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The Utilization and Challenges of Information Technology Tools among Healthcare Professionals at the Nigerian Navy Reference Hospital, Calabar

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ABSTRACT

Background - This study explores the utilization of information technology (IT) tools among healthcare professionals at the Nigerian Navy Reference Hospital, Calabar, focusing on the Electronic Medical Record (EMR) system and associated challenges.

Objective - The objective was to assess the extent of IT tool utilization, identify specific EMR modules utilized, and explore challenges encountered by healthcare personnel.

Methods - This study utilized a descriptive cross-sectional design. Semi-structured questionnaires were distributed to a sample of healthcare professionals at the Nigerian Navy Reference Hospital, selected to ensure representativeness. Cochran's formula was used for sample size determination. The questionnaires gathered data on demographics, patterns of IT tool utilization, and perceived challenges. Data analysis employed descriptive statistics to summarize demographic information, as well as to explore IT tool usage and challenges faced by healthcare professionals. Thematic analysis was applied specifically to examine the types of different modules used within the IT system.

Results - Results indicated that the majority of respondents were female (62.4%) and employed as civilians on a locum basis (68.8%). The primary IT tool utilized was the Electronic Medical Record (EMR) system, with modules such as patient information systems, laboratory management, and financial reporting. High utilization rates of IT tools were reported (72.8%), despite challenges including user resistance (47.99%) and increased workload (46.89%). These findings reveal the importance of addressing user concerns and optimizing IT infrastructure to enhance healthcare delivery.

Conclusion - The study underscores the significant role of IT in enhancing healthcare processes at the Nigerian Navy Reference Hospital and challenges that need to be addressed, such as improving technical support and infrastructure to optimize IT tool effectiveness.

Keywords - IT utilization, Electronic Medical Records, healthcare professionals, Nigerian Navy Reference Hospital

Introduction

A robust Health Information System (HIS) forms the backbone of a good health system. A well-functioning HIS ensures that the right information reaches the right individuals at the right time, enabling policymakers, managers, and healthcare providers to make informed decisions about patient care, resource allocation, and national health policies. A strong HIS enhances transparency and accountability by improving access to critical information (Ahmadi *et al*., 2017).

The application of Information Technology (IT) in healthcare involves using computers and software to collect, store, manage, or transmit data related to individual health or the activities of healthcare organizations. IT tools facilitate hospital management, such as managing admissions and appointments, improving the efficiency of medical personnel by reducing waiting times, minimizing paperwork, and ensuring that information is readily available in an easily readable form. Additionally, patient test results can be quickly added to the system, enhancing continuity of care. For patients, IT provides 24-hour access to health information and helps maintain data confidentiality through encryption and password protection (Elangovan *et al*., 2020).

Over the years, the healthcare sector has undergone a significant transformation driven by advancements in IT. The adoption of IT tools in healthcare has been crucial in enhancing patient care, improving operational efficiency, and achieving better health outcomes (Okolo *et al*., 2024). These tools include Electronic Health Records (EHRs), telemedicine platforms, diagnostic software, and comprehensive health information systems, all of which play a vital

role in modern healthcare delivery. Globally, substantial investments and policy support have marked the integration of IT in healthcare, leading to improvements in patient care coordination, data management, and clinical outcomes (Sheikh *et al*., 2021). While developed countries have made significant progress in this area, many developing countries, including Nigeria, continue to face challenges in effectively integrating IT tools into their healthcare systems (Apulu, 2012). In Nigeria, the healthcare system encounters numerous obstacles, such as inadequate infrastructure and limited financial resources, which have hindered the widespread adoption and effective utilization of IT tools (Apulu, 2012). Nevertheless, there is a growing recognition of the potential benefits of IT in improving healthcare delivery, prompting increased efforts to implement these technologies.

This study aims to explore the utilization of IT tools among healthcare professionals at the Nigerian Navy Reference Hospital, Calabar. It seeks to identify the types of IT tools in use, the extent of their utilization, and the challenges faced by healthcare professionals in employing these tools.

Methods

Study Area

The study was conducted at the Nigerian Navy Reference Hospital, Calabar (NNRH) in the Cross River State of Nigeria. Established as a premier healthcare institution for the Nigerian Navy, NNRH Calabar provides comprehensive medical services to naval personnel, their families, and the wider civilian population in the region. The hospital is strategically situated in Calabar, a city known for its historical significance and burgeoning healthcare needs. Calabar is the capital city of Cross River State in south-south Nigeria, known for its rich cultural heritage and as a major hub for tourism and commerce.

NNRH Calabar is equipped with modern medical facilities and technologies to deliver high-quality healthcare services. The hospital includes various specialized departments such as surgery, internal medicine, pediatrics, obstetrics and gynecology, laboratory, radiology, dental, and emergency services among others. The hospital employs a wide range of healthcare professionals, including doctors, nurses/midwives, pharmacists, laboratory scientists/technicians, and health information management staff among other medical and health professionals. These professionals are integral to the hospital's operations, ensuring the delivery of comprehensive and efficient healthcare services. NNRH Calabar has been gradually integrating Information Technology (IT) tools into its healthcare services. This includes the adoption of Electronic Health Records (EHRs) and other digital health solutions.

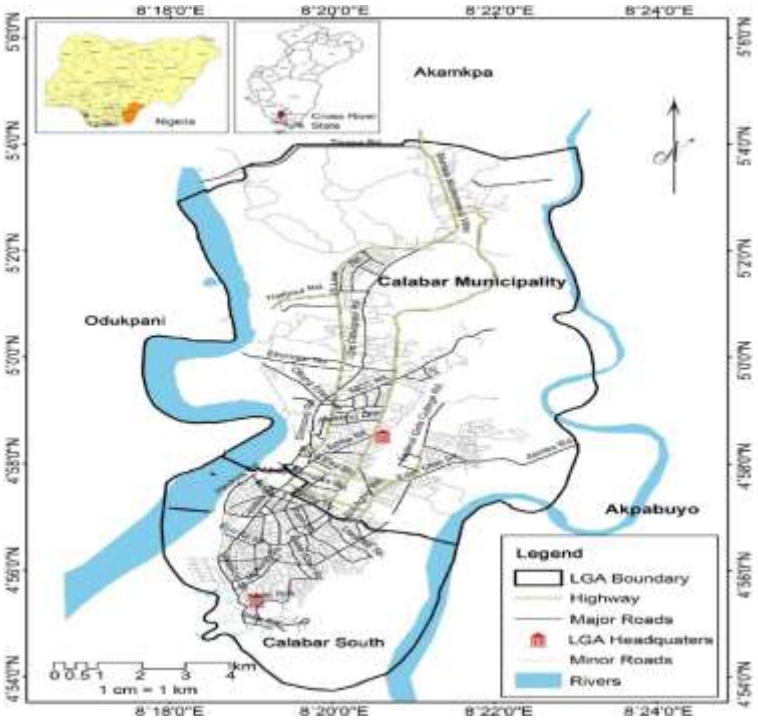

Figure 1: Map of Calabar metropolis (Source: Office of the Surveyor General, Cross River State, 2016)

Study Design

The study utilized a descriptive cross-sectional study design.

Study Population

The population of the study consists of healthcare professionals in various units and wards of the Nigerian Navy Reference Hospital, Calabar.

Inclusion and exclusion criteria

Inclusion Criteria

1. All health professionals who are under the employment of the Nigerian Navy Reference Hospital, Calabar, were considered for sampling.

Exclusion Criteria

2. All healthcare professionals who were ill, on shift, or leave during questionnaire distribution were excluded.

Data Collection Tool

A questionnaire was used for data collection from the sample population as well as physical observation of the IT tools in use. The questionnaire was structured into four sections to accomplish the research objectives; section A: Socio-demographic Data, Section B: with open-ended questions highlights the types of IT tools in use, section C: talks about the extent of their utilization, Section D: the challenges faced by healthcare professionals in employing these tools. The researcher reviewed all the questionnaires administered for completeness and appropriateness of the responses as required. Questionnaires not filled were retrieved and returned for proper filling.

Sample Size

The sample size was determined using the Cochran formula (Cochran, 1963), employing the formula (Z^2pq/d^2). This calculation accounts for factors such as the standard normal deviate (Z), which corresponds to the probability of type I error, prevalence (p) derived from previous studies (Iwu et al., 2016), where q represents the complement of the prevalence and the desired precision (d) set at 0.05. Adjustments were made for populations less than 10,000 using the formula n1=N/1+(N/n), where n represents the minimum sample size and N denotes the population size. Consequently, a sample size of **128** respondents was deemed appropriate, considering a 10% attrition rate.

Sampling Technique

The study utilized the multi-stage sampling method, which involves capturing samples in stages using progressively smaller sampling units (JSTOR, 2018).

Stage 1: The population of healthcare professionals at the Nigerian Navy Reference Hospital, Calabar, was stratified based on their departments (e.g., medical, nursing, administrative, laboratory, etc.).

Stage 2: Simple random sampling was employed within each stratum to select the participants.

Stage 3: Adjustments were made to account for the anticipated 10% attrition rate, ensuring that the final sample size remained a representative of the entire population.

Data Analysis and Management

Data analysis for this study followed a structured approach. Initially, data collection involved the distribution of well-reviewed questionnaires across various wards and departments of the hospital, complemented by observational methods.

Upon collection, the questionnaires were encoded and entered into Statistical Package for Social Sciences (SPSS) Version 26 for analysis. Descriptive statistics was used in this process, enabling the calculation of frequencies and percentages. These statistical measures provided a comprehensive overview of the demographic characteristics of the respondents. The types of IT tools used were analyzed through thematic analysis of responses to the open-ended questions in the questionnaire. Descriptive analysis was employed to assess the extent of IT tool utilization. The study focused on Electronic Medical Records (EMR) modules. Utilization levels were categorized into high (80% - 90%), moderate (50% - 79%), and low (less than 50%) categories. The study identified and summarized challenges encountered by healthcare professionals in using IT tools.

Ethical Considerations

Approval was obtained from the research and ethics committee of the University of Port Harcourt and the Commander of Nigeria Navy Reference Hospital Calabar.

Result

Out of the 128 distributed questionnaires, 125 were diligently completed and deemed suitable for analysis, yielding a response rate of 97.66%.

Demographic Characteristics of Respondent (Table 1)

Table 1: Demographic Characteristics of Respondent

Variables	**Frequency**	**Percentage (%)**
Gender		
Male	47	37.6
Female	78	62.4

Age		
<25	33	26.4
26-35	46	36.8
36-45	36	28.8
46-55	8	6.4
>56	2	1.6
Service Status		
Military	39	31.2
Civilian	86	68.8
Employment Type		
Permanent	39	31.2
Locum	86	68.8
Educational Level		
ND/RN	45	36
BSc/HND	58	46.4
MBBS	13	10.4
MSc/MPH	7	5.6
PhD/Medical Consultant	2	1.6
Specialty		
MBBS	16	12.8
Pharmacist	3	2.4
Pharmacy Technical	9	7.2
Nurses/ Midwives	57	45.6
Lab Scientist	4	3.2
Lab Technicians	13	10.4
Community Health	15	12
HIM	7	5.6
Counselor	1	0.8

The majority of respondents were female, comprising 62.4% (78 respondents), while males accounted for 37.6% (47 respondents). The age group with the highest representation was 26-35 years (36.8%, 46 respondents), followed by 36-45 years (28.8%, 36 respondents), and those under 25 years (26.4%, 33 respondents). A smaller proportion were aged 46-55 years (6.4%, 8 respondents) and over 56 years (1.6%, 2 respondents). Most respondents were civilians (68.8%, 86 respondents), with military personnel making up 31.2% (39 respondents). A significant majority of respondents were employed on a locum basis (68.8%, 86 respondents), while 31.2% (39 respondents) held permanent positions.

The largest educational group held BSc/HND degrees (46.4%, 58 respondents), followed by ND/RN qualifications (36%, 45 respondents). Smaller groups included MBBS holders (10.4%, 13 respondents), MSc/MPH degrees (5.6%, 7 respondents), and PhD/Medical Consultants (1.6%, 2 respondents). Nurses and midwives were the largest specialty group (45.6%, 57 respondents), followed by MBBS (12.8%, 16 respondents), community health (12%, 15 respondents), and lab technicians (10.4%, 13 respondents). Other specialties included HIM (5.6%, 7 respondents), lab scientists (3.2%, 4 respondents), pharmacy technicians (7.2%, 9 respondents), pharmacists (2.4%, 3 respondents), and counselors (0.8%, 1 respondent).

Types of IT Tools in Use (Table 2)

The finding revealed that the primary IT tool utilized at the Nigerian Navy Reference Hospital, Calabar, is the Electronic Medical Record (EMR). This system encompasses several key features including the following as revealed by the respondents:

Table 2: The EMR tools utilized in the health facility

EMR Modules	**Description**
Home	The dashboard offers notifications, a summary of important information, and easy access to frequently used features.
System Configuration	Includes settings and customization options like role management, Admin management, and Directory.
Patient	Includes a database for patient information, including patient biodata, medical data, and treatment records.
Doctor	Tools for managing doctor profiles, schedules, consultations, and treatment plans.
Dental	Specialized module for dental records, including patient dental history, treatment plans, and dental imaging
Pharmacy	Facilitates medication prescribing, inventory control, and dispensing, ensuring safe medication management
Referral	Module for managing patient referrals to specialists or clinics, including tracking and follow-up.
Laboratory	Integrates lab operations, enabling quick access to test results and efficient workflow management.
Radiology	Manages radiological images and reports, improving diagnostic accuracy and patient care.
Eye care	specialized module for eye care that contains records of eye surgeries, prescriptions for glasses and contact lenses, and patient eye examinations.
Finance	Financial management tools including billing, payments, and financial reporting.
Scheduling	Manage Patient appointments, allowing for effective scheduling and rescheduling of patient's appointments.
Ward management	Inpatient ward management, including bed distribution, patient intakes, and discharge procedures
Nursing Services	Nursing activity management, encompassing nursing notes, and patient care plans.
Inventory	A module for tracking and management of medical and non-medical supplies, including stock levels, orders, and usage reports.
Report	creating a range of reports using clinical, operational, and financial data to aid in compliance and decision-making.

Table 2 reveals a comprehensive utilization of Electronic Medical Record (EMR) tools at the Nigerian Navy Reference Hospital, Calabar, categorized into specific modules that enhance various aspects of healthcare delivery. The Home Module serves as a central dashboard for notifications and quick access to important features, improving user navigation and efficiency. The System Configuration Module allows for customization and role management, ensuring a personalized system setup. The Patient Module centralizes patient information, including biodata and medical records, facilitating easy data access and management. For doctors, the Doctor Module supports profile management, scheduling, and treatment planning, streamlining their workflow. Additionally, the Dental Module caters to dental services with specialized records and imaging, while the Pharmacy Module ensures safe and efficient medication management through prescribing and inventory control.

The Referral Module oversees patient referrals to specialists, tracking, and follow-up to ensure continuity of care. The Laboratory Module integrates lab operations for quick access to test results and efficient workflow management. The Radiology Module enhances diagnostic accuracy and patient care by managing radiological images and reports. The Eye Care Module specializes in records of eye surgeries, prescriptions, and examinations. Financial operations are supported by the Finance Module, which includes billing, payments, and financial reporting. The Scheduling Module optimizes patient appointment management, while the Ward Management Module organizes inpatient care, including bed distribution and discharge procedures. Nursing Services are managed through a module that includes nursing notes and care plans, and the Inventory Module tracks medical and non-medical supplies. Finally, the Report Module generates various reports using clinical, operational, and financial data to aid in compliance and decision-making.

The Level of IT Utilization (Table 3)

Table 3: Level of IT Utilization Among Health Care Personnel

Utilization Level	**Frequency**	**Percentage**
High Utilization (80% - 90%)	91	72.8
Moderate Utilization (50% - 79%)	29	23.2
Low Utilization (Less than 50%)	5	4.0

Table 3 reveals that the majority of healthcare personnel (72.8%) reported high utilization of IT tools, while 23.2% reported moderate utilization, and 4.0% reported low utilization

The Challenges Faced by Healthcare Professionals (Table 4)

Table 4: The challenges faced by healthcare personnel while utilizing the IT tools

Challenges	**Frequency**	**Percentage**
Workload Increase	128	46.89
Training and Support	5	1.83
User Resistance	131	47.99
Technical Issues	3	1.10
Infrastructure Limitations	6	2.20

Note: *The frequency exceeds 125 due to the multiple options selected by respondents.*

Table 4 shows that the most common challenge faced by healthcare personnel was user resistance (47.99%), followed closely by an increase in workload (46.89%). Training and support challenges were reported by just 1.83% of the respondents, technical issues by 1.10%, and infrastructure limitations by 2.20%.

Discussion

This study aimed to explore the utilization of information technology (IT) tools among healthcare professionals at the Nigerian Navy Reference Hospital, Calabar, and to identify the challenges they encounter.

The demographic analysis revealed a predominance of female healthcare professionals, primarily aged 26-35 years, aligning with Johnson et al. (2019), who also noted a significant female presence in healthcare settings and a concentration of younger professionals. Most respondents were civilians employed on a locum basis, reflecting broader employment trends in Nigerian healthcare where locum tenens positions are common. The largest group held BSc/HND degrees, followed by ND/RN qualifications. The predominance of nurses and midwives is consistent with national data reported by the Nigerian Health Workforce Profile (2020), indicating nursing and midwifery are common healthcare professions in the country.

The EMR system utilized integrates various specialized modules designed to enhance healthcare delivery. These include the home module, serving as a central dashboard for notifications and quick access to important features. The System Configuration module allows for settings customization, role management, and administrative controls. The Patient module centralizes comprehensive patient information, encompassing biodata, medical records, and treatment histories. In addition, the Doctor module which supports the management of doctor profiles, scheduling of consultations, and planning of treatment regimens. The Dental module specializes in dental records management, including patient histories, treatment plans, and dental imaging. The Pharmacy module facilitates safe medication prescribing, inventory management, and dispensing. Additionally, the Referral module tracks and manages patient referrals to specialists, ensuring seamless follow-up and continuity of care. The EMR system also includes modules for Laboratory operations, enabling efficient access to test results and workflow management, as well as Radiology for managing radiological images and reports to enhance diagnostic accuracy and patient care. These findings are supported by Kuperman et al. (2018) and Bates et al. (2017), who highlighted the efficiency and accuracy improvements associated with EMR systems. The high utilization rate of EMR tools (72.8%) among respondents indicates significant IT adoption in managing healthcare processes, echoing trends observed in studies conducted in other developing countries (Adams et al., 2020).

Healthcare professionals face several challenges: user resistance (47.99%), workload increase (46.89%), infrastructure limitations (2.20%), training and support (1.83%), and technical issues (1.10%). These challenges are echoed in studies by Jones et al. (2020) and Greenhalgh et al. (2019), which document similar barriers to IT adoption globally. Technical issues and infrastructure limitations, such as unreliable internet connections and outdated hardware, are common in many developing countries, as noted by Olok et al. (2019). Ongoing technical support and infrastructure improvements are crucial for sustaining IT utilization in healthcare. Comprehensive training programs are essential to equip healthcare professionals with the necessary IT skills, as highlighted by Heeks (2018). User resistance, often due to reluctance to change established workflows or fear of technology, can hinder IT adoption. Strategies to manage this resistance, including change management initiatives and involving staff in the implementation process, are recommended by Kotter (2018) and Proctor et al. (2019). Addressing workload concerns by optimizing IT systems to reduce administrative tasks can improve acceptance and utilization among healthcare professionals.

Conclusion

This study investigated the utilization of information technology (IT) tools among healthcare professionals. Despite high utilization rates indicating widespread adoption of IT, challenges such as technical issues, infrastructure limitations, and user resistance were identified. Addressing these challenges through enhanced technical support, infrastructure upgrades, and comprehensive training programs is crucial to fully harnessing IT's potential in healthcare, thereby optimizing patient care and operational efficiency at the study site and beyond. Addressing these challenges requires ongoing technical support and infrastructure improvements to ensure reliable and up-to-date systems. Comprehensive training programs are essential to enhance IT skills

among healthcare professionals, enabling them to fully utilize the available tools. Managing user resistance through change management initiatives and involving staff in the implementation process can facilitate smoother transitions to IT-based workflows.

Conflicts of Interest

No conflict of interest on this research declared by the authors

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