wjpmr, 2025, 11(10), 117-142

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH
www.wjpmr.com

SJIF Impact Factor: 6.842

Review Article
ISSN (O): 2455-3301
ISSN (P): 3051-2557

HEALTH INFORMATION TECHNOLOGY IN NURSING PRACTICE: CONTEMPORARY ISSUES AND PROSPECTS

Okere-Ejiogu Edith, Egbuchulem J.N., Vincent C.C.N., Ibebuike Julia, Nwagwu Solomon J., Emesowum Anthonia, Ezenwuba Clementina, Okoroafor Nkiru, Obeagu Emmanuel Ifeanyi*

Department of Nursing Science, Faculty of Health Sciences, Imo State University, Owerri, Imo State, Nigeria.

***Corresponding Author: Okere-Ejiogu Edith**
Department of Biomedical and Laboratory Science, Africa University, Mutare, Zimbabwe.
DOI: https://doi.org/10.5281/zenodo.17224068

Article Received on 01/08/2025 **Article Revised on 22/08/2025** **Article Accepted on 12/09/2025**

ABSTRACT
Health information technology (HIT) has transformed nursing practice by reshaping documentation, communication, and patient care delivery. Tools such as electronic health records (EHRs), telehealth platforms, mobile applications, and decision support systems have enhanced efficiency, reduced errors, and strengthened evidence-based practice. However, nurses continue to face significant challenges, including system usability issues, data privacy concerns, workflow disruptions, digital literacy gaps, and the risk of burnout. These issues highlight the need for supportive training, improved system design, and stronger policies. Looking ahead, advances in artificial intelligence, interoperability, personalized care technologies, and workforce empowerment present new opportunities to optimize HIT in nursing. By addressing existing barriers while harnessing these innovations, nursing practice can fully realize the potential of HIT to deliver safe, efficient, and patient-centered care.

KEYWORDS: *Health Information Technology, Nursing Practice, Electronic Health Records, Telehealth, Artificial Intelligence.*

INTRODUCTION
In the evolving landscape of healthcare, Health Information Technology (HIT) has become an integral part of nursing practice, enhancing patient care, streamlining workflows, and improving clinical-decision making. HIT encompasses a range of technologies, including electronic health records (EHRs), clinical decision support systems, telehealth solutions, and mobile health applications. These technologies have significantly transformed nursing practice by facilitating better communication, reducing errors, and improving efficiency (Idoko *et al.*, 2024).

However, the integration of HIT in nursing is not without challenges. Issues such as interoperability gaps, data security concerns, usability challenges, and legal and ethical dilimmas continue to hinder its full potential. Furthermore, the rapid evolution of technology raises questions about its future role in nursing, particularly with advancements in artificial intelligence, telehealth, and big data analytics (Okolo *et al.*, 2024).

Definition of Health Information Technology (HIT)
Health information technology is the hardware, software, and systems that comprise the input, transmission, use, extraction, and analysis of information in the healthcare sector. The end-users of this technology include not only patients, nurses, physicians, and other front-line healthcare providers, but also medical researchers, healthcare insurance companies, public health agencies, regulatory and quality assurance entities, pharmaceutical and medical device corporations, and various levels of government (Jen, *et al.*, 2022).

Defining health information technology calls for elucidation of what health entails. **Health** is generally taken to mean the condition of the body or mind. From a comprehensive and technical stance, the World Health Organization described health as a state of complete physical, mental, social and spiritual well-being of an individual and not merely the absence of disease or infirmity (World Health Organization (WHO), 2023). In line with the above, Forunsho (2017) opined that, good health consists in the holistic wellbeing of people anchored on free access to efficient health care, better nutrition, improved living conditions, useful health information and absence of avoidable premature deaths (Iroeze and Bernard, 2023).

Ama-Abasi, *et al.*, (2022) described **Information** as acquired or received knowledge based on facts, figures, opinions, ideas and inferences; stressing that information is critical for decision-making, solving problems and decreasing ambiguity on any subject of interest (Iroeze

and Bernard, 2023). **Health information** could mean specific or generation of information needs of patients in solving their health issues (Iroeze and Bernard, 2023). Similarly, Abasi and Undie (2021) described health information as the relationship between health education and health promotion. Possessing the right health information could promote wellness in terms of physical, spiritual and emotional stability (Iroeze and Bernard, 2023).

Specific scopes of health information cover sanitation rules and regulations (environmental cleanliness), family planning, disease control, drugs, immunization, location of good hospitals and clinics, infant care, and diagnostic results. It also includes news about standard health practices as adopted by international bodies and agencies responsible for global health activities, such as World Health Organization (WHO) and United Nations Fund for Population Activities (Tsawe, *et al.,* 2015). Tsawe *et al.,* (2015) look at health information from two perspectives: while health information is knowledge, facts and news generated from various sources, necessary for good physical and mental condition of human beings, it is a determinant of the right to the highest attainable standard of health including access to such information as protected by the right to exchange and import information.

Information Technology is a broad term used to describe the use of computers, software and networks by various organizations and businesses to organize data and information (Feder, M., 2022). Information technology is the use of any computers, storage, networking and other physical devices, infrastructure and processes to create, process, store, secure and exchange all forms of electronic data (Castagna and Bigelow, 2022).

Health Information Technology is defined as "the application of organized knowledge and skills in the form of devices, medicines, vaccines, procedures and systems developed to solve a health problem and improve quality of life." It is used interchangeably with "health care technology." (World Health Organization (WHO), (2025). Health Information Technology centers on the systems that make patient care possible, including systems that store information and those that enable communication between staff and patients. It focuses on the systems that maintain patient data and enhance patient care. Specialists who work in the field of HIT develop and maintain systems that store information, analyze data, and allow for secure communication between healthcare professionals, nurses, doctors and patients (Cooper, 2022).

Health information technology means information processing application using computer hardware and software for the storage, retrieval, use and disclosure of health information for communication, decision-making, quality, safety and efficiency of health care. Health information technology includes, but is not limited to: an electronic health record; a personal health record; telehealth; clinical decision support system; and electronic order entry. According to United States Department of Health and Human Services (2022), Health Information Technology involves the processing, storage, and exchange of health information in an electronic environment. It is the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, health data, and knowledge for communication and decision making.

The National Center for Biotechnology Information (NCBI) (2022), states that Health Information Technology includes various technologies that span from simple charting, to more advanced decision support and integration with medical technology. Health Information Technology supports health information management across computerized systems and the secure exchange of health information between consumers, providers, payers, and quality monitors (Shiraz University of Medical Sciences, 2025). Health care environments utilize ever-increasingly robust computer systems to manage staffing, track patient treatment, access medical profiles, and more. It presents numerous opportunities for improving and transforming healthcare which includes; reducing human errors, improving clinical outcomes, facilitating care coordination, improving practice efficiencies, and tracking data over time.

Health Information Technology (HIT) is an important means for helping health care providers provide high quality care that is safe, effective, timely, patient-centered, efficient and equitable (National Association of Community Health Centers (NACHC), 2022). Health information technologies are vast in their forms and functions, and at their core are the ability to better store and transmit information. Applications exist that allow health care institutions to perform overarching functions such as tracking operations, scheduling staff, maintaining communication with both staff and patients, keeping real-time inventory information, and more. A health information technology system could affect every facet of a health care center's operations.

Importance of Health Information Technology in Modern Nursing Practice

A major challenge facing nurses today is the demand of providing safe and quality care, while still being efficient and cost effective. In order to achieve these ambitious goals, the reduction of healthcare errors is requisite. According to World Health Organization (WHO), around 1 in every 10 patients worldwide is harmed in health care and more than 3 million deaths occur annually due to unsafe care (World Health Organization, 2023). In low-to-middle income countries, as many as 4 in 100 people die from unsafe care. Common adverse events that may

result in avoidable patient harm are medication errors, unsafe surgical procedures, health care-associated infections, diagnostic errors, patient falls, pressure ulcers, patient misidentification, unsafe blood transfusion and venous thromboembolism. Above 50% of harm (1 in every 20 patients) is preventable; half of this harm is attributed to medications (World Health Organization, 2023). Some estimates suggest that as many as 4 in 10 patients are harmed in primary and ambulatory settings, while up to 80% (23.6–85%) of this harm can be avoided (World Health Organization, 2019). On a global scale, the indirect cost of harm amounts to trillions of US dollars each year (World Health Organization, 2023).

Medical errors are a serious public health problem and a leading cause of death in the United States. Each year, around 400,000 hospital patients suffer preventable harm, with around 100,000 deaths due to faulty diagnostic processes (Rodziewicz, *et al.*, 2023). Medical errors typically include surgical, diagnostic, medication, devices and equipment, and systems failures, infections, falls, and healthcare technology (Rodziewicz, *et al.*, 2023).

Health services in Nigeria are characterized by inefficiency and poor management practices, which has become major obstacles to healthcare delivery. According to the World Health Organization (2019), close to 200 million people inhabit Nigeria, considered Africa's most populous country. Nigeria is also the country where nearly 20% of all global maternal deaths happen. Between 2005 and 2015, it is estimated that over 600 000 maternal deaths and no less than 900 000 maternal near-miss cases occurred in the country. In 2015, Nigeria's estimated maternal mortality ratio was over 800 maternal deaths per 100 000 live births, with approximately 58 000 maternal deaths during that year. By comparison, the total number of maternal deaths in 2015 in the 46 most developed countries was 1700, resulting in a maternal mortality ratio of 12 maternal deaths per 100 000 live births. In fact, a Nigerian woman has a 1 in 22 lifetime risk of dying during pregnancy, childbirth or postpartum/post-abortion; whereas in the most developed countries, the lifetime risk is 1 in 4900 (World Health Organization 2019). The United Nations Children's Fund (UNICEF), originally known as the United Nations International Children's Emergency Funds affirmed that daily, Nigeria records 2,300 cases of infant mortality and over 145 cases of maternal mortality (Attah, 2017). This positions Nigeria as the country with the second-largest contribution to the high infant and maternal mortality rate in the world.

One major challenge has been the continued use of the traditional paper record system in most public health facilities in Nigeria, which often time causes delay and long patient waiting time. The trend in health care is the introduction of technology to improve both quality of care and decreased costs. One basic tool that can change the narrative is the introduction of Health Information Technology (HIT). Health Information Technology has the potential and capability of improving the quality, outcomes, efficiency, patient safety and reduction in the cost of healthcare.

OVERVIEW OF HEALTH INFORMATION TECHNOLOGY IN NURSING

History and Building Blocks of Nursing Informatics

As cited by Adesina and Abimbola (2017), Florence Nightingale in 1857, using her mathematical and statistical knowledge, compiled and analyzed data, particularly from the Crimean War, to advocate for improved nursing and medical practices. Her work demonstrated the impact of sanitation and other factors on mortality rates, leading to significant reforms in healthcare.

However, nurses utilized computer-readable punch cards to check-off their observations of patients as early as 1965 (Adesina and Abimbola, 2017). The data from these cards were then read into computers at San Jose Hospital, which then served as an electronic record of patient care (Adesina & Abimbola, 2017). In 1966, nurses at the Institute of Living in Hartford used similar technology to document patient statuses. The term nursing informatics was not actually coined until 1980 by Scholes and Barber (Winters-Miner *et al.*, 2015). Thereafter, in 1992, the American Nurses Association approved nursing informatics as a recognized specialty. Since the mid-1990s nursing informatics has virtually exploded as a discipline. The United States began certifying nurses in Informatics competencies in the early 1990s. This occurred concurrently with the development of the internet and desktop computing advances (Health IT Workforce, 2017).

The American Nurses Association (ANA) (2015) defined Nursing Informatics as "the specialty that integrates nursing science with multiple information and analytical sciences (ie computer science, and information science) in identifying, collecting, processing, and managing data and information to support nursing practice, administration, education, research and the expansion of nursing knowledge to identify, define, manage, and communicate data, information, knowledge, and wisdom in nursing practice. Specifically, at the heart of this definition is identifying, collecting and processing of information. Nursing Informatics supports nurses, consumers, patients, the interprofessional healthcare team, and other stakeholders in their decision-making in all roles and settings to achieve desired outcomes. This support is accomplished through the use of information structures, information processes, and information technology (IT) (American Nurses Association, 2015).

The profession of nursing was among the first health disciplines to embrace informatics through its recognition of Nursing Informatics as a specialty practice area (Bickford, 2015). In little over two decades, Nursing Informatics has evolved into an expanding body

of knowledge, confirming and supporting its relevance and applicability to all domains of nursing (e.g., education, research, practice, information management and technology, and administration) (Bickford, 2015).

Building Blocks of Nursing Informatics indicates that nursing science is the ethical application of knowledge acquired through education, research and practice to provide services and interventions to patients in order to maintain, enhance or restore their health; to advocate for health, and to acquire process, generate and disseminate nursing knowledge to advance the nursing profession (Adesina and Abimbola, 2017).

Nursing science is the foundation on which the other sciences rest. Nursing science is the raison d'être of nursing informatics, and without the needs and context of nursing science, nursing informatics would have no purpose (Adesina and Abimbola, 2017).

Nursing is an information intensive profession. The steps of utilizing information, applying knowledge to a problem and acting with wisdom form the basis of nursing practice science (Adesina and Abimbola, 2017). Nurses acquire data and information in bits and pieces and then transform the information into knowledge which in turn is used to develop the profession.

Globally, healthcare delivery systems are anchored on how well healthcare institutions can deliver affordable and qualitative healthcare to its clients. However, healthcare delivery in Nigeria is perceived to still be below qualitative level given that, accessibility to medical information remains poor in Nigeria's public healthcare institutions, usually resulting in delayed, inappropriate decisions and ineffective service delivery; hence, the need to evaluate the implications of electronic health information system on medical records management in Nigeria's public healthcare institutions (Ojo and Popoola, 2015).

Key Components of Health Information Technology

Health information technologies (HIT) are widely viewed as essential tools for improving the quality and efficiency of health care delivery. HIT attempts to manage the explosion of ever increasing medical information by managing and communicating information in order to promote knowledge in nursing practice for quality care. The ultimate goal is to use technology to bring critical information to the point of care to increase efficiency and make healthcare safer and more effective.

Some examples of HIT are discussed below as follows

- **Electronic Health Record (EHR)**

One primary component of health information technology is the **Electronic Health Record** (**EHR**) which health care professionals and increasingly, patients use to store, share, and analyze health information. It is an electronic version of a patients medical history, that is maintained by the provider over time, and may include all of the key administrative clinical data relevant to that person's care under a particular provider, including demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data and radiology reports (Centers for Medicare & Medicaid Services (CMS) (2024).

EHR provides accurate, up-to-date, and complete information about patients at the point of care; enables quick access to patient records for more coordinated, efficient care; securely shares electronic information with patients and other clinicians; helps providers to more effectively diagnose patients; reduces medical errors, and provides safer care (National Coordinator for Health Information Technology (ONC) (2022).

An Electronic Health Record is a digital version of a patient's paper chart. This record contains an individual patient's complete medical history and should include everything from past treatments to allergies and current prescriptions. A well-developed EHR can provide a comprehensive outlook on a patient's medical history and physical makeup (National Coordinator for Health Information Technology (ONC) (2019).

Electronic Health Records are a vital part of Health Information Technology. They can contain a patient's medical history, diagnoses, medications, treatment plans, immunization dates, allergies, radiology images, and laboratory and test results (National Coordinator for Health Information Technology (ONC) (2019). It can allow access to evidence-based tools that providers can use to make decisions about a patient's care. It can automate and streamline provider workflow (National Coordinator for Health Information Technology (ONC) (2019).

EHRs are real-time, patient-centered records that make information available instantly and securely to authorized users. It allows doctors to better keep track of patient's health information and may enable them to see it when patient has a problem even if their office is closed. EHRs also make it easier for doctors to share information with specialists, so that specialists who need patient's information have it available when it is needed (National Coordinator for Health Information Technology (ONC) (2019). While an EHR does contain the medical and treatment histories of patients, an EHR system is built to go beyond standard clinical data collected in a provider's office and can be inclusive of a broader view of a patient's care (National Coordinator for Health Information Technology (ONC) (2019).

One of the key features of an EHR is that health information can be created and managed by authorized providers in a digital format capable of being shared with other providers across more than one health care organization. EHRs are built to share information with

other health care providers and organizations such as laboratories, specialists, medical imaging facilities, pharmacies, emergency facilities, and school and workplace clinics; so they contain information from all clinicians involved in a patient's care (National Coordinator for Health Information Technology (ONC) (2019). Several components of the EHR offer advantages in the delivery of complete nursing care.

❖ **Telemedicine or (Telehealth Clinical Services)**

This is an innovative way of getting access and delivering health care using digital devices such as the mobile device and computers. Telehealth is the use of technology-based virtual platform to deliver various aspects of health information, prevention, monitoring, and medical care. They cover emergency, preventative, rehabilitative, long-term, hospital, diagnostic, primary, palliative, and home care (Mechanic *et al.*, 2022).

The fastest growing sector of health care, telehealth's largest segment is telemedicine. Narrowly, telemedicine is defined as the practice of medicine via a remote electronic interface. Telemedicine care is a non-invasive way to keep people safe in their own homes preventing the need for individuals to go into care homes. It aims to retain independence and confidence in individuals, whilst maintaining confidence for families too.

Telemedicine is currently delivered in three major ways: Video conferencing, which is used for real-time patient-provider consultations; provider-to- provider discussions; and language translation services (Mechanic *et al.*, 2022). There are distinctions within telemedicine delivery. Most hospital-based health care delivery is doctor-to-doctor, providing expert specialist medicine to often rural, international, or nonspecialist physicians. In contrast, patient-to-doctor medical care is a growing market, and patients can reach physicians via direct-to-consumer service via telemedicine (Mechanic *et al.*, 2022).

The 3 types of telemedicine services are synchronous, asynchronous, and remote monitoring:

Synchronous Telehealth refers to the delivery of health information in real time. This allows for a live discussion with the patient or provider to deliver medical expertise. Another type of live (or synchronous) telemedicine visit is a facilitated virtual visit (FVV). An example of a facilitated virtual visit occurs when the patient is located at an accessible site (ie, clinic) where diagnostic equipment is available, and the medical provider is at a distant site. A telefacilitator (ie, medical assistant nurse, etc) gathers objective measures using equipment (ie, digital stethoscope, thermometer, pulse oxymeter, etc) and transmits this data to the provider (Mechanic *et al.*, 2022).

Asynchronous Telehealth refers to the "store-and-forward" technique. In contrast, a patient or physician collects medical history, images, and pathology reports and then sends them to aspecialist physician for diagnostic and treatment expertise (Mechanic *et al.*, 2022).

Remote Monitoring (Remote Patient Monitoring) involves continous evaluation of a patient's clinical status, wether through direct video monitoring of the patient or via review of tests and images collected remotely. Newer technologies, such as mobile device applications, allow for a wider range of telehealth (Mechanic *et al.*, 2022).

❖ **Clinical Decision Support System (CDSS)**

A Clinical Decision Support System (CDSS) is a computer-based system designed to assist healthcare professionals in making informed clinical decisions by providing them with knowledge and person-specific information (Boyce *et al.*, 2022). It is a tool that enhances decision-making in various clinical settings, including hospitals, clinics, and individual practices.

Clinical decision support systems (CDSS) are integrated analysis and deployment systems designed to facilitate decision-making in healthcare (Boyce *et al.*, 2022). They combine information about the current patient with information about past diagnoses and treatments stored in a database to provide feedback or recommendations that will aid healthcare providers in the decision-making process at the point of care (Boyce *et al.*, 2022).

A clinical decision support system is a computer program that is actively involved in the clinical decision-making process by delivering patient-specific recommendations to facilitate high-quality patient care (Awati *et al.*, 2024). It is an application that analyzes data to help healthcare providers make decisions and improve patient care (Awati *et al.*, 2024). It streamlines healthcare decision-making by providing quick acces to patient records; medical literature, and industry best practices. This reduces research time, allowing healthcare professionals to focus on direct patient care, leading to faster treatment and reduced administrative workload (Awati *et al.*, 2024).

Clinical Decision Support Systems (CDSS) provides clinicians, staff, patients or other individuals with knowledge and person-specific information, intelligently filtered or presented at appropriate times, to enhance health and better health care (Awati *et al.*, 2024). It encompasses a variety of tools to enhance decision-making in the clinical workflow. These tools include: Computerized alerts and reminders to care providers and patients based on patient specific data elements, including diagnosis, medication, and gender/age information as well as lab test results, Clinical guidelines/established best practices for managing patients with specific disease states, Condition-specific order sets, Focused patient data reports and summaries, Documentation templates, Diagnostic support,and Contextually relevant reference information, among

other tools (Awati *et al.*, 2024).

Clinical Decision Support Systems (CDSS) also provides these vital services: Improving patient and provider interaction and communication, as well as health care convenience, enabling safer**,** more reliable prescribing**,** helping promote legible**,** complete documentation and accurate, streamlined coding and billing, enhancing privacy and security of patient data, helping providers improve productivity and work-life balance, enabling providers to improve efficiency and meet their business goals**,** reducing costs through decreased paperwork, improved safety, reduced duplication of testing, and improved health (Office of the National Coordinator for Health IT, 2016).

❖ **Personal Health Records (PHRs)**

A personal health record (PHR) refers to the collection of an individual's medical documentation maintained by the individual or a caregiver in cases where patients are unable to do so themselves (Sarwal and Gupta, 2024). This personal information includes details such as: The patient's medical history, Applicable diagnoses, Historical and ongoing medications, including over-the-counter and alternative treatments, Past medical and surgical interventions, Immunization status, Allergies and other relevant medical conditions that can impact the delivery of emergency care (eg, type 1 diabetes), Blood type, Whom to contact in the event of an emergency, Insurance information, and Contact information for the patient's regular health providers (Sarwal and Gupta, 2024).

Any other information the patient feels is pertinent may also be included. This contrasts with electronic medical records (EMR) and electronic health records (EHR), which are usually maintained by the treating physician or hospital to provide medical care and for billing purposes (Sarwal and Gupta, 2024). A PHR may be either physical or, as has become increasingly common moving forward, electronic. This includes all self-reported and self-recorded health data, including health issues and treatments, records of vital signs and activity recorded with personal devices including smartphones and smartwatches, nutritional data such as diet composition and calorie intake, etc. (Sarwal and Gupta, 2024).

Several commercial applications are available that allow an individual to maintain a PHR, and some also allow integration of this data with the individual's EMR/EHR, allowing them to take better charge of their own health (Sarwal and Gupta, 2024). The goal of a PHR is to allow the patient to keep their health data on hand for ready access for both themselves and anyone involved in their care while maintaining the privacy and security of this data. A PHR can hence assist in providing tailored medical care (Sarwal and Gupta, 2024).

This is a lot like an Electronic Health Record, except that the patient controls what kind of information goes into it. Patient can use a PHR to keep track of information from his/her doctor visits, but the PHR can also reflect one's life outside the doctor's office and health priorities, such as tracking what patient eats, how much he/she exercises, and the blood pressure. Sometimes, one's PHR can link with his/her doctor's EHR (Office of the National Coordinator for Health IT, 2016). Personal health records (PHRs) can help patients better manage their care. Having important health information such as immunization records, lab results, and screening due dates in electronic form makes it easy for patients to update and share their records (Office of the National Coordinator for Health IT, 2016).

❖ **Remote Patient Monitoring**

Remote Patient Monitoring is the ability to monitor certain aspects of a patient's health from their own home. Remote patient monitoring lets clinicians access at-home and mobile devices, including wearables, to monitor and manage their patients' chronic and acute medical conditions, such as heart disease, diabetes, cancer, asthma, irregular sleep patterns, and even difficult pregnancies. These devices include blood pressure and heart rate monitors, blood glucose meters, smart inhalers, smart scales, apnea monitors, and maternity care monitors (Lindquist, 2025).

Remote patient monitoring pairs well with telemedicine when patients need to be monitored for certain health conditions. It can also prevent health complications in patients who are not able to easily travel. There are many symptoms and conditions that can be tracked through remote patient monitoring, including: High blood pressure, Diabetes, Weight loss or gain, Heart conditions, Chronic obstructive pulmonary disease, Sleep apnea, and Asthma. Many of the devices that patients use may be familiar to them, including: Weight scales, Pulse oximeters, Blood glucose meters, and Blood pressure monitors (Lindquist, 2025).

Other conditions require more complicated devices that will require patient training, including: Apnea monitors, Heart monitors, Specialized monitors for dementia and Parkinson's disease, Breathing apparatuses, and Fetal monitors (Lindquist, 2025).

❖ **Patient Portal** is a secure online website that gives patients convenient, 24 hour access to personal health information from anywhere with an Internet connection. Using a secure username and password, patients can view health information such as: Recent doctor visits, Discharge summaries, Medications, Immunizations, Allergies, and Lab results. Some patient portals also allow one to: Securely message doctor, Request prescription refills, Schedule non-urgent appointments, Check benefits and coverages, Update contact information, Make payments, Download and complete forms, and View educational materials. With patient portal, one can be in control of his/her health and care. Patient

portals can also save time, and help patient communicate with the doctor, and support care between visits (Carini *et al.*, 2021).

❖ **Electronic Prescribing (E-Prescribing)**

Is a prescriber's ability to electronically send an accurate, error-free and understandable prescription directly to a pharmacy from the point-of-care and is an important element in improving the quality of patient care. It allows the doctor to communicate directly with the pharmacy. This means one can go to the pharmacy to pick up medicine without having to bring the paper prescription. A paper prescription can get lost or misread (Centers for Medicare and Medicaid Services, 2023).

Electronic prescribing refers to a process by which prescription information is created electronically, transferred via electronic means, and dispensed electronically. This process replaces entirely the use of a paper prescription. In addition to e-prescriptions, both handwritten and computer generated paper prescriptions continue to be legally acceptable ways to prescribe a medicine (Government of West Australia Department of health, 2022).

❖ **Enterprise Master Patient Index or Enterprise-wide Master Patient Index (EMPI)**

This is a patient database used by healthcare organizations to maintain accurate medical data across its various departments. Patients are assigned a unique identifier, so they are represented only once across all the organizations' systems. Patient data can include name, gender, date of birth, race and ethnicity, social security number, current address and contact information, insurance information, current diagnoses, and most recent date of hospital admission and discharge (if applicable). EMPIs are intended to ensure patient data is correct and consistent throughout the organization regardless of which system is being updated (DelVecchio and Holman, 2017).

❖ **Medical Practice Management Software (PMS)**

This is a category of healthcare software that deals with the day-to-day operations of a medical practice including veterinarians. Such software frequently allows users to capture patient demographics, schedule appointments, maintain lists of insurance payors, perform billing tasks, and generate reports (American Medical Association, 2023).

Many formerly manual, time-intensive administrative tasks can be automated through the use of standardized electronic transactions. In the case of automating a medical practice's revenue cycle, the right Practice Management System (PMS) is key to achieving the potential efficiencies offered by electronic transactions and work flows (American Medical Association, 2023).

PMS software automates and streamlines a practice's administrative and billing functions. It typically has the ability to: capture patient demographics, schedule appointments, preregister patients (including insurance eligibility and benefit checks), determine patient financial responsibility for collections at the point of care, maintain insurance payer lists, perform billing, and generate reports (American Medical Association, 2023).

Benefits to Patient Care and Nursing Workflow

❖ **Privacy and Security**

Electronic systems can increase the protections of health information. Healthcare informatics can equip one with the knowledge and experience to identify potential threats and the skills to make a difference in protecting patients' personal information. For example, electronic information can be encrypted so that only authorized people can read it. Health Information Technology can also make it easier to record and track who has accessed health information (American Medical Association, 2023).

❖ **Medical Records Management in Healthcare Institutions**

In healthcare institutions, medical information and related records are collected, created, disseminated and utilized daily in very large volumes than any other organizations (Elikwu *et al.*, 2020). These records are fundamental to the well-being of the patients and are employed to ensure service delivery accountability of such health facilities (Ondieki, 2017).

Over the years, medical records have served and still serve multiple purposes in both private and public healthcare institutions; from purposes of births to the recording of deaths of individuals; while also serving as data for equipping and provision of needed medical facilities by visionary governments (Garba, 2016).

The significance of records management to healthcare facilities and institutions includes operational cost reduction and elimination of duplicated overhead costs; elimination of the creation of irrelevant records (Milena, 2015); reduces future costs by ensuring that expensive new equipment are only purchased for upgrading information management (Elikwu *et al.*, 2020); saves spaces by transferring inactive records to storage areas from busy offices and also ensure the timely destruction of expired records (Elikwu *et al.*, 2020).

Also, health records management saves time by ensuring proper organization and maintenance of records (Elikwu *et al.*, 2020); promotes effective public service delivery via access to needed information for programme monitoring, guarantee administrative stability and ensure informed policy decisions are made; upholds history by identifying and preserving vital research records and evidential information (Asunmo and Yaya, 2016).

❖ **Communication Technologies**

A range of communication technologies is being adapted for use in the Healthcare Services. These include digital

tools and services such as mobile phone apps, e-mail messaging, etc that can be used to enhance patients' self-care, facilitate patient-provider communication, inform health behaviors and decisions, prevent health complications, and promote health equity. Some are relatively simple to use, others require greater technical skills in terms of design and use (Centers for Diseases Control (CDC), 2022).

Computer-Assisted Diagnosis and Treatment (CAD/CAT) is a rapidly growing field of medicine that uses computer technology and telehealth to aid in the diagnosis and treatment of various diseases (Hamid *et al.,* 2023)**.** This technology gives providers access to diagnostic tools and treatment options so that they can make more informed decisions leading to improved patient outcomes. Recent findings indcate that CAD/CAT has expanded in allergy and immunology in the form of digital tools that enable remote patient monitoring such as digital inhalers, pulmonary function tests, and E-diaries. By incorporating this information into Electronic Medical Records (EMRs), providers can use this information to make the best, evidence-based diagnosis and to recommend treatment that is likely to be most effective (Hamid *et al.,* 2023).

Computerized Decision Support Software (CDSS) has been merged with other technologies to transport assessment data to aid clinical decision making. This includes the transfer of data such as vital signs and ultrasound readings. They use handheld electrocardiogram monitoring device equipped with a memory card to transfer data. This data informed the General Practitioner's discussion about the patient's condition with a specialist registrar, since then; there has been a rapid-expansion in more sophisticated computer-assisted technologies. This has brought about further opportunities for change in nurse's communication strategies. A community nurse was then able to offer telephone advice. Patients who were maintaining their conditions felt this was beneficial since it offered them effective contact with a Clinical Nurse Specialist while minimizing interaction time.

CHAPTER THREE
CONTEMPORARY ISSUES IN HEALTH INFORMATION TECHNOLOGY

While technology's role in the medical field is flush with benefits, it is important to recognize the potential downsides, including the way in which it can add to the financial burden of healthcare. The acquisition and implementation of technology is expensive. New devices, systems, and software typically come with high upfront costs. What is more, integrating these new technologies into existing systems may require significant investment, from the purchase of compatible equipment to the renovation of facilities (Javaid *et al.,* 2024).

Maintaining these technologies adds to the expense. Keeping up to date with the latest versions, ensuring compatibility with other systems, dealing with technical issues, and making necessary upgrades all contribute to ongoing costs (Javaid *et al.,* 2024). So why is medical technology so expensive? For one, the development of new medical technologies often involves extensive research and development (R&D) and a lengthy approval process to ensure safety and efficacy.

These products often require significant investment in infrastructure, maintenance, and training for proper usage, which can be incredibly costly. For example, a state-of-the-art Magnetic Resonance Imaging (MRI) machine can cost anywhere between one to three million dollars, depending on its specifications, and that is not even including the associated training and maintenance costs. This significant financial outlay is a key aspect of the cost of technology in healthcare. It is not just about purchasing equipment, it is also about maintaining it and training people to use it effectively (Javaid *et al.,* 2024).

Financial Burden: While technology brings numerous benefits to healthcare, such as increased efficiency and improved patient outcomes, it can also significantly increase costs, potentially leading to a greater financial burden on patients and the healthcare system. This includes the initial cost of implementing new technologies, ongoing maintenance, and potential for increased costs associated with some treatments or procedures (Haleem *et al.,* 2021).

Here is a more detailed breakdown

High Initial Costs: Implementing new technologies such as advanced imaging equipment, electronic health records (EHRs), or robotic surgery systems requires substantial upfront investment, which can be passed on to patients through higher healthcare costs (Haleem *et al.,* 2021).

Ongoing Maintenance and Upgrades: Technology requires continuous maintenance, updates, and staff training, all of which contribute to the overall cost.

Increased Procedure Costs: Some technological interventions, while potentially more effective, can be more expensive than traditional methods, such as minimally invasive surgery compared to open surgery (Haleem *et al.,* 2021).

Data Security and Privacy: Protecting sensitive patient data stored electronically requires robust security measures, adding to the cost of implementation and maintenance.

Digital Literacy: A lack of digital literacy among patients and some healthcare providers can hinder the effective use of technology, leading to inefficiencies and potentially higher costs.

Potential for Over-Utilization: The availability of

advanced diagnostic tools may lead to over-diagnosis and over-treatment, increasing costs without necessarily improving outcomes (Haleem *et al.*, 2021).

Technology Dependence

Health Informatiom Technology dependence has been defined as reliance on variety of devices, drugs and procedures to alleviate or remedy acute or chronic health problems

(National Institutes of Health (NIH), 2023). Healthcare delivery has become increasingly dependent on information technology to computerize almost all aspects of patient care, as evidenced by the proliferation of systems ranging from billing and accounts management to computerized provider order entry (CPOE) to sophisticated image-guided surgery systems.

It is not surprising that introducing these systems into the healthcare environment causes shifts in the way health care providers perform their work. As both personnel and organizations adapt to these new technologies, unintended adverse consequences may emerge. System unavailability, regardless of primary cause, can "create chaos" for users and organizations, and overdependence on technology are major types of unintended adverse consequences (Abdelaziz *et al.*, 2024).

Awareness of this issue is vital if organizations are to prepare for and effectively deal with system downtime, assure data accuracy, and help clinicians understand that these tools are designed to support clinical judgment rather than replace it. Finally, organizations should develop methods for measuring the overall efficiency of these systems and quantifiable strategies for system improvement (Abdelaziz *et al.*, 2024).

Data Quality and Accuracy

The accuracy and completeness of data entered into EHRs are critical for making informed clinical decisions. Data entry errors, incomplete data, and lack of standardization can lead to inaccuracies. Implementing quality control measures, training on data entry best practices, and leveraging automated tools for data validation are important steps (Kim *et al.*, 2017).

Regulatory Compliance

Healthcare organizations must comply with various regulations related to data privacy, security, and interoperability. Non-compliance can result in fines, penalties, and reputational damage. Staying informed about regulatory requirements and implementing appropriate security measures is crucial (Kim *et al.*, 2017).

Management Interests

Nursing leaders in all areas including research, education and administration and the Nursing and Midwifery Council of Nigeria have a big role to play in ensuring that nursing informatics is embraced by all nurses in Nigeria (Nursing and Midwifery Council of Nigeria (NMCN), 2019). The Nursing and Midwifery Council of Nigeria (NMCN) is the governing body of Nursing in Nigeria. Broadly, the Council's functions are related to those of designing, implementing and evaluating various nursing and midwifery educational programmes, of indexing, examination, registration, certification, licensure of professional nurses and midwives and monitoring standards of nursing and midwifery practice in Nigeria (Nursing and Midwifery Council of Nigeria (NMCN), 2019).

NMCN also has a part to play in making policies and developing a national informatics agenda for Nursing Education and Practice that are geared towards improving nurses' use of information and technology. These include: An agenda to educate nursing students and practicing nurses in core informatics content. This can be done by ensuring that all nursing schools have well equipped and functional computer rooms with internet facilities that will help nursing students be competent in the use of computers (Robinson-Bassey *et al.*, 2015).

Education/Level of Literacy

With the advent of computer technology use in nursing, the need for data to be analyzed and interpreted to become usable information in practice escalates with each passing year. In order to work with data, process information and derive knowledge, nurses must be able to apply synthesis and application to their practice. Therefore informatics competencies need to be developed in all three levels of expertise through basic and continuing nursing education programs (Nursing Informatics Learning Center, 2023).

Healthcare workers need to be adequately trained on the use of new technologies and how to integrate them into their clinical practice. Lack of time for training, limited resources, and the rapid pace of technological advancements can pose challenges. Providing comprehensive and ongoing training programs, along with access to support resources, is crucial (Kim *et al.*, 2017).

Healthcare informatics provides a myriad of opportunities for innovation. The need to adopt a culture in nursing that promotes acceptance and use of information technology has been identified as an important parallel (Achampong, 2017). Initiative to establishing Nursing Informatics competencies and educational strategies is very important. Hence, strategies for achieving nursing informatics competencies in the workplace include in-service training, intranet ready modules for teaching and learning purposes, free access to online resources, and opportunities for continuing education (Achampong, 2017).

Nursing education in Nigeria takes cognizance of the

National Policy in developing sound educational principles which are essential to the preparation of nurses to function independently and/or as members of interdisciplinary and intersectoral teams (Robinson-Bassey *et al.*, 2015). Hence, there are so many programmes in the nursing education in Nigeria starting from the basic nursing programme, degree programmes (Full time and Part time), distant learning programmes, Open University and Postgraduate (Masters and PhD) programmes in a few universities (Robinson-Bassey *et al.*, 2015).

Strategies for providing Nursing Informatics education within these programmes include; integrating nursing informatics into the curriculum or as individual courses of undergraduate and diploma nursing programmes, make nursing informatics a specialty or elective for graduate programmes, have nursing informatics certificate program in formal continuing education for practicing nurses and could be a non credit/informal continuing education programme for nurses (Robinson-Bassey *et al.*, 2015).

Nurses spend a significant proportion of their time on information related activities as part of clinical decision making in order to lead, co-ordinate and support the delivery of safe, effective, person centered care. In order to provide high quality care for patients, nurses need up to date, accurate, relevant information about the person and access to the latest evidence or best practice at the point of care delivery. Hence, research in nursing is necessary for the development of nursing practice since nursing informatics is a new specialty. It is important that research be carried out on nursing informatics being applied in the nursing practice in Nigeria (Robinson-Bassey *et al.*, 2015).

Education units of hospitals should ensure a continuing education programme that includes training of nurses on the use of computers, their application programmes and sourcing. In advanced degrees, a curriculum with targeted coursework in health management information systems can provide the expertise needed to help organizations run more efficiently and improve patient care (Adelphi University, 2023).

INTEROPERABILITY AND INTEGRATION CHALLENGES

Interoperability

In the arena of healthcare, interoperability is used to describe the capability of Information Technology systems and software to communicate, exchange data and allow for a more thorough use and evaluation of medical information (University of South Florida (USF) Health Morsani College of Medicine, 2017). It simply means that a patient's data can be accessed, shared, interpreted and updated by a host of providers from primary care physicians to hospital doctors, nurses, lab technicians, pharmacists, etc. Recently, healthcare interoperability has become a priority with the creation of the Office of the National Coordinator for Health Information Technology (ONC), which continues to work with private companies, government agencies and healthcare providers to improve the way data is inputted, maintained and shared (University of South Florida (USF) Health Morsani College of Medicine, 2017).

Different electronic health record (EHR) systems when it comes to interoperability and data sharing often struggle to communicate and share data seamlessly, hindering comprehensive care. This can lead to delays in diagnosis and treatment, errors due to incomplete information, and increased costs for healthcare facilities. Developing standardized data formats and protocols is crucial to improve interoperability (Kim *et al.*, 2017).

Interoperability process involves three levels: 1) **Foundational Interoperability**- facilitates the exchange of healthcare data from one system to another. 2) **Structural Interoperability**- ensures a uniform flow of data that does not alter or change the information, allowing it to be interpreted, and 3) **Semantic Interoperability**- allows the exchanged information to be accessed and used regardless of the operating system (University of South Florida (USF) Health Morsani College of Medicine, 2017).

Due to the massive amounts of data collected from a variety of systems that store and code data differently; data interoperability is an ongoing challenge. In some cases, interoperability is achieved through the use of a broker service, which converts the interface between two systems to allow for successful sharing and use (University of South Florida (USF) Health Morsani College of Medicine, 2017).

Despite the sophistication of healthcare computer networks and software, they still suffer in the area of interoperability, or the ease with which different health information systems share data. Many organizations are unable to distribute and receive information quickly, which can lead to negative health outcomes for patients and higher costs to facilities. Highly trained healthcare informatics professionals can play a vital role in addressing this problem (Adelphi Universty, 2023).

Integration Challenges

The digital transformation of healthcare has raised several challenges that affect patients, medical professionals, technology developers, policymakers and others (Bernstein, 2021). Challenges relate to concerns ranging from digital literacy among patients and the resulting unequal access to healthcare to issues related to data storage, access, sharing and ownership. Additional concerns relate to technology and ethics. For example, when medical robots are used, who is responsible for mistakes made during surgery: the hospital, the technology developer or manufacturer, the doctor who used the robot or someone else? (Bernstein, 2021).

Data Security and Patient Privacy

Healthcare organizations are attractive targets for cyberattacks due to the vast amount of sensitive patient data they store. Data breaches can lead to financial losses, reputational damage, and, most importantly, compromised patient safety. Ransomware attacks, insider breaches, and phishing scams are common threats (Kim *et al.*, 2017).

Medicine and technology are rapidly evolving fields, but cybercriminals are doing their best to keep pace. The Federal Bureau of Investigation's 2022 Internet Crime Report states the agency received 800,944 complaints amounting to over $10.3 billion in losses. Of these, phishing scams were the most prevalent; in these scenarios, a criminal will send an email or other communication tricking the recipient into providing personal information or completing a malicious action, such as downloading a corrupted file (Federal Bureau of Investigation (FBI), 2022).

In the healthcare sector specifically, an October 2020 ransomware attack on the University of Vermont Medical Center—which cost the facility $50 million, mostly in lost revenue—reveals that cybercriminals need not gain possession of assets to cause catastrophic impact to an organization (Adelphi University, 2023).

Information Technology malfunction risks include hardware and software failure, human error, spam, viruses and malicious attacks, as well as natural disasters such as fires, cyclones or floods (Queensland Australia Gov., 2023). A thorough examination of how heathcare uses IT can make one to understand and identify the types of IT risks.

The health information technology risks that could impact nursing care include

General threats

Hardware and Software failures --involve a malfunction within the electronic circuits or electromechanical components (disks, tapes, etc) of a computer system. Recovery requires IT expert assistance or to purchase a new computer to continue business operations.

Malware—malicious software designed to disrupt computer operation.

Viruses—codes that can spread from one computer to another, disrupting computer operations (e.g. sent through emails).

Spam, scams, and phishing—unsolicited contact that fool people into giving personal details or buying fake goods.

Human error—accidentally opening an email containing viruses, incorrect data processing, or careless data disposal.

Natural disasters—floods, storms, and bush fires may interrupt service within the business or to external suppliers (e.g. National Broadband Network and electricity) (Queensland Australia. Gov., 2023).

Criminal IT threats: Specific or targeted criminal threats to IT systems and data include: **Ransomware—** software that prevents the user from accessing their files or any part of the computer system until a ransom is paid.

Hackers—people who illegally break into computer systems.

Fraud—using a computer to alter data for illegal benefit.

Password theft—stealing log-in credentials to impersonate for illegal gain.

Denial-of-service—online attacks that prevent website access for authorized users.

Security breaches—physical break-ins as well as online intrusion.

Staff dishonesty—theft of data or sensitive information, such as customer details (Queensland Australia. Gov., 2023).

These concerns, in turn, raise security and privacy questions. For example, what if employers or insurers want to gather data from employees' direct-to-consumer genetic testing results? Or what if medical devices are hacked? The sophistication and variety of internet crimes speak to the need for health informatics to keep up with security. Healthcare Informatics provides an extensive understanding of how health information systems can anticipate security threats and, in many cases, avoid them (Adelphi University, 2023).

Usability and Nurse Burnout

- **Usability**

Health Information Technology systems can be difficult to use, leading to errors and inefficiencies in workflows. Complex user interfaces, long data entry times, and poor system functionality can negatively impact care delivery. User-centered design and ongoing training are essential to improve usability and reduce errors (Kim *et al.*, 2017).

When considering the usability of technology, barriers including fear of frequent breakdowns due to vulnerable infrastructures, staff shortage, and a potential increase in workload can be important in affecting healthcare worker's abilities to leverage technologies (Mohammednejad *et al.*, 2023).

Embracing the Electronic Healthcare Record as a tool in the delivery of care has been challenging (Piscotty *et al.*, 2015). When nurses view documentation as a difficult

and cumbersome task, it often slows the technology's acceptance. Alternatively, if the workflow is designed with the nurse in mind, adoption of technology will be increased (Piscotty *et al.,* 2015).

Clinical decision support systems (CDSSs) are increasingly integrated into healthcare settings to improve patient outcomes, reduce medical errors and enhance clinical efficiency by providing clinicians with evidence-based recommendations at the point of care. However, the adoption and optimisation of these systems remain a challenge (Chen *et al.,* 2023). Clinical Decision Support System (CDSS) with nursing care reminders is a specific tool nurses have to provide quality care and is a necessary requirement to attest to meaningful use of HIT.

Nursing care reminders embedded in the Electronic Health Record (HER) have been found to be related to a decrease in the occurrence of missed nursing care (Piscotty *et al.,* 2015). Basic nursing duties including (but not limited to) feeding, bathing, ambulation, turning, and hygiene are common nursing care activities that are often missed (Davis, 2024).

While the importance of basic nursing care is taught to nurses in their first year of education, these care items are some of the first to not be completed. Pressure ulcer development and pneumonia are just two complications that can be prevented when basic nursing care is delivered in a timely fashion. These complications may result in decreased quality of life for patients and increased healthcare costs. Reasons nurses do not complete nursing cares have been found to be related to a lack of staffing, teamwork, and material resources and a decrease in communication with fellow staff and patients (Boston-Leary *et al.,* 2024). For those working in rural areas, rural people's healthcare demands are typically higher, and they have more limited access to health services, technologies, and specialists (Mohammednejad *et al,* 2023).

❖ **Nurse Burnout**

In hospitals with high patient-to-nurse ratios, nurses experience burnout, dissatisfaction, and the patients experience higher mortality and failure-to-rescue rates than facilities with lower patient-to-nurse ratios. Nursing shortages lead to errors, higher morbidity, and mortality rates. Some states have begun to pass legislation to limit patient-to-nurse ratios (Haddad *et al.,* 2023).

Nurse-to-patient ratios can vary across different hospital units depending on the intensity and complexity of care. A safe hospital nurse staffing standard established by law in California 20 years ago mandates that nurses in adult medical-surgical units care for no more than five patients at one time (Levins, 2023).

Nevertheless, it is not unusual for many hospitals to set nurse-to-patient workloads higher. One reason hospital administrators do this is to lower costs by having fewer nurse employees, meanwhile, they can press the remaining nurses to work harder. But this spreads less nursing care across a larger group of patients and can have very serious consequences (Levins, 2023).

Legal and Ethical Consideration

Using health information technology to improve patient safety raises both ethical and legal issues, primarily concerning privacy, security, and data management. These issues include protecting patient confidentiality, ensuring secure data storage and transmission, and maintaining patient autonomy and informed consent when using Artificial Intelligence (AI) or other technologies. Additionally, there are concerns about algorithmic bias, data ownership, and the potential for misuse or breaches of patient information (Grosman-Rimon and Wegier, 2024).

Below is a more detailed breakdown of these issues:

Legal Issues

- **Compliance with HIPAA**: The Health Insurance Portability and Accountability Act (HIPAA) establish legal standards for protecting patient privacy and security. Healthcare organizations must adhere to HIPAA regulations when using HIT systems.
- **Data Security Breaches:** Breaches of patient data can lead to significant legal liabilities and reputational damage for Healthcare organizations (Grosman-Rimon and Wegier, 2024).
- **Liability for Errors and Damages:** If a HIT system causes harm due to errors or malfunctions, healthcare providers may face legal liability.
- **Intellectual Property:** Protecting the intellectual property of HIT systems and their algorithms is also a legal concern (Grosman-Rimon and Wegier, 2024).
- **Data ownership and access:** Legal frameworks need to address who has the right to access and use patient data, particularly in situations involving research or data sharing (Grosman-Rimon and Wegier, 2024).

Ethical issues

- **Patient Privacy and Confidentiality:** HIT systems store and transmit sensitive patient data, creating vulnerabilities to breaches and misuse. Robust policies and procedures are needed to protect patient records and ensure only authorized personnel can access them (Grosman-Rimon and Wegier, 2024).
- **Data Ownership and Consent:** Who owns data generated by HIT systems, and what consent mechanisms are necessary for its use, especially when involving AI or other technologies? These are complex ethical questions that need careful consideration (Grosman-Rimon and Wegier, 2024).
- **Autonomy and Informed Consent:** Patients have the right to understand how their data is being used and make informed decisions about their care. This includes understanding the potential risks and benefits of using HIT systems and AI (Grosman-Rimon and Wegier,

2024).

- **Algorithmic Bias:** AI and other technologies can introduce bias into diagnostic or treatment decisions, potentially disadvantaging certain patient groups. Ensuring fairness and equity in the use of these technologies is crucial (Grosman-Rimon and Wegier, 2024).

Costs and Resource Constraints

❖ **Costs**

Implementing and maintaining HIT systems can be costly, posing a challenge for many healthcare organizations, especially smaller facilities. Limited resources can impact the ability to implement new technologies, upgrade existing systems, and provide adequate training. Prioritizing investments in HIT that offer the greatest return on investment and exploring innovative funding models are necessary (Kim et al., 2017).

While technology in healthcare aims to streamline processes, there is a risk that it can increase service utilization, ultimately driving up healthcare costs. This is because technology can make some services more accessible or efficient, leading to greater demand (Javaid *et al.*, 2024).

Here is a more detailed breakdown

- **Cost of Technology Itself:** The initial investment in new technology, including hardware, software, and training, can be substantial, and the ongoing maintenance and upgrades can also add to the overall cost (Javaid *et al.*, 2024).
- **New Diagnostic and Treatment Options:** Technology can enable new diagnostic techniques or treatment options that may not be as cost-effective as older methods, therefore contributing to higher overall costs (Javaid *et al.*, 2024).
- **Data Analysis and Insights:** Technology can be used to analyze large data sets, potentially leading to more targeted interventions or more frequent monitoring, which could also increase costs (Javaid *et al.*, 2024).
- **Increased Accessibility:** Technology can make certain treatments or services more accessible, even in remote areas, potentially leading to more patients seeking them, therefore driving the costs higher (Javaid *et al.*, 2024).
- **Greater Efficiency and Convenience:** Tools like telehealth can improve efficiency and convenience, making it easier for patients to receive care and potentially leading to more frequent use and increase in costs (Javaid *et al.*, 2024).

❖ **Resource Constraints**

Healthcare resource constraints refer to factors that limit or restrict access to healthcare resources, such as equipment, staff, facilities, and financial resources. These constraints can lead to long wait times, delayed care, and even unmet healthcare needs (Thokala *et al.*, 2024). Healthcare resource constraints influence the capacity to deliver care, affecting both the costs and outcomes of medical interventions. If these constraints are not adequately accounted for in economic evaluations, there may be a lack of understanding regarding the full impact of implementing health technologies, leading to decisions being made with suboptimal information (Thokala *et al.*, 2024).

Here is a more detailed breakdown

Types of Constraints

- **Shortages of essential equipment**: For example, during the COVID-19 pandemic, there were shortages of masks, ventilators, and other critical supplies (Thokala *et al.*, 2024).
- **Lack of staff**: This can include insufficient doctors, nurses, or other healthcare professionals (Thokala *et al.*, 2024).
- **Limited facility capacity**: Hospitals and clinics may have limited bed capacity, operating room availability, or other physical resources (Thokala *et al.*, 2024).
- **Financial constraints**: Budgetary limitations can restrict the availability of resources, including staff, equipment, and supplies (Thokala *et al.*, 2024).
- **Technological gaps**: Limited access to advanced medical technologies or digital health solutions can also be a constraint (Thokala *et al.*, 2024).
- **Policy limitations**: Lack of clear and coordinated policies or regulations can hinder the effective utilization of healthcare resources (Abubakar, 2021).

Impact of Constraints

- **Longer wait times**: Patients may experience delays in accessing appointments, tests, or procedures (Thokala *et al.*, 2024).
- **Delayed or reduced care**: Resource limitations can force healthcare providers to prioritize certain patients or limit the scope of care (Thokala *et al.*, 2024).
- **Increased healthcare costs**: When resources are constrained, healthcare systems may incur higher costs due to inefficiencies, longer hospital stays, or the need to purchase more expensive equipment (Thokala *et al.*, 2024).
- **Reduced quality of care**: Resource constraints can impact the ability of healthcare providers to deliver high-quality, evidence-based care (Thokala *et al.*, 2024).
- **Unmet healthcare needs**: Some patients may not be able to access the care they need due to a lack of resources (Thokala *et al.*, 2024).

Addressing Healthcare Resource Constraints

- **Improving efficiency:** Optimizing existing resources and streamlining workflows can help improve resource utilization (Thokala *et al.*, 2024).
- **Investing in infrastructure:** Expanding healthcare facilities and acquiring necessary equipment can address physical limitations (Thokala *et al.*, 2024).
-**Strengthening workforce:** Attracting and retaining qualified healthcare professionals can address staff shortages (Thokala *et al.*, 2024).
- **Developing partnerships:** Collaboration between different healthcare providers and organizations can

help share resources and expertise (Thokala *et al.*, 2024).
- **Promoting innovation:** Adopting new technologies and approaches to care delivery can improve efficiency and resource utilization (Thokala *et al.*, 2024), and
- **Improving funding mechanisms:** Ensuring adequate funding for healthcare services can help address financial constraints (Thokala *et al.*, 2024).

PROSPECTS FOR HEALTH INFORMATION TECHNOLOGY IN NURSING PRACTICE

The prospect of Health Information Technology (HIT) in nursing is excellent as it offers immense promising advances such as: enhanced patient care through real-time data sharing, improved safety, streamlining workflows, and reducing administrative burdens for nurses (American Nurses Association Nursing Resources Hub, 2024). The integration of tools such as AI-powered decision support systems and telehealth platforms enhances clinical judgment and patient monitoring, while also creating opportunities for professional development and improved patient engagement. Key challenges include ensuring adequate training for nurses, maintaining data security, and designing systems that truly fit the workflow to maximize benefits and minimize negative impacts on practice (American Nurses Association Nursing Resources Hub, 2024).

Enhanced Patient Care and Outcomes

Real-time Data Access: Electronic Health Records and informatics systems allow nurses quick access to comprehensive patient data, enabling more effective and informed care (American Nurses Association Nursing Resources Hub, 2023).

Improved Patient Safety: Accurate documentation and better data sharing can minimize medical errors and improve communication, leading to better patient outcomes (American Nurses Association Nursing Resources Hub, 2023).

Personalized Care: Data analysis and AI can support individualized care plans and predictive algorithms that offer proactive patient advice care (American Nurses Association Nursing Resources Hub, 2023).
Streamlined Workflow and Efficiency

Reduced Administrative Burden: Technology helps automate data handling and other tasks, freeing up nurses to spend more quality time on direct patient care.

Facilitated Communication: HIT improves communication and collaboration among healthcare teams by providing a centralized platform for real-time information sharing.
Advancements in Nursing Education and Research

Accessible Education: E-learning platforms, simulations, and virtual resources provide nurses with continuous access to the latest medical knowledge and evidence-based practices.

Supporting Innovation: Access to timely and accurate data supports research and quality improvement initiatives, helping to implement new and evidence-based practices.
Emerging Technologies and Applications

Artificial Intelligence (AI): AI can power clinical decision support systems, automate data analysis, and assist in treatment planning, enhancing nursing decision-making.

Telehealth: Telehealth platforms, supported by informatics, have expanded the reach of care and improved coordination between healthcare professionals and patients.

Data Analytics: Integrating data mining and machine learning techniques enables better data analysis, leading to more precise forecasting and evidence-driven decision-making.

Key Considerations for the Future

Training and Competency: Nurses need adequate training and support to effectively use new technologies and navigate digital tools confidently.

Data Security and Privacy: As patient data becomes more digitized, maintaining strict security protocols to protect sensitive information is paramount.

System Design: HIT systems should be designed with nurses' workflows in mind to ensure seamless integration and avoid negatively impacting their practice, according to University of Michigan research.

The prospects for Health Information Technology (HIT) are robust, with continued growth driven by advancements such as Artificial Intelligence (AI), increasing demand for health information professionals, and the potential to revolutionize healthcare through data utilization. Health Information Technology improves patient outcomes by reducing errors and enabling real-time feedback, while also increasing efficiency and lowering costs for providers. Future developments will focus on co-creating HIT for patient-centered care and utilizing data for personalized medicine and disease prevention.

Benefits of Healthcare Informatics

The integration of technology into the healthcare system has helped contribute to advances in record storage, quality of patient care and cost minimization. Technology in Medical Field has increased accessibility, improved the accuracy of diagnosis, and streamlined processes. It has empowered patients, allowing them to monitor their health metrics in real-time and facilitating more patient-centered care. Technology has also transformed how healthcare providers and patients

interact and how healthcare itself is perceived and consumed (Stephen and Frank, 2024).

Innovations ranging from telemedicine to wearable devices have transformed the way medical practitioners diagnose diseases and monitor patients' health. They have even changed the way providers interact with their patients. The World Health Organization (WHO) has emphasized the essential role of medical devices and equipment for maintaining health system performance. It mentioned that within the context of a robust health system they ensure access to safe, effective, and high-quality medical devices that prevent, diagnose, and treat diseases (World Health Organization (WHO), 2024).

Inadequate selection and distribution of technologies can create inefficiencies and waste, or create risks to the quality of health services (National Institutes of Health (NIH), 2022). The rise of technology in the medical field has dramatically reshaped the landscape of healthcare provision. Still, when discussing medical technology, the question inevitably arises: how does medical technology increase healthcare costs? As technology advances, it presents new devices and systems that can greatly enhance patient care.

The downside is that these devices often require substantial investments for acquisition, implementation, and ongoing maintenance. The impact of technology on healthcare cost and quality should also be considered (National Institutes of Health (NIH), 2022).

While costs are high, the quality improvements brought by technology are equally significant. For example, with the use of telemedicine, a patient living in a rural area can consult a specialist hundreds of miles away, thereby eliminating the need for travel and making healthcare more accessible. Advanced medical technology can also lead to improved health outcomes (National Institutes of Health (NIH), 2022).

New imaging technologies and laboratory tests allow for earlier and more accurate disease detection, facilitating more effective treatments and leading to better patient survival rates (National Institutes of Health (NIH), 2022).

Here are some of the benefits cutting-edge informatics can provide for healthcare

❖ **Improved Healthcare Quality**

The goal of healthcare informatics is to improve treatment. One recent innovation is the introduction of Clinical Communication and Collaboration (CC&C) platforms, which are dedicated spaces for clinicians to communicate with each other over HIPAA-compliant smartphone or desktop applications (Adelphi University New York, 2024). CC&C platforms allow professionals to send confidential information, such as lab results and medication lists, safely and securely. In these dedicated spaces, a patient's care team can collaborate effectively, even if the physicians belong to different organizations.

Another way in which healthcare informatics technology has improved patient outcomes is through patient portals and telemedicine softwares that allow for communication between providers and patients. Technology such as encrypted messaging enables providers to communicate with patients remotely, which decreases the likelihood of injury, infection and so on. This benefit was especially useful during the height of the COVID-19 pandemic because it enabled certain non-emergency situations to be diagnosed and treated without face-to-face interaction.

❖ **HIT gives timely access on 24hrs basis to patients' records**

Adoption and use of HIT gives timely access on 24hrs basis to patients' records without delays than paper records**.** Use of HIT platform provides prompt access to patients' medical history on diagnosis, prescriptions, treatments and care. This finding supports the assertion of Zayyad and Toycan (2018) that it promotes access to updated medical records and interrelated information; also with Uluc and Ferman (2016) assertion that it enables accurate and timely communication among all practitioners involved in healthcare provision; and that it promotes interoperability between systems (Elikwu *et al.*, 2020).

❖ **Use of HIT platform ensures safety and protection of patient's medical records**

Use of HIT platform reduces overall patient waiting time and enhances the quality of care delivery. It enables proper documentation process; avoidance of improper filing, damage or loss of patient records, promotes efficient utilization of resources, and decrease in repetitive laboratory tests and other related services (Elikwu *et al.*, 2020).

❖ **Better Record Storage and Retrieval**

Electronic Health Records (EHRs) are, in many ways, the frontlines of healthcare informatics because of the volume of data generated and the importance of this data in all areas of medicine. Doctors treating patients and scientists performing studies need to retrieve information quickly and feel assured that the records they receive are accurate and complete (Adelphi Universty, 2023). Healthcare professionals have benefited from the integration of significant improvements in records management, such as the implementation of cloud-based systems. With EHRs, healthcare organizations can help build a healthier future for nations (Adelphi Universty, 2023).

❖ **Reduced Health Care Costs**

The impact of technology on healthcare cost and quality is multifaceted, with potential benefits that include improved patient outcomes and better resource use. Preventing errors is another key benefit of health informatics; digitizing records and using algorithms to

perform complex calculations helps ensure accuracy, which saves money and lives (Haleem *et al.,* 2021). When considering how to reduce healthcare costs, it is clear that integrating technology into healthcare practices has changed things for the better.

Such as noted below

Improved Diagnostic Accuracy: Technology can enhance the accuracy of medical diagnoses, helping to avoid unnecessary treatments and hospital stays. This not only improves patient care, but cuts costs across the board (Medesk, 2023).

Telemedicine: Telehealth services reduce the need for in-person visits, helping to alleviate travel and related costs for patients. For healthcare providers, it allows for reaching of more patients, potentially leading to increased productivity (Medesk, 2023).

Efficient Data Management: The use of EHRs allows healthcare providers to store and retrieve patient data more efficiently, reducing paperwork and administrative costs (Medesk, 2023).

Patient Self-Monitoring: Wearable technologies and health apps make it possible for patients to monitor their own health. This makes it easier to detect issues early and avoid expensive emergency care (Haleem *et al.,* 2021).

Predictive Analysis: With the rise of Artificial Intelligence (AI) and machine learning, predictive analytics can be used to anticipate health events, from disease outbreaks to individual patients' health deterioration. Early intervention can result in substantial cost savings (Haleem *et al.,* 2021).

Precision Medicine: Technology facilitates personalized treatment plans based on a patient's genetic makeup, lifestyle, and environment, increasing the effectiveness of treatments and potentially reducing the costs of unsuccessful treatments (Haleem *et al.,* 2021).

Authenticity: This is advanced software that allows users to analyze patient voices. By identifying patient pain points and areas of need, providers and organizations can work to address the challenges presented by technology and take full advantage of the new tools at their disposal. It is helping shape the future of healthcare by providing greater cost-effectiveness all around (Haleem *et al.,* 2021).

It is not just the high-tech, cutting-edge innovations that are making a difference. Simple digital technologies such as online portals can significantly reduce healthcare costs by streamlining appointments, prescription refills, and communication. These tools minimize administrative overhead and enhance patient engagement, ultimately leading to more efficient and cost-effective care (Haleem *et al.,* 2021).

Here is how online portals contribute to cost reduction

- Streamlined Scheduling: Online portals allow patients to book appointments themselves, freeing up staff time for more complex tasks and reducing wait times (Haleem *et al.,* 2021).

- Simplified Prescription Management: Patients can request refills and view their medication history online, reducing paperwork and potential errors (Haleem *et al.,* 2021).

- Enhanced Communication: Secure messaging platforms within portals facilitate communication between patients and providers, addressing questions and concerns promptly and potentially avoiding unnecessary clinic visits (Haleem *et al.,* 2021).

- Reduced Administrative Costs: By automating tasks and reducing the need for manual paperwork, online portals significantly lower administrative overhead for healthcare providers (Haleem *et al.,* 2021).

- Improved Patient Engagement: When patients are more engaged in their care, they are more likely to adhere to treatment plans, leading to better outcomes and potentially fewer expensive interventions (Haleem *et al.,* 2021).

In essence, by leveraging technology, healthcare providers can create a more efficient and cost-effective system that benefits both patients and the organization.

Artificial Intelligence and Machine Learning in Nursing

- **Adapting to Artificial intelligence and Machine Learning**

Artificial intelligence (AI) can be used to diagnose diseases, develop personalized treatment plans, and assist clinicians with decision-making. Rather than simply automating tasks, AI is about developing technologies that can enhance patient care across healthcare settings. AI is a major force in health informatics, assisting with image analysis for cancer screenings and enabling personalized medicine by tailoring treatments to a patient's unique genetic makeup.

However, challenges related to data privacy, bias, and the need for human expertise must be addressed for the responsible and effective implementation of AI in healthcare (Alowais *et al.,* 2023)

Artificial intelligence is a hot topic in many fields for the technology's ability to mimic human-made work, but what about AI's potential impact on healthcare? One of the foremost benefits of AI and machine learning is their ability to produce detailed diagnoses and treatment plans from complex data (Adelphi University, 2023). For instance, a doctor can input a patient's list of symptoms into a database, and AI can use machine learning to

cross-reference the symptoms with known illnesses, and then inform the doctor of potential causes, risk factors and treatments (Adelphi University, 2023).

AI's potential benefits for medicine are vast, which makes job candidates with training in the latest health information systems, data collection methods and analytic techniques a valuable commodity. Ultimately, the sophistication of current technology allows professionals in the field to turn challenges into opportunities for innovating new solutions (Adelphi University, 2023).

Improved Interoperability Solutions

- **Impact of nursing informatics on the nursing profession**

Nursing Informatics integrates nursing science, computer science and information science to facilitate the integration of data, information, knowledge and wisdom to support patients, nurses and other healthcare providers in their decision-making during healthcare delivery (Ademuyiwa et al., 2020). Hospitals and organizations across the healthcare continuum have adopted increasingly sophisticated health information technology to record patient data and guide clinical decision making.

Specialists in nursing informatics harness these sophisticated applications to support crucial duties like performing diagnostics, developing care plans, administering treatments, and educating patients and their families. Healthcare providers can now access an unprecedented volume of quantitative information that makes it possible to assess the needs of patients more accurately (Adelphi University, 2023).

Computer information systems, such as electronic health records (EHRs), play a crucial role in enhancing nursing practice and patient safety. They reduce medication errors, improve efficiency, and enable better patient assessments and monitoring. Computer order entry systems facilitate easy interpretation of physician orders, leading to more effective patient care (American Nurses Association Nursing Resources Hub, 2024).

Here is a more detailed look at the benefits

1. Reduced Medication Errors

Bar-coded medication administration (BCMA) systems: These systems require nurses to scan patient identification and medication barcodes before administration, minimizing errors related to the right patient, drug, dose, route, and time (American Nurses Association Nursing Resources Hub, 2024).

Computerized alert systems: These systems can detect potential adverse drug reactions or drug interactions, alerting clinicians and preventing harm (American Nurses Association Nursing Resources Hub, 2024).

Electronic prescribing systems: These systems can help prevent errors by ensuring accurate medication dosages and reducing the likelihood of prescribing errors (American Nurses Association Nursing Resources Hub, 2024).

2. Improved Efficiency and Workflow

Electronic health records (EHRs): EHRs allow nurses to access and manage patient data quickly and accurately, streamlining workflow and reducing administrative burdens (American Nurses Association Nursing Resources Hub, 2024).

Automated tasks: Computer systems can automate tasks like medication administration reminders and appointment scheduling, freeing up nurses' time for direct patient care (American Nurses Association Nursing Resources Hub, 2024).

Real-time data access: Nurses can access real-time patient data and analytics, enabling them to make more informed decisions and provide more proactive care (American Nurses Association Nursing Resources Hub, 2024).

3. Enhanced Patient Assessment and Monitoring

Data collection and analysis: Computer systems can collect and analyze patient data, providing nurses with valuable insights into patient health trends and risks (American Nurses Association Nursing Resources Hub, 2024).

Improved communication: Electronic communication tools allow nurses to easily communicate with physicians and other healthcare professionals, facilitating coordinated care (American Nurses Association Nursing Resources Hub, 2024).

Remote monitoring: Wearable sensors and other technologies can enable remote monitoring of patients' vital signs and other health parameters, allowing for early detection of problems (American Nurses Association Nursing Resources Hub, 2024).

4. Computer Order Entry Systems

Easy interpretation of orders: Computer order entry systems can make it easier for nurses to understand and interpret physician orders, reducing the risk of misinterpretation and errors (American Nurses Association Nursing Resources Hub, 2024).

Automated order processing: These systems can automate the process of entering and verifying orders, freeing up nurses' time for other tasks (American Nurses Association Nursing Resources Hub, 2024).

Integration with other systems: Computer order entry systems can be integrated with other systems, such as EHRs and medication management systems, to provide a seamless flow of information (American Nurses Association Nursing Resources Hub, 2024).

Computer information systems prevent nurses from making medication errors, helps nurses work faster, smarter and more competent in whatever they do. With

computer information systems, nurses perform better assessments and monitoring of patients diseases and ailments. Computer order entry systems help nurses easily interpret orders from physician in the management of a patient. There is better collaboration and sharing of patient information with other healthcare providers with computer information systems, and it helps nurses utilize research to provide evidence based care (American Nurses Association Nursing Resources Hub, 2024).

❖ **The impact of nursing informatics on the health care system**

Nursing informatics impacts the health care system and the nursing profession in a lot of ways (Adesina and Abimbola, 2017).

This includes

- **Digitization** of paper charting into interoperable electric charting, hence decreasing documentation time which relieves nurses from writing on and handling of papers, thus creating a paperless environment.- Elimination of ambiguity, redundancy and the tedious process of documentation.
- **Reduction** of turnaround time, which starts from the time a request is made, to the time it is fully accomplished. For example, laboratory results can be sent directly to the nurses' station with the use of an E-mail, so there is more time available for client care.
- **Nursing** informatics impacts quality and cost of health care, and
-**Optimizes** information management and communication among health care providers (Adesina and Abimbola, 2017).

❖ **Nurse Informatics Competencies**

Nursing Informatics has developed into a mandatory focus for all registered nurses on a global scale (Achampong, 2017). Now, in the twenty-first century, official organizations, schools, and continuing education which help prepare nurses for engaging in informatics related practice are springing up all over the world especially in technologically advanced nations. There is however a growing need for practicing registered nurses, nurse educators and researchers and nursing administration to ensure that the expected competencies in informatics are met (Achampong, 2017).

Nurses certified in Nursing Informatics are skilled in the analysis, design, and implementation of information systems that support nursing in a variety of healthcare settings; function as translators between nurse clinicians and information technology personnel and ensure that information systems capture critical nursing information (Achampong, 2017).

The Technology Informatics Guiding Educational Reform (TIGER) Nursing Informatics Competencies Model (2017) consists of three parts: **Basic computer competencies, information literacy and information management.** Grobe (1989) identified three levels of competencies as**: beginner entry or user level, intermediate or modifier level and advanced or innovator level of competency.** Each of the three competency levels includes both knowledge and skills required to: use information and communication technologies to enter, retrieve and manipulate data; interpret and organize data into information to affect nursing practice; and combine information to contribute to knowledge development in nursing (Nursing Informatics Learning Center, 2023). The expertise of these competencies is in a continuum and includes:

Technical competencies - Technical competencies are related to the actual psychomotor use of computers and other technological equipment. Specific nursing informatics competencies include the ability to use selected applications in a comfortable and knowledgeable way. It is important that nurses feel confident in their use of computers and software in the practice setting, especially at the bedside, in order to be able to attend to the client at the same time (Nursing Informatics Learning Center, 2023).

Utility competencies - Utility competencies are related to the process of using computers and other technological equipment within nursing practice, education, research and administration. Specific nursing informatics competencies include the process of applying evidenced based practice, critical thinking, and accountability in the use of selected applications in a comfortable and knowledgeable way (Nursing Informatics Learning Center, 2023).

Leadership competencies - Leadership competencies are related to the ethical and management issues related to using computers and other technological equipment within nursing practice, education, research and administration. Specific nursing informatics competencies include the process of applying accountability, client privacy and confidentiality and quality assurance in documentation in the use of selected applications in a comfortable and knowledgeable way (Nursing Informatics Learning Center, 2023).

A Beginner/User level of competency indicates nurses who demonstrate core nursing informatics competencies. This level includes practicing nurses, nurse administrators, nurse researchers and educators (Nursing Informatics Learning Center, 2023). In most taxonomy, this is the basic level that all nurses should minimally demonstrate, no matter what area of practice he or she works in. The competencies required by nurses in the workplace are categorized in a number of ways. Although different language is used to describe these competencies, the key concepts and categories are quite similar across taxonomies. All proposed frameworks include competencies that describe: the use of information and communication technology (technical competencies), the use of automated information in a professional context (utility competencies), decision-making with respect to planning for and using both the

technology and information (leadership competencies) (Nursing Informatics Learning Center, 2023).

Intermediate/ Modifier level of competency indicates nurses who demonstrate intermediate nursing informatics competencies. This level includes nurses who have mastered basic kills and use technology in inventive ways in their practice.

The Advanced/Innovator level of competency indicates nurses who demonstrate advanced and specialized nursing informatics competencies (Nursing Informatics Learning Center, 2023).

This level includes practicing nurses, nurse administrators, nurse researchers and educators who have mastered expert skills and use technology in design, plan and coordinate the use of technologies and informatics theory in nursing (Nursing Informatics Learning Center, 2023).

Advancements in Telehealth and Remote Monitoring

- **Technology and the Future of Healthcare**

Looking forward, it is easy to see that technology and the future of healthcare are inextricably intertwined. From artificial intelligence to precision medicine, telehealth, and beyond, the role of technology is set to expand even further, influencing all aspects of healthcare delivery. The advancement of technology in the healthcare field is expected to continue at an unprecedented rate. These advances will influence how to diagnose and treat diseases and fundamentally change the way healthcare is organized and delivered (Medical Device Network, 2023).

As technology develops, the healthcare informatics field is continually evolving to create a better patient experience. One major development in the future of healthcare informatics is the introduction of the **Internet of Things (IoT)** into the medical field. IoT is a system of wireless, interrelated and connected digital devices that can collect, send and store data over a network without requiring human-to-human or human-to-computer interaction. By allowing practitioners to predict health issues, as well as diagnose and treat patients both in-person and virtually, IoT has the potential to significantly enhance patient care (Medical Device Network, 2023).

Wearable devices are another emerging technology that can have a positive impact for patients' self-management of medical conditions. While commercial wearables such as smartwatches and fitness trackers are common, there are many more medical-focused wearable devices that patients can use. Healthcare systems such as Ochsner Health System and Kaiser Permanente are placing greater emphasis on providing wearables to patients. Wearables can allow patients to monitor their condition at home while simultaneously providing up-to-date data to practitioners about their patient's condition (Adelphi University New York, 2023).

Precision medicine technology creates treatment and prevention strategies that meet patient needs by considering individual variability in their environment and lifestyle. With increased access to an unprecedented variety and volume of medical data, precision medicine could revolutionize the medical field (Adelphi University New York, 2023).

One key area of growth is in the realm of artificial intelligence and machine learning. AI is expected to play a critical role in predictive analytics, helping providers anticipate health issues before they become severe and require more expensive interventions. By integrating data, AI can enable providers to develop personalized care plans (Alowais *et al.*, 2023).

Telemedicine, which has already seen substantial growth in recent years, is likely to become even more embedded in healthcare systems. This technology allows patients to receive care from the comfort of their own homes, reducing the need for in-person visits. As it evolves, telemedicine could help bring quality healthcare to more underserved populations (Alowais *et al.*, 2023)**.** **Blockchain technology** also holds significant promise. It has the potential to enhance the security and interoperability of health records, making it easier for providers to share and access information while maintaining patient privacy. This could lead to more coordinated care and better health outcomes (Alowais *et al.*, 2023)**.**

Policy and Legislative Support

Policy and legislative support are crucial for successful health information technology implementation. They provide the framework for developing and implementing electronic health records (EHRs) and other digital health solutions, ensuring patient privacy and data security, and fostering interoperability between systems. Regulatory bodies play a vital role in creating policies that facilitate EHR adoption while protecting patient and provider rights (Stephen *et al.*, 2024).

- **Key aspects of policy and legislative support in HIT include**

Enabling EHR Adoption: Policies can encourage the adoption of EHRs by offering incentives, such as financial support for implementation and meaningful use programs (Trout *et al.*, 2022).

Data Privacy and Security: Regulations such as HIPAA (Health Insurance Portability and Accountability Act) and HITECH Act (Health Information Technology for Economic and Clinical Health Act) establish standarsds for protecting patients' health information and ensuring its confidentiality and security (Trout *et al.*, 2022).

Interoperability and Data Sharing: Policies can promote interoperability by mandating standards for data exchange between different EHR systems and healthcare organizations, facilitating seamless information sharing and improving patient care (Trout *et al.*, 2022).

Public-Private Sector Collaboration: Policies can encourage partnerships between public and private sectors to leverage expertise and resources in developing and implementing HITsolutions, such as state health information exchanges (Trout *et al.*, 2022).

Funding and Incentives: Government funding programs, such as the State Health Information Exchange Cooperative Agreement Program, can provide financial support for HIT initiatives, while incentives such as reduced penalties for certain actions can encourage participation (Trout *et al.*, 2022).

Monitoring and Evaluation: Policies can establish mechanisms for monitoring and evaluating the impact of HIT implementation, ensuring that it meets its objectives and is adapted as needed (Trout *et al.*, 2022).

❖ **Examples of relevant policies and legislation are**

HITECH Act: The HITECH Act, also known as the Health Information Technology for Economic and Clinical Health Act, includes provisions to incentivize and fund the adoption of Electronic Health Records (EHRs). This is done by providing financial incentives to eligible professionals and hospitals who successfully demonstrate "meaningful use" of EHR technology, as well as by providing funding for EHR implementation (Cohen, 2016).

HIPAA: Health Insurance Portability and Accountability Act (HIPAA) sets national standards for the protection of patient health information, ensuring its confidentiality and security.

The HIPAA Privacy Rule establishes national standards to protect individuals' medical records and other individually identifiable health information (collectively defined as “protected health information”) and applies to health plans, health care clearinghouses, and those health care providers that conduct certain health care transactions electronically (United States Department of Health and Human Services (HHS), 2024).

The Rule requires appropriate safeguards to protect the privacy of protected health information and sets limits and conditions on the uses and disclosures that may be made of such information without an individual’s authorization. The Rule also gives individuals rights over their protected health information, including rights to examine and obtain a copy of their health records, to direct a covered entity to transmit to a third party an electronic copy of their protected health information in an electronic health record, and to request corrections (United States Department of Health and Human Services (HHS), 2024).

National Health ICT Strategic Framework: The Nigerian government's framework for promoting ICT in healthcare is the National Health Information and Communication Technology (Health ICT) Strategic Framework. Developed by the Federal Ministry of Health, this framework outlines a strategy for leveraging ICT to improve healthcare delivery and achieve universal health coverage in Nigeria. The framework was expected to run between 2015 and 2020 and aims to improve access to, and quality of, health services (Elechi *et al.*, 2024).

State-Level Policies: Many states have their own policies and laws related to HIT, often addressing specific issues such as health information exchange and data security. By providing a strong regulatory and policy framework, countries and regions can effectively promote the adoption of HIT and harness its benefits for improving patient care, reducing costs, and enhancing healthcare efficiency (Elechi *et al.*, 2024).

DRAFT NATIONAL eHEALTH POLICY: The Project Management Office (PMO) within the Federal Ministry of Health, in collaboration with other relevant agencies, is responsible for monitoring and evaluating the implementation of policies and initiatives, including the eHealth policy. This includes developing indicators for evaluation and collaborating with other agencies to strengthen civil registration and vital statistics. The PMO also plays a key role in strengthening and integrating existing surveillance systems into the overall health information system. Additionally, the PMO supports the implementation of special projects within the Ministry and fosters collaboration with other departments, agencies, and institutions (Elechi *et al.*, 2024).

Below is a more detailed breakdown of their responsibilities

Monitoring and Evaluation: The PMO is responsible for tracking the progress and effectiveness of health programs, projects, and plans.

Policy Implementation: They play a crucial role in ensuring that health policies are implemented effectively and efficiently.

Special Projects: The PMO oversees the development and implementation of special projects, ensuring they align with the Ministry's strategic goals and objectives.

Collaboration: The PMO works closely with other relevant agencies, departments, and institutions to achieve common health goals.

Strengthening Health Systems: They contribute to the development and strengthening of the health system by integrating various components and improving data

collection and analysis.

eHealth Policy: The PMO plays a key role in the development and implementation of the eHealth policy, aiming to leverage technology to improve healthcare delivery (Elechi *et al.*, 2024).

Enhanced Nursing Education and Training in Health Information and Technology

The increasing availability of technology devices or portable digital assistant devices continues to change the teaching-learning landscape, including technology-supported learning. Portable digital assistants and technology usage have become an integral part of teaching and learning nowadays. Cloud computing, which includes YouTube, Google Apps, Dropbox and Twitter, has become the reality of today's teaching and learning, and has noticeably improved higher education, including nursing education. Technology in nursing education is used in both clinical and classroom teaching to complement learning (Gause *et al.*, 2022).

Enhanced nursing education and training in health information and technology focuses on integrating technology into nursing education to improve efficiency, effectiveness, and quality of care. This involves using computer-based learning, simulations, and telehealth to prepare future nurses for the technological advancements in healthcare. Nursing informatics, a key aspect, manages and communicates data, information, knowledge, and wisdom in nursing practice, enabling data-driven decision-making (Gause *et al.*, 2022).

Below is a more detailed breakdown

1. The Importance of Technology in Nursing

Improved Efficiency and Quality of Care: Technology streamlines workflows, improves data access, and enhances communication, ultimately leading to better patient outcomes.

Enhanced Learning and Engagement: Technology-based tools like simulation, gamification, and virtual learning environments can make learning more engaging and effective.

Accessibility and Flexibility: Online learning and telehealth provide access to education and training from anywhere, at any time, making it more convenient for nurses and students.

Preparation for the Future: Nurses need to be proficient in using technology to manage health information, communicate with patients, and collaborate with other healthcare professionals (Gause *et al.*, 2022).

2. Key Aspects of Enhanced Training

Nursing Informatics: The integration of nursing, computer, and information science to manage and communicate data, enabling data-driven decision-making.

Computer-Based Learning: Using online modules, simulations, and interactive exercises to teach concepts and skills.

Simulation-Based Learning: Using realistic simulations to practice clinical skills and procedures without putting real patients at risk.

Telehealth: Leveraging technology to provide remote care and education, expanding access to healthcare and training.

Faculty Training: Equipping nursing educators with the skills and knowledge to effectively integrate technology into their teaching practices (Gause *et al.*, 2022).

3. Benefits of Enhanced Education

Improved Patient Care: Nurses equipped with technology are better able to gather, analyze, and use information to make informed decisions about patient care.

Increased Efficiency: Technology can streamline workflows, reduce paperwork, and improve communication, freeing up nurses' time for patient care.

Enhanced Safety: Technology can help reduce errors, improve medication management, and enhance communication between healthcare providers.

Greater Access to Information: Nurses can access a wealth of information, including the latest research and clinical guidelines, to improve their practice.

Increased Engagement and Motivation: Technology can make learning more engaging and motivating for students and nurses (Gause *et al.*, 2022).

CONCLUSION

Health information technologies are widely viewed as essential tools for improving the quality and efficiency of health care delivery. With Health Information Technology (HIT) becoming the modus operandi in dissemination of information among healthcare workers especially nurses, it is imperative that major stakeholders try as much as possible to provide functioning HIT materials to enable nurses fully adopt such into practice. The benefits of technology are beginning to emerge in smaller practices and organizations, as well as in large organizations that were early adopters. Effects on outcomes, including quality, efficiency, and provider satisfaction of health information technology were positive overall. However, dissatisfaction with electronic health records among some providers remains a problem and a barrier to achieving the potential of health information technology. These realities highlight the need for studies that document the challenging aspects of implementing health information technology more specifically and how these challenges might be addressed. It is also important that barriers limiting adoption and use of HIT be tackled to make for faster dissemination of information and storage and subsequently, improved patient satisfaction and care.

REFERENCES

1. Abdelaziz, S., Garfield, S., Neves, A. L., Lloyd, J., Norton, J., Dael, J. V., Wheeler, C., McLeod, M., and Franklin, B. D., (2024). What are the unintended patient safety consequences of healthcare technologies? A qualitative study among patients, carers and healthcare providers. BMJ Open. https://bmjopen.bmj.com/content/14/11/e089026
2. Abubakar, B., (2021). Primary Health Care in Nigeria: Progress, Challenges and Collaborating for Transformation.https://articles.nigeriahealthwatch.com/primary-health-care-in-nigeria- progress-challenges- and-collaborating-for transformation /#:~:text =Challenges %20 remain%20despite%20policies%20targeted%20at%20PHC%20delivery &text=They%20include%2C%20fragmented%20governance%20and ,human%20resources%20and%20poor %20funding.
3. Achampong, E.K., (2017). Assessing the Current Curriculum of the Nursing and. Sage Journals https://journals.sagepub.com › doi
4. Adelphi University New York (2023). Benefits of Informatics in Nursing - Online Programs. https://online.adelphi.edu › articles › benefits-of-inform...
5. Adelphi University New York (2024). 3 Challenges and 3 Benefits of the Current Healthcare Informatics Landscape. https://online.adelphi.edu/articles/challenges-benefits-health-informatics/#:~:text=At%20its%20most%20simple%2C%20the,communication %20between%20providers%20and%20patients.
6. Ademuyiwa, I. Y., Faleke, S. O., and OtetubI, E. E., (2020). Knowledge and Use of Nursing Informatics among Nurses in a University Teaching Hospital in Lagos, Nigeria. International Journal of Medical Research & Health Sciences, 10(12): 63-69. https://www .researchgate. net/publication/364321544_Knowledge_and_Use_ of_Nursing_Informatics _among_Nurses_in_a_University_Teaching_Hospital_in_Lagos_Nigeria
7. Adesina, K. A. and Abimbola, O. Implication of Information Communication Technology (ICT) on Nursing Development and Nursing Outcome. International Journal of Healthcare Sciences ISSN 2348-5728 (Online), 2017; 4(2): (1-10). www.researchpublish.com Page | 1 Research Publish Journals.
8. Alowais, S. A., Alghamdi, S. S., Alsuhebany, N., Tariq Alqahtani, T., Alshaya, A. I., Almohareb, S. N., Aldairem, A., Alrashed, M., Saleh, K. B., Badreldin, H. A., Al Yami, M. S., Al Harbi, S and Albekairy, A. M., (2023). Revolutionizing healthcare: the role of artificial intelligence in clinical practice https://bmcmededuc.biomedcentral.com /articles/ 10.1186/s 12909-023-04698-z#:~:text=Integrating% 20AI%20into%20 healthcare%20 holdsand% 20influence%20patient%2Dphysician%20trust.
9. Ama-abasi, D. R., Egbe, I. M., and Omoniyi, O M. Information need and resource utilization of pregnant women in University of Calabar. IP Indian Journal of Library Science and Information Technology, 2022; 7(1): 22-31.
10. American Medical Association (2023). How to select a Practice Management System. https://www.ama-assn.org/practice-management/claims-processing/how-select-practice-management-system
11. American Nurses Association. (2015). Health IT initiatives. http://nursingworld.org/MainMenuCaterfories/The Practice of Professional Nursing/Health IT.org
12. American Nurses Association Nursing Resources Hub (2024). How Technology Is Changing the Nursing Industryhttps://www.nursingworld.org/content-hub/resources/workplace/how-technology-is-changing-the-nursing-industry/#:~:text=From%20time%2Dsaving%20software%20to,quality%20patient%20care%20and%20outcomes..
13. American Nurses Association Nursing Resources Hub (2023).What Is Nursing Informatics. https://www.nursingworld.org/content-hub/resources/nursing-resources/nursing-informatics/#:~:text=health%20technology%20systems.,What%20Is%20the%20 Value%20of%20Nursing%20Informatics%20in%20 Health%20Care, Data%2Ddriven%20 decision%20making.
14. Asunmo, A.O. and Yaya, J.A. Management and preservation of health records in some selected hospitals in Lagos State, Nigeria: International Journal of Information Research and Review, 2016; 3(1): 1601-1605.
15. Attah, A.O. (2017) Implementing the Electronic Health Record in a Nigerian Secondary Healthcare Facility: Prospects and challenges; Department of Clinical Medicine the Faculty of Health Sciences, the Arctic University of Norway.
16. Awati, R., Charles, M., and DelVecchio, A., (2024). Clinical Decision Support System (CDSS) https://www.techtarget.com/searchhealthit/definition/clinical-decision-support-system-CDSS
17. Bernstein, C., (2021) and TechTarget (2021). What is digital health (digital healthcare) and why https://www.techtarget.com/searchhealthit/definition/digital-health-digital-healthcare
18. Bickford, C. J., The specialty of nursing informatics: New scope and standards guide practice. *CIN: Computers, Informatics, Nursing*, 2015; *33*(4): 129–131. doi:10.1097/CIN.0000000000000150. https://connect.springerpub.com/content/book/978-0-8261-4122-4/part/part01/chapter/ch01?implicit-login=true
19. Boston-Leary, K., Lee, M., and Mossburg, S.E., 2024). Missed Nursing Care: Errors of Omission

Request PDF ResearchGate https://www.researchgate.net › publication › 23797358... Patient
20. Safety Amid Nursing Workforce Challenges https://psnet.ahrq.gov/perspective/patient-safety-amid- nursing-workforcechallenges#:~:text=Inadequate%20nurse%20staffing%20can%20lead,with%20care%2C%20and%20hospital%20readmissions
21. Boyce, R. D., Camacho, J., Liang, W., Wiisanen, K., and Devine, B., (2022). Overview of effective pharmacogenomic clinical decision support https://www.sciencedirect.com/science/ article/abs/pii/B9780128244531000105
22. Carini, E., Villani, L., Pezzullo, A. M,. Gentili, A., Barbara, A., Ricciardi, W., and Boccia, S., The Impact of Digital Patient Portals on Health Outcomes, System Efficiency, and Patient Attitudes: Updated Systematic Literature Review. Journal of Medical Internet Research, 2021; 23(9): e26189. DOI:10.2196/26189
23. Castagna, R., and Bigelow, S. J., (2022). What is Information Technology? Definition and Examples. https://www.techtarget.com>searchdatacenter>definition
24. Centers for Diseases Control (CDC), (2022). Health Communication and Health Information Technology. //www.thecommunityguide.org › topics › health-co
25. Centers for Medicare & Medicaid Services | CMS (.gov) (2024). Electronic Health Records – CMS.https://www.cms.gov › key-initiatives › e-health › records
26. Centers for Medicare & Medicaid Services (CMS.gov) (2023). E-Prescribing https://www .cms. gov › medicare › e-health › eprescrib
27. Chen, Z., Liang, N., Zhang, H., Li, H., Yang, Y., Zong, X., Chen, Y., Wang, Y., and Shi. N., Harnessing the power of clinical decision support systems: challenges and opportunities, 2023; 28; 10(2): e002432.doi:10.1136/openhrt-2023-002432.https://pubmed. ncbi.nlm.nih.gov/38016787/#:~:text= Abstract, health;%20quality%20of%20health%20care.
28. Cohen, M. F., (2016). Impact of the HITECH financial incentives on EHR adoption in small, physician-owned practices. International Journal of Medical Informatics. https://www.sciencedirect.com/science/article/abs/pii/S1386505616301460#:~:text=Notably%2C%20the%20HITECH%20Act%20included,required%20to%20meet%20Meaningful%20Use.
29. Cooper, N., (2022). What is health information technology? https://www.phoenix.edu/Blog /what-is-health-information-technology.html Davis, U.C., (2024). Missed Nursing Care. Agency for Healthcare Research and Quality. website of the Department of Health & Human Services. https://psnet.ahrq. gov/primer /missed-nursing-care
30. DelVecchio, A., and Holman, T., 2017). Enterprise Master Patient Index (EMPI). https:// www. techtarget.com/searchhealthit/definition/master-patient-index-MPI#:~: text=An%20enterprise%20master%20patient%20index,patient%20records:%20deterministic%20and%20 probabilistic.
31. Elechi, U. S., Elechi, K. W., Onyeugbo, E. G., Akujobi, C. D., Nwoda, C. S., (2024). The Impact of Digital Transformation on Healthcare Delivery in Nigeria: Challenges and Recommendations. https://rsisinternational.org/journals/ijrsi/articles/the-impact-of-digital- transformation-on-healthcare-delivery-in-nigeria-challenges-and-recommendations/#:~:text= National%20eHealth%20Policy,and%20healthcare%20levels%20%5B7%5D
32. Elikwu, M. I., Igbokwe, C., and Emokhare, G., (2020). Effect of Electronic Health Information System on Medical Records Management in Public Healthcare Institutions. ...ResearchGate DOI:10. 36108 /unizikjb /0202 .30 .0140 https://www.researchgate.net › publication › 34931742.
33. Feder, M., (2022). What is information technology (IT)? A Beginner's GuideUniversity of Phoenix https://www.phoenix.edu/blog/what-is-information-technology.html
34. Federal Bureau of Investigation (FBI) (2022). Internet Crime Complaint Center Releases 2022 Statistics. FBI.gov https://www.fbi.gov › field-offices › springfield › news
35. Garba, K. D., (2016). Effects of Health Records Management on Service Delivery ResearchGate https://www.researchgate.net › publication › 31856822...
36. Gause, G., Mokgaola, I.O., and Rakhudu M. A., (2022). Technology usage for teaching and learning in nursing education: An integrative review. National Institutes of Health (NIH) (.gov). https://pmc.ncbi.nlm.nih.gov › articles › PMC9257720
37. Government of West Australia Department of health (2022). Electronic Prescribing Systems health.wa.gov.au. https://www.health.wa.gov.au › Articles › Electronic-Pres.
38. Grosman-Rimon, L., and Wegier, P., (2024). With advancement in health technology comes great responsibility-Ethical and safety considerations for using digital health technology: A narrative review. National Institutes of Health (NIH) (.gov) https://pubmed.ncbi.nlm.nih.gov ›
39. Haddad, L. M., Annamaraju, P., and Toney-Butler, T. J., (2023). Nursing Shortage. https://www.ncbi.nlm.nih.gov/books/NBK493175/#:~:text=Nursing%20shortages%20lead%20to%20 errors,patient%2Dto%2Dnurse%20ratios.
40. Haleem, A., Javaid, M., Singh, R. P., and Suman, R., (2021). Telemedicine for healthcare: Capabilities, features, barriers, and applications. PMCID: PMC8590973 PMID: 34806053.

https://pmc.ncbi.nlm.nih.gov/articles/PMC8590973/#:~:text=Regular%20hospital%20visits%20can%20be,workflow%20of%20hospitals%20and%20clinics.
41. Hamid N., Portnoy, M. J., and Pandya, A., (2023). Computer-Assisted Clinical Diagnosis and Treatment. Children's Mercy. https://scholarlyexchange.childrensmercy.org › papers
42. Health IT Workforce (2017). Implication of Information Communication ... Research Publish Journals. https://www.researchpublish.com › upload › book
43. Health and Human Services (HHS.gov) (2022). Health Information Technology. https://www.hhs.gov › for-professionals › special-topics
44. Idoko, B., Idoko, J, E., Ugwu, O. J., Alakwe, J. A., Idoko, F. O., Ayoola, V. B., Ejembi, E. V., and Adeyinka, T., Advancements in health information technology and their influence on nursing practice in the USA. Magna Scientia Advanced Research and Reviews, 2024; 11(2): 168-189 DOI:10.30574/msarr.2024.11.2.0111. https://www.researchgate.net/publication/382681196_Advancements_in_health_information_technology_and_their_influence_on_nursing_practice_in_the_USA
45. Iroeze, P. and Bernard, I. I., (2023). Health Information Provision and Utilization as Predictors of Safe Health Practices of Nursing Mothers in Imo State, Nigeria. Digital Commons. https://digitalcommons.unl.edu › libphilprac
46. Javaid, M., Haleem, A., and Singh, R. P., Health informatics to enhance the healthcare industry's culture: An extensive analysis of its features, contributions, applications and limitations, 2024; 123-148https://www.sciencedirect.com/science/article/pii/S294995342 4000092
47. Jen, M. Y., Kerndt, C. C., and Korvek, S. J., (2022). Health Information Technology – StatPearls – NCBI Bookshelf. National Institutes of Health (.gov). https://www.ncbi. nlm. nih. gov › books › NBK470186
48. Kim. M. O., Coiera, E., and Magrabi, F., (2017). Problems with health information technology and their effects on care delivery and patient outcomes: a systematic review24(2):246–250.doi:10.1093/jamia/ocw154https://pmc.ncbi.nlm.nih.gov/ articles/PMC7651955/#:~: text=Issues%20with%20system%20functionality%2C%20including,in%2010%20studies %20(29%25).
49. Levins, H., (2023). How Inadequate Hospital Staffing Continues to Burn out Nurses and Threaten Patients Penn LDI https://ldi.upenn.edu › our-work › research-updates ›
50. Lindquist, M., (2025). What Is Remote Patient Monitoring (RPM)? An Expert Guide. https://www.oracle.com/health/remote-patientmonitoring/#:~:text=Remote%20patient %20monitoring%20lets%20clinicians,patterns%2C%20and%20even%20difficult%20pregnancies.
51. Medesk (2023). How Telemedicine Reduces Costs and Improves Patient Outcomes https://www.medesk.net › blog › telehealth-reduces-hea..
52. Medical Device Network (2023). Leading medical companies in the Internet of Things theme https://www.medicaldevice-network.com › data-insights
53. Mechanic O.J., Persaud Y., and Kimball A.B. (2022). Telehealth Systems. National Institutes of Health (NIH) (.gov). https://www.ncbi.nlm.nih.gov › books › NBK459384
54. Milena, M. The Importance of Health Records: Health, 2015; 7: 617-624. Effects of Health Records Management on Service Delivery https://www.researchgate.net › publication › 31856822...
55. Mohammednejad, F., Klassen-Ross, T., Hemingway, D., and Banner, D., (2023). Impacts of Technology Use on the Workload of Registered Nurses. National Institutes of Health (NIH) (.gov). https://www.ncbi.nlm.nih.gov>pmc
56. National Association of Community Health Centers (NACHC), 2022). Health Information Technology (HIT)https://www.nachc.org › Health Center Operations
57. National Center for Biotechnology Information (NCBI), (2022) National Institutes of Health (.gov), Implementation of Health Information Systems to Improve ...https://www.ncbi.nlm. nih.gov › articles › PMC9691236
58. National Institutes of Health (NIH) (.gov), (2022). Purchasing high-cost medical devices and equipment in healthcare facilities. https://www.ncbi.nlm.nih.gov /pmc /articles/ PMC 9438058/
59. Nursing and Midwifery Council of Nigeria (NMCN), (2019). Function - Nursing and Midwifery Council of Nigeria. https://www.nmcn.gov.ng › function
60. Nursing Informatics Learning Center, 2023). Nursing informatics competencies: Self Assessment for nurses. http://www.nursinginformatics.com/niassess/index.html. Retreaved from Academic Journals. https://academicjournals.org › article-full-text-pd
61. Office of the National Coordinator for Health IT (.gov) (2016). What Is Health Information Technology? Fact Sheet https://www.healthit.gov › default › files › pdf
62. Office of the National Coordinator for Health Information Technology (ONC) (.gov) (2019). What is an electronic health record (EHR)? | HealthIT.gov. https://www.healthit.gov › faq › what- electronic-health-...
63. Office of the National Coordinator for Health Information Technology (ONC) (.gov) (2022). What are the advantages of electronic health records? https://www.healthit.gov › faq › what- are-

advantages-el...
64. Ojo, A. I., and Popoola, S.O., Some Correlates of Electronic Health Information Management System Success in Nigerian Teaching Hospitals: Biomedical Informatics Insights, 2015; 7: 1-9. https://www.researchgate.net/publication/349317424_effect_of_electronic_health_information_system_on_medical_records_management_in_public_healthcare_ institutions
65. Okolo, C. A., Ijeh, S., Arowoogun, J. O., Adeniyi, A. O., and Omotayo, O., Reviewing the Impact of Health Information Technology on Healthcare Management Efficiency. International Medical Science Research Journal P-ISSN: 2707-3394, E-ISSN: 2707-3408, April 2024; 4(4): 420-440. DOI: 10.51594/imsrj.v4i4.1000 Fair East Publishers Journal Homepage: www.fepbl.com/index.php/imsrj
66. Ondieki, F. Effects of Health Records Management on Service Delivery: A Case Study of Kisii Teaching and Referral Hospital: Journal of Hospital & Medical Management, 2017; 3(1:6): 1-5.
67. Piscotty, R. J., Kalisch, B., Gracey-Thomas, A., Yarandi, H., Electronic nursing care reminders: implications for nursing leaders PMID, 2015; 25906130. DOI: 10.1097 /NNA. N0000000000000192
68. Queensland Australia. Gov., (2023). Managing information technology risk Business Queensland. https://www.business.qld.gov.au › online-risk-security
69. Robinson-Bassey, G.C., and Edet. O.B., Nursing Informatics Education and Use: Challenges and Prospects in Nigeria. Global Journal of Pure and Applied Sciences, 2015; 21, 2015: 171-179 Copyright© Bachudo Science Co. Ltd. Printed in Nigeria Issn 1118-0579. www.globaljournalseries.com, Email: info@globaljournalseries.com
70. Rodziewicz, T. L., Houseman, B., and Hipskind, J.E., (2023). Medical Error Reduction and Prevention. National Institutes of Health (NIH) (.gov). https://pubmed.ncbi.nlm.nih.gov › ...
71. Sarwal, D., and Gupta, V., (2022). Personal Health Record. Personal Health Record - StatPearls -NCBI Bookshelf. National Institutes of Health (NIH)(.gov)https://www.ncbi. nlm.nih.gov › books ›NBK557757
72. Shiraz University of Medical Sciences (2025). Health Information Technology https://gsia.sums.ac.ir/en/Program/2111/Health-Information-Technology
73. Stephen, M., and Frank, L., (2024). The Role of Electronic Health Records in Transforming Healthcare Delivery and Financial Gains. University of Northampton. https://www.researchgate. net/publication / 377407661_The_Role_of_Electronic_Health_ Records_in_ Transforming_ Healthcare_Delivery_and_Financial_Gains
74. Stephen, M., Jay, D., and Oyeniyi, J., (2024). The Impact of Electronic Health Records on Healthcare Delivery Transformation and Economic Benefits https://www.researchgate.net / publication/377407747_The_Impact_of_Electronic_ Health_Records_on_Healthcare_ Delivery_ Transformation_and_Economic_Benefits
75. Thokala, P., Duarte, H., Wright, S., Husereau, D., Durand-Zaleski, I., Lindgren, P., Postema, R., Machnicki, G., and Garrison, L., (2024). Incorporating Resource Constraints in Health Economic Evaluations: Overview and Methodological Considerations PMCID: PMC11865382 PMID: 39688639.https://pmc.ncbi.nlm.nih.gov/articles/PMC11865382/#:~:text=It%20is%20well%20known%20that,being%20made%20with%20suboptimal %20information.
76. Trout, K.E., Chen, L.W., Wilson, F. A., Tak, H.J.T., and David Palm, D., (2022). The Impact of Meaningful Use and Electronic Health Records on Hospital Patient Safety. https://pmc.ncbi. nlm. nih .gov/articles/PMC9564815/
77. Tsawe, M., Moto, A., Netshivhera, T., Ralesego, L., Nyathi, C., and Susuman, A. S., (2015). Health Information . Provision and Utilization as Predictors of Safe Health Practices of Nursing Mothers in Imo State, Nigeria. DigitalCommons. https://digitalcommons.unl.edu › libphilprac
78. Uluc, N.C., and Ferman, M., (2016). Effect of Electronic Health Information System on Medical Records Management in Public Healthcare Institutions. ...ResearchGate DOI:10.36108/unizikjb/0202.30.0140 https ://www.researchgate.net › publication › 34931742..
79. United States Department of Health and Human Services (HHS.gov), (2024). HIPAA Privacy Rule -. https://www.hhs.gov › hipaa › for-professionals › privacy
80. Morsani College of Medicine (2017). What is Interoperability in Healthcare? https://www.usfhealthonline.com › health-informatics
81. Winters-Miner, L. A., Bolding, P., Hill, T., Nisbet, B., Goldstein, M., Hilbe, J. M., Walton, N., Miner, G., and Koch,S., (2015). Predictive Analytics in Nursing Informatics. https://www.researchgate.net/publication/323517974_Practical_Predictive_Analytics_and_Decisioning_Systems_for_Medicine_Informatics_Accuracy_and_Cost-Effectiveness_for_Healthcare_Administration_and_Delivery_Including_Medical_Research
82. World Health Organization (2019). Maternal health in Nigeria: generating information for action. Spotlight on Nigeria. https://www.who.int/news/item/25-06-2019-maternal-health-in- nigeria-generating-information-for-action
83. World Health Organization (2024). Medical

devices. https://www.who.int/health topics/medical-devices
84. World Health Organization (WHO) (2023). Patient safety. https://www.who.int ›Newsroom › Fact sheets › Detail
85. World Health Organization (WHO), (2025). What is health technology? https://www.who.int/teams/health-product-policy-and-standards/assistive-and-medical-technology/medical-devices
86. Zayyad, M.A. and Toycan, M. (2018). Factors affecting sustainable adoption of e-health technology in developing countries: an exploratory survey of Nigerian hospitals from the perspective of healthcare professionals. https://peerj.com/articles/4436/