

**UNIVERSITY OF GHANA, LEGON
COLLEGE OF HEALTH SCIENCES
SCHOOL OF NURSING AND MIDWIFERY**



**NURSES' CHALLENGES IN THE UTILIZATION OF
ELECTRONIC HEALTH RECORDS AT 37 MILITARY HOSPITAL,
GHANA**



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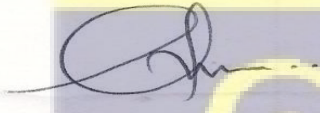
DECLARATION

I, Eunice Sarpeh Mensah, hereby certify that the research described in this statement was carried out by me under the guidance of Professor Adelaide Ansah-Offei, of the University of Ghana's School of Nursing and Midwifery. All writers of articles, theses, and books cited in this study have been given proper credit for their work. This dissertation has not already been approved partially for another degree, and it is not presently being submitted for another degree, I attest. In light of this, I accept full responsibility for any study shortcomings.

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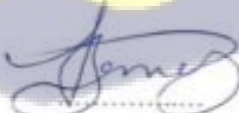
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INTEGRI PROCEDAMUS

DEDICATION

I dedicate this work to my family and all my loved ones who have inspired me in various ways to make this work successful. Also, I dedicate this work to the staff and management of the University of Ghana, especially to the staff of the Department of Nursing.



ACKNOWLEDGMENT

I begin by expressing my gratitude to the Almighty God for the gift of life and protection, and for granting me the strength to successfully complete this work. I extend my sincere appreciation and thanks to my hardworking supervisor, Professor Adelaide Ansah-Offei, for her kind guidance and immense contributions to this research. I deeply appreciate all of her efforts and pray that God blesses her abundantly. I also want to express my gratitude to all the study participants for their willingness to take part in this research. The success of this study depended on their significant efforts and their sharing of personal information with us in trust. I remain grateful to them. Finally, I am also grateful to the authors whose works I consulted in the literature review, as their insights were invaluable to this study.



ABSTRACT

Electronic Health Records (EHRs) have become an essential tool in modern healthcare settings, providing numerous benefits to the health system. Considering the technicalities and digital nature of the EHR system, its utilization among nurses can be challenging due to various barriers. The study explored the challenges nurses face with using the EHR system at 37 Military Hospital in the Greater Accra Region of Ghana. A descriptive cross-sectional study was conducted from March to April 2024. Multistage sampling was used to sample 300 nurses. Data on challenges were grouped into three and were collected via a questionnaire (Likert scale). Using SPSS (version 27), descriptive and linear regression analyses were conducted at a 95% significance level. For technological and system-related challenges, the majority of the nurses consented that technical glitches and system downtime hinder their productivity when using the EHRs (85.0%); believed that interoperability issues between EHR systems create difficulties in accessing patient data from different facilities (66.3%); and data entry in the EHR is time-consuming which affects their ability to provide direct patient care (56.3%). Concerning workflow challenges, 65.3% of the nurses agreed that using the EHR system for documentation increases the time they spend on data entry tasks; and 49.3% agreed that EHR data entry requires frequent interruptions, affecting their focus on patient interactions. Regarding data security challenges, 72.0% of the respondents expressed concern about the security of patient data stored in the EHR system; 56.0% were confident in their ability to protect patient confidentiality and privacy when using the EHRs; and 52.0% agreed that ongoing training and updates on data security are readily available to support their knowledge and skills. Also, some demographic characteristics like age, gender, work experience, kind of ward/unit, and professional ranks of nurses were statistically associated with these challenges. Addressing these challenges can enhance patient care delivery and nursing practice efficiency.

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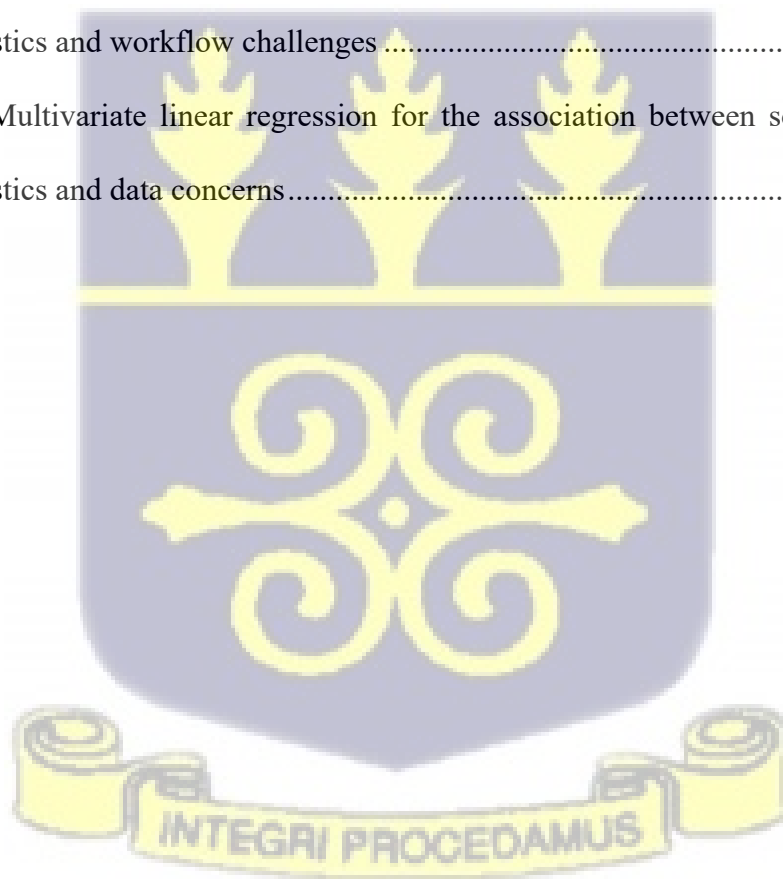
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LIST OF ABBREVIATIONS

CPOE	Computerized physician order entry
DHIMS	District health information management system
DHIS	District health information system
EMIS	Education management information system
EHR	Electronic health record
EHRs	Electronic health records
GHS	Ghana Health Service
HAMS	Health administration management system
ICT	Information and communication technology
IHOST	Internal host
IICD	International information and communication development
IT	Information technology
KATH	Komfo Anokye Teaching Hospital
MEDITECH	Medical information technology
MOH	Ministry of Health
NAHIT	National alliance for health information technology
RIS	Radiology information system
SNOMED CT	Systematized nomenclature of medicine clinical terms
SPSS	Statistical product and services solutions
USA	United States of America
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter of the study describes the background of the study, problem statement, purpose of the study, research questions, significance of the study, operational definitions, and the organizational structure of the study. Therefore, this section gives valuable information on recent and past highlights on the use of electronic health records and its challenges across the world. While setting out the main problem at hand, the chapter outlined the goals to be achieved and the significance of the achievement of set goals.

1.1 Background of the study

Electronic health record (EHR) systems have revolutionized the healthcare industry by streamlining medical documentation and improving patient care (Alanazi et al., 2020). EHRs have replaced traditional paper-based records with digital platforms, offering numerous advantages such as easy accessibility, data integration, and enhanced decision-making (Alkureishi et al., 2016; Gopidasan et al., 2022). EHR systems, which have been shown to improve both the reliability and quality of health information and communication, as well as the general standard of healthcare services, are also included in the information and communication technology (ICT) deployment of the Ghanaian healthcare systems. The National Alliance of Health Information Technology in the United States of America (NAHIT, 2008, p.6) defines EHR as "an electronic record of health-related information on an individual that can be created, gathered, managed, and consulted by authorized clinicians and staff within one healthcare organization." An EHR often includes lists of patient issues, medicines, allergies, and health maintenance data, as well as progress comments, different test findings, and ordering features.

The global adoption of EHR systems has been steadily increasing over the years. According to Alanazi et al. (2020), the use of electronic health records (EHRs) has become a standard practice in modern healthcare due to their numerous benefits, including improved data accessibility, streamlined workflows, enhanced patient safety, and better clinical decision-making. Basil et al. (2022) added that different countries and healthcare organizations have been implementing various EHR systems based on their specific needs, budget constraints, and technological capabilities. Epic Systems is one of the most widely used EHR systems, particularly in large healthcare systems and academic medical centers in the United States of America. It offers a comprehensive suite of solutions, including electronic health records, patient engagement tools, and revenue cycle management. Other global systems include Cerner, Allscripts, eClinicalWorks, MEDITECH, InterSystems TrakCare, EMIS Health, VistA, and Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT). A few of the set-up electronic health records systems in Ghana include GHS IHOST, Health Administration Management System (HAMS) provided by Infotech Ghana, District Health Information System (DHIS), District Health Information Management System (DHIMS), Health Information Management Systems (HIMS), and Hospital Administration Management Systems (HAMS) (Aabebe et al., 2024; Acquah-Swanzy, 2015; IICD, 2014).

In the opinion of Park et al. (2015), EHR is now approved for usage in health organizations due to its low failure rate concerning operations and service, as well as the transmission of precise, trustworthy, and up-to-date information that assists decision-making. Furthermore, Aabebe et al. (2024) and Acquah-Swanzy (2015) believes that EHR permits information analysis to provide reports as proof to demonstrate why particular resources are allocated to specific portions of the same business while others

receive less attention. Hessels et al. (2015) also add that EHR usability has enhanced documentation and patient outcomes, such as decreasing the duration of stay, minimizing prescription blunders, increasing time efficiency, and providing tools for decision-making. EHRs, in the view of Gopidasan et al. (2022), can facilitate cross-disciplinary collaboration by increasing the visibility of every discipline's activity. According to Addo and Agyepong (2020), an EHR system may also track nursing-specific outcomes by recording and synthesizing nursing data.

It should be highlighted, however, that the adoption and usage of EHR do not always imply its success and anticipated effects. According to Gephart et al. (2015), the deployment of EHR caused disruptions in nurses' workflow, difficulties locating information to inform nursing care, and the ongoing modification of nursing work patterns to comply with technological needs. Quist (2020) states that due to the complexity of ICT and its ancillary infrastructure, there are significant hurdles to the implementation and utilization of EHR. These difficulties must be carefully identified and, if possible, eliminated. Quist (2020) believes that by doing so, the expected objectives for the systems' implementation would be realized. As a result, this dissertation recognizes the inherent issues with EHR deployment and usability across major institutions in Ghana. It attempts to identify the challenges associated with the use of EHR systems and make recommendations to improve their uptake and usefulness among nurses.

1.2 Statement of the problem

Although the government has implemented various e-health programs to ensure the complete integration of EHR systems in all Ghanaian medical facilities, the e-health system is still in its infancy, according to Addo and Agyepong (2020) and Acheampong (2012). Many hospitals, according to them, are still in the partial implementation stage,

and others are in the trial stage. The integration of EHR systems at 37 Military Hospital in 2017 presents both opportunities and challenges for nursing staff. Quist (2020) cautions that while EHRs promise enhanced efficiency and patient care, addressing the challenges associated with their use is crucial for ensuring a seamless transition. Addressing issues such as training, interoperability, data security, and the potential depersonalization of care will empower nurses to leverage EHRs effectively and contribute to the hospital's mission of providing exemplary military healthcare services. As frontline caregivers, nurses play a pivotal role in patient care and safety, making it imperative to examine the challenges associated with the use of EHRs by nurses.

Several studies on the usability and challenges of EHRs in Ghanaian health institutions have been conducted. These include studies done at the University of Ghana Hospital (Hayford, 2019), Komfo Anokye Teaching Hospital (KATH) in Kumasi (Gyamfi, 2016; Gyamfi et al., 2017), S. D. A. Hospital in Kumasi (Addo & Agyepong, 2020), Asamankese Government Hospital (Antwi, 2022), Effia Nkwanta Regional Hospital (Acquah-Swanzy, 2015), selected hospitals in the Central Region (Mensah et al., 2022), and the Eastern Region (Essuman et al., 2020). Even though the 37 Military Hospital, a specialized hospital in Accra, has adopted and incorporated an EHR system into its operations, there have been no empirical studies on the system's challenges at the facility. Quist (2020) and Gephart et al. (2015) opine that the transition and adoption of EHR are without challenges, particularly concerning the integration of EHR systems into the workflow of nurses. It is only by highlighting these challenges that Quist (2020) and Gephart et al. (2015) believe hospitals could optimize healthcare delivery and enhance patient outcomes.

According to the hospital's 2022 Annual Report, inaccuracies and inconsistencies in patients' data were observed in the use of the EHR system, indicating

a need for scientific evidence on challenges faced by the healthcare professionals and subsequently make recommendations for urgent corrective measures. Furthermore, the 2023 Report highlighted that a number of staff members fail to log out after using the EHR system, posing potential security and data integrity concerns. In practical terms, several healthcare professionals have expressed frustration over frequent power interruptions, which hinder or delay their ability to use the EHR system effectively during patient care. Given that nurses represent the largest segment of the hospital workforce and maintain the most direct contact with patients, it is imperative to conduct a study that explores the specific challenges they encounter in utilizing the EHR system. Also, the 37 Military Hospital is strategically located in the heart of Accra which functions as a central referral hub, receiving patients from a wide network of healthcare institutions while delivering medical services to both military personnel and the civilian population. Given its pivotal role within the national healthcare system, the implementation of a robust and responsive EHR system, capable of ensuring the accuracy and reliability of patient data, is indispensable for the delivery of high-quality, coordinated, and efficient healthcare services across the country. It is in light of this that the study aimed to explore the challenges faced by nurses in the use of EHRs in 37 Military Hospital in the Greater Accra Region of Ghana.

1.3 Purpose of the study

This study sought to examine the challenges faced by nurses in the utilization of EHRs in 37 Military Hospital in the Greater Accra Region of Ghana.

The specific objectives included;

1. To identify technological and system-related challenges associated with the use of EHRs by nurses in 37 Military Hospital, Accra.

2. To examine workflow challenges associated with the use of EHRs by nurses in 37 Military Hospital, Accra.
3. To find out data security concerns associated with the use of EHRs by nurses in 37 Military Hospital, Accra.
4. To assess demographic factors influencing system-related, workflow and documentation, as well as data security, privacy and training challenges associated with the use of EHRs.

1.4 Research questions

The following research questions were addressed:

1. What are the technological and system-related challenges associated with the use of EHR by nurses in 37 Military Hospital, Accra?
2. What are the workflow challenges associated with the use of EHR by nurses in 37 Military Hospital, Accra?
3. What are the data security concerns associated with the use of EHR by nurses in 37 Military Hospital, Accra?
4. What are some of the demographic factors influencing system-related, workflow, as well as data security privacy and training challenges associated with the use of EHRs by nurses?

1.5 Significance of the study

This study will make immense contributions to nursing management, practice, and research. An examination of the challenges associated with the use of EHRs by nurses in 37 Military Hospital will become a document for which nursing managers will be ably informed about the success of EHR services at the 37 Military Hospital. Such information will help Hospital Management to take appropriate measures to improve the usability of the system among nurses. The findings of the study will also help nursing

managers design effective strategies and working frameworks to assist nurses' adoption and usability of the EHR. After documenting the barriers, nursing managers will be able to implement interventions geared towards the elimination of the identified barriers to improve the usability of EHRs. The result of the study will also give voice to nurses to share their views on the challenges they face in the use of EHR. The study will become a blueprint for nurses' suggestions and expectations to enhance the usability of EHR. The findings of this study will also provide empirical evidence for future research. The recommendations put forward will guide future research in the area of nursing and health technology.

1.6 Operational definitions

The significant variables used in this study have been conceptually and operationally defined as shown in Table 1 below.

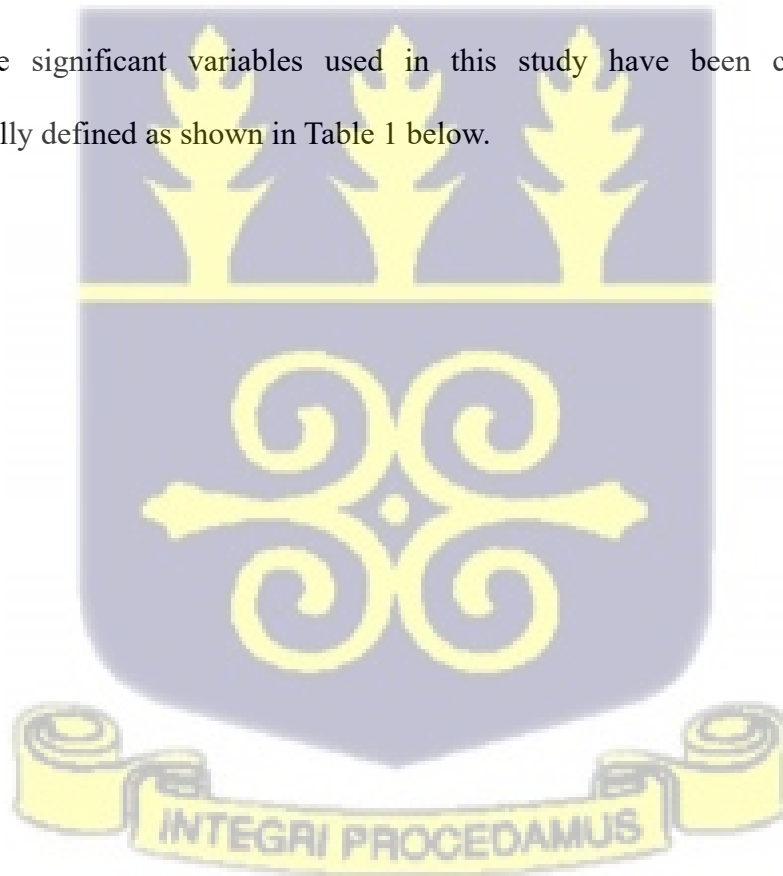


Table 1: Operational definitions

Variable	Conceptual definition	Operational definition	Tool for measurement
Age	The chronological number of years or months since a person's birth	The age category of nurses which is trichotomized as 26-30 years, 31-35 years, and above 35 years	Ordinal frequency
Gender	The characteristics of men, women, boys or girls that are socially constructed.	The biological make up or attributes of the nurse categorized into male and female	Nominal frequency
Level of education	The different level of educational opportunities and pathways available to nurses	The highest educational level attained by nurses categorized as diploma, bachelor degree or master degree.	Ordinal frequency
Work experience	A period of years a nurse works for an organization to gain skills, learn more about the job, and explore career options.	The number of working years a nurse has spent in the profession which is grouped into < 5years, 5-10 years, and 11-15 years	Ordinal frequency
Unit/ward	The specific place/area/department of work assigned by the superior which is usually based on the skills and specialty of the nurse.	The specific nursing area (unit/ward) where the respondent currently works.	Nominal frequency
Professional rank	The current professional rank or cadre of the nurse which is based on the qualification and experience of the nurse.	The current professional rank or cadre of the nurse.	Ordinal frequency
Technological and system-related challenges	The inter and intra operability challenges affecting the flow and integration of data in the EHR system.	The challenges or issues relating to the computer software and system of operation in the EHRs.	Likert scale
Workflow challenges	The disruption of the effectiveness and efficiency of data including documentation processes across the various disciplines in the EHR system	The challenges regarding the flow of nursing activities, tasks, assignment and reports writing of patients.	Likert scale
Data security concerns	Concerns relating to data access and permission, privacy compliance, and confidentiality. It also include the training concerns associated with data security.	The challenges associated with how patients' information (data) are protected and secured as well as training needs of nurses in the use of EHR.	Likert scale

1.7 Organization of the study

The dissertation consists of five interrelated chapters. Chapter one is the introduction and covers the background to the study, statement of the research problem, research questions, objectives of the study, scope and significance of the study, as well as the organization of the study. Chapter two comprises the literature review, where both the theoretical and empirical literature are reviewed. Chapter three outlines the methodology for the study. Chapter four reports the results while the discussion is

covered under chapter five. The final chapter presents the summary, conclusion, and recommendations of the study.

1.8 Summary of chapter one

This section has provided an introduction to the study being carried out. The background, as well as the problem that propelled the study, has been addressed. Likewise, the purpose of the study and research questions have been enumerated. The significance of the study, operational definitions and the organization of the various chapters of the dissertation have also been captured.



CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section provides a review of related literature which is in line with the study objectives. A narrative methodology is used in reviewing related literature and contextualize the research problem. According to Cronin, Ryan, and Coughlan (2007), this methodology provides a comprehensive overview of literature by discussing key concepts and trends and highlighting gaps to improve research. This section has theoretically reviewed relevant literature on the usability and adoption of EHR by nurses across countries. It has reviewed literature on health informatics and EHRs, including definitions, components, benefits, challenges and strategies for improving its usability. Hence, the review is aimed at understanding the broader context of EHRs concerning their complexity, usability, challenges, and suggestions.

2.1 Health informatics

Health informatics, often known as e-health, is a cross-disciplinary field that combines aspects of healthcare, computer engineering, and information technology (IT). IT applications have resulted in enormous changes in healthcare, with health practitioners transitioning from paper-based to computerized systems (Hillestad et al., 2005). It comprises a variety of methodologies, technology, software, and resources designed to improve data collection, retrieval, and usage in health-related fields. Computers, information and communication systems, health information system workflow, and formal medical terminologies are examples of health informatics instruments used in various fields of healthcare. When computers became capable of storing and managing enormous volumes of data, the notion of health informatics developed. Various technological breakthroughs have altered society during the last few

decades (Szczzerba & Huesch, 2012). The most recent IT technology in healthcare is virtual world technology, which is a computer-based simulated environment. It employs three-dimensional imagery and acoustics that have previously been employed in diagnosis, therapy, and health education. This technology, for example, can assist medical students in becoming more professional in gathering the initial medical history of patients and physicals via EHRs, as well as analyzing information from magnetic resonance imaging scans, computerized tomography scans, and x-rays. Furthermore, the creation of three-dimensional virtual body architectures can assist practitioners in seeing, exploring, and manipulating dozens of internal organs (Jialin et al., 2012).

Health informatics has provided numerous advantages to healthcare, including reduced human error, improved medical data security, easier access to medical information, reduced duplication of efforts and documents, optimization of health data documentation, lower costs of technology for communication and information, support for decision-making activities, higher standards of care, and data repositories. Individuals may also gain exposure to a wide range of reputable health information and expertise, and patients can track and manage their ailments by accessing their own health information. Using health informatics tools, patients with chronic diseases and carers can collaborate more effectively (Hillestad et al., 2005). On the other hand, health informatics promotes personal health by providing extensive tools for representing, retrieving, and visualizing health data. It may give a thorough measurement and visualization of the human body and uses formal models to gain a better knowledge of the human body's functions or workings. Health informatics also adds to health knowledge. For example, it uses data mining algorithms to analyze data from many angles and summarize it into meaningful information. Following that, health informatics helps foster well-organized healthcare by offering effective health information system

design for patient-centred treatment as well as suitable information management methodologies (Haux, 2010). Investments in healthcare-related computer technology may vastly increase the breadth and quality of treatment accessible to patients and medical experts such as nurses, physicians, and other clinicians. Health informatics can assist in reducing the risk of medical mistakes and aid in the early diagnosis of health issues through the proper utilization of EHRs.

2.2 Electronic health records

With the introduction of the EHR system, the healthcare sector has seen significant use of ICT. According to the International Standard Organization, EHRs are a repository of data regarding the health of a subject of care in a computer-processable format. Thus, they are computerized systems that collect, store, and display health information. In certain countries, the term EHRs refer to computerized hospital documentation schemes that include clinical data input at the point of service by a health care practitioner (WHO, 2006). Additionally, EHRs are a systematized collection of patient data that is electronically recorded (Tumbo, 2020). The term EHRs, like automated health records, were used to identify digital schemes based on imaging of documents or systems put up in a medical practice or community health centre. These were frequently utilized by general practitioners in many industrialized nations, including patient identifying data, medication, prescription production, and test results. In certain circumstances, all of the medical information supplied by the doctor is included during each patient's appointment.

EHRs have been utilized in some form or another in the United States of America (USA) since the 1960s. Between 1960 and 1970, the federal government of the USA established laws to establish 'Medicare', resulting in a rapidly expanding healthcare system (Seymour et al., 2012). For several years, the Institute of Medicine

has urged the medical community in the United States to use electronic health records, claiming that they will enhance healthcare quality by making it less hazardous and more effective (Ndifon et al., 2016). Various court actions against healthcare organizations developed after the 1960s, with the inflow of various and innovative entities in the healthcare business and with health being considered as being crucial, the USA established harsher industrial regulations (Seymour et al., 2012). As a result, the need for improved medical records in healthcare has increased, resulting in widespread acceptance and installation of electronic health records systems by many healthcare facilities.

EHRs allow patients' health records/data to be exchanged across many healthcare facilities via an integrated network. Thus, EHRs are intended to address the various shortcomings of the paper-based record system, ultimately enhancing care quality (Tang & McDonald, 2006). In most healthcare settings, paper records have been replaced with digital records in EHR systems. They facilitate the delivery of unified and consistent healthcare by making health information instantaneously available (Wang & Biedermann, 2010). EHR systems include patient health records and are administered by healthcare professionals such as physicians, clinicians, and hospitals. Healthcare procedures are extremely collaborative, and numerous professionals from various disciplines must collaborate to improve care quality. The employment of computer-based approaches has revolutionized the attainment of this aim. EHR, for example, is widely utilized to replace paper health records with electronic versions. EHR can increase treatment quality while simultaneously lowering costs (Bleich & Slack, 2010). EHR systems are superior to paper-based counterparts in three important ways: from the perspectives of patients, general practitioners, and health professionals (Deloitte, 2006). Patients, for example, must physically transmit their health information from one

physician to another in paper-based systems, but with an electronic system, all patient information is maintained in the EHR database and health providers have access to patients' data. Furthermore, patients with chronic conditions, such as diabetes, cannot often update their health progress in a paper-based system, but chronic care patients may quickly update their medical data and play an active part in their treatment in a digital system. Whereas paper-based systems make it difficult for health practitioners to get important patient treatment information, electronic systems save patient information in an integrated health record database, allowing practitioners to collaborate more effectively. Finally, using a comprehensive electronic system provides health practitioners with more trustworthy and precise data (Deloitte, 2006; Wang & Biedermann, 2010).

EHRs have attracted the attention of scholars, medical professionals, and policymakers due to their benefits in improving operational efficiency, reducing medication errors, increasing adherence to guidelines, issuing appropriate alerts, and lowering costs (Jabour & Jones, 2013). Hence, Ghana's Ministry of Health (MOH) has emphasized the need for EHR adoption (Ghana E-Health Strategy, 2009), recognizing the benefit of the system.

2.2.1 Components of electronic health records

The typical EHR system is a multi-part, embedded health data system. According to Tang (2003), a functioning EHR scheme should be capable of longitudinally storing patient health information and data; effectively managing results generated by the scheme; facilitating digital interaction and connectivity; providing support to patients; and assisting in handling administrative duties and reporting. Nørh (2006) emphasizes the following EHR elements: clinical documentation, booking assistance, communication/messaging, result management, charge capture/billing, and

disease management. However, most contemporary EHR systems are built to incorporate data from several components such as administrative, laboratory, vital signs, radiology, pharmacy, physician, nursing, and clinical notes among others. Any department may create electronic records. Hospitals and clinics may have many auxiliary system providers; in this scenario, these systems are not always connected with the main EHR system. It is feasible that these systems are stand-alone, with various vocabularies being employed. Data from various systems can be merged if proper interfaces are given; otherwise, a physician must open and log into a succession of programmes to obtain the whole patient record. Depending on the service supplied, the number of components present varies, and this will collectively include the following;

(i) *Administrative system:* It comprises administrative data made up of patient enrollment, admission, discharge, and transfer information, which are critical components of the EHR. It also includes the patient's name, medical record number or master patient index, demographics, employer history, principal complaint, patient disposition, and other information, as well as billing information. It can also contain social history data such as marital relationship, home environment, daily routine, dietary habits, routines for sleeping, exercise patterns, smoking habits, use of alcohol or drugs, and family history data such as personal health history, hereditary diseases, father, mother, and sibling(s) health status, age, and cause of death. Aside from fields such as "comments" or "description," these records often include name-value pairs. This data is used to identify and assess patients, as well as for all other administrative functions (Tang 2003; Nøhr 2006).

(ii) *Laboratory system and vital signs:* This is an independent and critical unit in the clinical care process that is linked to the primary EHR system and provides information for treatment, diagnosis, prevention, and health management. Laboratory test findings

influence 60% to 70% of medical decisions (Dolin et al., 2006) while logical observation identifiers names and codes (LOINC) is the most often used coding method for representing laboratory test data (Wells et al., 2013). Vital signs are markers of a patient's overall physical health, which covers things like pulse rate, respiration rate, arterial pressure, body temperature, body mass index (BMI), and could be found on the EHR system (Casey, 2012; Newton et al., 2013).

(iii) *Radiology system:* The radiology information systems (RIS) component is used to manage, store, manipulate, and distribute medical imaging and radiological data (Bayley et al., 2013; Paxton et al., 2013)

(iv) *Pharmacy system:* It involves inventory management, prescription management, billing, and medicine distribution. Patient's medication and immunization history, including drug name, dose, route, amount, frequency, start and end date, prescriber, allergic response to drugs, and source of prescription, is found here (Jamoom, 2012; Paxton et al., 2013).

(v) *Computerized physician order entry (CPOE):* This is another critical EHR component which electronically allows a doctor to input medical orders and instructions for a patient's treatment (Hardeep et al., 2012) and it is distributed across the network system for any order to be carried out (Hagop, 2002).

(vi) *Nursing and clinical documentation:* The component provides details regarding the patient's treatment and services and involves clinical reports, patient evaluations, and progress reports (Quan et al., 2008). This component contains physician, nurse, and other clinician notes, pertinent periods and dates associated with the document, personnel in charge of the stated care, flow sheets (vital signs, input and output, and

problem lists), perioperative notes, notes on discharge, transcription document management, and health records abstracts (Hardeep et al., 2012).

2.2.2 Facilitators of electronic health records

EHR facilitators are actions or efforts carried out by institutions or authorities in order to facilitate EHR deployment and utilization (Cotea, 2010). Physicians, professionals, managers, and patients all have different EHR facilitators (Kamadjeu et al., 2005; Dobrev et al., 2008). Lau et al. (2012) discovered three major levels of EHR facilitators in their evaluation of the influence of EHR on physicians' practice in Canada: micro-, meso-, and macro or health care principles. A comparable EHR research done among occupational health physicians in Romania by Triff et al. (2012) backed up this claim. System quality factors, information quality, service quality, and EHR usage variables were identified as micro-level facilitators (Lau et al., 2012). However, the meso-level facilitators were standardized data content, legal agreements that affected EHR documentation, performance and user behaviours, practice standards for medical guidance, the professional boundaries of practice and medico-legal standards that regulate EHR use, and financing (Lau et al., 2012; Triff et al., 2012). Perceived ease of use, encouragement, efficiency, and familiarity were all recognized as facilitators among the various user groups (McGinn et al., 2011; Achampong, 2014). Furthermore, workflow impact, technical support via personal contacts or documents, interoperability, communication (thoughts, opinions, or information by speech or writing), or expert support where physicians know how to assist other physicians in completing a medical task through a document or direct interaction or physicians with expertise in EHR usage supported with details on how to utilize the system were all recorded as facilitators (Castilo et al., 2010; McGinn et al., 2011).

Nagle and Catford (2008) identified prioritizing investment in information management tools, clinical information systems, EHR training and education, process and work integration, 24-hour user-assisted support clinical processes and applications, evaluation, and EHR education curriculum as critical in adopting EHR. According to Saleem et al. (2005), additional EHR facilitators include a restriction of the number of reminders at a site, strategic placement of computer workstations, integration of reminders into the workflow, the ability to document system problems, and receiving prompt administrator feedback. Learning, training sessions, infrastructure, non-formalization, openness, non-centralization, and cooperation were all identified as EHR utilization enhancers (HMIS, 2008; Gururajan & Hafeez-Baig, 2014). Recent research has identified decreases in errors, medical and administrative effectiveness, health outcomes, project preparation, user impressions, excellent infrastructure and privacy settings, facility features, and time savings as motivators for EHR use (Achampong, 2014; Healy & Lubeck, 2012; Kruse et al., 2015). Mwang'ombe (2021) in her studies also highlighted some facilitators to the usability and adoption of EHRs in clinical management. The study was a descriptive cross-sectional survey among 215 medical practitioners from Mombasa county, Kenya. Using quantitative analytical approaches, staff attitude, ICT knowledge and internet connectivity facilitated the implementation of EHR. Internet connectivity had significant moderating effect on the utilization of EHR in healthcare facilities.

2.2.3 Benefits of electronic health record system

A well-established EHR has several advantages. Some of the possible benefits of e-health include cost savings, higher safety, and improved health. E-health can improve health care and reduce fatalities by offering illness-preventive and chronic disease management systems (Goldschmidt, 2005). The Institute of Medicine of the United

States of America stated that when properly designed and used, health IT is expected to assist in improving health professionals' efficiency, decreasing operating/administrative expenses, and improving patient security. Other benefits include increased efficiency, improved correctness of health papers, and timely and accessible documentation (Kalra, 2006). EHRs will also improve healthcare efficiency. This is accomplished through the healthcare provider's efficiency, which reduces staffing rates and healthcare costs (Helton et al., 2012). EHRs allow for the re-engineering of clinical job practices to improve job efficiency. Another element of healthcare cost reduction is that EHRs almost eliminate the requirement for medical transcriptions (Seymour et al., 2012).

EHRs improve healthcare quality by reducing errors in diagnosis and treatment. By enhancing medical documentation and clinical decision support systems, EHRs help reduce medical errors and overall healthcare expenditures. E-prescribing also helps to eliminate medication errors. EHRs will also save money by minimizing duplicate testing and patient testing (Connelly et al., 2011). Finally, EHRs can cause the elimination of massive amounts of paper produced when paper papers are made and circulated (Seymour et al., 2012). EHRs give patients quick access to their data and will help them become more involved in their treatment (Connelly et al., 2011).

2.3 Challenges associated with the utilization of electronic health record system

With all of the benefits that EHRs provide to healthcare, there are still certain challenges that must be handled and surmounted. The first issue for an EHR is the high cost of EHR systems (Connelly et al., 2011) which is grouped into start-up and continuing expenses. EHR implementation has been hampered by economic and commercial reasons (Parè et al., 2014). According to past research, the key cost obstacles include high start-up expenses, high continuing expenditures, uncertainty regarding return on investment, and a lack of financial resources. Start-up costs

encompass all expenses incurred to operationalize an EHR system in a physician's practice, such as hardware and software purchases, contracting and selection charges, and installation fees. These prices appear to be in the high range per physician, with EHR software expenditures alone being extremely high. Many experts believe that these expenses are considerable and should be seen as a significant obstacle to physicians adopting EHRs, particularly those with limited IT resources.

In addition to the initial expenditures, building an EHR system necessitates a significant investment in system administration, servicing, management, and support for it to function successfully and efficiently (Anyango, 2017). These charges include the long-term costs of tracking, altering, upgrading, and maintaining EHRs that will be relevant. Furthermore, providers impose exorbitant fees for after-sales servicing. These anticipated expenses make clinicians hesitant to embrace EHRs. The high initial and continuing expenditures of implementing an EHR system might make it difficult for a medical practice to acquire sufficient financial resources. Because these expenses are so high, there may be inadequate financial resources to meet them, especially in small and medium-sized practices with limited IT budgets. Poor maintenance culture, the absence of a strategy to drive EHR deployment, and a lack of adaptable systems, as seen at Korle-Bu Teaching Hospital, have been noted as hurdles to EHR usage in Ghana (Achampong, 2012; Lubeck & Healy, 2012). Adopting EHR technologies at a hospital represents a significant transition for all stakeholders. This transformation process might be quite difficult. Some of the issues that might develop at the beginning of change include the current organizational culture and the urge to protect the status quo, a lack of motivation, individual and local opposition by personnel, and a lack of competent leadership. Organizational culture and difficulties around technology adoption in healthcare settings are critical, but little study has been done on this. An EHR-friendly

culture encourages the adoption of EHRs throughout the organization. According to Protti and Bowden (2010), if the cultural shift necessary to transition from paper to an EHR system does not occur, EHR system adoption will be delayed.

In South Africa, Katurura and Cilliers (2018) undertook a systematic review targeted at ascertaining the challenges associated with the use of EHR across healthcare units. The fifteen articles included in the review had been published between 2006 and 2017 and had reported on EHR usability and associated challenges. The challenges impeding the use of EHR in South African healthcare facilities included technical, environmental and social-related factors. These factors were those pertaining to the lack of supporting infrastructure, lack of commitment and user training, low institutional and political influence concerning policy framework, legislations and regulations, and the lack of managerial support for the implementation of EHR. These factors militated against the high use and adaptation of EHR across healthcare facilities in South Africa.

For this study, the challenges are classified into technological and system-related, workflow and documentation, as well as data security, privacy and training concerns (Achampong, 2012; Lubeck & Healy, 2012; Chaudry & Koehler, 2013; Bedeley & Palvia, 2014; Anyango, 2017; Butler-Henderson & Alanazi, 2020; Antwi, 2022).

2.3.1 Technological and system-related challenges associated with EHR use

The implementation of EHR is faced with several technological and system challenges. An observation made by Acquah-Swanzy (2015) in an interpretive case study identified challenges including poor network connections, illegible handwriting of some doctors, unstable power supply and increased work tasks. Although the facility at the study site had sufficiently prepared before the implementation of EHR, the system still had these pertinent setbacks. In a systematic review by Tolentino and Gephart

(2021), communication barrier was the central challenge identified among nurses in using EHR. The review included 26 articles published between 2008 and 2018. The result of the review observed that though nurses embraced and acknowledged the efficacy of an EHR system in their practice, their experience with the system has been marred by communication barriers. Nurses were reported not to have had meaningful interactions with other clinicians and patients. They had difficulty using the system, experienced constant shutdown of the system, lamented on the lack of customization, inaccessibility of computers in patients' room and the suboptimal function of the system. These challenges are reflected in the frustration of nurses with the workflow of the system. This impeded effective communication between nurses and other clinicians. Patient education was also shown to be a barrier to adopting the EHR system in Australia (Gururajan & Hafeez-Baig, 2014). Other impediments to EHR adoption mentioned in other studies included date and language issues (Bagayoko et al., 2010; Bouamrane & Mair, 2013; Chaudry & Koehler, 2013). Further research found that low performance on goals based on health information technology and data limitations in completing research needs hampered EHR use (Jha et al., 2009; Malaekhe et al., 2012; Newgard et al., 2012).

Isemeck et al. (2019) have explored factors impeding the use of EHR in Kenya. Their investigation examined the use of EHR in 12 government-owned hospitals with a sample of 108 medical professionals. The existing level of EHR use across the studied healthcare units was relatively low, and the level was accounted for by organizational and technological factors. The technologically-related factors included nonfunctional and inadequate ICT infrastructure, erratic power supply and weak internet connectivity. For institutional-related factors, the authors included low financial investment and resources, inadequate training support for staff, inadequate staff with technical expertise,

non-user involvement and the lack of a harmonized standard legal enforcement. The technological factors had a higher influence towards the rate of adoption and usability of EHR among the medical professionals. Relatedly, Jawhari (2016) also examined the challenges of implementing the EHR system in Kenya. The study adopted a qualitative approach to explore the perception of front-line staff about the challenges, benefits and impact of EHR in primary healthcare. The challenges of implementing EHR in primary healthcare were categorized into infrastructure, software and organizational factors. Software and infrastructure challenges included server failures, corrupted files, complex interface, cost, unreliable power supply, inappropriate or the lack of workstations, poor interoperability and confidentiality issues. User satisfaction and acceptance, lack of training and expertise, difficulty in retaining expert staff, low incentivization and the lack of institutional framework as well as sluggish managerial attitude also challenged the successful implementation of EHR in primary healthcare. These challenges were barriers to the usability of EHR among medical professionals. To overcome these challenges, Jawhari (2016) recommended the institution of appropriate infrastructure and software systems.

Some studies in Ghana also identified several technological and software issues in the use of EHRs. Quist (2020) reported that the implementation of EHR by the Ghana Health Service (GHS) faces the following challenges: poor internet connectivity, unstable electricity supply, poor interoperability and connectivity with other units, non-integration of health data and minimal training of EHR staff. These challenges were reported by eighty healthcare workers from ten hospitals across the country. Mensah et al. (2022) explored the post-implementation challenges of EHR in the Central Region of Ghana. The qualitative study conducted 21 in-depth interviews among health workers in two selected health facilities. The post-implementation challenges included

technological, logistical, managerial support, training challenges and equipment issues. Nurses' source of frustration was attributed to erratic power supply, unstable internet connectivity and lack of funding. These challenges limited the use of EHR to critical care units only. At Asamankese Government Hospital in Ghana, Antwi (2022) also identified the following challenges faced in the implementation of EHRs: unstable internet network, electricity instability, inadequate training of staff and IT literacy. The study, however, observed that not only did clinicians acknowledge the benefits of EHRs, but they had also integrated the system into their operations. All units at the hospital were using EHRs. The identified challenges, however, were threats to the continual use of the system in the hospital.

Finally, at the Seventh Day Adventist Hospital in Kumasi of Ghana, Addo and Agyepong (2020) observed some challenges associated with the use of EHR in healthcare delivery. The study adopted a quantitative approach to explore the variables among 100 medical personnel. The identified challenges were inadequate computer knowledge and frequent power outages that resulted in frequent system downtime with its resultant effect on lack of interest in using the implemented EHR system. The challenges hampered the smooth functionality of the system.

2.3.2 Challenges associated with workflow and EHR use

Many medical professionals, including nurses, assert that using EHRs requires more time for each patient compared to using paper because, in some situations, using paper records during clinical encounters may be less cumbersome and efficient. When using EHRs, physicians may have to stop halfway through the consultation to enter details about patients or kinds of prescriptions, which will interrupt the flow. Furthermore, because physicians are poor at typing and inputting data, each patient visit will take longer than previously (Anyango, 2017). Another issue is that, depending on

the EHR system used, the EHR may result in increased clinical documentation time. Some physicians and nurses may be resistant to change and will prefer to stick with the old paper systems (Connelly et al., 2011). Failure to change clinical processes while using an EHR may ruin whatever efficacy that the investment intends to accomplish.

Nurses and physicians are concerned about a lack of time. Insufficient time, monetary capacity, and understanding of computer proficiency have been identified as primary impediments preventing general practitioners from using electronic records over manual records. Due to their high workload, physicians are concerned about a shortage of time (Jarousse, 2010). Additionally, nurses and physicians frequently believe that devoting additional time to training would interfere with their work schedule and reduce their productivity. As a result, training programmes should be designed in such a way that they do not interfere with the staff's usual work schedule (Anyango, 2017). Understanding the various components of the EHR system and workflow process is critical so that training may be structured in such a manner that particular components of training are delivered to specific persons who will only utilize that component in their work. However, EHR implementation with optimized time planning may be viable (Ford et al., 2010).

According to Boulus (2005) and Kleynhans (2011), users of EHR confront transitory phase issues such as disruptions of work timelines, a temporary decline in output, and the usage of both digital and paper-based records. Furthermore, Logue and Effken (2012) discovered that stakeholders with limited health literacy, high computer fears, and physical and cognitive disability were unable to utilize EHR systems. Furthermore, personnel changes that resulted from some individuals abandoning the facility, practice, or management position, as well as the loss of computers, resulted in poor EHR adoption (Kamadjeu et al., 2005). Alami et al. (2022) also explored

challenges with EHR usability during propounding on pediatric inpatients. The study observed the usability of EHR among thirty residents using surveys, video recording and think-aloud comments. Usability challenges included data overload, missing/hidden information, difficulty identifying trends, and conducting manual calculations which affected the workflow of EHRs. These challenges affected the effectiveness of residents during propounding tasks in paediatric care. To overcome these challenges, the following suggestions were proffered: reducing information access costs, creating a checklist, automating calculations and standardizing notes, as well as frequent EHR training.

At KATH in Ghana, Gyamfi (2016) explored the facilitators and barriers to the use of EHRs for emergency medical care. Using the qualitative descriptive approach, 24 medical officers from the emergency department of KATH were sampled. From the interview engagement, EHR usability had the following constraints: funding, inadequate computers and accessories, full-time information technology experts, automatic data and power backups, data entry and limited office space. Staff at the emergency department also doubled as EHR personnel, which increased their workload and limited the effective use of the system thereby affecting workflow and documentation system. The facilitators of EHR usability included the desire to improve emergency medicine practice through data persistency; availability of some logistics such as computers, scanners, printers, office space, open source EHR, local area network and external storage devices; involvement of emergency department's internal management committee; motivation; previous knowledge in information technology; capacity building and training.

2.3.3 Data security concerns on EHR use

The security of the EHR plan is a critical issue that must be addressed. This is because system conflicts hinder all nurses and physicians from doing their duties. Backup and redundancy plans must be developed. Since medical records include a plethora of sensitive information, computerized medical records might be a lucrative target for hackers (Prairie, 2011). Theft of medical information is already a big issue, which will be exacerbated by the introduction of EHRs (Featherly, 2011). The majority of healthcare professionals in poor countries lack or have insufficient fundamental ICT knowledge or skills needed to properly utilize EHR systems (Alverson et al., 2009; Bedeley & Palvia, 2014), which may impact users' decisions to adopt or reject EHR systems. In the opinion of Ajami and Tadi (2013), EHR developers tend to underestimate the computer knowledge and abilities required of healthcare practitioners, even though the system is not only perceived as sophisticated but also extremely difficult to use in practice. Furthermore, some people's typing abilities and speed are rather slow, while others lack this. Some of the variables influencing EHR adoption in health institutions are lack of knowledge and abilities in the usage of computer technology among users (Kanyua, 2015). In reality, it prevents health practitioners from fully utilizing the system.

A further impediment to EHR implementation in underdeveloped nations is a lack of healthcare professional knowledge and availability. According to Achampong (2012), the number of employees with the desired level of IT literacy in EHR is insufficient; however, the few who have received IT training are not involved in mainstream ICT-related activities such as EHR design and implementation because the existing human resource post lacks a structure for ICT professionals. On the contrary, hiring and maintaining experienced full-time informatics workers is tough (Alexandria

et al., 2011). In many instances, medical facilities lack health IT staff for no apparent reason, and if they are available, they get overwhelmed due to the multiple duties that they are involved in, keeping them from fully engaging in the implementation of any new technology (Isemeck et al., 2019). As a result, in order to satisfy the efficacy and value of EHR system usage, healthcare institutions must provide appropriate staff experience and a workforce that is dependable and capable; otherwise, the problem of limited EHR system adoption will remain.

Another major impediment to EHR adoption is the breach of patients' privacy, which is becoming more of a worry due to the nature of information exchanged among healthcare personnel. To defend against non-user access, the hospital management and healthcare worker code of conduct establish privacy legislation rules and regulations to ensure the privacy and security of patient information. Many studies have revealed that health workers consider this information as very crucial and would not readily send it into a digital platform because doing so could lead to legal issues (Boonstra & Broekhuis, 2010), or if entered, there are security challenges because they are likely to be monitored by individuals who play a role in the system's use. Also, policymakers participating in the construction of this system do not impose severe procedures to safeguard patient data safety and privacy (Menachemi & Collum, 2011).

A systematic review by Alanazi et al. (2020) also pointed out risks of adopting an EHR system such as disruption of provider-patient communication, privacy and security challenges and high start-up and maintenance costs as challenges to the utilization of EHRs. The authors reported that these challenges were negative perceptions held by healthcare personnel towards their use of EHRs. The review included 14 articles published between 2006 and 2017. Reid (2016) observed basic challenges to the implementation of EHR within primary care practices in Southwestern

Ohio. In a developed city, the adoption and usability of EHR by primary care physicians were minimal. The barriers accounting for the low utilization of the system were poor staff training on the system, feelings of frustration with the new system, staff resistance, system purchase cost, maintenance cost, system failures and selection of suitable system of medical operations. In Doha (Qatar), Mather (2019) observed that the usability of EHR among nurses is highly challenged. The qualitative exploratory study interviewed 11 nurses, after which content analysis was applied to interpret the data. Though nurses expressed satisfaction with the EHR system, they acknowledged technical and administrative challenges associated with the implementation of the system. The lack of training and education, unavailability of technical expertise, difficulty in adapting to change and the lack of managerial support affected the implementation of EHR.

In Ghana, Attafuah et al. (2022), in a qualitative study, explored barriers to the effective use of EHR by nurses. The study engaged 10 health leaders from nine hospitals in three regions of Ghana. The assessment showed that poor quality of records, lack of involvement of frontline clinicians in the development of the EHR system, inadequate training of staff and limited workstations are some of the challenges associated with the use of EHR in hospitals. These challenges resulted in the dissatisfaction of health leaders with the EHR system rolled out by the Ghana MOH via GHS. Providing additional workstations, involving staff in the system development and circulating more computers were some prudent suggestions put forward to motivate the use and acceptance of the EHR system among healthcare providers.

2.4 Strategies to overcome barriers and challenges of EHR systems

Several studies have recommended that policy initiatives should be developed with a focus on funding, training of technical support personnel on EHR, interoperability, adaptability, and flexibility of EHR usage (Jha et al., 2009; Robertson et

al., 2010; Mair et al., 2012). Similarly, O'Malley et al. (2009) discovered a need to broaden the review of policies to include care coordination to promote inter-practice data sharing and multi-provider decision support, as well as emphasize the enactment of policy reforms that will improve EHR implementation within medical settings. Bouamrane and Mair (2013) discovered that stakeholders of EHR need to become familiar with EHR suppliers and promote the culture of user-centred improvement to tackle EHR challenges and increase its utility in Scotland. Pragmatic steps are to be implemented to harness patient data security and privacy in EHR-enabled healthcare settings (Achampong, 2012). Furthermore, strong leadership and project management strategies, personalized effective training and education, and the development of EHR usage guidelines are required to be considered (Cotea, 2010; Canada Health Infoway, 2013). In their research of EHRs in poor countries, Kalogiropoulos et al. (2008) concluded that it would be beneficial if developed countries could assist developing countries in designing and implementing EHRs that are appropriate for their environment. Furthermore, they added that additional study, assessment, and development in the EHR disciplines are advocated to address the EHR issues.

If healthcare practitioners build and cultivate trust in their relationships with colleagues, the future of EHR will be greatly enhanced. Staff are encouraged to prioritize organizational objectives over personal aspirations, even in competitive circumstances (McCarthy et al., 2014). EHRs should be viewed as public commodities, according to a recent study. In addition, healthcare institutions were required to develop various rules and incentives for EHR implementation (Gururajan & Hafeez-Baig, 2014). There appeared to be a demand for work practice support systems to facilitate electronic data interchange (Miller & Sim, 2004). EHR project success stories needed the engagement of all levels of leadership, as well as political will at the organizational and

national levels, to establish and sustain the EHR system. EHR stakeholders are also required to draw lessons from prior users' deep experiences and contribute to the design, deployment, and maintenance stages of EHR. Local dialogues on EHR might be organized to gather public input (HMIS, 2008; Williams & Boren, 2008; Robertson et al., 2010; Mair et al., 2012).

Rozenblum et al. (2011) proposed the establishment of a main provincial medical information office to set criteria for the utilization of relevant EHR data. Clinicians are urged to invest in EHR (Rozenblum et al., 2011). EHR users are urged to meet frequently and engage in extended discussions on IT issues in order to promote EHR usage by exchanging information and experiences. Clinicians should take typing lessons (Boulus, 2005).

2.5 Factors influencing the challenges associated with the utilization of EHR system

In Ghana, Essuman et al. (2020) explored the factors associated with the utilization of EHR in the Eastern Region. The study employed the quantitative approach. Three hundred and ninety-six healthcare professionals were sampled for the study. The use of EHR among the professionals was relatively low, an indication given by 59% of the sample. The factors associated with the usability included the lack of EHR software packages, lack of technical personnel to install and operate EHR technology resources, high cost of EHR resources, poor communication between users and the lack of computer competence. These personal and institutional-related factors accounted for the poor use of EHR across healthcare facilities in the Eastern Region. In their conclusion, the researchers indicated that although medical professionals acknowledge the significance of EHR, there are pertinent challenges impeding its effective use across healthcare facilities.

In Jordanian hospitals, Alnassar (2012) reported that organizational and individual characteristics factors significantly affect behavioural intentions to use EHR. Organizational factors included leadership structure and attitude, user involvement and participation, training and high cost of implementing EHRs. Individual characteristics also include user-patient relationship, user autonomy and resistance to new technology.

2.6 Summary of chapter two

In this present century, ICT has taken up the majority of physical work activities and assignments. Hence, EHRs have replaced the paper systems in most hospitals, where most of the healthcare facilities across the world have resorted to the use of EHRs for processing and storing patients' information. This section reviewed relevant literature on the definition, components, and benefits of EHR, including the usability, adoption and challenges of EHR faced by nurses across countries.

Some of the numerous advantages associated with the utilization of EHRs are increased efficiency, improved correctness of health papers, and timely and accessible documentation. The components of EHRs are summarized as administrative, laboratory, vital signs, radiology, pharmacy, physician, nursing, and clinical documentation.

Despite the multitudinous benefits of EHRs, there are still challenges in the application of EHRs among nurses, which are classified into technological and system-related challenges; workflow and documentation challenges; and data security, privacy and training concerns. Although the Ghana MOH and GHS have been implementing EHRs in some health facilities for the past years, some of these challenges among nurses may co-exist. This calls for studies of this nature and superlative efforts to be put in place to address EHRs issues across the globe, especially in Ghana to achieve optimal data management in the provision of patient care.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This section explains how the study was conducted. It details the study design and identifies the study site, population, sample size, sampling technique, study variables, tool and procedure for collecting data, data analysis and presentation, data management, and ethical considerations.

3.1 Research design

A design is chosen for each research that acts as a foundation for the whole investigation. The design anticipates how data for the study will be collected, analyzed, and presented to answer the researcher's questions. The descriptive cross-sectional study design was used for this present investigation. According to McCombes (2022), a descriptive cross-sectional survey is an attempt to describe an actual situation while analyzing the connections between the variables. A survey is a data-gathering strategy in which questionnaires or personal interviews are used to collect information about a specific group to explain a phenomenon (Ponto, 2015). This approach enables the collection of information to test hypotheses or answer questions about the current state of the subject of investigation. Since it includes documenting, describing, analyzing, and interpreting existing situations, this design aids in the diagnosis of a problem. The descriptive research strategy was used because it helped elicit a large number of opinions from a diverse range of responses from the population being studied. It also helped define factors in the study work thoroughly and precisely. Using this approach allowed the researcher to investigate challenges associated with the use of EHR by nurses in 37 Military Hospital without having to change any of the research variables.

3.2 Research setting

The 37 Military Hospital in Accra was the study area. The facility is a specialized hospital located in Accra, on the main road between Kotoka International Airport and Central Accra. It is the largest military hospital in the Republic of Ghana. It has a 400-bed capacity and was founded in the year 1941. Its main objective is to provide health care to service personnel and their families, civilian employees of the Ministry of Defense and their families, ex-service personnel as well as the general public for a fee. Currently, it also serves as the government's emergency and disaster hospital and United Nations Level IV Hospital in the West Africa sub-region. The facility has a 24-hour accident and emergency department, pharmacy, x-ray, dental, gynaecology, paediatrics, veterinary, ear, nose, and throat, surgical, ophthalmology, pathology, renal dialysis, public health, and trauma departments. The hospital has 19 nursing wards/units providing health services to the population. There are about 847 professional nurses and midwives working in various nursing wards or units in the hospital which include Trauma and surgical, Allied ward, Anaesthesia, Accidents and emergency, General theatre, Maternity ward, Medical emergency, Medical ward, Neurosurgery, Obstetrics and gynaecology, Orthopedic ward, Pathology and Surgical wards. The EHR system was replaced with paper health records system and was deployed across the various departments in the hospital since 2017. The EHR system is currently operational in all the nursing wards/units which is used to manage patients care. The facility also has a medical education unit that supervises a health training school.

3.3 Target population

A population is a group or set of all the units to whom the study findings will be applied. In other words, a population is a collection of all the units that share the

variable feature under investigation and for whom research findings may be generalized (Shukla, 2020). Registered nurses and midwives at the 37 Military Hospital were the population for this study.

3.3.1 Inclusion criteria

- Registered nurses and midwives from the rank of staff nurse/midwife to principal nurse/midwife working in the various units/wards of the 37 Military Hospital.
- Registered nurses and midwives who were available on the day of data collection.
- Registered nurses and midwives who agreed to be part of the study and signed a written informed consent form.

3.3.2 Exclusion criteria

- Registered nurses and midwives who were not on duty on the day of data collection.
- Nurses and midwives below the rank of staff nurse (such as enrolled nurses and nurse assistants) and above the rank of principal nurses/midwives (like deputy director of nursing/midwifery officers, and chief nursing/midwifery officers).

3.4 Sample size determination

A subset of the population will be used as a representative of the entire group as a whole (Kendra, 2010). When the population size is quite large, researchers collect information from a smaller group. This information from the smaller group is a representation of the total population under study. The selection of the sample size was based on Slovin's (1960) formula for determining sample sizes. The formula is given as $n = \frac{N}{1 + (N) \times (E)^2}$; where n = Sample size; N = Nursing population of 1,198 at 37 Military Hospital, and E = margin of error of 5% at 95% confidence interval. After substituting the numbers into the formula, the final sample size was approximated at 300.

3.5 Sampling technique

A multi-stage sampling procedure was used to recruit the study respondents at 37 Military Hospital. In the first stage, all the 19 nursing wards/units in the hospital were listed. Thirteen wards/units were purposefully selected because these wards/units frequently use all the interfaces of the EHRs in the provision of services to patients every day.

Furthermore, a probability proportional-to-size technique was employed to determine the sample size in each of the 13 selected wards/units. This technique was based on the number of nursing/midwifery staff in each of the selected wards/units as exhibited in Table 2.

Finally, a convenience sampling technique was used to select the eligible nurses/midwives for the study. This technique is also referred to as accidental or availability sampling. Available and willing respondents were recruited in the study until the desired sample size in each selected ward/unit was reached. The researcher distributed the instrument to only respondents who fell within the inclusion criteria set for the study.

Table 2: Approximated sample size in the selected wards/units

Ward/unit	Total nurses/midwives in each ward (A)	Percentage (B%): $A/847 \times 100$	Proportionate sample size: $B\% \times 300$
Trauma and surgical	25	3.0	9
Allied ward	108	12.7	38
Anaesthesia	53	6.3	19
Emergency	25	3.0	9
General theatre	51	6.0	18
Maternity ward	51	6.0	18
Medical emergency	108	12.7	38
Medical ward	130	15.3	46
Neurosurgery	51	6.0	18
Obstetrics & gynaecology	25	3.0	9
Orthopedic ward	51	6.0	18
Pathology	53	6.3	19
Surgery	116	13.7	41
Total	847	100	300

3.6 Data collection instrument

A structured questionnaire was the main instrument for the data collection for the study. This questionnaire was adapted from Electronic Health Record End User Survey by Michigan Public Health Institute, USA (Harbor, 2019) after obtaining permission. Amedahe (2000) posits that a questionnaire consists of a list of statements or questions relating to the aims of research questions or hypotheses to be answered and verified and which the respondent is required to answer by writing or shading. This instrument ensured a high level of anonymity. The questionnaire had four main sections. Section A contained items to elicit demographic information. It was used to ask the following: gender, age, educational level, work experience, ward/unit, and professional rank. Items in Section B had been designed on a five-point Likert scale format with responses ranging from strongly disagree to strongly agree. There were 10 items in this section seeking the technological and system-related challenges associated with the use of EHR by nurses. In Section C, there were 10 items also designed on a five-point Likert scale format. These items sought to find out workflow and documentation challenges associated with the use of EHR by nurses. The last section, Section D contained 10 items also designed on a five-point Likert scale format which sought data security, privacy, and training challenges associated with the use of EHR by nurses.

3.7 Data collection procedure

The main technique of data collection was through the use of a pre-tested structured questionnaire on printed A4 papers. The data collection was done from March to April 2024 during the morning and afternoon nursing shifts from 9:00 am to 4:00 pm with the help of four well-trained research assistants. The recruitment of four research assistants was necessary to help in the data collection procedures including participant recruitment and consent forms process across the 13 nursing wards/units.

The principal investigator was there to supervise the data collection exercise by randomly moving across the nursing wards/units monitor the data collection activities in the hospital. However, nurses who sent the questionnaire to their homes were followed with phone calls by the research assistants. Permission was sought from the hospital administration, departmental heads and in-charges of the various wards/units to give access to the research assistants to involve respondents of the unit in the study. Since the ward/unit in-charges were already aware of the study and period of data collection, they helped the research assistants to identify eligible nurses per the morning/afternoon shift for the study. The eligible respondents were briefly enlightened on the purpose of the study being carried out and assured of their anonymity and the added value of participating in the study. The demands of the questionnaire were well explained to the respondents before the administration was done. Respondents who agreed to be part of the study were made to sign an informed consent form. The research assistants gave support to respondents who needed it. During the participant recruitment process, two nurses declined to participate in the study since they were going for a meeting.

To ensure that items in the questionnaire were effectively responded to and also prevent normal service disturbances at the unit/ward, respondents were given a day to respond to the items and return the filled questionnaire to the research assistants during the following day's shift. The questionnaires that were completely filled by the respondents on the day of data collection were collected. The research assistants and the principal investigator kept track of all questionnaires distributed to ensure a high collection rate.

3.8 Data management

The questionnaires were in printed form (hard copies) and protected in a suitcase with a lock and key during data collection. After data collection, the data (respondents'

information) was inputted and transported onto a password-protected computer, which was kept in a well-locked cabinet in a lockable room. All the respondents' information was coded to prevent exposing their identity. The database was only available to authorized members of the research team. The questionnaires (hard copies) would be destroyed after the completion of the study in three years.

3.9 Data analysis

The Statistical Product and Service Solutions (SPSS) version 27.0 was used for the analysis of the data. A quantitative analytical approach was adopted in analyzing the gathered data, which gave easy comprehension of the analysis made. The data was inputted into Microsoft Excel before transferring it onto the SPSS platform. Since a paper form of questionnaire was used for data collection, the responses were first typed onto Microsoft Excel. This allows adequate data cleaning before importing into SPSS platform. The SPSS does not allow direct typing of individual participant's information onto the system. A p-value less than 0.05 was considered significant during the analysis of data. The sociodemographic characteristics of respondents were selected as the independent variables, while the main challenges nurses face in using EHR (technological and system-related challenges; workflow challenges; and data security concerns) were the main dependent variables during the multivariate analyses. These variables have been explained in Table 1.

Descriptive statistics in the form of frequency and percentage values were used to analyze the data. Tables were generated to give a pictorial representation of the data. The sociodemographic characteristics of the respondents were summarized and/or categorized using simple descriptive values. The mean value and standard deviation (SD) of the continuous socio-demographic variables (age and work experience), as well as the challenges faced by nurses in the use of EHRs in the Likert scale, were reported

since they were evenly distributed among the respondents. During the analysis, the “agree” and “strongly agree”, and “disagree” and “strongly disagree” segments of the challenges faced by the nurses were grouped as “Agree” and “Disagree” respectively. This method of categorization was informed by previous studies (Hessels et al. 2015; Kalra, 2006) and consultations with a statistician which provides a very good statistical inference.

Univariate linear regression analysis was used to determine the association between sociodemographic characteristics and challenges (technological and system-related; workflow; and data security concerns) faced by the nurses at the 37 Military Hospital. The sociodemographic variables that showed significant association ($p < 0.05$) with the challenges faced by nurses were ushered into the multivariate analyses. In the multivariate analyses, multivariate linear regression was used to identify factors associated with the challenges faced by nurses.

3.10 Reliability and validity

To ensure reliability and validity in the study, the questionnaires were first developed based on research objectives. The questionnaire was adapted from Electronic Health Record End User Survey by Michigan Public Health Institute, USA (Harbor, 2019). After which, they were shown to the supervisor for review of content validity. The questionnaires (research instruments) were assessed to determine if they can accurately measure the set objectives. Needed rectifications and additions were made by the principal investigator after discussions with the research supervisor. Cronbach's alpha of 0.69 indicated that the reliability of items in the questionnaire was adequate for the study.

Furthermore, pretesting was done. The questionnaire was pretested at the Greater Accra Regional Hospital (Ridge Hospital) where 30 questionnaires were administered to

the eligible nurses using the same selection criteria. The pretesting did not only help to restructure some of the wording of the questions and assess the clarity and pattern of the questions but also aided in obtaining deeper insights into the study events. In addition, it was aimed to rule out ambiguous statements and to ascertain respondents' general reactions. It also helped to establish participants' interest in answering the questions.

Finally, the principal investigator provided optimal supervision during the period of data collection. The filled questionnaires were double-checked to ensure that all omissions were rectified and corrected. Moreover, the research assistants verified each questionnaire for errors of completion and for a follow-up to ensure clarity from respondents on each day.

3.11 Ethics consideration

All necessary considerations were given to ethics binding the conduct of scientific and academic research. All needed introductory letters were obtained from the Ethics Review Committee of the University of Ghana and the 37 Military Hospital to gain entrance into the research site. Upon reaching the research site, management of the facility was consulted to gain entrance into the facility. Respondents were briefed on the rationale for the study and made aware of their right to participate and not to participate. Respondents were also informed of all associated risks in participating in the study and assured of their confidentiality. Those who declined to participate were not coerced in any form. No respondent was coerced to consent to participate in the study. Information gathered was also treated for academic purposes solely and not leaked to a third party.

3.12 Summary of chapter three

This section has highlighted the methodology of the study. It has described the study design, study area, population, sample size, sampling technique, study variables, data collection tool and procedure, analysis technique and ethical considerations. This

study, therefore, used a descriptive cross-sectional design to collect data from 300 eligible nurses working at 37 Military Hospital in the Greater Accra Region of Ghana.



CHAPTER FOUR

RESULTS

4.0 Introduction

This chapter presents the results of primary data collected from nurses during the study. The presentation was showcased in the form of frequency tables. All questionnaires were included in the data analysis representing a 100% response rate.

4.1 Sociodemographic characteristics of the nurses

Table 3 shows the sociodemographic characteristics of the 300 sampled nurses at 37 Military Hospital. Simple descriptive statistics in the form of frequency and percentage were used to summarize and categorize the sociodemographic variables of the nurses.

The mean ($\pm$ sd) age of the nurses was 33.0 ($\pm$ 4.0) years, while the majority of them were found in the age range of 31–35 years (66.0%). More than two-thirds of the nurses were females (76.3%) and were also holders of bachelor's degrees (78.0%) in the nursing education spectrum. Additionally, a greater proportion of the nurses were senior nursing officers (43.7%), while 15.3% of the nurses were stationed at the Medical ward of the 37 Military Hospital. Whereas most of the nurses had working experience between five to ten years, the mean($\pm$ sd) working experience among these sampled nurses was 8.5 ($\pm$ 4.1) years.

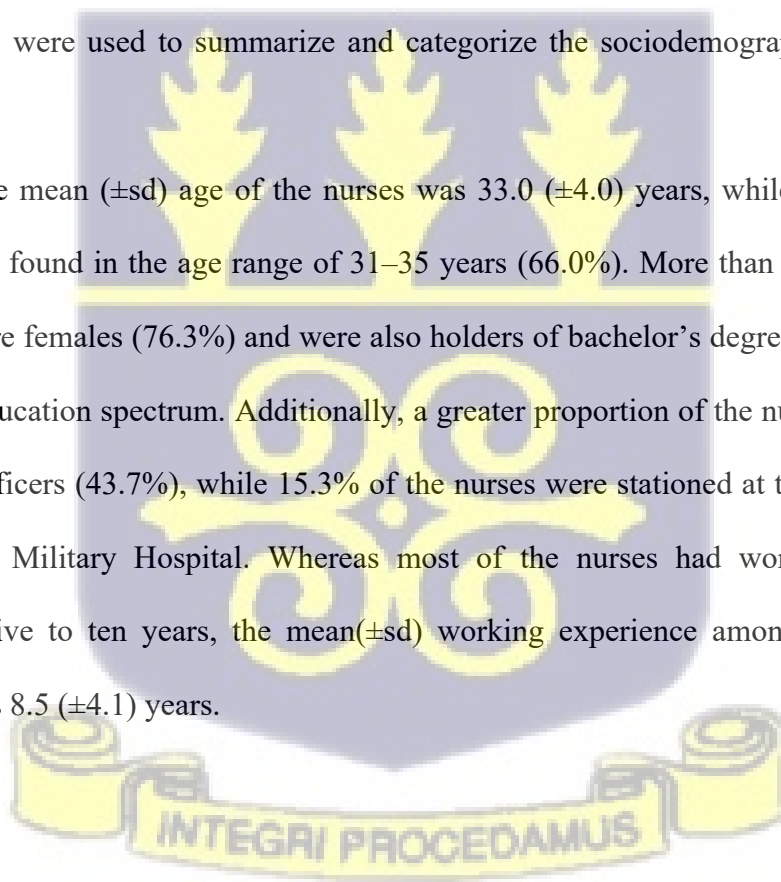


Table 3: Sociodemographic characteristics of nurses (N=300)

Variable	Frequency distribution	
	Frequency (N)	Percentage (%)
Age category		
26–30 years	83	27.7
31–35 years	198	66.0
> 35 years	19	6.3
Mean ($\pm$ sd)	33.0 ($\pm$ 4.0)	
Gender		
Female	229	76.3
Male	71	23.7
Level of education		
Diploma	9	3.0
Bachelor's degree	234	78.0
Master's degree	57	19.0
Work experience		
Less than 5 years	93	31.0
5–10 years	141	47.0
11–15 years	66	22.0
Mean ($\pm$ sd)	8.5 ($\pm$ 4.1)	
Unit/ward		
Trauma and surgical	9	3.0
Allied ward	38	12.7
Anaesthesia	19	6.3
Emergency	9	3.0
General theatre	18	6.0
Maternity ward	18	6.0
Medical emergency	38	12.7
Medical ward	46	15.3
Neurosurgery	18	6.0
Obstetrics & gynaecology	9	3.0
Orthopedic ward	18	6.0
Pathology	19	6.3
Surgery	41	13.7
Professional rank		
Staff nurse	9	3.0
Senior staff nurse	28	9.3
Senior certified registered anesthetist	19	6.3
Nursing officer	95	31.7
Senior nursing officer	131	43.7
Senior midwifery officer	9	3.0
Principal nursing officer	9	3.0

Source: Field data (2024)

4.2 Technological and system-related challenges faced by nurses in the use of EHRs

As shown in Table 4, descriptive analyses in the form of frequency and percentage with mean and standard deviation were used to summarize the technological and system-related challenges faced by nurses in the use of EHRs.

The majority of the nurses agreed that the EHR interface is user-friendly and easy to navigate (90.3%), their digital literacy skills enable them to fully leverage the capabilities of the EHR (89.7%), they were confident in using EHR functionalities efficiently (87.7%), they encounter technical glitches and system downtime which hinder their productivity (85.0%), and sometimes face interoperability issues between EHR systems in accessing patient data from different facilities (66.3%). In addition, nearly two-thirds of the nurses (59.3%) disagreed that they encounter challenges in adapting to changes in the EHR interfaces and workflows, while 41.7% of them also disagreed that EHR systems updates and improvements are communicated effectively to them.

Table 4: Technological and system-related challenges on the use of EHRs among nurses (N=300)

Variable	Frequency distribution							
	Agree		Disagree		Undecided		Mean	SD
	N	%	N	%	N	%		
The EHR interface is user-friendly and easy to navigate	271	90.3	27	9.0	2	0.7	3.96	0.83
I feel confident in using EHR functionalities to access patient information efficiently.	263	87.7	19	6.3	18	6.0	4.03	0.72
Technical glitches and system downtime hinder my productivity when using the EHR	255	85.0	36	12.0	9	3.0	4.21	1.06
I find it challenging to adapt to changes in EHR interfaces and workflows.	112	37.3	178	59.3	10	3.3	2.81	1.01
Interoperability issues between EHR systems create difficulties in accessing patient data from different facilities.	199	66.3	46	15.3	55	18.3	3.70	0.95
I receive sufficient training to effectively utilize the various features of the EHR.	214	71.3	76	25.3	10	3.3	3.55	1.07
My digital literacy skills enable me to fully leverage the capabilities of the EHR	269	89.7	9	3.0	22	7.3	4.18	0.68
EHR systems updates and improvements are communicated effectively to users.	128	42.7	125	41.7	47	15.7	3.01	1.11
The EHR system integrates well with other hospital technologies and information systems.	139	46.3	96	32.0	65	21.7	3.05	1.03
Data entry in the EHR is time-consuming and affects my ability to provide direct patient care.	169	56.3	111	37.0	20	6.7	2.80	1.12

Source: Field data (2024)

SD: Standard deviation

4.3 Workflow challenges faced by nurses in the use of EHRs

Table 5 displays the workflow challenges of using EHR. The above category of challenges faced by the nurses is statistically described by using frequency and percentage.

Most of the nurses believed that; using the EHR system for documentation increases the time they spend on data entry tasks (65.3%), the EHR system supports efficient and effective patient care delivery (74.3%), EHR documentation processes are well-integrated into their daily nursing routines (78.0%), the EHR system provides adequate tools and templates for comprehensive documentation (78.3) and also EHR use has positively impacted their overall workflow efficiency (78.7%). On the other hand, more than half of the nurses disagreed that they have challenges balancing patient care tasks with data entry in the EHR (53.3%), and also encountered difficulties in locating and accessing specific patient information within the EHR (66.0%).

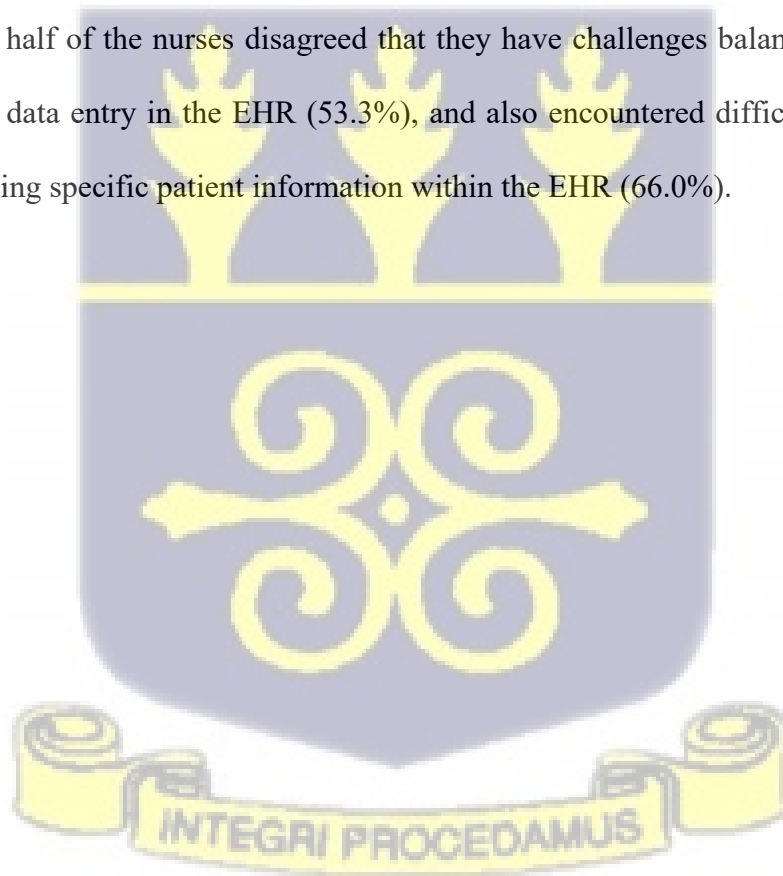


Table 5: Workflow challenges on the use of EHRs among nurses (N=300)

Variable	Frequency distribution							
	Agree		Disagree		Undecided		Mean	SD
	N	%	N	%	N	%		
Using the EHR system for documentation increases the time I spend on data entry tasks	196	65.3	104	34.7	0	0.0	3.34	1.24
EHR implementation has caused disruptions in my established nursing workflows.	66	22.0	234	78.0	0	0.0	2.41	1.05
I find it challenging to balance patient care tasks with data entry in the EHR.	102	34.0	160	53.3	38	12.7	2.77	1.04
EHR documentation processes are well-integrated into my daily nursing routines.	234	78.0	56	18.7	10	3.3	3.72	0.91
The EHR system supports efficient and effective patient care delivery.	223	74.3	12	4.0	65	21.7	3.86	0.71
I feel confident in my ability to record patient data accurately and completely in the EHR.	253	84.3	19	6.3	28	9.3	4.12	0.82
EHR usage has positively impacted my overall workflow efficiency.	236	78.7	28	9.3	36	12.0	3.85	0.79
EHR data entry requires frequent interruptions, affecting my focus on patient interactions	148	49.3	124	41.3	28	9.3	3.20	1.19
The EHR system provides adequate tools and templates for comprehensive documentation.	235	78.3	55	18.3	10	3.3	3.78	0.95
I encounter difficulties in locating and accessing specific patient information within the EHR.	83	27.7	198	66.0	19	6.3	2.61	0.89

Source: Field data (2024)

SD: Standard deviation

4.4 Data security concerns faced by nurses in the use of EHRs

Descriptive statistics in the form of frequency and percentage were also used to present the data security concerns faced by nurses in the use of EHRs.

As presented in Table 6, most of the nurses disagreed that they received adequate training on data security protocols and best practices for handling patient information in the EHR (56.7%) and felt that they were well-prepared to handle potential data breaches or security incidents related to the EHR (41.3%). Furthermore, a greater percentage of the nurses expressed concerns about the security of patient data stored in the EHR system (72.0%), mentioned that the EHR system allows for secure and controlled

sharing of patient data when authorizing healthcare providers (72.0%), were aware of the consequences of data security breaches and the importance of reporting any potential incidents (78.3%), and have confidence in navigating the EHR system without compromising patient privacy or data security (81.3%). Finally, slightly above half of the nurses stated that the hospital has effective measures in place to safeguard patient data from unauthorized access (56.3%) and were confident in their ability to protect patient confidentiality and privacy when using the EHR (56.0%).

Table 6: Data security concerns on the use of EHRs among nurses (N=300)

Variable	Frequency distribution						Mean	SD
	Agree		Disagree		Undecided			
	N	%	N	%	N	%		
I am concerned about the security of patient data stored in the EHR system	216	72.0	47	15.7	37	12.3	3.71	0.90
I receive adequate training on data security protocols and best practices for handling patient information in the EHR	112	37.3	170	56.7	18	6.0	2.74	1.11
I am confident in my ability to protect patient confidentiality and privacy when using the EHR	168	56.0	66	22.0	66	22.0	3.40	0.99
The EHR system provides clear guidelines on data access and permissions to ensure privacy compliance.	140	46.7	123	41.0	37	12.3	3.05	0.93
I feel well-prepared to handle potential data breaches or security incidents related to the EHR.	121	40.3	124	41.3	55	18.3	2.96	1.04
The hospital has effective measures in place to safeguard patient data from unauthorized access.	169	56.3	48	16.0	83	27.7	3.46	0.83
I am aware of the consequences of data security breaches and the importance of reporting any potential incidents.	235	78.3	38	12.7	27	9.0	3.71	0.88
Ongoing training and updates on data security are readily available to support my knowledge and skills.	156	52.0	115	38.3	29	9.7	3.01	1.13
The EHR system allows for secure and controlled sharing of patient data when authorizing healthcare providers.	216	72.0	56	18.7	28	9.3	3.66	0.92
I feel confident on navigating the EHR system without compromising patient privacy or data security.	244	81.3	18	6.0	38	12.7	3.87	0.69

Source: Field data (2024)

SD: Standard deviation

4.5 Influence of sociodemographic characteristics on technological and system-related challenges

Table 7 describes the association between sociodemographic characteristics and technological and system-related challenges. Univariate and multivariate linear regression analyses were used to identify sociodemographic variables associated with the technological and system-related challenges. The final regression model was statistically significant ($p < 0.001$), with the dataset's variability at 75%.

It was revealed that nurses aged between 26–30 years ($\beta: -0.262$; 95%CI: $-0.496, -0.028$; $p = 0.028$) and 31–35 years ($\beta: -0.469$; 95%CI: $-0.587, -0.353$; $p < 0.001$) had decreased technological and system-related challenges as compared to those below 31 years. Female nurses had higher technological and system-related challenges as compared to their male counterparts ($\beta: 0.216$; 95%CI: $0.078, 0.354$; $p = 0.002$). Comparably, nurses with working experience of 5–10 years ($\beta: 0.405$; 95%CI: $0.273, 0.537$; $p < 0.001$) and 11–15 years ($\beta: 0.856$; 95%CI: $0.678, 0.948$; $p < 0.001$) were associated with increased technological and system-related challenges than those with less than 5 years of experience.

Moreover, nurses who work at the general theatre ($\beta: 0.253$; 95%CI: $0.016, 0.488$; $p = 0.036$) and orthopedic ($\beta: 0.551$; 95%CI: $0.287, 0.815$; $p < 0.001$) wards were associated with increased technological and system-related challenges whereas those working at the emergency ($\beta: -0.718$; 95%CI: $-0.989, -0.447$; $p < 0.001$), maternity ($\beta: -0.349$; 95%CI: $-0.613, -0.084$; $p = 0.010$) and neurosurgery ($\beta: -0.334$; 95%CI: $-0.575, -0.092$; $p = 0.007$) units/wards were associated with decreased challenges. Lastly, nursing officers ($\beta: 1.453$; 95%CI: $1.151, 1.757$; $p = 0.021$), and senior nursing officers ($\beta: 1.351$; 95%CI: $1.087, 1.616$; $p < 0.001$) had increased technological and system-related challenges as compared to principal nursing officers.

Table 7: Multivariate linear regression for the association between sociodemographic characteristics and technological and system-related challenges

Variable	Univariate linear regression			Multivariate linear regression		
	β	95%CI	p-value	β	95%CI	p-value
Age group						
> 35 years			Reference			Reference
31–35 years	-0.237	-0.345, -0.130	<0.001*	-0.469	-0.587, -0.353	<0.001*
26–30 years	0.350	0.140, 0.559	0.001*	-0.262	-0.496, -0.028	0.028*
Gender						
Male			Reference			Reference
Female	0.178	0.060, 0.296	0.003*	0.216	0.078, 0.354	0.002*
Level of education						
Master's degree			Reference	N/A		
Bachelor's degree	0.047	-0.077, 0.171	0.458	N/A		
Diploma	0.830	0.528, 1.131	0.391	N/A		
Work experience						
Less than 5 years			Reference			Reference
5–10 years	-0.144	-0.258, -0.032	0.012*	0.405	0.273, 0.537	<0.001*
11–15 years	0.203	0.067, 0.338	0.004*	0.856	0.678, 0.948	<0.001*
Unit/Ward						
Trauma and surgical			Reference			Reference
Allied ward	0.145	-0.104, -0.393	0.253	0.284	-0.089, 0.479	0.175
Anaesthesia	-0.310	-0.582, -0.038	0.025*	0.157	-0.105, 0.419	0.239
Emergency	-1.200	-1.516, -0.884	<0.001*	-0.718	-0.989, -0.447	<0.001*
General theatre	-0.350	-0.624, -0.076	0.012*	0.253	0.016, 0.488	0.036*
Maternity ward	-0.700	-0.974, -0.426	<0.001*	-0.349	-0.613, -0.084	0.010*
Medical emergency	-0.118	-0.367, 0.130	0.350	0.309	-0.090, 0.528	0.206
Medical ward	-0.552	-0.797, -0.307	<0.001*	-0.184	-0.379, 0.011	0.065
Neurosurgery	-0.550	-0.824, -0.276	<0.001*	-0.334	-0.575, -0.092	0.007*
Obstetrics & gynecology	-0.300	-0.616, 0.016	0.063	-0.319	-0.595, 0.042	0.224
Orthopedic ward	-0.350	-0.624, -0.076	0.012*	0.551	0.287, 0.815	<0.001*
Pathology	-0.711	-0.982, -0.439	<0.001*	-0.199	-0.446, 0.048	0.113
Surgery	-0.441	-0.689, -0.194	0.001*	0.179	-0.052, 0.410	0.128
Professional rank						
Principal nursing officer			Reference			Reference
Staff nurse	1.200	0.820, 1.580	0.069	1.828	0.485, 2.171	0.076
Senior staff nurse	0.289	-0.020, 0.599	0.067	1.321	-0.975, 1.667	0.081
Senior anesthetist	0.205	-0.121, 0.532	0.217	0.979	-0.654, 1.305	0.112
Nursing officer	0.373	0.091, 0.654	0.010*	1.453	1.151, 1.757	0.021*
Senior nursing officer	0.531	0.252, 0.808	<0.001*	1.351	1.087, 1.616	<0.001*
Senior midwifery officer	0.200	-0.180, -0.580	0.302	1.100	-0.794, 1.406	0.289
Final regression model						
R^2	0.750					
p-value	<0.001					
Source: Field data (2024)						
*p < 0.05			β : Estimate			

4.6 Influence of sociodemographic characteristics on workflow challenges

Linear regression analyses were performed to identify sociodemographic variables associated with the workflow challenges. It was disclosed that the model explained 75% of the variance in the data showing a significance of $p < 0.001$.

As shown in Table 8, it was discovered that nurses with diploma certificates had increased workflow challenges ($\beta: 3.470$; 95%CI: 3.084, 3.856; $p < 0.001$) compared to those with master's degrees. Furthermore, nurses working in areas such as allied ($\beta: -0.424$; 95%CI: -0.619, -0.230; $p < 0.001$), emergency ($\beta: -0.663$; 95%CI: -0.920, -0.345; $p < 0.001$), general theatre ($\beta: -0.357$; 95%CI: -0.594, -0.121; $p = 0.003$), neurosurgery ($\beta: -0.361$; 95%CI: -0.607, -0.115; $p = 0.004$), and pathology ($\beta: -0.407$; 95%CI: -0.647, -0.166; $p = 0.001$) wards/units exhibited decreased challenges on EHR workflow processes while those stationed at the anaesthesia ($\beta: 0.246$; 95%CI: 0.007, 0.484; $p = 0.044$), and maternity ($\beta: 0.432$; 95%CI: 0.121, 0.742; $p = 0.007$) units/wards encountered increased EHR workflow challenges.

Finally, as compared to principal nursing officers, senior staff nurses ($\beta: 3.010$; 95%CI: 2.655, 3.366; $p < 0.001$), nursing officers ($\beta: 2.730$; 95%CI: 2.421, 3.039; $p < 0.001$), and senior nursing officers ($\beta: 2.489$; 95%CI: 2.217, 2.761; $p < 0.001$) faced increased EHR workflow challenges in the execution of their duties at the hospital.



Table 8: Multivariate linear regression for the association between sociodemographic characteristics and workflow challenges

Variable	Univariate linear regression			Multivariate linear regression		
	β	95%CI	p-value	β	95%CI	p-value
Age group						
> 35 years			Reference	N/A		
31–35 years	0.020	-0.104, 0.145	0.750	N/A		
26–30 years	0.148	-0.094, 0.390	0.231	N/A		
Gender						
Male			Reference	N/A		
Female	0.054	-0.075, 0.184	0.409	N/A		
Level of education						
Master's degree			Reference			Reference
Bachelor's degree	0.109	-0.027, 0.244	0.115	0.343	-0.234, 0.453	0.541
Diploma	0.840	0.512, 1.167	<0.001*	3.470	3.084, 3.856	<0.001*
Work experience						
Less than 5 years			Reference			Reference
5–10 years	-0.135	-0.259, -0.010	0.035*	-0.051	-0.167, 0.065	0.389
11–15 years	0.105	-0.045, 0.256	0.169	0.638	-0.472, 0.804	0.701
Unit/Ward						
Trauma and surgical			Reference			Reference
Allied ward	-0.568	-0.847, -0.289	<0.001*	-0.424	-0.619, -0.230	<0.001*
Anaesthesia	-0.316	-0.620, -0.011	0.042*	0.246	0.007, 0.484	0.044*
Emergency	-0.800	-1.155, -0.445	<0.001*	-0.633	-0.920, -0.345	<0.001*
General theatre	-0.900	-1.207, -0.593	<0.001*	-0.357	-0.594, -0.121	0.003*
Maternity ward	-0.600	-0.907, -0.293	<0.001*	0.432	0.121, 0.742	0.007*
Medical emergency	-0.224	-0.503, 0.055	0.116	0.100	-0.142, 0.342	0.418
Medical ward	-0.791	-1.066, -0.517	<0.001*	-0.192	-0.412, 0.028	0.086
Neurosurgery	-1.050	-1.357, -0.743	<0.001*	-0.361	-0.607, -0.115	0.004*
Obstetrics & gynecology	-0.800	-1.155, -0.445	<0.001*	-0.111	-0.383, 0.161	0.421
Orthopedic ward	-0.100	-0.407, 0.207	0.522	-1.489	-1.217, 1.760	0.621
Pathology	-0.968	-1.273, -0.664	<0.001*	-0.407	-0.647, -0.166	0.001*
Surgery	-0.880	-1.157, -0.604	<0.001*	-0.227	-0.464, 0.010	0.061
Professional rank						
Principal nursing officer			Reference			Reference
Staff nurse	1.100	0.672, 1.528	<0.001*	0.530	-0.081, 0.980	0.082
Senior staff nurse	0.529	0.180, 0.877	0.003*	3.010	2.655, 3.366	<0.001*
Senior certified anesthetist	0.211	-0.157, 0.578	0.261	2.167	-1.855, 2.480	0.201
Nursing officer	0.354	0.037, 0.670	0.029*	2.730	2.421, 3.039	<0.001*
Senior nursing officer	0.344	0.030, 0.657	0.032*	2.489	2.217, 2.761	<0.001*
Senior midwifery officer	0.400	-0.028, 0.828	0.067	1.457	-1.111, 1.802	0.991
Final regression model						
R^2	0.752					
p-value	<0.001					
Source: Field data (2024)	*p < 0.05	β : Estimate				



4.7 Influence of sociodemographic characteristics on data security concerns

Table 9 displays the association between sociodemographic characteristics and data security concerns on EHR. Univariate and multivariate linear regression analyses were used to identify sociodemographic variables associated with data security concerns. The model was statistically significant ($p < 0.001$) and also explained almost two-thirds ($R^2 = 0.637$) of the variance in the data.

The analysis revealed that nurses with 5–10 years of work experience had lesser EHR-related data security concerns ($\beta: -0.502$; 95%CI: $-0.643, -0.360$; $p < 0.001$) as compared to those with less than five years of experience. Additionally, nurses from general theatre ($\beta: -1.039$; 95%CI: $-1.327, -0.753$; $p < 0.001$), maternity ($\beta: -1.694$; 95%CI: $-2.071, -1.318$; $p < 0.001$), medical emergency ($\beta: -1.039$; 95%CI: $-1.333, -0.746$; $p < 0.001$), obstetrics and gynaecology ($\beta: -1.723$; 95%CI: $-2.053, -1.394$; $p < 0.001$), pathology ($\beta: -0.719$; 95%CI: $-1.011, -0.427$; $p < 0.001$) and surgery ($\beta: -0.752$; 95%CI: $-1.040, -0.474$; $p = 0.011$) ward/units encountered fewer data security concerns as compared to those from trauma and surgical emergency unit. Nurses with senior ranks including nursing officers ($\beta: -1.893$; 95%CI: $-2.268, -1.158$; $p = 0.001$), and senior midwifery officers ($\beta: -0.529$; 95%CI: $-0.949, -0.110$; $p = 0.013$) had lesser EHR data security concerns as compared to the principal nursing officers.

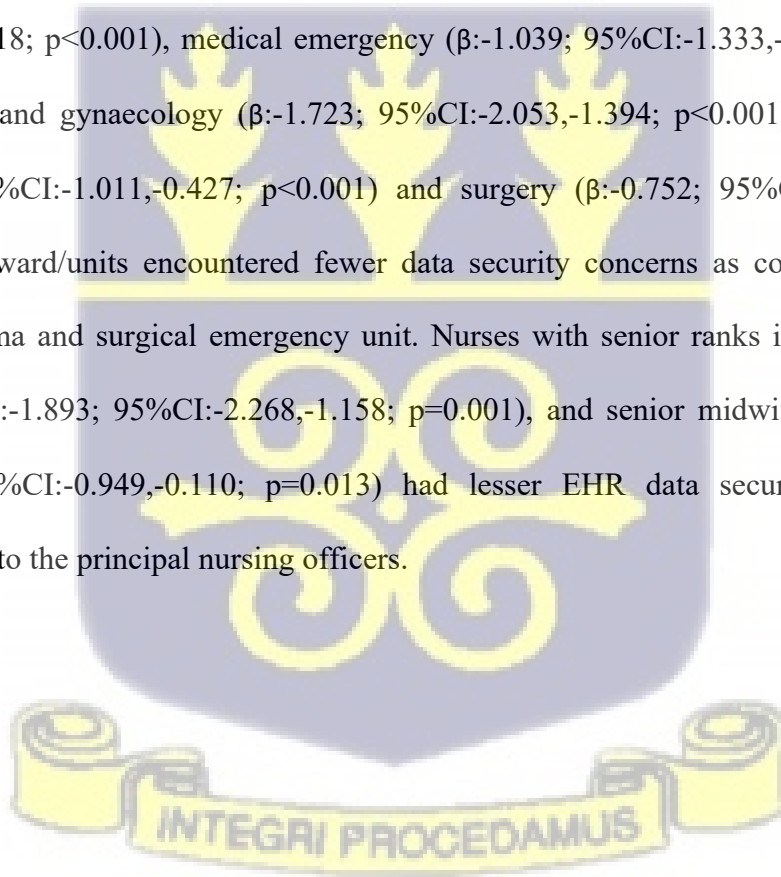


Table 9: Multivariate linear regression for the association between sociodemographic characteristics and data concerns

Variable	Univariate linear regression			Multivariate linear regression		
	β	95%CI	p-value	β	95%CI	p-value
Age group						
< 35 years			Reference	N/A		
31–35 years	-0.114	-0.237, 0.009	0.070	N/A		
26–30 years	0.220	-0.019, 0.460	0.071	N/A		
Gender						
Male			Reference	N/A		
Female	0.127	-0.002, 0.256	0.063	N/A		
Level of education						
Master's degree			Reference			Reference
Bachelor's degree	0.189	0.051, 0.328	0.007*	-0.071	-0.203, 0.062	0.297
Diploma	-0.219	-0.556, 0.117	0.200	-2.080	-2.548, 1.611	0.186
Work experience						
Less than 5 years			Reference			Reference
5–10 years	-0.192	-0.318, -0.066	0.003*	-0.502	-0.643, -0.360	<0.001*
11–15 years	-0.145	-0.297, 0.007	0.061	-1.225	-1.427, 1.024	0.066
Unit/Ward						
Trauma and surgical			Reference			Reference
Allied ward	-0.137	-0.425, 0.152	0.351	-0.279	-0.515, 0.043	0.071
Anesthesia	-0.200	-0.515, 0.114	0.212	-0.275	-0.565, 0.014	0.062
Emergency	-0.100	-0.467, 0.267	0.592	-0.195	-0.544, 0.154	0.271
General theatre	-0.450	-0.767, -0.132	0.006*	-1.039	-1.327, -0.753	<0.001*
Maternity ward	-1.000	-1.318, -0.682	<0.001*	-1.694	-2.071, -1.318	<0.001*
Medical emergency	-0.689	-0.978, -0.401	<0.001*	-1.039	-1.333, -0.746	<0.001*
Medical ward	-0.011	-0.294, 0.272	0.940	-0.759	-1.025, 0.492	0.851
Neurosurgery	-0.250	-0.568, 0.067	0.122	-0.974	-1.272, 0.675	0.091
Obstetrics & gynecology	-1.000	-1.367, -0.633	<0.001*	-1.723	-2.053, -1.394	<0.001*
Orthopedic ward	-0.300	-0.618, 0.018	0.064	-1.224	-1.553, 0.894	0.072
Pathology	-0.400	-0.715, -0.085	0.013*	-0.719	-1.011, -0.427	<0.001*
Surgery	-0.307	-0.593, -0.021	0.036*	-0.752	-1.040, -0.464	0.011*
Professional rank						
Principal nursing officer			Reference			Reference
Staff nurse	-0.600	-1.017, -0.182	0.005*	-6.119	-5.574, 6.665	0.154
Senior staff nurse	-0.329	-0.668, 0.010	0.058	-1.752	-2.184, 1.321	0.061
Senior certified anesthetist	0.089	-0.269, 0.448	0.623	-1.010	-1.389, 0.631	0.724
Nursing officer	-0.322	-0.631, -0.013	0.041*	-1.893	-2.268, -1.518	0.001*
Senior nursing officer	-0.147	-0.452, 0.158	0.343	-1.124	-1.453, 0.794	0.256
Senior midwifery officer	-1.000	-1.417, -0.582	<0.001*	-0.529	-0.949, -0.110	0.013*
Final regression model						
R^2	0.637					
p-value	<0.001					
Source: Field data (2024) *p < 0.05 β : Estimate						

4.8 Summary of chapter four

This chapter presented the results of the study after quantitative analysis, and the results were presented in the form of frequency tables. Obviously, most of the nurses were females and young adults with higher working experience. The majority of the

nurses appreciated technological and system-related challenges; workflow challenges; and data security concerns in the utilization of EHRs during patient care.



CHAPTER FIVE

DISCUSSION

5.0 Introduction

This chapter illustrates the discussion of key findings. The significant findings and the valuable information obtained from this study have been carefully discussed based on relevant literature.

EHRs have become an essential tool in modern healthcare settings, providing numerous benefits such as improved patient care, increased efficiency, and reduced medical errors (Acquah-Swanzy, 2015). However, the usability of EHR systems among nurses can be challenging due to various barriers. Considering the technicalities of information and communication and the digital nature of EHRs, data on the barriers to its use is required to promote its effective usage among nurses (Hessels et al., 2015). In Ghana, the use of technology such as EHRs in the healthcare system has become one of the positive steps in attaining Universal Health Coverage by 2030 through appropriate data management. EHR system could be associated with some challenges among nurses due to its novelty nature in most health facilities in Ghana. Therefore, this study examined the challenges faced by nurses with the use of EHR at 37 Military Hospital in the Greater Accra Region of Ghana.

In this study, the nurses were averagely young (33.0 ± 4.0 years). This finding is parallel to a study by Anaman-Torgbor et al. (2022), where their study respondents were in their youthful age but inconsistent with a study by Acheampong and his colleagues (Acheampong et al., 2021). The willingness of respondents to participate across the various studies could account for the age differences. This means that the nurses in this study are energetic and have longer years of service in the nursing profession. Additionally, considering them as a younger population, they have several years ahead

of them to practically train newly recruited nurses to improve health service delivery via available technological tools and methods. Therefore, it is necessary to assess technology-related challenges and improve their knowledge levels about information communication and technology.

More than two-thirds of the nurses in the facility (n=234; 78.0%) attained a bachelor's degree in nursing. The study results were not only similar to the findings reported by Acheampong et al. (2021) but also incongruent with some studies in Ghana (Honyenuga & Adzoyi, 2012; Ohene et al., 2022). The different research settings could be accountable for these variations, as the former study was conducted in a tertiary hospital where there is a higher level of recruitment of degree-holder nurses. It also indicates that the higher educational level among the nurses in this study is a strong indication that most of the nurses have the capacity to use quality improvement and basic research ideas to solve technology-related challenges in the service through appropriate guidance.

The majority of the nurses (n=207; 69.0%) have worked for at least five years in the hospital. This is also in line with the professional rank of the respondents, where nearly all the nurses (n=291; 91.0%) in the hospital are senior professionals. These findings are dissimilar to reports in sub-Saharan Africa (Mensah et al., 2022; Hinneh et al., 2023), where few nurses were in the junior nursing rank and had long-term service. Different study settings and working environments in sub-Saharan Africa could be accountable for this dichotomy. It gives an added advantage for the nurses to use their long-term service and seniority in the nursing profession to fully operationalize the use of the EHRs in the facility. These nurses will be able to prudently navigate through the EHRs and explore some of the deficiencies in the EHR system for proper redress and interventional measures.

5.1 Technological and system-related challenges faced by nurses in the use of EHRs

Regarding the technological and system-related challenges faced by nurses in using EHRs, majority of them asserted that the interface is user-friendly (90.3%) and are also confident in using EHR functionalities to access patient information efficiently (87.7%). Several studies across the world (Ford et al., 2010; Ajami & Tadi, 2013; Kanyua, 2015) agree with the present study findings. Meanwhile, recent findings from Ghana that reported that some EHR interface and its operationalities are complex to navigate (Antwi, 2022; Mensah et al. 2022) are incongruent with this study's results. The former studies were conducted in developed countries that have well-developed EHR systems as compared to the latter studies. These recent studies reported that most clinical staff, like nurses encounter EHR interface difficulties and always struggle to identify the pattern and workflow areas during service hours. The results of our study could happen due to the introduction of ICT at the training institutions and the deep love of ICT by the current nurses. These nurses now use ICT for their licensure examinations (Ghana Nursing and Midwifery Council, 2020) and can appreciably manage the use of EHRs at their workplaces.

About 85.0% of the respondents agreed that technical glitches and system downtime hinder their productivity when using the EHR while few nurses (37.3%) find it challenging to adapt to changes in EHR interfaces and workflows. This aligns with findings from studies conducted by Bowman (2013), Tsai et al. (2020), and Jimma and Enyew (2022), all indicating that technical glitches and system downtime pose obstacles to productivity when using EHR systems. On the contrary, Anyango (2017) discovered that most medical practitioners, especially nurses and doctors, easily adapt to the changes in the EHR interface and that technical issues are minimal. The time of initiation and love for the EHR system use by nurses in the various study hospitals and

countries could be responsible for the disparities. The implication here is that the prevalence of technical glitches and system downtime significantly impedes the productivity of users when interacting with EHR systems.

The study revealed that challenges with interoperability among EHR systems pose obstacles in retrieving patient data from various facilities (66.3%), while most of the nurses believed they had received sufficient training to effectively utilize the various features of the EHR (71.3%). This is congruent with the study by Anyango (2016) and Attafuah et al. (2022), which also showed that despite the high level of training given to health practitioners (nurses), there exist interoperability issues between EHR systems that create difficulties in assessing patient data from different health facilities by these health staff. These reported studies were conducted in Southern Ghana where there are similar work culture characteristics among health professionals. The study finding suggests that healthcare facilities should prioritize investments in interoperability solutions that facilitate seamless exchange of patient data across different EHR systems. This could involve adopting standardized protocols and technologies to ensure compatibility and smooth data transfer.

Additionally, it was revealed that digital literacy skills enable most nurses to fully leverage the capabilities of the EHR (89.7%), but half of them think that EHR systems updates and improvements are communicated effectively to them (42.7%). The findings are not only analogous to some studies from Qatar and America (Reid 2016; Mather, 2019) but also disagree with some findings from Kenya (Jawhari, 2016; Isemeck et al., 2019). The variance in study settings could explain the different findings. The former studies are from developed countries (Qatar and America), whereas the latter study was conducted in a low-income country (Kenya). The deep love for social media such as Facebook, WhatsApp and TikTok among nurses could be accountable for this

study's findings. Social media does not only build the digital literacy skills of health professionals but also helps them to interact effectively with ICT (Kumari, 2019; Sanfo, 2023) which indirectly places these nurses in an advantageous position to adequately leverage the abilities of the EHR system. Also, the EHR system and its communications are mostly managed by the administrators of the software which prevents core clinical staff including nurses to receive regular system updates (Sanfo, 2023).

Finally, more than half of the respondents (56.3%) agreed that data entry in the HER is time-consuming and affects their ability to provide direct patient care. Meanwhile, less than half of them (46.3%) disclosed that the EHR system integrates well with other hospital technologies and information systems. These results align with the findings of studies by Gopidasan et al. (2022), Msiska et al. (2017), and Negro-Calduch et al. (2021), which revealed similar challenges. In South Africa, dissimilar findings were elaborated where the authors reported that most clinical staff find it easier to enter data accurately and precisely into the EHR system during the provision of care (Katurura & Cilliers, 2018). The discrepancies in the level and frequency of training before the introduction of the EHR system from different parts of the world (Australia, Ghana, Malawi, South Africa, United Kingdom, and USA among others) could explain this variation. Given the widespread acknowledgement among nurses, it is essential to evaluate current EHR systems to identify areas where data entry processes could be simplified, thereby reducing the time nurses spend on documentation tasks. Healthcare facilities can also provide frequent and comprehensive training sessions for healthcare staff on efficient data entry techniques and utilize resources to continuously educate them on best practices for documentation within EHRs.

5.2 Workflow and documentation challenges faced by nurses in the use of EHRs

Regarding the workflow and documentation challenges of using EHR, out of the 300 nurses, 65.3% agreed that using the EHR system for documentation increases the time they spend on data entry tasks, while the majority of them disagreed that EHR implementation has caused disruptions in their nursing workflows (78.0%). This is in agreement with other similar studies (Jawhari et al. 2016, Keshta and Odeh 2021, Baumann et al. 2018) that stated that EHR implementation is associated with increased documentation time for hospital staff. For instance, previous studies using EHR audit logs estimated that healthcare professionals spent on average 3.7 hours per day using the EHR for their daily work (Goldstein et al., 2020). In contrast, other studies have revealed that EHRs shorten the documentation time by more than 50% (Poissant et al., 2005; Bisrat et al., 2021). The EHR systems used in the studied hospitals and countries are different with diverse interfaces which could be responsible for these variations. Most of the available technological tool permits nurses to commonly perform a left-click or double-click with a computer mouse before inputting data onto an EHR page. This could explain why less experienced nurses spent much longer performing EHR documentation. One recommendation to reduce input time is to introduce a touchscreen-based EHR in addition to a computer mouse (Guo et al., 2019).

Almost four-fifths of the nurses supported that the EHR documentation processes are well-integrated into the daily nursing routines (78.0%), and so the EHR system supports efficient and effective patient care delivery (74.3%). A cross-sectional study by Addo and Agyepong (2020) supports this study finding, while a recent study in Kenya (Mwang'ombe, 2021) disclosed that the EHR system does not contain all the nursing activities, which renders the EHR inefficient. The different types of EHR systems used in different countries could be responsible for these findings. The EHRs

used in most hospitals in developing countries like Ghana have improved over the years due to regular system updates, hence most of the nursing tasks are adequately integrated into the system (Gyamfi, 2016; Alami et al., 2022), thereby improving overall patient outcome when accurately used by nurses.

Although a large number of the nurses were confident in recording patients' data accurately and completely in the EHR system (84.3%), about one-third of them found it challenging to balance patient care tasks with data entry in the EHR (34.0%). The study findings are in line with some Ghanaian studies (Attafuah et al., 2022; Mensah et al., 2022). Similar characteristics of the study settings could account for these results. A plausible explanation for these findings is that nurses at 37 Military Hospital have been trained adequately on the use of EHRs, which makes them able to use and record patients' information in the EHR system effectively. Moreover, since the nurses have been used to the paper system of providing care to patients for a long time, they sometimes encounter difficulties in balancing patients' care with their information in the EHR system.

Another workflow and documentation challenge of using EHR is that, as reported by the majority of respondents (49.3%), EHR data entry requires frequent interruptions, affecting their focus on patient interactions. Notwithstanding, about 78.7% agreed that EHR usage has positively impacted their overall workflow efficiency. This is consistent with past studies that stated that EHR data entry requires frequent interruptions, affecting users' focus on patient interactions (Alkureishi et al., 2016; Murphy and Reddy, 2017; Boonstra & Broekhuis, 2010). The similarity is plausible because these aforementioned studies were conducted a few months after the introduction of the EHR system at their workplaces. However, they emphasized that the EHR system has sufficiently enhanced the workflow effectiveness and efficiency. In

light of the significant challenges reported on frequent interruptions during EHR data entry, it is imperative to implement strategies to mitigate this issue and enhance healthcare professionals' focus on patient interactions. This is because most of the nurses have witnessed the use of the EHR system and how it is improving work activities, thereby making work easier and faster.

It was established that a large proportion of the nurses consented that the EHR system provides adequate tools and templates for comprehensive documentation (78.3%), while less than one-third of the nurses face difficulties in locating and accessing specific patient information within the EHR system (27.7%). Some findings in Jordan and Asia (Alnassar, 2012; Alami et al., 2022) are in support of these findings. However, a systematic review by Katurura and Cilliers (2018) is in disagreement. The type of study design reported by the researchers could be responsible for these variations. Over the years, the EHRs have undergone transformational changes and modifications (Sanfo, 2023). These modifications have contributed enormously to its satisfaction rate among medical professionals in the area of documentation (Connelly et al., 2011; Gururajan & Hafeez-Baig, 2014)., thereby making it less difficult to access client information in the EHR system (Triff et al., 2012).

5.3 Data security challenges faced by nurses in the use of EHRs

The majority of the nurses/midwives (72.0%) expressed concern about the security of patient data stored in the EHR system, although 56.0% of them were confident in their ability to protect patient confidentiality and privacy when using the EHR. Similarly, Keshta and Odeh (2021) reported that most health workers are interested in data privacy and security. It is important to safeguard health data in the EHR system at separate locations in different forms due to its sensitivity in providing care to patients. Despite rapid technological advancement, EHR systems remain heavily

vulnerable to security breaches. When patients' health data are shared or linked without their knowledge, autonomy is jeopardized. Over the past decade, almost 3 million health records have been disclosed, lost, or stolen in the United States of America (Jamshed et al., 2015). There are several strategies that healthcare organizations can use to enhance the security of their databases, including having a backup, the use of firewalls, Firefox technology, and encryption. Multiple safeguards may be necessary to strengthen the protection of health databases (Basil et al., 2022).

Less than half of the nurses received adequate training on data security protocols and best practices for handling patient information in the EHR system (37.3%), were well-prepared to handle potential data breaches or security incidents related to the EHRs (40.3%), and also agreed that EHR system provides clear guidelines on data access and permissions to ensure privacy compliance (46.7%). The findings agree with some studies in Southern Ghana (Achampong, 2022; Antwi, 2022; Attafuah et al. 2022) where the authors reported inadequate EHR training, inadequate preparation to use EHRs and support, leadership and privacy concerns among medical professionals, including nurses are prominent challenges they face in the utilization of EHRs. However, some reports by Reid (2016) and Mather (2019) were not in support of the findings. The diverse study settings could explain these distinctive findings. Training and adequate preparation (being psychological, physical and environmental) are very key in the use of EHRs (Cotea, 2010; Tumbo, 2020). Medical professionals including nurses can do their best to maintain privacy and confidentiality in the use of EHRs when they are adequately trained and prepared before using the EHR system (WHO, 2006).

More than half of nurses, 56.3% and 72.0%, respectively, stated that the hospital has effective measures in place to safeguard patient data from unauthorized access and that the EHR system allows for secure and controlled sharing of patient data when

authorizing healthcare providers. This is similarly reported in the studies conducted by Ayamolowo et al. (2023), Essuman et al. (2020), and Ramoo et al. (2022) which acknowledged that health facilities and EHR operators have strategies to protect EHR-related data. These researchers employed similar cultural settings and study methodology which accounts for this comparison as most of the EHR systems are in their early phase of application. A strong recommendation to further enhance the security measures regarding patient data in EHR systems could be to regularly conduct comprehensive security audits and penetration testing. These audits should assess the system's vulnerabilities and strengths, ensuring that the security measures remain robust and up-to-date (Wuerth et al., 2014). Moreover, establishing clear protocols for handling and sharing patient data, along with strict access controls and monitoring mechanisms, can further reinforce the protection of sensitive information within the EHR system (Hamade et al., 2019).

Furthermore, regarding the training challenges of the nurses, slightly above half (52.0%) agreed that ongoing training and updates on data security are readily available to support their knowledge and skills. This is in line with the research by Lambooij et al. (2017), Abu Raddaha (2018), and Jaber et al. (2021) where the majority of nurses had ongoing training and updates on data security to support their knowledge and skills. A valuable recommendation to address training challenges among nurses would be to implement a structured and continuous education program focused specifically on data security and EHR usage. This program should offer regular training sessions, workshops, and online resources tailored to the needs of healthcare professionals (Abu Raddaha, 2018). Additionally, integrating feedback mechanisms to assess the effectiveness of the training programs and identifying areas for improvement can ensure

that the training remains relevant and beneficial (The Society for Adolescent Health and Medicine, 2014; Gedikci Ondogan et al., 2023).

The majority of the nurses were aware of the consequences of data security breaches and the importance of reporting any potential incidents (78.3%) and also confident in navigating the EHR system without compromising patient privacy or data security (81.3%). Tang (2003) and Tang & McDonald (2006) conform with this study's results. They reported that a well-implemented EHR system reduces data security and privacy problems among health practitioners. Across the globe, similar EHR security systems are used in the provision of care to patients. The benefits of the EHR system in the health system outweigh its demerits, which call for the need for EHR adoption in Ghana (Ghana E-Health Strategy, 2009; Olukorode et al., 2024). This is because the use of the EHR system empowers nurses and other medical practitioners to satisfactorily perform effective data management and control, thereby reducing data security breaches and communication gaps (Jabour & Jones, 2013; Olukorode et al., 2024).

5.4 The influence of sociodemographic characteristics on technological and system-related challenges

The study's results revealed a significant association between age group and technological/system-related challenges ($p < 0.05$). Nurses aged 26 to 30 years ($\beta: -0.262$; 95%CI: $-0.496, -0.028$; $p = 0.028$) and 31 to 35 years ($\beta: -0.469$; 95%CI: $-0.587, -0.353$; $p < 0.001$) old were associated with lower technological and system-related challenges. In contrast, according to Smith and Anderson (2020), older individuals may encounter more difficulties in adapting to new technologies or systems due to factors such as decreased technological exposure or cognitive flexibility (Pew Research Center, 2019). The dissimilarities in study settings could contribute to this variation. Therefore, healthcare facilities should be interested in younger nurses during their recruitment

process and consider implementing targeted training programs or user-friendly interfaces to accommodate the needs of older employees to mitigate these challenges (Jones et al., 2021).

The present study found a significant association between gender and EHR challenges as female nurses were associated with increased technological or system-related challenges (β :0.216; 95%CI:0.078,0.354; $p=0.002$). This aligns with existing literature indicating gender disparities in technology adoption and proficiency (Hargittai & Shafer, 2006). Similar work environments among these studies could be responsible for this relationship. The study by Cheryan et al. (2017) indicates that women may encounter barriers such as stereotype threat or lack of representation in technology-related fields, contributing to higher levels of perceived challenges. Hence, gender biases in technology usage and adoption should be discouraged since most nurses are females (Haque et al., 2020). To address this disparity, health facilities should promote inclusivity and diversity in technology-related roles and provide support mechanisms tailored to the needs of female nurses (Wajcman, 2020).

Work experience was found to be significantly correlated with technological/system-related challenges ($p<0.05$). Nurses with work experience of 5–10 years (β :0.405; 95%CI:0.273,0.537; $p<0.001$) and 11–15 years (β :0.856; 95%CI:0.678,0.948; $p<0.001$) were associated with increased technological and system-related challenges. This finding is incongruent with that of Van Dijk (2020), which has a dissimilar study setting to that of the present study. The possible explanation could be that employees with longer tenure may exhibit resistance to change or reliance on outdated systems, leading to increased difficulties in adopting new technologies (Ragunathan et al., 2008). Other researchers may also argue that individuals with less

experience may face challenges due to limited exposure to technological tools or organizational systems (Alam & Perry, 2002).

Some wards/units at the 37 Military Hospital were associated with technological/system-related challenges ($p < 0.05$). Nurses/midwives who worked at the general theatre ($\beta: 0.253$; 95%CI: 0.016, 0.488; $p = 0.036$) and orthopedic ($\beta: 0.551$; 95%CI: 0.287, 0.815; $p < 0.001$) wards were associated with higher technological and system-related challenges whereas those working at the emergency ($\beta: -0.718$; 95%CI: -0.989, -0.447; $p < 0.001$), maternity ($\beta: -0.349$; 95%CI: -0.613, -0.084; $p = 0.010$) and neurosurgery ($\beta: -0.334$; 95%CI: -0.575, -0.092; $p = 0.007$) units/wards were correlated with decreased challenges. It could be possible that the nurses at the emergency, maternity and neurosurgery wards/units possess greater technological proficiency and practical experience with electronic systems. Furthermore, the consistent oversight and supportive supervision provided by ward In-charges could foster a culture of accountability and attentiveness, thereby enhancing staff engagement with the EHR system and minimizing operational challenges. The nursing wards/units (especially general theatre and orthopedic wards) in the hospital can prioritize educational initiatives aimed at improving digital literacy among nurses working at the general theatre and orthopedic wards to bridge this gap (Ponte & Simon, 2021). Inservice training activities on the use of EHR should be promoted in the hospital to improve patient care and data management.

The findings of the study highlight a significant association between professional rank and technological/system-related challenges ($p < 0.05$). Higher professional ranked nurses including nursing officers ($\beta: 1.453$; 95%CI: 1.151, 1.757; $p = 0.021$), and senior nursing officers ($\beta: 1.351$; 95%CI: 1.087, 1.616; $p < 0.001$) were positively related to technological/system-related challenges. This contradicts a similar study finding which

found that lower-ranking employees experienced technological challenges (Chen et al., 2021). Healthcare facilities can foster a culture of collaboration and communication to facilitate knowledge-sharing and problem-solving among nurses of different ranks, thereby mitigating the impact of hierarchical barriers on technology adoption (Carmeli et al., 2013).

5.5 The influence of sociodemographic characteristics on workflow challenges

The present study highlighted a noteworthy relationship between education level and workflow (including documentation) challenges ($p < 0.05$). Nurses with diploma certificates demonstrated a significantly higher beta estimate of 3.470, indicating increased challenges ($\beta: 3.470$; 95%CI: 3.084, 3.856; $p < 0.001$). This disagrees with the findings by Gagnon et al. (2020), who disclosed that healthcare professionals with higher education levels display greater proficiency in managing complex workflows and utilizing electronic documentation systems. The professional rank of nurses used in the comparable study could be responsible for this dichotomy. Disparities in educational opportunities may exacerbate workflow challenges among nurses with higher educational attainment, underscoring the importance of targeted interventions to enhance digital literacy and workflow management skills due to the wrong perception associated with higher level of education (Hodgkinson et al., 2017).

The study also identified a significant association between unit/ward and workflow/documentation challenges ($p < 0.05$). Nurses working in areas such as allied ($\beta: -0.424$; 95%CI: -0.619, -0.230; $p < 0.001$), emergency ($\beta: -0.663$; 95%CI: -0.920, -0.345; $p < 0.001$), general theatre ($\beta: -0.357$; 95%CI: -0.594, -0.121; $p = 0.003$), neurosurgery ($\beta: -0.361$; 95%CI: -0.607, -0.115; $p = 0.004$), and pathology ($\beta: -0.407$; 95%CI: -0.647, -0.166; $p = 0.001$) wards/units exhibited decreased challenges on EHR workflow processes while those stationed at the anaesthesia ($\beta: 0.246$; 95%CI: 0.007, 0.484; $p = 0.044$), and maternity

(β :0.432; 95%CI:0.121,0.742; $p=0.007$) units/wards encountered increased EHR workflow challenges. Variances in workflow processes including documentation requirements among different units or wards may contribute to varying experiences of challenges among healthcare professionals (Westbrook et al., 2018). For instance, staff in care settings like maternity wards may face time constraints and high patient volumes, potentially leading to documentation errors or delays (Gephart et al., 2019). Conversely, those in outpatient settings may encounter challenges related to care coordination across multiple providers or management of electronic health records (Adler-Milstein et al., 2017).

Lastly, the study results indicated that senior staff nurses (β :3.010; 95%CI:2.655,3.366; $p<0.001$), nursing officers (β :2.730; 95%CI:2.421,3.039; $p<0.001$), and senior nursing officers (β :2.489; 95%CI:2.217,2.761; $p<0.001$) faced increased EHR workflow challenges. In line with findings by Rangachari & Rissing, (2018), higher-ranking healthcare professionals including senior nurses and managers, encounter unique challenges in managing workflow documentation and balancing administrative duties with direct patient care and navigating complex organizational structures. The similarity is as a result of the similar number of participants used in the study. Other findings also argue that lower-ranking staff members may also face obstacles related to limited decision-making authority or access to necessary resources for effective workflow management (Greenhalgh et al., 2018).

5.6 The influence of sociodemographic characteristics on data security challenges

Work experience in this study was found to be significantly correlated with EHR challenges as nurses with 5–10 years of work experience had lesser EHR-related data security concerns (β :-0.502; 95%CI:-0.643,-0.360; $p<0.001$). Experienced health staff including nurses may express few challenges about security risks and privacy breaches

based on past experiences or knowledge of industry best practices (Straub & Welke, 1998). This similarity happens since the studies were conducted in secondary-level hospitals where most experienced nurses are located. Thus, healthcare institutions should leverage the expertise of experienced employees to mentor and guide less experienced colleagues (He & Han, 2019).

The findings of the study showed a significant association between unit/ward and challenges regarding data security ($p < 0.05$). Nurses working at wards/units such as general theatre ($\beta: -1.039$; 95%CI: -1.327, -0.753; $p < 0.001$), maternity ($\beta: -1.694$; 95%CI: -2.071, -1.318; $p < 0.001$), medical emergency ($\beta: -1.039$; 95%CI: -1.333, -0.746; $p < 0.001$), obstetrics and gynaecology ($\beta: -1.723$; 95%CI: -2.053, -1.394; $p < 0.001$), pathology ($\beta: -0.719$; 95%CI: -1.011, -0.427; $p < 0.001$) and surgery ($\beta: -0.752$; 95%CI: -1.040, -0.474; $p = 0.011$) encountered fewer data security concerns. This is in accordance with the study results of Ponte and Simon (2021), which revealed that there is a significant association between various units/wards and challenges regarding data security. The nurses in the above-mentioned wards/units (general theatre, maternity, medical emergency, obstetrics and gynaecology, pathology, surgery) might have more knowledge and experience with using technology with greater understanding of data security. Their ward leaders may also regularly check on them and support them, which encourages the nurses to use the EHR system more carefully, resulting in fewer problems. Notwithstanding, it calls for healthcare institutions to regularly conduct unit-specific risk assessments and training programs to address the unique needs and challenges faced by staff members in different clinical settings (Adler-Milstein et al., 2017).

Nurses with senior ranks including nursing officers ($\beta: -1.893$; 95%CI: -2.268, -1.158; $p = 0.001$), and senior midwifery officers ($\beta: -0.529$; 95%CI: -0.949, -0.110; $p = 0.013$) had lesser EHR data security concerns. In as much as this study's findings

contradict that of Cruz-Jesus et al., (2019) and Huang et al., (2019), these senior nurses have the capacity to understand the significance of patient information with reference to their professional ethics of confidentiality, which could be the reason behind lesser challenges on EHR data security and privacy. Health facilities need to provide cybersecurity training and awareness campaigns to ensure that all staff members feel empowered to protect sensitive information effectively (Boss et al., 2015).

5.7 Summary of chapter five

This section has thoroughly discussed the findings of the study by comparing and contrasting relevant literature. Since this study is a novelty type, some of the discussions were compared to challenges faced by other medical practitioners across the globe, where the study settings were also mostly at secondary and tertiary levels of health care.



CHAPTER SIX

SUMMARY, CONCLUSION, AND RECOMMENDATION

6.0 Introduction

This final chapter presents a summary of the key findings, recommendations to the relevant stakeholders for appropriate actions, implications of study findings, and conclusion.

6.1 Summary of key findings

The introduction to the study being carried out was provided. The background as well as the problem that propelled the study, were addressed. Likewise, the significance, purpose of the study and research questions were enumerated. The study aimed to explore the challenges faced by nurses in the use of the EHR system at 37 Military Hospital in the Greater Accra Region of Ghana.

Secondly, the relevant literature on the utilization and adoption of EHRs by nurses across countries was reviewed. It reviewed the previous studies and theoretical literature on EHR systems, definition, components, benefits, challenges and strategies for improving its usability. The challenges were classified into technological and system-related, workflow, as well as data security concerns.

Moreover, the methods employed in the study was highlighted. This study used a descriptive cross-sectional design to collect data on challenges faced by nurses in the use of EHRs from 300 nurses through a structured questionnaire. Descriptive and linear regression analyses were conducted at a 95% significance level by using SPSS.

The results of the study were reported in the form of tables. The prominent findings included;

- The average age of the nurses was found to be 33.0 years while about 47.0% of the nurses had 5–10 years of working experience.

- More than two-thirds of the nurses were females (76.3%) and were also holders of bachelor's degrees (78.0%) in the nursing education spectrum.
- Regarding the technological and system-related challenges with the use of EHR, 85.0% of the respondents agreed that technical glitches and system downtime hinder their productivity when using the EHR, 66.3% of the respondents agreed that interoperability issues between EHR systems create difficulties in accessing patient data from different facilities, and 56.3% agreed that data entry in the EHR is time-consuming and affects their ability to provide direct patient care.
- Also, concerning the workflow and documentation challenges of using EHR, 65.3% agreed that using the EHR system for documentation increases the time they spend on data entry tasks, and 49.3% agreed that EHR data entry requires frequent interruptions, affecting their focus on patient interactions.
- In addition, concerning data security, privacy, and training challenges associated with the use of EHR, 72.0% of the respondents expressed concern about the security of patient data stored in the EHR system, 56.0% were confident in their ability to protect patient confidentiality and privacy when using the EHR, and 52.0% agreed that ongoing training and updates on data security are readily available to support their knowledge and skills.
- Nurses aged 26–35 years and nurses working at the emergency, maternity, neurosurgery units/wards were associated with reduced technological and system-related challenges. Female nurses, senior nurses (like nursing officers, and senior nursing officers), nurses with at

least 5 years of working experience, and those stationed at the general theatre and orthopaedic units/wards had increased technological and system-related challenges.

- Nurses having diploma certificates, working in areas like anaesthesia and maternity units/wards, and others with higher ranks (including senior staff nurse, nursing officer, and senior nursing officer) had increased workflow challenges, while those stationed at allied, emergency, general theatre, neurosurgery, and pathology were associated with decreased workflow challenges.
- Nurses with 5–10 years of working experience, nurses stationed at the general theatre, maternity, medical emergency, obstetrics and gynaecology, pathology, and surgery units/wards, and those with professional ranks such as nursing officers and senior midwifery officers were associated with lesser EHR-related data security concerns.

The key findings were discussed thoroughly. Thus, the significant findings and the valuable information obtained or achieved in this study were carefully discussed based on relevant literature. Summary of the entire dissertation was presented including key findings, recommendations, implications, and conclusions.

6.2 Recommendations

Based on the results of the study revealing challenges faced by nurses when using EHR systems, here are some recommendations to address these issues:

6.2.1 Healthcare institutions (37 Military Hospital)

Healthcare institutions, especially 37 Military Hospital should:

1. Prioritize EHR systems that are intuitive and user-friendly to reduce the learning curve for nurses and to minimize data entry time.
2. Offer thorough training programs to nurses on how to effectively use EHR systems. Training should cover basic functionalities, troubleshooting common technical issues, and best practices for data entry and documentation. Also, continuous training and support should be available to address evolving system updates and new features.
3. Establish a dedicated technical support team to promptly address any technical glitches or system downtime experienced by nurses.
4. Implement robust security measures to safeguard patient data within EHR systems. This should include encryption, access controls, audit trails, and regular security assessments to mitigate the risk of data breaches.

6.2.2 Government (Ministry of Health)

Government should:

1. Provide funding or grants for healthcare institutions to upgrade their technology infrastructure, including EHR systems. This could involve ensuring systems are up-to-date, addressing technical glitches, and improving interoperability between different systems.
2. Encourage EHR system developers to adopt a user-centered design approach, involving nurses and other end-users in the development process.
3. Offer support and resources for health facilities to optimize their workflows around EHR usage. This may involve reevaluating documentation processes, streamlining data entry tasks, and implementing best practices for integrating EHRs into daily nursing practice.

4. Allocate funding for research and development initiatives focused on improving EHR technology. This may involve supporting projects aimed at developing innovative solutions to common challenges such as system downtime, data entry efficiency, and interoperability issues.

6.3 Implications of study findings

6.3.1 Nursing practice and administration

The study findings provide a strong indication of the relevance of formal and regular in-service training or capacity building for all nurses in the nursing field of practice and administration. This will provide nurses with the necessary knowledge and skills to address challenges related to EHR, which is the current technology and network system used across health facilities. Additionally, it is prudent to promote a reliable and supportive environment in the nursing practice and administration by addressing challenges such as concerns about data security and privacy, documentation, and technological and workflow activities that impede or slow down nursing procedures that could lead to poor patient outcomes. This will not only make nurses to be smart in their decision-making but also help to improve clinical efficiency and effectiveness thereby building their self-esteem and making them confident in the nursing practice.

6.3.2 Nursing education

In the field of nursing education, the findings climax the significance of integrating and/or featuring EHR as a critical segment in the training and education of nurses. Both classroom (theory) and practical (clinical) aspects of this technology should be comprehensively assessed or evaluated in nursing education. Hence, the nursing curriculum should embrace this technology so that trainee nurses will be equipped with adequate skills and professionally developed to meritoriously utilize this EHR tool in their practice and teaching. This will help to roll out or produce technologically skillful

nurses to address most system-related challenges in the utilization of EHRs in health facilities.

6.3.3 Nursing research

EHR is one of the clinical or medical technology areas which is under-researched in nursing science and education, especially in sub-Saharan Africa like Ghana. This calls for nursing researchers to actively focus most of their research topics and ideas in the field of EHR. Future research should look at longitudinal and intervention studies as well as quality improvement approaches aimed at developing innovative solutions to significant challenges related to system downtime, data entry efficiency, and interoperability issues. Moreover, other studies could assess all-inclusive factors associated with EHR use and its challenges on a large scale. It is established that these future innovations and research will not only contribute adequately to nursing knowledge but will also create a foundation for systematic and scoping reviews and help in policy planning and decision-making in the field of nursing.

6.4 Conclusion

The study discovered that nurses face significant challenges when using EHR systems in their daily practice. Technical glitches, system downtime, and interoperability issues hinder productivity. Data entry is time-consuming, impacting direct patient care. Workflow challenges increase time spent on data entry, affecting nurses' focus on patient interactions. Data security challenges are also highlighted. Sociodemographic characteristics such as age, gender, work experience, professional rank, and units/wards of the nurses were correlated with EHR-related challenges. Addressing these challenges can enhance patient care delivery as well as the efficiency and effectiveness of nursing practice.

6.5 Summary of chapter six

This chapter has summarized all the six chapters in the dissertation and has provided a conclusion to the study. Additionally, recommendations for the Ghana MOH and the 37 Military Hospital have been provided for possible interventions and policy decisions.



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APPENDICES

Appendix A: Questionnaire



UNIVERSITY OF GHANA

Questionnaire for Nurses

Dear respondents,

I am a final-year graduate student at the School of Nursing and Midwifery at the University of Ghana. I am conducting a study on “Challenges associated with the use of Electronic Health Records (EHRs) by Nurses in 37 Military Hospital”. The results of this study will improve the use of EHRs to maximize healthcare. This data being solicited from you will be used solely for academic purposes. Be assured that all the information given to us will be treated with the highest level of confidentiality. It will take you a maximum of 25 minutes to respond to all items raised in the instrument. In case you need more time, the questionnaire will be given to you, and you will return it to the research assistants on the following day. Thank you for your willingness to participate in the study.

Researcher:

Contact Number:

Supervisor:

INSTRUCTIONS: Kindly indicate by ticking (✓) the appropriate option where applicable.

SECTION A: Demographics

1. Gender:

Female ☐ Male ☐

2. Age:

- | | |
|--------------------------------------|--------------------------------------|
| a. 20-25yrs ☐ | e. 41-45yrs ☐ |
| b. 26-30yrs ☐ | f. 46-50yrs ☐ |
| c. 31-35yrs ☐ | g. 51-55yrs ☐ |
| d. 36-40yrs ☐ | h. 56-60yrs ☐ |

3. Level of Education:

- a. Diploma [] c. Master's degree []
b. Bachelor's degree [] d. Doctoral degree []

4. Work experience

- a. Less than 5yrs [] d. 16-20yrs []
b. 5-10yrs [] e. 21-25yrs []
c. 11-15yrs [] f. More than 25yrs []

5. Unit/Ward

6. Rank

SECTION B: Technological and System-Related Challenges

The following are statements on technological and system-related challenges to the use of EHR among nurses. Kindly indicate by ticking (✓) the extent to which you agree to each statement: where SD = Strongly Disagree, D = Disagree, UN = Undecided, A = Agree, SA = Strongly Agree.

S/N	Technological and System-related Challenges	SD	D	UN	A	SA
7.	The EHR interface is user-friendly and easy to navigate					
8.	I feel confident in using EHR functionalities to access patient information efficiently					
9.	Technical glitches and system downtime hinder my productivity when using the EHR					
10.	I find it challenging to adapt to changes in EHR interfaces and workflows					
11.	Interoperability issues between EHR systems create difficulties in accessing patient data from different facilities					
12.	I receive sufficient training to effectively utilize the various features of the EHR					
13.	My digital literacy skills enable me to fully leverage the capabilities of the EHR					
14.	EHR systems updates and improvements are communicated effectively to users					
15.	The EHR system integrates well with other hospital technologies and information systems					
16.	Data entry in the EHR is time-consuming and affects my ability to provide direct patient care					

Source: Adapted from Michigan Public Health Institute, USA, 2019

SECTION C: Workflow Challenges

The following are statements on workflow including documentation challenges to the use of EHR among nurses. Kindly indicate by ticking (✓) the extent to which you agree to each statement: where SD = Strongly Disagree, D = Disagree, UN = Undecided, A = Agree, SA = Strongly Agree.

S/N	Workflow challenges	SD	D	UN	A	SA
17.	Using the EHR system for documentation increases the time I spend on data entry tasks					
18.	EHR implementation has caused disruptions in my established nursing workflows					
19.	I find it challenging to balance patient care tasks with data entry in the EHR					
20.	EHR documentation processes are well-integrated into my daily nursing routines					
21.	The EHR system supports efficient and effective patient care delivery.					
22.	I feel confident in my ability to accurately and completely record patient data in the EHR					
23.	EHR usage has positively impacted my overall workflow efficiency					
24.	EHR data entry requires frequent interruptions, affecting my focus on patient interactions					
25.	The EHR system provides adequate tools and templates for comprehensive documentation					
26.	I encounter difficulties in locating and accessing specific patient information within the EHR					

Source: Adapted from Michigan Public Health Institute, USA, 2019



SECTION D: Data Security Challenges

The following are statements on data security challenges to the use of EHR among nurses. Kindly indicate by ticking (✓) the extent to which you agree to each statement: where SD = Strongly Disagree, D = Disagree, UN = Undecided, A = Agree, SA = Strongly Agree.

S/N	Data security challenges	SD	D	UN	A	SA
27.	I am concerned about the security of patient data stored in the EHR system					
28.	I receive adequate training on data security protocols and best practices for handling patient information in the EHR					
29.	I am confident in my ability to protect patient confidentiality and privacy when using the EHR					
30.	The EHR system provides clear guidelines on data access and permissions to ensure privacy compliance					
31.	I feel well-prepared to handle potential data breaches or security incidents related to the EHR					
32.	The hospital has effective measures in place to safeguard patient data from unauthorized access					
33.	I am aware of the consequences of data security breaches and the importance of reporting any potential incidents					
34.	Ingoing training and updates on data security are readily available to support my knowledge and skills					
35.	The EHR system allows for secure and controlled sharing of patient data when authorizing healthcare providers					
36.	I feel confident on navigating the EHR system without compromising patient privacy or data security.					

Source: Adapted from Michigan Public Health Institute, USA, 2019

Thank you



Appendix B: Consent Form

Title of the study: Challenges Faced by Nurses with the Use of Electronic Health Records in 37 Military Hospital in the Greater Accra Region of Ghana

Statement of person obtaining informed consent

I have fully explained this research to..... and have given sufficient information about the study, including that on procedures, risks and benefits, to enable the prospective participant to make an informed decision to or not to participate.

DATE..... NAME.....

Statement of person giving consent

This study has been described to me in a language that I understand, and I voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving reason at any stage of the study and this will not negatively affect me in any way.

PARTICIPANT'S NAME.....

PARTICIPANT'S SIGNATURE/THUMBPRINT.....

DATE.....

