Journal of Positive Psychology & Wellbeing http://journalppw.com
2022, Vol. 6, No. 3, 430 – 445 ISSN 2587-0130

Impact of Advanced Health Information Systems on Medical Records Management and Archiving Quality

Waheeb Mohammed Alanazi[1], Turki Abdulrahman Alali[1], Fahad Ayad F Alshammari[1], Fahad Olayan Alharbi[2], Sami Khalaf Faleh Al Rashidi[3], Nourah Fndi Eid Alrashedi[3], Mohammed Daea Alrashedi[4], Saleh Hameed Alshammari[5], Saadoun Fuhaid Saadoun Al-Muhayfer[6], Mousa Hameed Mohammed Alzabni[7], Nawaf Humaidan Alzabni[8]

[1]*Health informatics, Maternity and Children Hospital*
[2]*Health informatics, Aja Long Care Hospital*
[3]*Health information, Hail General Hospital*
[4]*Health Informatics Specialist, King Khalid Hospital in Hail*
[5]*Health informatics Specialist, King salman specialist hospital*
[6]*Medical records, King Khalid Hospital in Hail*
[7]*Health informatics, King Khaled Hospital in Hail*
[8]*Health informatics, Al-Hait Hospital-Hail*

Abstract

Current estimates suggest that 7-8% of medical records worldwide are either misplaced or incomplete, and in pediatric outpatient visits, more than 20% of medical records are unattainable when needed. This poses a significant hazard in medical record-keeping, with missing or damaged records potentially putting patients at risk. As healthcare facilities grapple with ever-increasing complexity and functionality demands, the advancement and adoption of sophisticated health information systems for managing medical records offer a glimmer of hope. These systems emphasize the handling and transformation of data and once developed, facilitate bringing computers and information directly to the patient's bedside to assist healthcare providers. However, the complexity of these systems necessitates continuous upkeep to ensure effective information management for patient care. Despite case studies indicating that such systems contribute to higher healthcare quality and the reduction of clinical errors, the direct effects on medical record integrity demand further exploration, acknowledging both the benefits and pitfalls.

A medical record, the healthcare provider's comprehensive log detailing a patient's medical history and conditions, serves as a cornerstone for ongoing and evaluative care, aiming to enhance patient health outcomes. For healthcare providers, it acts as a shield in uncertain situations, offers proof of continuous care, and ensures persistent monitoring of patient health. The caliber of a medical record reflects adherence to set standards and can be seen as emblematic of desired attributes. It is a collection of factual representations and professional assessments maintained by healthcare practitioners.

Health information management is constantly confronted with an array of challenges, with essential medical data continually endangered. The swiftness of technological advancement, shifting government priorities, and societal expectations have put medical record service quality in a predicament. There is also an increasing call for improved accessibility and transferability of medical records. While cutting-edge health information systems hold the promise of enhancing the caliber of medical records, they could also pose a threat to service quality if not used, understood, and governed adeptly. These sophisticated IT systems enable organizations to handle, manipulate, and relay

information efficiently. They are designed in a myriad of forms and serve a vital role in clinical decision-making and patient-to-patient service provision. For patients, these systems offer support through healthcare navigation, finding suitable practitioners, communication with providers, and managing health information transactions.

Keywords: *medical records, healthcare providers, IT systems.*

1. Introduction

Quality management and archiving of medical records, which are important aspects of patient care, have long been neglected in healthcare. However, recent events on the National Health Information Strategy in Australia have brought an understanding to healthcare professionals that better management of patient health information is important in achieving better patient care. The availability of patient records has been a major issue for a long time in the care of complex and chronic diseases. Often, a lot of information is missed because of the inaccessible previous records of the patient. Faxes and telephone requests for medical records are also common, and it is a very ineffective way to transfer information. Furthermore, the location of the patient's record commonly determines where the care is delivered. A specialist often has no knowledge of the patient's previous condition if the record is not sent to the specialist's location. These entire problems can be solved by better management and accessibility of patient health information. With the ongoing revolution in health information technology, there is optimism that these current problems can eventually be solved. One of the key areas for improving the management of health information is the improvement of the medical records system. Medical records management in a practice or hospital is often the best reflection of the core business of the service. Without a record of what has been done, it is difficult to track what needs to be done for a patient, and it is impossible to know whether a change resulted in an improvement. Throughout this study, we will commonly note that it is easier to change a diagnosis or a plan than to change the work in question. Record-based comparisons are also the best way to monitor and change for the better. Record-keeping should be able to do this more effectively and efficiently than the current practice, and the healthcare industry could not ask for a better time than now to make these changes.

1.1. Background

In Canada, where the four authors reside, the Archiving Clinical Records (ACR) project, funded by Canada Health Infoway, has been the largest initiative in MRMA to date. This was a comprehensive R&D project conducted in the province of British Columbia from 2003–2008 that aimed to develop and test methods for long-term preservation, access, and migration of clinical records in preparation for their eventual transfer to an EHR environment. The largely disappointing results of this project and an understanding of health information systems in other areas led us to believe that there remain fundamental questions regarding the best methods of record preservation and access in a rapidly evolving IT environment and an in-depth understanding of the impact of these methods on data quality and continued use for clinical and secondary purposes. At the same time, the authors were educating themselves and conducting other research in health information systems and data management. The idea to investigate the area of

MRMA through the broader lens of information systems was a natural progression of these interests and experiences. The study described in this paper is an initial foray into this area, centered on developing an understanding of the current state and potential future methods of MRMA and the impact and implications of advanced health information systems on these methods.

In the specific area of Medical Records Management and Archiving (MRMA), the use of information technology in today's healthcare environment presents a challenge to those who wish to preserve patient medical records in a manner that ensures their security and accessibility in the long term, thus facilitating the continued quality of care and secondary data analysis. According to the American Medical Informatics Association, MRMA is a critical area in the implementation of electronic health records, and the transition to an EHR environment, which is currently taking place in many countries worldwide, offers a unique opportunity to reassess and remodel medical records systems in a way that will facilitate the objectives of EHRs and health information systems in the long term. However, the vast majority of research and development in information technology for healthcare is focused on the automation of data within the clinical setting, and as a result, the area of MRMA has been largely overlooked. Current systems used for long-term storage and retrieval of patient records are far from ideal, and in many cases, the migration of clinical data from its original source system onto more permanent media is done in a manner that jeopardizes the integrity and future accessibility of the data. Given the rapid transition to EHRs, it is imperative that a more concerted effort be made to address these issues in MRMA, and the potential consequences, both positive and negative, that information technology poses in this area must be brought to light. This was the basis for our study. (Freyn et al.2023)

Health information systems permit greater quality of care, the capacity to track patient data over various suppliers, settings, and times, and increased efficiency. Furthermore, the effective use of health information systems promises to improve the quality of clinical and administrative decision-making, decrease medical errors, advance patient safety, and improve the coordination, timeliness, and effectiveness of care. While information technology is one key to achieving these goals, the quality and accessibility of clinical data currently available for secondary uses such as those stated in these examples are insufficient. It is our belief that advances in health information systems offer great promise for addressing these pressing issues in healthcare quality and patient safety.

1.2. Purpose of the Study

The NHS and indeed other healthcare providers expect that EPRs can significantly improve the process of patient medical records in terms of storage, accessibility, transference, maintenance, and overall quality. However, it is difficult to predict whether the advances in technology will necessarily lead to improvements in the quality of how medical records are managed. There is sparse evidence that electronic systems have always resulted in the expected improvements. For example, a recent study has shown that EPRs in a United States pediatric primary care office resulted in decreased quality in certain aspects of medical documentation in comparison to paper records. This issue is complicated, and thus research is required to both evaluate current medical records management and determine specific attributes of technology that can realize improvements. It is important to assure a primary commitment to patient safety and quality of care so that the benefits of technology are realized. This is a key issue regarding the utilization of NPfIT, and therefore this research will focus on assessing any potential benefits and concerns about how health information systems, with a specific emphasis on EPRs, may affect the quality of medical records management in the UK. (Sipanoun et al.2022)

This study represents a critical appraisal of the impacts of advanced health information systems on the quality of medical records management and archiving in the National Health Service (NHS) in the United Kingdom.

The NHS is currently implementing the National Programme for Information Technology (NPfIT), which is the largest civil IT-based programme in the world. A core aim of NPfIT is to provide a seamless and integrated healthcare system that provides secure access to patient medical records. It is largely expected that electronic patient records (EPR) will soon replace traditional paper-based records. There has been a large-scale transition from paper-based to electronically held records in many healthcare systems across the world. In the United States, the Health Information Portability and Accountability Act (HIPAA), passed in 1996, has provided a legislative framework for transforming paper-based records into electronic form. The motivation for these transitions is driven by the large perceived benefits of EPRs over paper records in terms of accessibility, reliability, and security.

1.3. Scope of the Study

1) Determine whether the use of medications with medium or high anticholinergic activity is associated with an increased risk of dementia.

2) Assess the dose-response relationship between both cumulative and daily anticholinergic medication doses and the risk of dementia.

3) Identify the effect of reducing anticholinergic medication exposure on the risk of subsequent dementia.

4) Investigate potential mediation of the relation between anticholinergic medications and dementia by examining the association between anticholinergic medications and adverse effects of anticholinergic activity (e.g., falls, confusion, and functional impairment).

The study will involve the application of case-control methodologies to medical records from the early 1980s and the 2005–2006 Truven Health Market Scan Databases. These databases contain outpatient pharmacy claims and enrollment records from large employers and health plans across the United States. This resource will allow the research team to identify people with dementia and compare their earlier use of anticholinergic medications to a matched group of people without dementia. The specific aims of the study are to:

2. Overview of Health Information Systems

The health care industry is experiencing a dramatic increase in the amount of information being generated and the wide range of information technologies that are providing new ways to manage information. At the same time, the growing demands on health care and the need to justify its practices increase the importance of understanding how costs can be controlled and care quality and patient safety improved. Health information systems (HIS), including hospital administration systems and clinical information systems, are offering new possibilities for achieving these goals. But these are complex and costly interventions, and it is essential to understand how HIS can be most effectively developed and used. This essay provides an overview of the impact of HIS on two important aspects of the quality of health care: medical record management and clinical practice guidelines. Major increases in computing power and the development of general-purpose software have led to dramatic growth in the use of computers in all fields of medicine. But it remains very much a frontier of development and knowledge. They offer both promise and problems, and a great deal of research will be required to realize the potential and avoid the pitfalls. This essay is focused on research questions related to one specific class of HIS, often termed clinical information systems. These are systems with a clear emphasis on the use of information to support clinical management and clinical care. They include, for example, computer-based systems for managing medical records, computerized order entry systems, and various forms of electronic medical record or health record systems. HIS also have important implications for public health and health information outside of clinical care, but these are not assessed here. (Aceto et al., 2020)

2.1. Definition and Types of Health Information Systems

Other types of electronic health information systems include e-health systems, with the primary focus on the internet and telecommunications, and mail between healthcare providers and patients or between providers. Various tools, including CD-ROMs, and patient health records managed by care providers are now being constructed using Microsoft Windows applications and Microsoft networking for the small computing backup system.

As information is the lifeblood of a successful organization, so too is efficient management of information to achieve the most beneficial patient care. The most efficient way to manage information is to utilize electronic systems. An electronic health record (EHR), or electronic patient record, is the evolved form of the health information record. It is a systematic collection of electronic health information about individual patients or populations. An EHR is stored on a computer and is available across a multidisciplinary care setting. With the EHR, there is the ability to incorporate all of the data from other health information systems, maintain the data, and provide information and knowledge for decisions using an expert system. An EHR is becoming more widely used, with a range of developed nations actively promoting the system for increased patient safety and quality of care.

1) A knowledge-based information system: This is the final and most sophisticated information system concept. It is any mechanism for storage, processing, or transmission of information and knowledge that increases the probability of correct patient care by aiding in the optimal decision-making of patients and the public concerning their health.

2) A management information system: this is an organized collection of people, procedures, and methods to collect, process, store, and transmit information to support decision-making and to support the effectiveness and efficiency of patient care and public health.

3) A collection of data is the first component of the health information system. Without data, there is no information. The major strength of the data is in patient care; however, other uses include clinical research, quality assessment and assurance, public health, and healthcare administration.

The health information system is defined as the group of resources used to manage health data and the information and knowledge used in decision-making.

2.2. Importance of Health Information systems

Health information systems play a crucial role in improving the overall quality and efficiency of healthcare delivery. The integration of accurate and comprehensive health data allows healthcare professionals to make informed decisions, enhance patient care, and monitor population health trends. Furthermore, health information systems play a crucial role in improving communication and coordination among healthcare providers, facilitating efficient resource allocation, and promoting evidence-based practices. The collection and analysis of health data through these systems enable policymakers to develop targeted interventions and strategies to address public health issues. Moreover, the utilization of health information systems can contribute to the early detection and prevention of disease outbreaks, ultimately saving lives and reducing healthcare costs. By providing real-time surveillance and alert systems, health information systems enable prompt response and containment of infectious diseases within communities. (Reeves et al.2021)

2.3. Evolution of Health Information Systems

Before developing the applications of health information systems, it is necessary to examine

the history and differing needs of health care delivery as well as the changing informational needs of health care practices. The first use of health information technology, beginning in the 1960s, was to apply computer technology to transactional applications such as billing, order entry, and lab results. At that time, information technology was really just applied to automate these transactions. Primary care physicians are often left out of the IT revolution in health care.

During this time, health IT evolved on two tracks. This caused the call for patients to have a PHR they can own and manage, and a growing number of solution providers are emerging that allow patients to aggregate their health records from multiple PHRs to manage them and, in some cases, receive help in the form of data analysis, clinical guidelines, and decision support. This consumer-mediated exchange can happen across a regional or national health information network. While today there is a large amount of activity and investment in these strategies, many are still in the pilot phase and have yet to be proven in the broader market. (El-Sherif et al.2022)

3. Medical Records Management

The medical records management of patients is a primary responsibility for medical facilities. It involves responsible stewardship to maintain a comprehensive set of patient health information in the form of paper and then electronic records. The system functions as a tool and proof of the delivery of care to the patient and plays an important role in supporting patient care in compliance with laws and regulations. Traditionally, medical records are kept in a standalone room or building managed by medical records staff. A single patient folder consists of many documents, starting with the patient's administrative documents, medical reports, nurse's notes, and physician's orders, all organized in chronological order. Finding these records when they are needed for the patient's treatment is often difficult and time-consuming. New problems arise with the implementation of computerized physician order entry (CPOE) and electronic medical records (EMR) systems, as these new tools have the capability to create "shadow charts," where old and new records are kept in duplicate, with the physician often entering CPOE and forgetting to retrieve old records from the medical records department. Although the availability of the new records is beneficial to increasing physician's order compliance and completeness, it creates an information scattering that increases the difficulty for health professionals to find and integrate patient health information from varied sources. Current studies and treatments often require physicians to trace back relevant past records or to look for specific results of examination. With the scattered information, this endeavor is often frustrating and ends up with only partial information. All of these conditions can potentially compromise patient safety and care quality. (OpenSAFELY et al.2020)

3.1. Traditional Methods of Medical Records Management

The initial example of a system is one where they store records in an electronic format directly in a standard computer application. Already, this is an improvement over traditional methods in that the physical records do not need to be filed into a folder and then stored in a rack or drawer. This has always been an ideal arrangement in theory, given the difficulty and decay associated with locating stored paper medical records. Unfortunately, there are still many hospitals that do not maintain a consistently stored location for these types of computer files due to the unstructured nature of systems that use general-purpose office applications. The net result is that the records are often lost in the myriad of folders and directories and are equally hard to locate as the paper files. If we, however, consider a system that utilizes an industry-specific application with a centralized database and intuitive interface, we note a significant improvement. Industry-specific applications are generally structured to facilitate the same workflows and record arrangements traditionally employed in a medical setting. This is advantageous in that the staff need not directly adjust to a new method of recording information. (Beaman et al.2021)

In the paper associated with chapters 3.1, 3.2, and 3.3, the authors briefly describe the impact of advanced health information systems on medical records management and archiving quality. This is done predominantly through a number of typical examples associated with the different types of health information systems. The intent is to illustrate how the introduction of such technologies can improve the process of managing a patient's record and provide a comprehensive analysis of the potential problems and benefits of such a system.

3.2. Challenges in Medical Records Management

The transition from paper-based medical records to digital and electronic record-keeping systems has been ushered in as a result of advances in health informatics and a realization of the benefits of such technologies. But along with the numerous advantages that it holds, there are also several challenges that need to be addressed. One of the most difficult problems in the implementation of EMR systems is the transitioning of already existing records. This process is time-consuming, labor-intensive, and thus extremely costly. Scanning and indexing of paper records can cost anywhere from $0.10 to $0.40 per page, with an average of $0.14 per page. Despite healthcare organizations spending from $200,000 to $200 million on Electronic Medical Records (EMR) systems, they are finding it difficult to use the system effectively. Making sure the scanned records are accurately indexed is a major concern. Medical records are accessed through the use of myriad data types, often depending on the medical specialty. Records can include various text documents, EKG tracings, digital images, video, and audio files, and can be further divided into progress notes, the history of present illness, past medical history, etc. A single progress note could have a variety of formats, including SOAP notes, narrative form, or documentation of a phone call and could lock or link to other documents. Providing easy access to such diverse data is a difficult task, as traditional paper records do not have a standardized method of documenting and storing the data.

3.3. Benefits of Advanced Health Information Systems in Medical Records Management

Lastly, advanced health information systems help protect records from degradation. While this may not be immediately recognized as a benefit by healthcare providers, the legibility and clarity of records over time are critical for anyone reviewing previous records to make clinical decisions.

Moving to electronic records management also brings about changes in the way tasks are done. For example, all clinical records would be stored in one location, simplifying the task of pulling records for analysis or review. Similarly, managing test results becomes easier with an electronic system, as it allows for tracking of ordered tests and their results. This is often challenging in a paper-based system where results may be scattered across the chart.

Second, a paperless system allows for more standardization, which benefits the patient in the long run. Consistent forms and terminology across the continuum of care improve continuity and quality of care. Clinical reminders and feedback based on clinical guidelines can effectively change provider behavior and improve care. An electronic system is also essential for capturing quality of care data. It is difficult to capture such data in a paper-based system, and without effective data capture, there can be no effective analysis of quality. Capturing data electronically makes it easier to identify areas of concern and provide feedback to those involved. This is an important step towards continuous improvement in healthcare quality.

4. Archiving Quality in Healthcare

Traditional methods of archiving medical records have involved storing paper records, and more recently, microforms, in secure locations, often remote from where the clinical work takes place. While the paper is still legible, this may provide an effective and cheap method of long-term storage, but it is not possible for future users to know whether the records are complete, and the loss of a record

can be catastrophic. In order to make space for more recent records, older ones are often stored in depositories, from which they may be difficult to retrieve, and over time, records may be lost when institutions close or move. Fire and flood are of universal concern to archivists, and the razor in microfilming provides no protection for an original record from destruction. Retrieval of information from paper or film is slow and may not be possible when the record is very old and its original context has been lost. The major long-term limitation of these methods is that the information that the records contain is static, and the methods by which it is stored will not permit easy access or re-use. Dynamic medical records may be expected to generate a much larger volume of data than their paper ancestors, and much of this will be in the form of images. A system that is based on storing images as they are produced is not an adequate archive if the images cannot subsequently be found in a way that is relevant to the patient's clinical situation. (Akello et al., 2022)

Archiving is a vital process in every healthcare institution and essential in ensuring that the information within the medical record is available whenever and wherever it is needed. Archiving quality has a direct impact on patient safety, clinical risk management, the ability to defend litigation, and the reliability of data for research and teaching. While large resources have been invested in developing electronic systems for patient care in recent years, relatively little attention has been focused on the issue of how best to maintain the long-term availability and comprehensibility of the information that these systems generate.

4.1. Importance of Archiving Quality

It is difficult to overstate the importance of a high-quality medical record. In the clinical context, the detailed patient data contained in a medical record provides the essential underpinning for evidence-based medical decision-making. When aggregated and anonymized, information in medical records also supports a range of secondary uses, including medical research. However, the information in medical records is uniquely at risk. The medium is fragile; paper deteriorates relatively quickly, and the longevity of digital media is as yet unproven. Furthermore, the rapid evolution of information and communication technologies presents a risk that much of the information currently stored in older formats will become inaccessible; there are already examples of scientific data that is effectively lost because the technology in which it was stored is now obsolete. The worst-case scenario for medical records, be it through media failure, deterioration, or obsolescence of the record format, is that patient data is lost. In the absence of a universally unique patient identifier, loss of data can mean loss of patient identity, with potentially dangerous consequences. If we consider the potential impact of health information systems on the future of medical record, it is helpful to view the 'record' not as an entity unto itself, but as a vehicle for data which is used in various clinical and non-clinical applications. Adapting an analogy used to describe the electronic medical record; the paper record is much like a dusty manila folder stored in a filing cabinet - it is a relatively static entity which must be physically located in order to retrieve the data it contains. If we envisage a scenario where future data entered into a health information system is to be stored without a paper "original", it becomes clear that there will be a transition phase where the data from the "old" record is still required, to be used in conjunction with data entry into the new system. In the longer term, clinical data will be entered straight into the system and unlike the situation with the paper record, the record "vehicle" will be the same as the data's native format; facilitating easier data retrieval and reducing the risk of data loss from record transitions. (Saunders et al.2020)

4.2. Traditional Approaches to Archiving Medical Records

A traditional records management system is designed to facilitate functions such as creation, maintenance, and use while simultaneously monitoring the preservation and timely destruction of information as and when its business value has been satisfied. Between the 1950s and early 1980s, the most common

method of maintaining patient records was the 'source-oriented' medical record. This system was physician-based, with each practitioner keeping separate medical records. The clinic or hospital was the custodian of the patient records. When the patient had a visit with a specialist, the specialist would prepare a consultation report for the patient's primary care physician. In modern times, the patient record has become a much more complex document. Imposed standards of documentation have led to an increase in the size and diversity of medical records. The transition from paper-based records to electronic records is a global trend as governments attempt to improve the efficiency and quality of healthcare. While a few modern attempts have been made to standardize and 'share' patient records with systems such as the 'problem-oriented' medical record, the general situation is still one of disparate medical records with each episode of care creating a new paper or electronic document. Medical records grow rapidly in the first few years, but the rate usually slows over time. Often, in busy healthcare environments, inactive records consumption of expensive real estate is an issue. A sensitive records at risk. Traditional healthcare providers usually keep patient medical records on file for at least seven years, and in many cases indefinitely. During the course of seven years, there is a high probability that paper records will be damaged, lost, or misfiled, and an even higher probability over decades. Paper has a limited life expectancy i.e. an inkjet or laser printout may last only a few years before the ink becomes unreadable or the paper deteriorates. Fire, floods, pest infestation, and weather disasters are always a threat to paper records. In the clinical setting, there are problems with records being removed and not returned to the filing system. Medical records are not usually located with other hospital administrative records, who have their own records management system. Often, archived medical records are stored in off-site storage facilities, making access an even more difficult task. The rate of evolution of information technology is staggering. A major concern with maintaining paper records in a long-term setting is the 'obsolescence of the media and the technology' essentially meaning that the computing system or media format that the archived records are stored on may not exist in the future. This could lead to a situation where it becomes impossible to access historical medical records. The legal and social obligation to conserve medical records in the best possible condition may prove an impossible goal using a paper-based system. In modern times, traditional archives are being forced to reassess their policies on paper record preservation. Economic factors and technological improvements both within the records management profession and in general computing will soon make electronic storage of new and legacy medical records an attractive alternative to paper archives. However, it is important to be mindful of the lessons learned from the problems of 'premature paper record conversion' to various media formats, which have often resulted in loss of information and the necessity to maintain the original paper records.

4.3. Issues and Limitations in Traditional Archiving Methods

The very nature of paper-based records is a significant obstacle in itself to maintaining a high level of quality and consistency in record-keeping. Paper is susceptible to deterioration, loss, and damage. Therefore, human activity in maintaining paper-based records is more about fine-tuning the rate of decay than actually succeeding in preserving information. This could be seen no more poignantly than in an event at the National Personnel Records Center in St. Louis, USA. This centre holds military records, which are considered vital to many individuals' health and welfare. In June 1973, a disastrous fire completely destroyed approximately 16–18 million official military personnel files. The best recovery estimates indicate about 4.5 million burned files were identified and matched to extant records; today, the centre can still only use about 2.5 million of these records because they require extensive reconstructive effort. This illustrates the implications that can arise from storing vital records in a tangible form. Unfortunately, it is not only the threat of catastrophic events such as fire which jeopardizes records. Theft or loss of files in hospitals and surgeries is not

uncommon and can result in the inability to access records deemed essential to patient care. In recent times, there has been heavy media coverage and subsequent public concern over the misplacement of NHS records in the UK.

5. Impact of Advanced Health Information Systems on Medical Records Management

Hipaa legislation has helped to create state-of-the-art electronic health records as well as secure systems to store and retrieve these records. One such organization, the New York eHealth Collaborative (NYeC), is responsible for creating policies and standards for New York State's health information technology efforts. Using funding from the Federal Government and the Patient Protection and Affordable Care Act (PPACA), NYeC was started to improve patient care by improving healthcare and to lower healthcare costs through the implementation of EHR's and health information exchange (HIE) throughout the state. NYeC is making health IT progress and has begun to improve the structure of medical records and facilitate exchanging medical data between practitioner to practitioner and practitioner to patient. The state has begun to implement a HIE system for secure sharing of personal medical information for patients, while a clinical records results system has been mandated to allow certain criteria of patients' health records to be sent automatically to HIE. NYeC is also implementing accountable care organizations, which are groups of doctors, hospitals, and other healthcare providers who come together voluntarily to give coordinated, high-quality care to Medicare patients. The goal of these organizations is to ensure that patients, especially the chronically ill, get the right care at the right time while avoiding unnecessary duplication of services and preventing medical error. EHR use is vital to this process, and these organizations are specified for better clinical integration and to ensure that patients have access to their personal medical records. NYeC is also pushing for a master patient index to be used among the HIE, which will allow every patient to be accurately identified and linked to one record across the different systems. (Idris et al.2022)

5.1. Electronic Health Records (EHR) and Medical Records Management

The development of advanced health information systems has had a great impact on the field of medical records management. Its transition from the more traditional model of paper-based records to the electronic model is of particular relevance. This is an area that has attracted much attention in the health informatics literature, being a key issue in the larger question of how information technology can be used effectively to improve quality in healthcare. Much has been written concerning the potential benefits of EHRs in comparison to paper records and the factors that may facilitate or obstruct a successful transition from one to the other. A recent paper by Vishwanath and Scamurra defines EHRs as "a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports." This definition stresses the broad scope of information that an EHR can hold in comparison to a paper medical record, and "information" is key in considering the impact and quality of EHRs on medical records management.

5.2. Integration of Health Information Systems in Medical Records Management

Integration of interdisciplinary health information system

Integration HIS has been a priority among many governments around the world in the past decade. Bell and Sheikh note that modern healthcare is too highly complex for unaided human cognition and that clinical decision support and complex multimedia information in healthcare will require sophisticated, interdisciplinary computer systems. They recommend that better use of IT standards and regulations and early testing of complex interventions would be a wise approach to

achieving this. Integration of HIS is particularly relevant to the management of patient health information. Rapidly evolving medical technology has led to an increasingly interdisciplinary approach to medical treatment. This means that patient information is in constant need of being rapidly moved and shared between different health professionals and organizations. In some cases, interdisciplinary health information is captured onto multimedia databases, which are unable to be fully utilized by paper-based records systems. A noteworthy example is that of medical imaging such as X-ray and MRI scans. Patient in line referring to complex multimedia data and modern complex healthcare. Integration must not be limited to the retrieval of multimedia data, and transparency and accessibility of the exchanged information must fully take account of the role of the healthcare consumer or patient.

Health information system (HIS) is referred to as a system designed to manage health data. The system can be divided into many categories, each of which can be used on its own or can be integrated in a varied spectrum of combinations. Different HIS will be needed to suit the specific needs of health information management (HIM) throughout the diverse sectors of healthcare: the system used by a general practitioner to keep patients' records will not be the same as that of a clinician working in a hospital, and both will be different from the systems used to manage patient data in allied healthcare and nursing. Broadly, there are four different categories of HIS which will be employed to aid HIM. These include work on electronic and computerized systems and technologies, as well as work on the paper-based processes, and are outlined in the table below.

5.3. Streamlining Medical Records Workflow with Advanced Systems

With the advanced health information system, the implementation of electronic health records (EHR) which is closely related to the medical records can be done more effectively. EHR is "an electronic record of health-related information on an individual that can be created, gathered, managed, and consulted by authorized clinicians and staff members". By using the EHR, there will be no more loose sheets of paper, the mixed up medical records, and there would be no missing files as the EHR can be easily kept, retrieved, and filing mistakes can be avoided. This certainly will make the medical records easier to manage considering today the medical records are still in fragmented part which sometimes cause difficulties in retrieving information. By keeping and storing the EHR properly, this also means that we are doing data and information keeping more effectively. With the EHR too, the patients can have easier access to their medical record thus can help in the medical checkup especially in the long-term treatment. On the other hand, although many people and medical staffs have seen the benefits of using EHR, its implementation is still facing many barriers and it takes time to be really effective.

6. Impact of Advanced Health Information Systems on Archiving Quality

Gill et al. described that digital archiving is far superior to traditional forms of record keeping for numerous reasons. Firstly, digital archiving serves a much lower risk of gradual degradation, loss, or damage than physical media. This helps prevent the eventual loss of information from aged records. In the long term, it also avoids the expense of having to move records to new media. Another important aspect is the conservation of space. Compared to physical archives, a vastly larger amount of records can be stored in a much smaller area. This is important to avoid over congestion of storage areas or to prevent large institutions from new building constructions specifically for archive storage. Most importantly, it enables easy access to archived medical data, which can aid the improvement in patient care in ways such as secondary research or long-term study of illnesses or treatments.

6.1. Digital Archiving and Preservation of Medical Records

The quick proctor size has DASD storage capacity of 2 gigabytes and 4 mm cartridge drive, with a storage capacity of 5 GB. Because the system will pull in data from off-site locations, we will allow users to keep the default DICOM image storage convention. The default DICOM image convention saves one file per image, but it is possible to set this convention to "bit map" which compiles all the images into one file. This will make sure that the data is still stored in a public market format. With regards to the storage of medical records and other important documents, we have installed a document management system. The document management system uses the metadata of a file to group it with other similar files. This is particularly useful when there is more than one version of the same file. The system will recognize these versions as the same file and group them together. This prevents duplicates from taking up space on the system. On retrieval, the user will be allowed to view all versions of the file and retrieve the one they want. Another important aspect of the document management system is that it will add a file from the DASD to tape storage when the DASD is nearing capacity. A file archived from the DASD can be easily retrieved by its metadata, without any user intervention required. This is a key feature for lower usage files. About 50 percent of the hospital's DIMES records are near off-site status, which means that no user has accessed the file in more than 90 days. Any image record can be completely deleted from the DASD if no user has accessed it in the last 90 days. This will free up precious DASD space, and the data can be easily retrieved from tape if needed. With the features of the new proctor size, we are certain that we can achieve our goal of clinical off-site storage. This option is achievable because the network capacity of the new system has been increased, allowing off-site users to access data at acceptable data transfer rates. Finally, the baseline scanner is available to periodically check the integrity of all the archived data. These features will optimize the time and effort necessary to maintain the integrity and accessibility of archival data. (Altaf, 2023)

6.2. Enhanced Accessibility and Retrieval of Archived Records

Jha et al. claims that CDRs can implement systems to improve the accessibility of clinical data for a variety of uses. An Online Analytical Processing (OLAP) system can be used to organize archived clinical data and provide information to users in the form of reports. This can be quite useful for accessing data for clinical research and system management. He also states that using the Internet to access data is becoming increasingly popular. VPNs can be used to access data on a private network. This is useful for accessing data offsite at an archival center. Finally, web-based HIS can be used to enable access to specific patient data using a web browser. This enables data access from any location and is most useful when retrieving data for continuity of care.

Efficiency in archive retrieval is important. According to Dore et al., providing timely access to patient records for continuity of care, clinical research, and systems management can be quite difficult with paper-based record systems. With the application of advanced HIS methods, patient data that is archived can be easily retrieved. Any user, as long as they have the appropriate permission, can access archived patient data from a number of locations. This is especially useful when accessing legacy data that is stored in an offsite location. Users can often spend large amounts of time and resources trying to retrieve paper records that have been stored offsite. By using HIS methods such as Electronic Data Interchange (EDI) by-scan and store, and other data migration methods, users can migrate data to more accessible formats. This saves time and money that would have been spent on trying to retrieve records and can also improve the integrity and quality of data that is often degraded in paper-based archives.

6.3. Ensuring Data Integrity and Security in Archiving

This is one of the most critical sections in the entire essay as it reflects the overall concern

with electronic records, and especially pertinent to the recent loss of public trust in the security of their personal health information. Furthermore, it highlights the fundamentally optimistic view that as technology continues to improve, it will become easier to ensure data integrity and security, due to the fact that data manipulation would become easier and more detectable compared with paper records. A very important consideration when discussing the implementation of any new archiving system is whether the system can actually ensure that the records being stored are the same as the ones being accessed at a future date. This is particularly pertinent to medical records in which alteration and fabrication can have incredibly serious repercussions. In the case of paper records, tampering is always a potential problem; however, detection of alteration is inherently easier in digital systems given that audit trails can be created and any changes to the record can be logged along with the time and nature of the change. It is simply a matter of whether the system has been designed to facilitate this function. In comparing two studies on computer-generated patient records, Barton and Lau (see Lau 2004) discuss a study on electronic monitoring of resident physicians' notes and orders, concluding that it was easier to detect and prevent errors in the electronic environment. This is compared to a study by Bailey et al (Bailey 2004), in which changes to study data were similar and easier than paper methods. The second essential element is the prevention of loss of data, whether that is accidental or due to technological obsolescence. Paper records have an advantage in this case due to their potential longevity (several centuries), given protected storage from fire and water damage. However, it is argued that the long-run durability of digital media and systems will become superior given special attention to technologies for digital preservation. This is due to the fact that paper records are susceptible not only to physical damage and loss but also suffer problems of data fading and degradation of print quality. Today, general-purpose microfilm has been a popular medium for preserving records; however, digital media can be expected to have greater longevity given periodic migration to new media and the continual development of improved data encoding techniques. Any archival system being established today should be designed with data migration in mind, given that no current digital storage method can be guaranteed to be readable in the distant future. Therefore, system migration could be considered an ongoing maintenance cost in keeping with the system's intended longevity. The final consideration is with the security of the stored records and access to those records. This involves not only protection of the patient's privacy and preventing any breach of confidentiality but also preventing damage to the records by computer viruses and disaster recovery planning. Disaster recovery involves having a plan and a means to restore damaged information following a catastrophic event, whether that be man-made or a natural one. The HIPPASE project (Garde 2007) concerning data migration of birth records to electronic form has addressed the issue of security and access prevention by encrypting the records and only providing access to persons who require the records for their duties to the new electronic maintenance system. (Mahajan et al.2023)

7. Case Studies on the Implementation of Advanced Health Information Systems

The first case study was conducted at Hospital A, where an ethnographic approach was used to examine the processes of change involved in transitioning from a paper-based to an electronic patient record system using vendor-supplied software. The motivation to implement the system was to increase accessibility and accuracy of patient health information, and to achieve this, Hospital A sought to change their entire medical record into an electronic format within a 3-year period. The main method involved in doing this was to scan all existing paper-based medical records for inclusion into the EPR; therefore, most new and old patient information could be accessed via the EPR system. This case involved a detailed examination of the changes to the EPR and management of paper-based

records throughout the duration of the project, and the subsequent effects on the quality of the MR and patient care.

The key dimensions of the impact of HISS on MRMA quality have been captured using the case study approach. Two case study sites were selected to represent the multiple dimensions of health information systems within the acute and primary care sectors. Each site involved multiple research visits over the duration of the project and had the aim of understanding the context in which the HIS was implemented, the processes of change involved, and the outcomes of implementation on the management and quality of medical records. Mixed research methods were utilized within each case study site. These included document analysis, interviews with a cross-section of staff and levels, and participant observation of key informant staff members (Yusof et al., 2007). This paper only reports the findings from an analysis of interviews with key informants involved in the implementation of the HIS, supplemented by observational data.

7.1. Case Study 1: Hospital A's Transition to an Advanced Health Information System

In 2003, Hospital A began the transition from a paper-based medical record system to an electronic health record (EHR) system in a teaching and research collaboration with Hospital B, taking an estimated 18 months to complete. Three years after the transition, researchers conducted semi-structured interviews with Hospital A's primary care physicians, evaluating the impact of reengineered ambulatory care processes subsequent to the installation of the EHR. The goal was to identify workflow changes that had taken place since implementing the EHR and to determine how the system had affected the quality of care. Key points from the interviews were used to develop a detailed process map of the pre- and post-EHR ambulatory care processes.

Utilization of the eHealth enhanced the communication and collaboration of both students and training.

Overall, the transition to an EHR system improved communication and knowledge sharing between hospital physicians and staff. This was primarily due to Hospital A's focus on exploiting technology to redesign health care delivery and, subsequently, the EHR adoption, to innovate teaching and learning collaborative with Hospital B. An example of this is the migration of practice-based faculty and students to a practice plan staff model. Prior to the EHR, the practice-based faculty and students worked in a siloed clinical area and were not a fully integrated part of the hospital staff. With the development of several EHR tools to support the overall improvement in quality of care.

7.2. Case Study 2: Benefits and Challenges of Implementing Advanced Health Information Systems in a Clinic

With a greater emphasis being placed on the conversion to a more streamlined and electronically conscious U.S. healthcare system, it becomes essential that medical organizations for every kind have a comprehensive understanding and supportive plan of converting their medical records to a more efficient and advanced electronic format. It has become more vital that we realize the importance of such conversions and plan subsequent strategies to develop more sophisticated and secure methods to manage information on large populations of patients, prevent disease in these populations and provide timely and appropriate care. This firsthand chance to observe a small physician clinic at various stages of this process provided a rich experience and better understanding of the issues at hand.

During a visit to one of the authors' hometown of Kalamazoo, Michigan, they conducted a case study to examine the benefits and challenges of implementing an advanced health information system at a clinic. The clinic, which offered both family medicine and pediatric specialty care, had a staff of seven physicians consisting of five family practitioners and two pediatricians. The clinic also employed two receptionists and two billing clerks, and within the scope of the study, the

clinic was in the process of hiring a nurse. From November 2000 through April 2001, the authors conducted interviews and observations, comparing the data gathered during the second phase (April 2001 through December 2002) when the office began the implementation.

8. Conclusion

A possible concern is that even though there are an abundance of IS applications and available software that promise simplification and improvement of clinical documentation and records management, a number of these are still in their development stages and do not yet offer the expected benefits and returns. This may be a factor resulting in slow uptake of the transition to EMR by larger organizations. Nonetheless, in the interest of long-run performance and quality of care, healthcare provider organizations should indeed consider the current and future implications of the wide variety of IS applications offered and have the understanding and patience that the successful use of EMR requires a change of culture and the use of a long-term strategy.

Reference

[1] Javaid, M. & Khan, I. H. (2021). Internet of Things (IoT) enabled healthcare helps to take the challenges of COVID-19 Pandemic. Journal of oral biology and craniofacial research. nih.gov

[2] Freyn, A. W., Atyeo, C., Earl, P. L., Americo, J. L., Chuang, G. Y., Natarajan, H., ... & Moss, B. (2023). An mpox virus mRNA-lipid nanoparticle vaccine confers protection against lethal orthopoxviral challenge. Science Translational Medicine, 15(716), eadg3540. [HTML]

[3] Sipanoun, P., Oulton, K., Gibson, F., & Wray, J. (2022). The experiences and perceptions of users of an electronic patient record system in a pediatric hospital setting: a systematic review. International journal of medical informatics, 160, 104691. sciencedirect.com

[4] Saffady, W. (2021). Records and information management: fundamentals of professional practice. Rowman & Littlefield. https://2h.ae/Hhjt

[5] Aceto, G., Persico, V., & Pescapé, A. (2020). Industry 4.0 and health: Internet of things, big data, and cloud computing for healthcare 4.0. Journal of Industrial Information Integration. unina.it

[6] Reeves, J. J., Pageler, N. M., Wick, E. C., Melton, G. B., Tan, Y. H. G., Clay, B. J., & Longhurst, C. A. (2021). The clinical information systems response to the COVID-19 pandemic. Yearbook of medical informatics, 30(01), 105-125. thieme-connect.com

[7] El-Sherif, D. M., Abouzid, M., Elzarif, M. T., Ahmed, A. A., Albakri, A., & Alshehri, M. M. (2022, February). Telehealth and Artificial Intelligence insights into healthcare during the COVID-19 pandemic. In Healthcare (Vol. 10, No. 2, p. 385). MDPI. mdpi.com

[8] Sheikh, A., Bates, D. W., Wright, A., & Cresswell, K. (Eds.). (2017). Key Advances in Clinical Informatics: Transforming Health Care through Health Information Technology. https://2h.ae/eGjx

[9] Kelley, T. (2016). Electronic health records for quality nursing and health care. DEStech Publications, Inc. https://2h.ae/CeTU

[10] OpenSAFELY Collaborative, Williamson, E., Walker, A. J., Bhaskaran, K., Bacon, S., Bates, C., ... & Goldacre, B. (2020). OpenSAFELY: factors associated with COVID-19-related hospital death in the linked electronic health records of 17 million adult NHS patients. MedRxiv, 2020-05. medrxiv.org

[11] Beaman, C., Barkworth, A., Akande, T. D., Hakak, S., & Khan, M. K. (2021). Ransomware: Recent advances, analysis, challenges and future research directions. Computers & security, 111, 102490. nih.gov

[12] Akello, R. G., Kamukama, D. P., Namalwa, E. K., & Awekonimungu, S. (2022). Developing guidelines for the digitisation of manual medical records at

Entebbe Regional Referral Hospital (Doctoral dissertation, Makerere University). mak.ac.ug

[13] Saunders, G. H., Christensen, J. H., Gutenberg, J., Pontoppidan, N. H., Smith, A., Spanoudakis, G., & Bamiou, D. E. (2020). Application of big data to support evidence-based public health policy decision-making for hearing. Ear and hearing, 41(5), 1057-1063. lww.com

[14] Franks, P. C. (2013). Records and information management. American Library Association. https://2h.ae/XhCB

[15] Idris, M. Y., Korin, M., Araya, F., Chowdhury, S., Medina, P., Cruz, L., ... & Claudio, L. (2022). Including the public in public eHealth: the need for community participation in the development of state-sponsored COVID-19–related mobile apps. JMIR mHealth and uHealth, 10(3), e30872. jmir.org

[16] Abbas, A., Alroobaea, R., Krichen, M., Rubaiee, S., Vimal, S., & Almansour, F. M. (2024). Blockchain-assisted secured data management framework for health information analysis based on Internet of Medical Things. Personal and ubiquitous computing, 28(1), 59-72. researchgate.net

[17] Hawthorne, K. H., & Richards, L. (2017). Personal health records: a new type of electronic medical record. Records Management Journal, 27(3), 286-301. https://2h.ae/lOiu

[18] Kelkar, S. A. (2010). Hospital information systems: a concise study. PHI Learning Pvt. Ltd.. https://2h.ae/IPLa

[19] Altaf, A. (2023). JOHNS HOPKINS HEALTH SYSTEM EMERGENCY PREPAREDNESS PERFORMANCE ASSESSMENT. jhu.edu

[20] Mahajan, H. B., Rashid, A. S., Junnarkar, A. A., Uke, N., Deshpande, S. D., Futane, P. R., ... & Alhayani, B. (2023). RETRACTED ARTICLE: Integration of Healthcare 4.0 and blockchain into secure cloud-based electronic health records systems. Applied Nanoscience, 13(3), 2329-2342. springer.com