states, including FCT. However, only 113 (83.1%) private facilities agreed to participate in the study. Therefore, more public facilities were included in the survey. The final sample size comprised 872 facilities (759 public and 113 private).

2.5.Cleaning and Analysis of Data

All the data from these sources were compiled in a database using Microsoft Excel. The data were verified using the standard method, and all errors were eliminated. The data were analyzed with

IBM-SPSS 25.0. Descriptive statistics were performed, and the results are presented in Tables. Chi-Square analysis was performed, and $p<0.05$ was considered significant.

2.6.Ethical issues

The research team placed ethical considerations at the forefront of their design process when developing the survey instruments and adopted the following methods in mind:

i. Facility management was fully informed and approved for conducting the study in their facilities.
ii. The study team made sure to keep the survey protocols and interviews as unintrusive and straightforward as possible to avoid any delays in the work process.
iii. To be sure that participants knew about the purpose of the study and how long they could expect to be interviewed, the data collectors reminded them about the length of the interview period and the purpose of the findings. The team also confirmed the source's anonymity and permitted respondents to decline to respond to the questions if they so desired.

3. Results

The study comprised 113 private and 759 public health facilities. The proportion of private facilities using log forms for reporting and ordering medical supplies was 86.7% and 79.8% of public facilities, with 80.7% of all facilities using log forms. Most (71.1%) of the ICT types available in the healthcare facilities were acquired by a staff member, with 60.2% in private and 72.7% in public. Only 16.5% of the public healthcare facilities got any ICT facility from the government, while 57.5% of private facility managements provide their ICT ($p<0.001$). Facility management (2.8%) and donors (8.8%) were the minor ICT providers in public healthcare facilities. Also, government (0.9%) and donors (3.5%) were the least ICT providers in private healthcare facilities, as shown in Table 1.

Table (1) Availability of log form and provider of ICT in the health facilities

Variable	Response	Facility ownership		Total (n=872)	X^2	P-value
		Private (n=113)	Public (n=759)			
Log form for reporting and ordering medical supplies	Verified	98 (86.7)	606 (79.80)	704 (80.70)	2.996	0.083
	Not verified	15 (13.3)	153 (20.20)	168 (19.30)		
Source/Provider of ICT facilities	Staff member	68 (60.2)	552 (72.7)	620 (71.1)	7.540	0.006*
	Government	1 (0.9)	125 (16.5)	126 (14.4)	19.324	<0.001*
	Facility management	65 (57.5)	21 (2.8)	86 (9.9)	331.718	<0.001*
	Donation	4 (3.5)	67 (8.8)	71 (8.1)	3.677	0.055

As shown in Table 2, while more than half (52.2%) of private healthcare facilities had a computer, only 24.6% of public facilities has it, with mean availability of 28.2% in all primary and

secondary healthcare facilities (p<0.001). The basic handset was the most available ICT tool with 75.2% overall availability, 79.6% in private and 74.6% in public health facilities, mostly acquired by staff members. Smartphones, Tablets, local area networks (LAN), and WiFi were rarely available in both private and secondary healthcare facilities in Nigeria. However, their availability was significantly higher in private than public healthcare facilities (p<0.05). Availability of Smartphone was (15.9% vs 9.1%); Tablets (8.8% vs 1.3%); LAN (23.9% vs 8.4%) and WiFi (13.3% vs 3.7%)) in private and public health facilities respectively. Out of the six ICT types assessed, mean availability in private and public healthcare facilities are 2 and 1, respectively (p<0.001).

Table (2) Types of ICT used according to Facility Ownership

Type of ICT available	Facility level				
	Private	**Public**	**Total**	**X^2**	**P-Value**
Computer	59 (52.2)	187 (24.6)	246 (28.2)	36.927	<0.001
Basic Handset	90 (79.6)	566 (74.6)	656 (75.2)	1.359	0.244
Smartphone	18 (15.9)	69 (9.1)	87 (10.0)	5.121	0.024
Tablet	10 (8.8)	10 (1.3)	20 (2.3)	24.900	<0.001
LAN	27 (23.9)	46 (6.1)	73 (8.4)	40.778	<0.001
WiFi	15 (13.3)	28 (3.7)	43 (4.9)	19.276	<0.001
Average ICT/6	1.94 ± 1.51	1.19 ± 0.99	1.29 ± 1.10	t (6.896)	<0.001

The primary use of the ICT, as shown in Table 3, is for routine communication with general use in 71.3% of all the assessed facilities, 76.1% private, and 70.6% public facilities (p>0.05). Almost two of every five (38.9%) of private facilities use ICT for record-keeping and clinical consultation (35.4%), significantly higher than 22.5% and 16.2% of public healthcare facilities (p<0.001). ICT use for other medical functions such as patient records, insurance, mobile transactions, supply chain management, and staff training was generally shallow in public and private healthcare facilities. However, the situation was better in private than in public facilities.

Table 3: Main use of ICT according to facility ownership

SN	The primary application of ICT tools	Facility ownership				
		Private	Public	Total	X^2	P-value
1	For registering patients	24 (21.2)	75 (9.9)	99 (11.4)	12.606	<0.001
2	Record purposes in the facility	44 (38.9)	171 (22.5)	215 (24.7)	14.255	<0.001
3	For electronic record-keeping	19 (16.8)	53 (7.0)	72 (8.3)	12.550	<0.001
4	For insurance purposes	8 (7.1)	26 (3.4)	34 (3.9)	3.505	0.061

5	Mobile money transactions	5 (4.4)	6 (0.8)	11 (1.3)	10.430	0.001
6	Routine communications	86 (76.1)	536 (70.6)	622 (71.3)	1.448	0.229
7	Advertisement and for keeping service-related activities	24 (21.2)	103 (13.6)	127 (14.6)	4.648	0.031
8	For managing medical supplies and stocks	13 (11.5)	75 (9.9)	88 (10.1)	0.286	0.593
9	Staff training	13 (11.5)	68 (9.0)	81 (9.3)	0.756	0.385
10	Clinical consultation	40 (35.4)	123 (16.2)	123 (16.2)	23.838	<0.001

4. Discussion

This study found that the majority (80.0%) of private and public health facilities in Nigeria still use more log forms for medical information management instead of the current ICTs. The basic handphone was the most widely used ICT tool in more than 75% of all healthcare facilities. The basic handsets were neither provided by the government nor the facility management but primarily the personal phones of the staff members. Even phones were usually being used for routine communication and not for job-related purposes. There was an overall low availability of Smartphones (10.0%), and less than five percent of all facilities had Tablets. The availability of Tablets and Smartphones was significantly low in public healthcare facilities compared to private ($p<0.05$).

Computer availability was inadequate (less than 25%) in public health facilities but relatively available (52%) in private facilities ($p<0.001$). Besides, the use of internet facilities (LAN and WiFi) was shallow in all facilities but significantly higher in private than public facilities ($p<0.001$). The average number of ICT tools available in private facilities was 2 of 6 and only 1of 6 in public facilities ($p<0.001$). The findings of this study are consistent with previous studies in Nigeria. A survey conducted in Yenagoa, Bayelsa State in Nigeria found that the facilities use the telephone more than any other ICT tools. The phones were the personal belongings of the facility staff. It further shows a very poor availability of internet facilities and computers [1]. This finding is also similar to low internet connectivity and high use of phones reported in Nigeria by Idowu *et al* [11].

The effects of inadequate availability of ICT tools in Nigerian healthcare facilities also reflect in applying these tools. For instance, while about 20% of private healthcare facilities use ICT tools for patient registration, less than 10% of public facilities use them for the same purpose ($p<0.001$). The overall average use of ICTs for supply chain management, staff training, mobile transactions, health insurance claims, and electronic media record was below 10% in all facilities surveyed. The poor ICT usage in healthcare management found in this study has also been associated with a lack of ICT facilities in some previous studies in Nigeria [2,6,13]. It may also be due to poor infrastructures such

as lack of electricity supply, as reported in some studies [1,7,14]. Poor availability and usage of ICTs in this study can also be attributed to inadequate financing. Very little assistance was obtained from the government and donors in public health facilities. In contrast, the management of private facilities was responsible for the provision of ICTs in their facilities in addition to staff phones. This inadequate funding implies a huge financial burden on the facilities for the procurement and installation of the ICTs. This finding agrees with a previous report that low usage of ICTs is a result of financial implications [14]. Similar low levels of healthcare delivery in the Niger Delta have also been associated with the non-availability of ICT infrastructures [7].

5. Conclusion

This study shows a poor availability and inadequate use of ICT tools in Nigerian healthcare facilities. This situation requires an urgent intervention which can be achieved through collaboration between stakeholders in the private and public sectors. The government and donor agencies need to provide ICTs tools for Nigerian healthcare facilities to assist them in data management and healthcare services. This step will further improve availability and access to quality and affordable healthcare services in Nigeria. It is also essential for all sub-Saharan Africa countries to adopt technological changes in improving the health sector.

6. Declarations

6.1.Conflict of Interest

Nil

6.2.Acknowledgments

Nil

7. References

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