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ASSESSMENT OF RECORDS AND INFORMATION MANAGEMENT IN SELECTED DENTAL HOSPITALS IN SOUTHWESTERN NIGERIA

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Abstract: Documentation of the interaction or consultations between dentists and their patients is particularly important in the management of a dental practice. The literature has established the importance of adopting digital technologies for documentation; however, there is a dearth of information on which technologies are available for dental records and information management. Therefore, this study examines the existing digital technologies available for dental records and information management. The study was conducted in six federal tertiary hospitals across six states in southwestern Nigeria, and primary data were collected using 300 copies of structured questionnaires administered among dental practitioners, patients, and IT managers. The questionnaire presented three categories of information management technologies: information generation technologies, information preservation technologies, and information retrieval technologies. The results showed that out of the list of presented available tools for records and information management, the use of pens, papers, and card indexes were the most commonly used forms of technologies with 94.4%, 88.9% and 49.4% respectively, in the study area.

Keywords: Records and Information management, Digital technologies, Dental hospitals, Health Information System, Health Technologies, Nigerian Dental Management, Health Information Technology.

INTRODUCTION

A record is the imprint of an occurrence, instance, procedure, or eventuality as it happens or occurs, which is to be used as a reference, description, or history. According to Adebayo *et al.* (2014), records are stored data generated or collected in the commencement, during, or conclusion of an official or personal event and comprise content, setting, and framework that is adequate to make available proof of the event notwithstanding its medium or form. Also, according to Molepo and Cloete (2017), a record that is usually kept for evidence or information is a permanent account of anything. In most traditional institutions, information written with a pen on a piece of paper can be regarded as a record as it pertains to the word.

A dental record is a comprehensive collection of a person's dental history and health information. It often includes information such as tooth numbers, X-rays, fillings performed, and a record of health-related history and medication. Other pieces of dental information that may be a part of a record include any procedures, visits to the dentist, and recommendations for future treatment. Dental records are used to inform dental care decisions and treatment plans (ADA, 2021). The management of records must involve value with regard to storage, recovery,

and use of inputs, processes, and outputs. The process is a series of constant and monotonous actions in which procedures and implementations fit together. Value, however, must not apply only to the management of records, but also to the management of information.

Information, on the other hand, as it is known today, involves both physical and electronic information. Information has a life cycle, which can be defined as the stages through which every (written or computerized) record goes from its generation or creation to its final archiving or destruction (Ramnath, 2016). The information lifecycle management stages are creation, storage, retrieval, usage, and retirement.

No matter the format or source (data, electronic documents, audio, paper documents, video, etc.), any organizational setup must be able to manage this information throughout the information lifecycle for delivery through a variety of channels, which may include mobile devices and online interfaces (Association for Intelligent Information Management, 2021). Information is described as stored, structured, or classified data that is beneficial to the recipient. The receiver of information can take actions or make choices based on the received information. Information is a critical organizational resource for decision making and management in any organization. It can help scientists, practitioners, and managers make decisions, develop plans, coordinate activities, overtake competitors, undertake advanced-level research, and provide services.

According to the Association for Intelligent Information Management (2021), information management is the process of gathering, organizing, and disseminating data originating from one or more sources to one or multiple audiences, specifically those who have an interest in or legal claim to the information. In addition, according to Opoku (2015), information management includes all processes in which all types of information assets are collected, managed, disseminated, leveraged, and disposed of within an organization. The systematic, innovative, and cautious gathering, storage, processing, and dissemination of information will make a strategic contribution to achieving the organization's objectives. He further stated that information management ensures efficient accessibility to and usage of knowledge by individuals and groups. This implies that information management is a framework in which resources are collected, synchronized, controlled, and processed using sequential phases to provide information for one or more purposes to different users within an organization. Several researchers have identified a connection between information management and organizational performance.

However, information is considered useful and meaningful only if it is timely, accurate, complete, consistent, and comprehensive. Formal or informal information must be managed, and it requires intensive use of digital and information technologies so that anyone can access it from anywhere, at any frequency, yet remain intact. Its proper management and use can fuel creativity, accelerate innovation development, increase productivity levels, ensure consistent quality standards, and increase the relative level of competitiveness (De Alwis and Higgins, 2002).

Even though both terms (records management and information management) are often used interchangeably, it is noteworthy that they are different and several attempts have been made to distinguish them. According to Kumar (2017), record management is the practice of capturing, organizing, and maintaining records, typically in an electronic format. It involves techniques such as organizing, managing, and preserving records over time to ensure their accuracy and integrity. Record management also includes policies, procedures, and standards of the creation, maintenance, and disposal of records, whereas information management involves strategies and systems used to capture, store, and manage data, knowledge and information. It involves the processing, curating, and archiving

of information, and the knowledge and understanding required to use it effectively. Information management also includes the control of data and information resources to support decision making.

In developing countries, the public health care sector is still laden with a several challenges, such as provision of unreliable health care systems and inadequate health amenities (e.g. health center personnel, medical equipment etc.) that offer poor outcomes relative to total health care expenses (Osundina *et al.*, 2015). A previous study showed that the Nigerian health care sector is critically marginalized, in spite of its strategic position in Africa, and has suffered several tragedies. It also revealed that the current method of handling dental/medical/health records in most Nigerian hospitals is traditional writing on forms and paper, which are then gathered in a folder for storage (Welcome, 2011).

Numerous issues such as difficulties in information storing and retrieval, information irregularity, information instability, probability of data loss, time-consuming paperwork maintenance, and many more are some of the many problems posed by this traditional method of keeping patient health records (Ayanlade, 2018; Funmilola and Ozichi, 2015). Similarly, it has been identified that the shortage of space for the growing number of health records is the biggest issue for manual records. In terms of physical storage for the processing of health records in paper form, studies have indicated that many institutions will continue to struggle with this challenge (Obotu *et al.*, 2018).

Hospitals produce many records daily, meaning that records accumulate to enormous volumes of paper records after a given time. This can make it difficult to find certain documents, and there is likewise insufficient space to hold most of the records until they are disposed of, thus becoming the biggest problem for records documented on paper (Were, 2013).

A number of different technologies are available for records and information management and were listed and categorized in Rao (1999) into three groups. They are information generation technologies that include writing (e.g. Pencil, Pen, Desktop computers, Tablet devices, Smartphones, etc.), word processors (e.g., Google Docs, Microsoft Word etc.), characters and voice recognition technologies (for example Automated phone systems, Google Voice) etc. Information preservation technologies include paper and magnetic storage (for example Magnetic tape, floppy disks, hard disk drives, video discs etc.) while information retrieval technologies include card indexes, printers, database management systems such as EHR/EMR, Internet services, and web pages/web sites.

The importance of proper documentation of communication between the dentist and a patient in dental practice cannot be overemphasized. In developed countries, electronic systems that increase the effectiveness and efficiency of managing records and information produced and owned by any establishment are widely used (Eusoff and Yusof, 2011). However, there is a lack of appropriate structures for handling health information in Nigeria (Adeleke *et al.*, 2015; Dosumu *et al.*, 2012).

The manually managed system is fraught with several issues, such as storage of data and recovery difficulties, inconsistency of data, instability of data, danger of data loss, time-consuming paperwork maintenance, and much more (Ayanlade, 2018). In addition, all patient treatment information is usually maintained on case notes, which contain complete patient's health history. A card indicating the patient's hospital number, call day, consulting doctor's name, and date of next appointment is normally given to them. This implies that the patient has to carry this card along every time to aid retrieval of his case note, whenever he visits the hospital, which is a major disadvantage of the manual system. Circumstances may arise that suddenly put patients in a sick condition and

may not hold their card, he/she might have to go through all the necessary registration and investigations again, which will no doubt delay his treatment, thus making the traditional hospital management systems inefficient (Kaur and Grover, 2013).

In Nigeria, paper-based dental record keeping has been observed to intensify challenges related to accessing patients' records and patient tracking, and the transition from paper to digital technologies could nevertheless positively change the daily workflow practices of dentists and supporting staff (Funmilola and Ozichi, 2015). It is therefore important to determine if the findings still hold true.

METHODOLOGY

This study was conducted in Nigeria, which is formally referred to as the Federal Republic of Nigeria and it is on the western coast of Africa. The country has 36 states with its Federal Capital Territory, known as Abuja. It was estimated that there were more than 178.5 million people in 2016, although the United Nations projected a population of up to 186 million. Nigeria's entire population accounts for approximately 2.35% of the world's total population (World Population Review, 2019)**.**

With a population of approximately 17.5 million, Lagos is Nigeria's most populous city in the southwest zone. Nigeria has the largest population of any country in Africa and has been recognized as an important market by several organizations, with one of the largest number of health workforces in Africa.

However, the distribution of health workers is poor, favoring urban, southern, curative, and tertiary care service delivery. For some cadres of health workers, over 50% work in the southwestern region of the country, with most of them residing in the commercial city of Lagos (Federal Ministry of Health, 2014).

Therefore, the study was conducted in the southwestern geopolitical zone of the country, which consists of six (6) states namely: Ekiti, Lagos, Ondo, Osun, Oyo, and Ogun States. It is home to the largest number of hospitals and dental clinics.

Brief description of the hospitals under study:

Nigeria has three levels of health institutions: primary, secondary, and tertiary. The three-tier of government in Nigeria (Local Government, State, and Federal) enjoys significant autonomy and exercises substantial authority in the allocation and use of its resources. They all share the responsibility for providing health programs and services in Nigeria. The National Health Policy and the National Health Act delegate roles and duties to each tier (Uzochukwu, 2017).

Primary health care centers are overseen by the LGAs and were created in Nigeria's rural and urban locations, with a view to providing fairness and ease of good health access to the populace. The secondary health care facilities managed by each state government consist of state or government hospitals and state teaching hospitals. Whereas, the tertiary health care facilities under the management of the federal government comprise teaching hospitals, specialist hospitals, and federal medical centers.

This study focused on tertiary health institutions that comprise teaching hospitals, federal medical centers, and specialist hospitals. However, because most specialist hospitals in Nigeria are privately owned, they were thereby exempted from this research.

a. Teaching hospitals

These are health institutions associated with universities where undergraduate and postgraduate medical trainings of doctors are conducted, largely by academic staff from the affiliated colleges of health sciences (Langabeer *et al.*, 2018). The institution is fully established, accredited, and departmentally arranged for teaching. Each

department may have any number of consultant units, each with respective outpatient consultation periods, theater sessions, ward units, and so on. Due to this unique purpose, teaching facilities generally charge higher fees than smaller hospitals and provide highly specialized services and comprehensive care.

With the exception of cases that come through the casualty or accident and emergency unit, patients are typically referred from a lower-order institution rather than coming to the clinics of a teaching hospital that is intended to be a referral hospital. The most advanced form of health care facility is a teaching hospital. In a bid to meet the health needs of its citizens, the Nigerian government established at least one tertiary hospital in each state of the federation (Akande, 2004). The teaching hospitals selected for this study were Obafemi Awolowo University Teaching Hospital Complex (OAUTHC) in Ile-Ife, Osun State; University College Hospital in Ibadan, Oyo State; and Lagos University Teaching Hospital in Lagos State.

b. Federal Medical Centers (FMCs)

These are general hospitals owned and usually funded by the Federal Government. Therefore, they operate at a higher level than other general hospitals. These are tertiary hospitals that operate in departments like the Teaching Hospitals, but are not associated with medical colleges or institutions. The general mandate provided to all FMCs within the context of the laws creating them is to provide people with reliable, accessible, specialized/tertiary hospital care and eventually reduce the burden of illness within the population, by delivering prompt and emphatic preventive, curative, and rehabilitative care (Welcome, 2011).

Population and sampling

Sampling is the act, method, or procedure of choosing a suitable sample or a representative percentage of the population for defining the criteria or features of the population as a whole (Mugo & Nzuki, 2014). The sampling technique employed for this study is multi-stage sampling. Multi-stage sampling refers to sampling plans where the sampling is carried out in stages using smaller and smaller sampling units at each stage (Mirakhmedov *et al.*, 2015).

The first stage involves purposive selection of the southwestern zone from the six (6) geo-political zones in Nigeria. Stage two was the purposive selection of six (6) federal tertiary hospitals in the zone, which are hospitals with functioning dental clinics. Purposive sampling, also referred to as judgment, subjective, or selective sampling, is a non-probability sampling method in which the researcher relies on his or her own judgment when selecting participants from the population for inclusion in the study (Etikan *et al.*, 2016).

A total of 240 respondents were randomly and carefully chosen, comprising 40 respondents from each of the six hospitals. Thus, for each hospital, 35 dental practitioners and 5 information technology management staff were randomly selected. The term "random sampling" refers to some selection methods in which sample participants are chosen at random, but with a known likelihood of selection (Lavrakas, 2008).

Two sets of questionnaires were administered to elicit information from IT staff and dental practitioners. Data retrieved were analyzed using the SPSS 20 package. Primary data were collected for this study using a structured questionnaire, and secondary data were also gathered from relevant journals, publications, reports, and magazines. Questionnaire as an instrument of data collection was selected because it provides a wide coverage with minimum cost, both in terms of resources, effort, and time. Two (2) sets of questionnaires were designed: One set for 35 respondents of each hospital's dental practitioners (making 210 in all the six states) and another set for five IT staff from each hospital (thus making a total of 30 IT staff from the six states).

The validity and reliability of the questionnaire were tested with the aim of ensuring that the questionnaires were relevant to the study questions and objectives. A pilot study was conducted in which 10 samples of the research questionnaire were given to respondents from the two types of hospitals under study. This was done to confirm the accuracy of the questionnaire, to correct any error in the questionnaire and eliminate potential issues. The various ambiguities, observations, and comments made at the pre-test stage were used to improve the quality of the questionnaire. It helped ensure that the questions were clearly structured and that respondents were capable of giving the same interpretation to all the questions with no bias with their answers, eventually helping to respond to the questions of the research. The questionnaire reliability was tested using Cronbach's alpha method to calculate the internal consistency of findings across the test scale.

RESULTS AND DISCUSSION

Among the 240 copies of the questionnaire that were administered, 183 (76% response rate) were completed, retrieved, and fit for analysis.

The essential technologies currently used for information management were categorized into three groups as stated in Rao (1999): Information Generation: Pencils, Pens, Desktop computers, Smartphones, Tablet devices, Microsoft Word, Google Docs, Automated phone systems, Google Voice, etc.; Information Preservation: Paper, Magnetic storage: Floppy disk, Magnetic tape, Hard disk drive, Video disks, etc.; Information Retrieval: Card Index, Printers, EMRs/EHRs, Webpages/Websites, etc. The responses of the dental practitioners from all hospitals regarding whether they use any of the listed technologies are given in Table 1.

All the dental practitioners (100%) identified pencils and pens as the major technology used for information generation in the hospitals, 27.2% claimed they use Desktop computers, Smartphones, Tablet devices, amongst others for information generation. About 24.1% of them also mentioned using word processors such as Microsoft Word and Google Docs in their information generation or information gathering processes. Characters and voice recognition tools such as automated phone systems and Google voice app were used by 6.8% of the dental practitioners for information generation.

Information preservation, which according to Finquelievich et al. (2012) "includes all actions taken with the aim of ensuring accessibility to records" is done mainly through the use of paper, as identified by 88.9% of dental practitioners. This corroborates findings by several researchers, such as Ayanlade (2018) and Adeleke *et al*. (2015), who found that records management in Nigerian hospitals is predominantly paper-based. Approximately 12.9% also use magnetic storage devices such as hard disk drives, floppy disks, magnetic tapes, etc., while only 14.8% agreed that they use video disks for information preservation. Lastly, information retrieval is mostly done through the traditional card indexing method as 49.4% agreed. Printers are also used for the retrieval of information as agreed by 25.9%; 6.2% agreed to the use of database management systems such as EHR; and 17.9% used internet services such as websites and web pages to retrieve data.

SUMMARY

This study examined the existing digital technologies available for dental information management in selected dental hospitals in southwestern Nigeria. The southwestern zone of Nigeria comprises Ogun, Oyo, Lagos, Osun, Ondo, and Ekiti states. The area of study includes six tertiary hospitals with dental clinics: three (3) teaching hospitals and three (3) federal medical centers in the selected zone.

Data were collected through two sets of pre-tested and validated questionnaires that were administered to respondents, which consisted of dental practitioners and IT staff of the selected tertiary hospitals within the southwestern region. The collected data were analyzed using appropriate descriptive statistics.

Table 1: Types of technologies deployed for information management in selected dental hospitals

Technologies	Frequency N=162	Percentage (%)
Information Generation		
Writing: Pencil, Pen, etc.	153	94.4
Desktop computer, tablet devices, and smartphones.	44	27.2
Word Processors: Microsoft Word, Google Docs, etc.	39	24.1
Character and voice recognition: Automated phone systems	11	6.8
Information Preservation		
Paper	144	88.9
Magnetic storage: Floppy disk, magnetic tape, hard disk drive, etc.	21	12.9
Video disk	24	14.8
Information Retrieval		
Card index	80	49.4
Printers	42	25.9
Database management system: EHR/EMR	10	6.2
Internet Services: Web pages, websites, etc.	29	17.9

The study revealed that the mainly used technologies for information management in dental hospitals are pencils, pens, paper, and card indexing. Likewise, it was found that all hospitals still practiced traditional manual records management methods. This corroborates the findings of several other studies that information management is fully paper-based in Nigerian hospitals.

The study concluded that information management in Nigerian tertiary dental hospitals is still mainly paper-based.

Recommendations

These succeeding recommendations were suggested on the basis of the findings of this study. Given the ongoing advancement of information and communications technology (ICT) across all facets of our economy, we must continue to use ICT as tools for providing high-quality and secure health care services.

i. Dental hospital management is encouraged to replace paper-based functions with electronic processes by adopting available digital technologies for information management.
ii. The use of currently deployed digital technologies should be increased and non-functional technologies repaired or replaced.

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