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Challenges In Implementing Integrated Electronic Health Records (EHRS) in Namibia's Public Health Sector

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Abstract

The study was aimed at investigating the challenges of implementing integrated Electronic Health Records (EHR) in the Namibian Public Health Care Sector. The study employed qualitative research approach. An exploratory design was used in this study to engage IT Personnel. The study used the purposive sampling technique to select twenty respondents, particularly focusing on the IT department. The study discovered that the Ministry of Health and Social Services (MoHSS) have isolated Electronic Health Record Systems (EHRS) such as the DHIS2 and Ptracker. The MoHSS had attempted to implement integrated EHRS, however it experienced various challenges. This study discovered challenges such as lack of network infrastructure, computer literate personnel, inadequate IT personnel, lack of policies and project documentation to implement the health records. Another challenge that hindered the addressing of issues such as supply of all up-to-date computer devices and software; having proper filing system and improving the slow connection due to poor network infrastructures is budget constraints. The study further discovered a lack of interoperability and standardization, the absence of unique identifiers for patients and the lack of data warehousing to be the main barriers for the full implementation of the integrated electronic health records system. Some of the recommendations of the study are that the MoHSS develops national policies and implementation frameworks to guide the implementation of EHRS, secure adequate funds specifically for the implementation of EHRS, develops and implements training framework for IT staff, administrative and health professional, implements unique patient identifier system and utilize open standards to enable system interoperability for implementation of the e-Health Record System. The study also recommends that MoHSS consider partnering with private service providers to enter into network infrastructure sharing agreements.

Keywords: e-Health Records, Integrated Electronic Health Records, Health Information Systems, Public Health Care, Interoperability, Implementation Barriers, e-Health Systems, IT Infrastructure

1. INTRODUCTION

Health care is an area particularly concerned with the sensitivity of big data of patients. It is paramount that proper health care record systems and their management maintain a healthy system, a healthy society, and a healthy country at large. Although the adoption of electronic health records (EHR) in hospitals and medical offices is not yet worldwide, adoption of EHR systems in hospitals and outpatient clinics is increasing especially in the developed world [1]. According to [2], an electronic health record is a medical history of a patient that is kept by the health care provider for some time period and it includes all administrative clinical data such as demographic data, progress reports, problems, medications, important signs, medical history, immunization reports, laboratory data and radiology reports. EHRs can support and transform the way information is stored, accessed, shared, and analyzed for patients, patient cohorts, and organizations, creating a base for potentially dramatic advancement in quality of care, patient wellbeing, public health monitoring, and research [3]. The adoption and use of electronic health records (EHR) has an ability to bring about increased efficiency and enhanced patient care[4]. High quality, timely and accurate information is essential in making sound decisions, providing quality and timely care, but this information can only be available to health professionals if there are integrated health information systems [5].

Widespread adoption and upgraded use of information technology has been promoted because of its potential to efficiently manage health information and efficiently share it between service providers. While governments such as Namibia are building hospitals, clinics, and other primary health care facilities dedicated to the provision and enhancement of health care services, proper keeping of health care records still remains a challenge [6]. In an effort to establish integrated health records in the Namibian public health care sector, in 2011 the MoHSS launched the Integrated Health Care Information Management System (IHCIMS) in Windhoek [7]. Although the system was launched, it was not successfully implemented as the Ministry (MoHSS) is still using a paper-based health record system.

The main goal for the Namibian government is 'Health for All Namibians' but it has been a daunting task for the government to achieve this objective. One of the reasons for this challenge is that the health system is fragmented, and data is obtained from different incompatible systems [8]. The variety of health information systems (HIS) are isolated hence restricting access to integrated data across the entire health system, resulting in data limitation, data duplication and reporting from primary health care facilities, leading to inaccurate institution-based information throughout the health system.

Study by [8] revealed that, to date, only a few developing countries have adequate, clear and efficient health information systems that meet the needs of their countries and facilitate progress towards the UN's Sustainable Development goals to secure and create the infrastructure required to support health systems, but Namibia is not among those countries. According to [9], knowledge is an asset to every organization, and it needs to be protected and well-handled. Also, due to the lack of efficient records management systems in the Namibian public health care sector, medical personnel face difficulties in delivering timely and reliable health care to patients. Ineffective record-keeping systems typically contribute to lengthy waiting periods for patients before they access health care services. Furthermore,[10] pointed out that fragmentation and lack of integration bring about redundancy and an additional workload for health personnel as information regarding the health status, disease incidence, prevalence, and treatments is most of the time collected frequently and separately. This is attributed to the fact that HISs is different, both technically in terms of applications, platforms, protocols, and language, in relation to funding mechanisms/organizations.

The Namibian public health sector is faced with difficulties in implementing EHRs. The current state in the MoHSS involves fragmented silos of data generated from non-integrated health information systems used in some departments. The lack of interoperability between these systems means no data is shared between them. The ministry still relies on paper records in most hospitals and clinics. Sometimes health professionals end up not providing effective services because patients' medical history is not included in the available medical reports. Personnel spend a lot of time searching for information in conventional paper records management systems which is not helpful to the operation of an organization. Achieving better health outcomes, effective reporting and monitoring, and providing effective health care requires timely, accurate, consistent, complete and well secured data [11]. It is therefore important to conduct a study such as this to identify pressing challenges that hinder adoption of HER and what can be done to address them.

Although MOHSS acquired an e-health system in 2011, which cost a lot of money, that system was never fully implemented but put on hold due to some challenges that still need to be addressed by the Ministry. This research aimed to investigate barriers that hinder the implementation of integrated electronic health records (IEHR) as well as propose solutions to putting in place IEHR in the Namibian public health sector. To reach the main objective of the study, the following questions were studies.

1) What are the current Health Information Systems used to handle Electronic Health Records in the Namibian public healthcare sector?
2) What are the daily patient health records challenges encountered by health workers in different departments?

3) What are the main challenges preventing the implementation of integrated EHR?
4) How can EHR be successfully implemented?

2. METHODS

The study employed a qualitative approach that falls under the interpretivism research paradigm. Hence, the study made use of an exploratory design. Exploratory design seeks to understand what is happening, to seek new insights, to ask questions and to assess phenomenon in a new light [12] . The research sought to investigate and provide evidence regarding the barriers that hinder the implementation of integrated electronic health records in the Namibian public health sector and identify possible solutions. It also sought to identify and examine HIS that may be found in the MoHSS in order to determine their effectiveness on the organization and the community at large. This was achieved effectively, by making use of the qualitative approach.

The research was conducted at MoHSS Head office and Windhoek Central Hospital with permission from the MoHSS. The accessible population of study for the research was the Ministry of Health and Social Services IT department. The study employed the population of all staff members that work in "Human health and social work activities" as the baseline, which was recorded to be 19,527, based on The Namibian Labour Force Survey 2018 Report [13]. Therefore, the population is approximate, as this population would have increased in recent years. Hence, the study deduced the sample from the above-mentioned department at the Ministry of Health and Social Services Head Office and Windhoek Central hospital. The study employed a sample of 20 since few individuals have access to information that the researcher needed.

The sample size of 20 respondents was purposively selected from the IT department of the MOHSS Head office and Windhoek Central Hospital, as the researcher believed they would provide the right information to achieve the objectives of the study, therefore, the researcher opted to only consider that department that is likely to have the required information. 10 respondents were from the MOHSS Head office and 10 from Windhoek Central Hospital. Purposive sampling was deemed to be the best sampling option as it allowed the researcher to choose respondents who have the best knowledge regarding the research topic or phenomena. The roles and responsibilities of the MoHSS information and technology (IT) department staff make them the natural choice for the study sample. They are involved in carrying out assessment of all information and communication technology needs for the ministry. They provide daily technical support to all information systems used in the ministry, they are responsible for maintaining the network and computer infrastructures of the ministry and they are also involved in acquisition and implementation of new

information systems for the ministry. [12] stated that this type of sampling is extremely useful when you want to construct a historical reality, describe a phenomenon or develop something about which only a little is known. [14] pointed out that the purposive sampling technique is the deliberate choice of an informant due to the qualities the informant possesses. This reduces time and resource wasting in sampling people that will not provide the desired information.

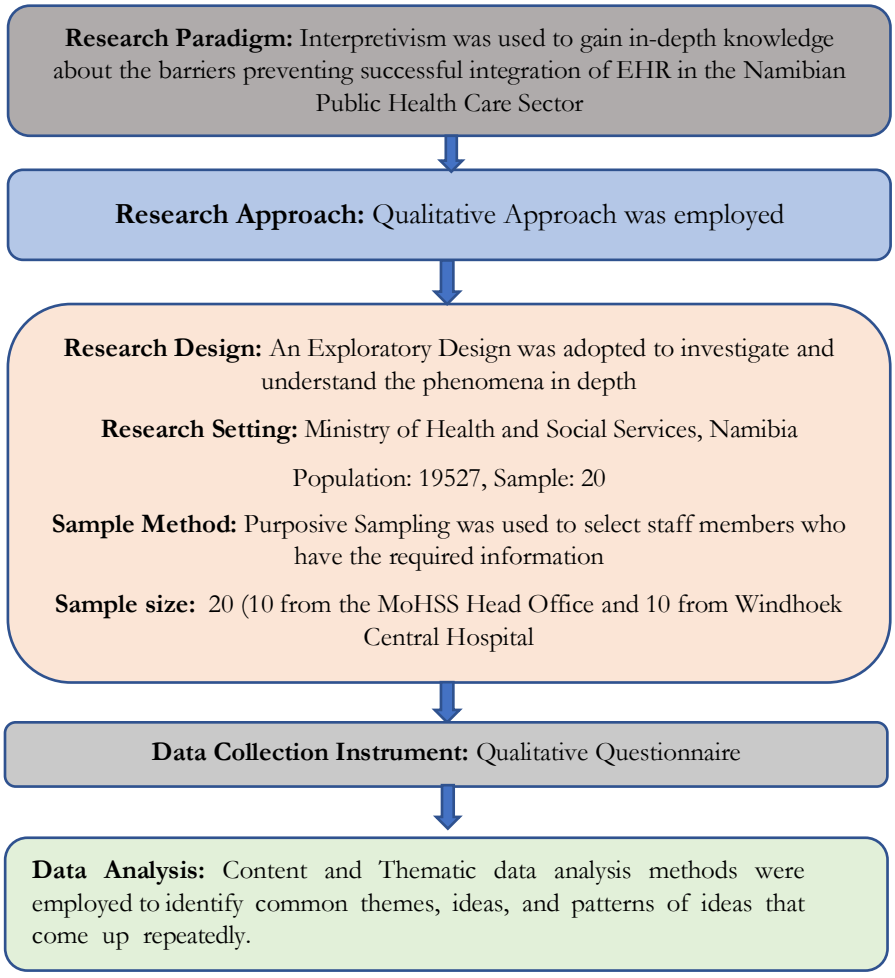

Figure 1. Research Process

The study used a questionnaire with qualitative questions consisting of both open and closed ended questions. The purpose of the questionnaire was to discover the opinions and understandings as well as experiences of MoHSS on electronic

health records which allowed the researcher to investigate and identify the available HIS in place, examine their effectiveness to the organization and the community at large, and most importantly identify the challenges that have hindered the MoHSS from implementing EHR. The questionnaire was designed based on information derived from the review of current literature and with questions that directly address the study's research questions. [15] stated that qualitative questionnaires are the most frequent qualitative data collection tool in health services research. In order to minimize bias, the researcher included a section in the questionnaire informing participants that their data will be kept confidential, their personal data such as names were also not recorded to ensure their anonymity. This provided a sense of privacy to the participants, enabling them to provide more honest or transparent responses to the questions.

The data collected from the respondents was validated by comparing it with some of the findings from existing literature including MoHSS reports and was found to be correlating. The collected data was analysed using content and thematic data analysis methods. The researcher closely examined the data to identify common themes, ideas, and patterns of ideas that come up repeatedly. The challenges were identified from recurring themes obtained through the thematic analysis of the questionnaires' data. Figure 1 illustrates the research process for this study.

3. RESULTS AND DISCUSSION

This section presents the findings of the study, as per the research questions of the study. It covers the demographic information of the respondents, findings on the identified integrated EHR in the Namibian public healthcare sector; examine the HIS that are in place at the moment, and identify challenges faced by the Namibian public healthcare sectors during the implementation of EHR. Further, the section provides the major day-to-day patient health records challenges encountered by health workers in different departments.

3.1. Respondents Characteristics

The demographic information presents the gender, age groups and years in service of the respondents in the study. The demographic information is summarized in Table 1.

Table 1. Demographic Information

Characteristics		Frequency
Gender	Male	10
	Female	10
Age	21- 24	2
	25-30	6

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Characteristics		Frequency
	31-34	2
	35-40	4
	40+	6
Experience	0-3 years	4
	3-4+ years	8
	7+	8

Six respondents revealed that they serve in the Information Technology (IT) department; two revealed that they served in the department of Information Technology Support Service; about eight respondents were from Health Information System department; and four participants were from Information Management department. The researcher felt this was a fair representation of the IT departments.

About sixteen of the respondents, indicated that the MoHSS has Electronic Health Record Systems (EHRS), whilst four of the respondents revealed that the Ministry mostly utilizes the District Health Information System (DHIS2). [16] pointed out that DHIS2 is used for supporting health information management in 67 countries, including the Solomon Islands. However, there have been few publications on its performance evaluations. DHIS2 enhances disease reporting systems, in particular for monitoring infectious diseases such as malaria. According to the respondents, PTracker is another system that the MoHSS utilizes. PTracker intends to increase the quality of prevention of mother-to-child transmission (PMTCT) of Human Immunodeficiency Virus (HIV) monitoring and evaluation systems by integrating and strengthening current systems. It also aims to validate Namibia's progress towards the elimination of mother-to-child HIV transmission through the use of Ptracker. However, findings further revealed that currently there is no integrated EHRS in the Namibian public Health System, this coincides with Sahay, et al., (2000), that pointed out that fragmentation and lack of integration bring about redundancy and an additional workload for health workers as information regarding the health status, disease incidence, prevalence and treatments is most of the time collected repeatedly, and separately.

Moreover, other EHRs the Ministry uses include e-TB Manager, Electronic Patient Monitoring System *(EPMS)*, Pharmacy Management Information System (PMIS), Meditech, SysPro, Master Facility List (MFL), E-Death and E-Birth notification system. Respondents pointed out that the MoHSS utilizes the District Health Information System (DHIS2) currently. Respondents expressed that it is a greater challenge to access health records of the patients from primary healthcare facilities as MoHSS does not have an integrated e-Health System in place.

The study discovered that medical practitioners access patients' health records only through their health passports and manual records. However, this was found to be challenging in a situation where these two get to be destroyed by fire or water. [17] emphasized the need for the single point where data capture could be brought, processed, and distributed, then it could mean faster data analysis and reporting. [18] further stressed that this process is difficult in the Namibian public Health Care Sector context because data comes from different fragmented sources, hence the need for an integrated health system with one point, a data warehouse.

The study shows that four of the respondents revealed that some patients 'data are uploaded by primary health care facilities in every region on the DHIS2 to which the tertiary facilities have access. However, this was found not reliable as sometimes there is no personnel to enter those data onto the system. The study found out that, due to the lack of an e-Health Record System most medical practitioners search for patients' health records using the patients' identifier or through referrals. However, this raised concern on the aspect of confidentiality with patients' information. According to [19] physicians and nurses will benefit from the availability of patient information in a structured and processed format that can be tracked in real time, rather than the tedious paper-based scribbles, because it provides an unequalled decision-making opportunity in the electronic version. They have also noted that HIS improves the overall quality of care, particularly in chronic diseases.

The study further found that other hospitals access the health records of patients that transferred from the regions by sharing emails, use of health passports, searching using patient identifiers, or using the name to access patients' medical health records and using referrals.

3.2. Current E-Health System used at the Ministry of Health and Social Services (MoHSS)

Although there is a number of challenges hindering the full implementation of the Integrated Health Care Information Management System (IHCIMS), there are unintegrated Heath Systems that the MoHSS is currently using. These systems serve different purposes within the Ministry.

a) District Health Information System (DHIS2)

The DHIS2 is an open-source software platform for reporting, analysis, and dissemination of data for all health programs. This system is used by Regional Program Officer mainly and it captures the aggregate data of the patients. Findings indicate that the system captures all data and allows data sharing. About four of the respondents indicated they were faced with challenges of data quality and low connectivity.

b) Electronic Patient Monitoring System (EPMS)

The system is used mainly by doctors and nurses, unlike the DHIS2, which captures the aggregate data of the patients. The system is the counselling and testing (HCT) database. This system captures patient-level information, and thus it captures all information. Although there were no challenges experienced with this system, the system is standalone. The system does not allow data sharing with other systems, hence the need for integration with other systems.

c) Integrated Health Care Information Management System (IHCIMS)/E-Health

The Integrated Health Care Information Management System (IHCIMS)/E-Health system is utilized by doctors and nurses; captures patient-level information as the EPMS. This is mainly designed to manage patient data at health facilities. The system allows data sharing with other systems, and it captures all information. There were no challenges experienced with this system. However, the system is still under development.

d) Pharmacy Management Information System (PMIS)

The Pharmacy Management Information System (PMIS) is used to monitor the stock level and availability of all pharmaceutical products and it captures the aggregate data of the patients. The findings revealed that there were no challenges experienced with this system. In addition, the system captures all data and allows data sharing.

e) Meditech

Meditech system is used in laboratories around the country for stock management and sample processing and results gathering. It is used by doctors and nurses to capture patient-level data information. Although there were no challenges experienced with this system, the system is standalone. The system does not allow data sharing with other systems, thus the need for integration with other systems. The system captures all data; however, it does not allow data sharing with other systems.

f) SysPro

SysPro system is used by administration officers to capture medicine information. This system captures all information. There were no challenges experienced with this system, the system is standalone. The system does not allow data sharing with other systems, hence the need for integration with other systems.

g) Ptracker

This is a system for the prevention of mother-to-child transmission of HIV, used by doctors and nurses to capture all data, mainly at patient-level data information. Four of the respondents revealed that PTracker data is not always uploaded on time. Therefore, the current system assists minimally in having patients' health records available and readily accessible.

h) Electronic Dispensing Tool (EDT)

The Electronic Dispensing Tool (EDT) system is to capture patient-level data information, and it is used by doctors and nurses. EDT system captures all information. There were no challenges experienced with this system, the system is standalone. However, it does not allow data sharing with other systems, hence the need for integration with other systems.

i) E-Birth

The E-Birth system captures new-born babies' information and is used by doctors and nurses. Although the system captures all information, it does not share information with other systems. Thus, the need for integration with other systems.

j) E-Death

The *E-death* system is employed by doctors and nurses to capture death information. The system captures all information; however, it does not share information with other systems. Therefore, there is a need for integration with other systems.

3.3. Challenges faced by the Namibian public healthcare sector in implementing the IHCIMS and EHRS

The study revealed that although IHCIMS was not fully implemented in all health facilities around the country, the system was developed and was in the phase of deployment to various hospitals. However, it was fully deployed at Windhoek Central Hospital and Oshakati State Hospital. Nineteen of the respondents pointed out that the IHCIMS was used since its launch in 2011, especially at Central Hospital and Oshakati State Hospital, however, one of the respondents indicated that the system has never been used since its launch. Fifteen of the respondents revealed that the IHCIMS was launched to be used across all health facilities and departments in the entire country, while four respondents indicated they are not aware and only one of the respondents revealed that the IHCIMS

was launched not to be used across all health facilities and departments in the country.

The study identified the following challenges that prevented the full implementation of the system. These are lack of network infrastructure (especially to distanced health facilities), insufficient equipment (such as computers and printers), irresponsive IT structure due to shortage of staff, resistance to change by staff members, lack of implementation plan and the high level of computer illiteracy amongst users, duplication of data, lack of interoperability, lack of data warehousing and fragmented health information systems creating a burden on some staff and making data inconsistent and untraceable.

The study found out that the greatest challenge for the implementation of the EHRS is the lack of network infrastructure. About six of the respondents revealed that the lack of financial resources, network infrastructure, and human resources in terms of skilled staff, especially in computer literacy. [20] pointed out that data connectivity and infrastructure in Namibia proves a challenge; to support the idea of integration as only a few regions have internet connectivity and in those areas that are covered, the speed is very low [21] [22]. Very few offices use 3G and 4G, where there is integrated HIS, there is an exchange of high volumes of data. According to [21] the gap between rural and urban areas has been identified as one of the elements hampering the delivery of e- government services. When it comes to the availability of technology infrastructure, there is a disparity between rural and urban communities in Namibia. This poses a challenge to the full participation of staff on HIS.

[10] have noted that it is equally important that the right infrastructure in terms of right-sizing, the servers, and PCs, with good bandwidth network connectivity and clean power supply, be given top priority in ensuring smooth and satisfactory HIS implementation. According to four of the respondents, it revealed that there is a need to conduct user equipment specification, site assessment and to procure necessary hardware equipment. The findings imply that logistics and interoperability are required to be fixed to successfully implement the new system. Other two respondents express that there are still old computers and devices, emphasizing that there is a greater need for the latest computers and devices that will enhance the successful implementation of the new EHRS.

A lack of policies for the implementation of electronic health records and systems documentation were also raised as points for concern. According to [22] systems are not fully documented, which makes them difficult to follow. In addition, NGOs who have supplied some of the systems do not provide their documentation of systems. Therefore, there is no guiding policy on

documentation. [23] argues that organizational change management, planning, training, managing expectations, and user acceptance are critical to the successful integration of HIS. Hence, there is a greater need for the policies and other regulatory documents that will safeguard the implementation of e-Health.

Financial constraints were noted to be among the challenges. About five of the respondents cautioned that the implementation will not succeed, unless the budget constraints are dealt with to ensure there are sufficient financial resources, even to sustain the system thereafter. According to [20] optimal healthcare delivery regardless of location requires technology, is costly without the economies of scale, and it is dependent upon the availability of a skilled workforce. The study also showed that the lack of a designated time-frame and training especially in computer literacy remains a concern toward implementation of the *EHRS,* hence there is a need for the government to have a work-frame schedule for the implementation of the system. Resistance to change was also noted to continuously hinder the implementation of the e- Health System in the MoHSS.

Daily operational challenges were also noted. Twelve of the respondents affirmed that the systems the MoHSS use are the same across all the regions, however, two of the respondents disagree that the systems are the same across the regions. Approximately four of the respondents stressed that slow connection due to poor network infrastructures delay the service delivery in this area. Four of the respondents pointed out that there is a daily challenge of data duplication, this slowdown, and the current system by prolonging the acquisition of data as one has to compare all the data to ensure they are matching. Outdated computer devices and software, lack of proper filing systems, lack of backup of the patients' health records and poor communication among health professionals due to lack of systems integration were also some of the challenges expressed. [22] revealed that doctors are resistant to using the new integrated system (IHCIMS), making it hard for them to communicate among themselves.

The findings revealed that the MoHSS had attempted to implement the EHRS but experienced various challenges including lack of network infrastructure, shortage of computer literate personnel, lack of adequate financial resources and lack of technical experts for developing, integrating and maintaining HIS. [24] emphasized without knowledgeable personnel with capabilities of integrating and implementing HIS in the health institutions, the implementation of HISs is most likely to fail. The absence of policies, implementation timeframes and availability of funds have contributed to the failure in implementing integrated HIS and EHRS,

The findings of the study confirmed that the MoHSS has plans to work on the above challenges. Fourteen respondents affirmed this and four revealed that they

are not aware if the Ministry has plans to tackle the challenges. Further, the findings revealed that the MoHSS prepared most of its staff for the implementation of the EHRS. It has goals to provide a digitalized system that will ensure easy data exchange between various information systems, without compromising the confidentiality of patients' health records. The Ministry further plans to ensure that the EHRS communicate to each other enabling interoperability and to avoid data redundancy. Lastly, respondents revealed that a couple of meetings and follow-up consultations had been going on regarding the implementation of the e-health Record System.

3.4. Strategies and preparedness for implementing IHCIMS and EHRS

The study found out that the Ministry was currently busy implementing and expanding the network infrastructure in all health facilities, especially to the district health centres and clinics and making budgetary provisions for procurement of IT equipments. Results further discovered that the Ministry had done the restructuring exercise already and IT positions were created in the regions. Most importantly, the MoHSS has developed the implementation plan referred to as "*E- health strategy*" and finally, about seventeen of the respondents stated that the Ministry will introduce a computer literacy programme to tackle the challenge of illiterate staff members. The remaining three respondents did not specify regarding the introduction of the computer literacy programme.

Approximately fifteen of the respondents revealed that due to the ongoing strategies of tackling the challenges hindering the implementation of IHCIMS, the staff is prepared. Results show that the ongoing strategies include communication with the management of the implementation and the training of analyst programmers. The study further found out that the business process re-engineering was conducted, and the technical support team was set up by the World Health Organization (WHO), specifically to build capacity among the staff members. While four revealed that they do not know if the staff are prepared. Only one of the respondents indicated that the staff is not prepared for future implementation of the EHR system, due to lack of network infrastructure as this is regarded as the main challenge.

3.5. Barriers hindering the implementation of Integrated Health Records

The main hindering factors for the full implementation of Integrated Health Records (IHRs) in the Namibian Public Health Care Sector, were rated as lack of interoperability and standardization. The lack of unique identifier for patients and data warehousing for patient data were also found to be the main hindering factors to the implementation of the Integrated Health Records. Other hindering factors comprise of lack of system documentation (such as policies), resistance to change,

poor internet connectivity in Namibia, and lack of computer literate human resources and high staff turnover.

Study by [10] stated that if the systems are not fully documented and there are no guiding policies on documentation, it makes it difficult to use the current systems. As a result, it is difficult to integrate such systems without full knowledge of their functionality. In addition, [22] revealed that among all health professionals, doctors are most resistant to use the new integrated system, and this coincides with the finding of the study that resistance to change rated (10%) hinders the full implementation of the (IHRs) in the Namibian Public Health Sector. Study by [18] emphasized that a standard unique health identifier for each individual makes it easy to link a person to all his/her health information, therefore without this in place it retards the implementation of the IHRs in the Namibian Public Health Care Sector. Hence, this becomes a challenge in Namibia compared to other countries.

3.6. Importance of Implementing the Health Electronic Record to patients

Generally, having the Health Electric Record will reduce the time patients spent in queues waiting for their health records to be retrieved, especially those that lost their health passports or those transferred from other health facilities. The study agrees that having a health electronic record, will improve the health service delivery and speed up the accessibility of medical delivery. The system will further at the same time retrieve patients' health information, making it easier and quicker. The issue of missing health records of some patients, especially those that happen to have their health passports lost or destroyed, will be solved, as there will be no need for paper-based health records. Medical practitioners will easily access the health records of the patients, no more patients' information sharing through emails. Patients will have access to their health records, making it easy for them to know their next medical appointment.

3.7. Discussion

The study has identified significant challenges that have hindered the Namibian government from fully implementing IHCIMS and EHRS. While the DHIS was fully implemented at Windhoek Central Hospital and at Oshakati State Hospital, nationwide implementation has been hampered by lack of adequate infrastructure, skilled personnel as well as technical and financial constraints. African countries such as Rwanda, Ghana, Malawi and South Africa have also implemented the DHIS but while it is used to capture and provide some health information, it is not sufficient to be used as a fully functional IHCIMS [25]. Challenges such as lack of adequate network infrastructure at many hospitals and clinics especially in rural areas have remained a pressing barrier preventing timely access to data and

resulting in delayed data sharing. Most countries in sub-Saharan Africa are faced with similar challenges whereby there is a large disparity between urban and rural areas in terms of network infrastructure [26].

Organizational challenges such as lack guiding implementation policies or strategies, shortage of computer literate personnel, lack of expertise and shortage of ICT department staff members, resistance to change, inefficient coordination among health personnel and outdated computer equipment have also largely contributed to failure of the implementation of IHCIMS and EHRS. Successful implementation of IHCIMS and EHRS does not only require infrastructure, but also heavily relies on organizational readiness, governance and policy frameworks as well as clear implementation strategies [27].

Irrespective of past failures, the Namibian MoHSS has started working on addressing some of the identified challenges by setting up network coverage to remote areas, replacing outdated computer equipment and creating IT positions for health facilities in the regions and creating a national e-health strategy. However, the issues of inadequate funding, lack of interoperability between existing systems and lack of unique patient identifier system still pose a challenge to fully implementing integrated health information systems and EHRS. If the MoHSS can work on addressing these challenges, only then can it come closer to achieving the goal of having EHRS.

4. CONCLUSION

This study investigated the challenges that hinder the implementation of integrated Electronic Health Records (EHRs) in the Namibian public healthcare sector, Ministry of Health and Social Services, Namibia and to recommend solutions to mitigate them. This study discovered that although there are several challenges hindering the full implementation of the Integrated Health Care Information Management System (IHCIMS), there are some existing isolated health systems that the MoHSS is currently using. The study established that the MoHSS experiences challenges in handling health records of patients due to the absence of an integrated e-Health System. Medical practitioners face challenges in delivering effective health services as they access patients' health records only through their paper-based health passport and manual records. The study revealed that some patients' data are uploaded by primary health care facilities in every region on the DHIS2 to which the tertiary facilities have access. However, this was found not reliable as sometimes there are no personnel to enter those data into the system. The study found out that, due to the lack of an e-Health Record System, most medical practitioners search for patients' health records using the patients' identifier or through referrals. However, this raised concern on the aspect of confidentiality with patients' information.

On the main challenges preventing the implementation of EHRs, the study discovered these to be as follows: lack of interoperability, standardization, Unique Identifier for patients and data warehousing. Other hindering factors comprise of lack of system documentation (such as policies), resistance to change, poor network connectivity in Namibia, and lack of computer literate human resources. Furthermore, challenges such as financial resources constraints, insufficient and inexperienced IT personnel, lack of policies and project documentation have also been discovered. The MoHSS budget constraints posed a greater challenge of all aspects.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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