

A Study of Digital Transformation in Healthcare & Its Trends

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Abstract: *The health industry relies heavily on the exchange of data. Hospitals, primary care centres, clinics, and labs are just a few places that produce massive amounts of data. The need for standardized national patient identity in many countries and concerns over patient privacy and data security are significant challenges. This study aims to analyze the scope of multidimensional benefits that can be achieved for the healthcare sector, especially in India, with the implementation of EMR systems with advanced technology, leading to a large-scale digital transformation. Medical history, family history, test results, and prescription list are essential. Medical practitioners could better monitor patient health, diagnose concerns, and reduce patient care errors. These days, people's medical histories are often dispersed among various doctors and institutions. Information is kept in the minds of its keepers, on bits of paper, and in digital spreadsheets. While some medical facilities use electronic medical records, the vast majority still rely on paper files to retain patients' medical histories. This article used a mixed methodology for analyzing the research problem. Primary quantitative data was gathered from the survey, and secondary qualitative data was used in the paper for analysis. Quantitative analysis is conducted by various statistical tests using SPSS, while a thematic analysis is also presented in the paper to explore the existing secondary information on the topic thoroughly. This report examines how hospitals in India and throughout the world are digitizing patient data to illuminate the healthcare industry's digital transformation. In keeping with current thinking, this article highlighted the advantages of switching from the conventional paper-based healthcare system to a computer-based one focusing on the individual patient. The results of the paper further indicate that blockchain, AI, machine learning, IoT, and Big Data analytics are currently trending in the market that can be utilized for a sustainable and large-scale digital transformation. Thus, it is concluded that digital transformation is necessary for enhancing the healthcare sector's overall efficiency, especially for documentation processes.*

Keywords: Healthcare Digitization, Mobile Healthcare, E Healthcare, Electronic Medical Records, Hospital Information Systems, E Prescriptions

1. Introduction

1.1 Healthcare & Digital Transformation

Healthcare can be defined as the prevention, diagnosis, treatment, amelioration, or cure of disease, sickness, injury, or other physical and mental disabilities in humans. Healthcare delivery is the responsibility of health professionals and allied health areas. In the context of global health, the potential of technology to assist fair, cost-effective, and efficient healthcare systems is infinite (Blandford et al., 2018). Digital health interventions combine digital technology with healthcare delivery.

Digitalization and digital transformation provide the healthcare industry with vast opportunities to overcome current obstacles. It can simultaneously resolve several problems and aid the industry on multiple fronts (Hermes et al., 2020). Digital patient records, cloud computing, artificial intelligence and machine learning, big-data analysis, robotics, the internet of things, automation, and communication infrastructure are among the most promising digital technologies for healthcare.

A hospital is a medical facility with doctors, nurses, and other medical professionals on duty and sophisticated diagnostic and treatment facilities. Historically, hospitals recorded patient information using manual recordkeeping techniques. Documents are tracked, managed, and stored using the paper-based documentation system. Most can keep track of the different versions created and edited by various users. Every day, hospitals, clinics, and private practices must manage a large quantity of medical data and billing information (Pai et al., 2021). It is required by law

that doctors maintain their patients' medical records and recordings for at least ten years after their last appointment, even if the patient has passed away. Storage regulations for medical records vary between hospitals and clinics. This results in a great deal of paper and records over time (Bali et al., 2011). The hospital scans all paper papers that are created or brought in. Each scanned document is indexed and either attached to an existing electronic patient record or a new record might be established.

When handling a substantial amount of paper, errors are inevitable. Clinicians cannot determine the perfect treatment protocol or adverse reaction to a prescribed drug if files or paperwork are misplaced. Transporting paper documents from the archives to the appropriate division requires physical labor. Some requests for records can take as long as several days to process. Spending less time and money on administrative paperwork frees up more time and money for services that actually provide value, like better health care. In-house medical record storage poses security risks. During natural disasters such as floods, fires, etc., documents might be destroyed. The volume of data gathered, saved, and utilized has expanded rapidly, as has computer reliance. Utilizing high-quality information to improve patient care is the most critical challenge in the healthcare sector. Thus, high-quality data can maximize the effectiveness of health information (Mohanan et al., 2017). The digitization of patient data might enhance accessibility and portability (Bhavnani et al., 2016). The patient's medical history may be maintained digitally, and authorized professionals may have access. Patients are no longer required to bring their medical history to appointments with healthcare experts.

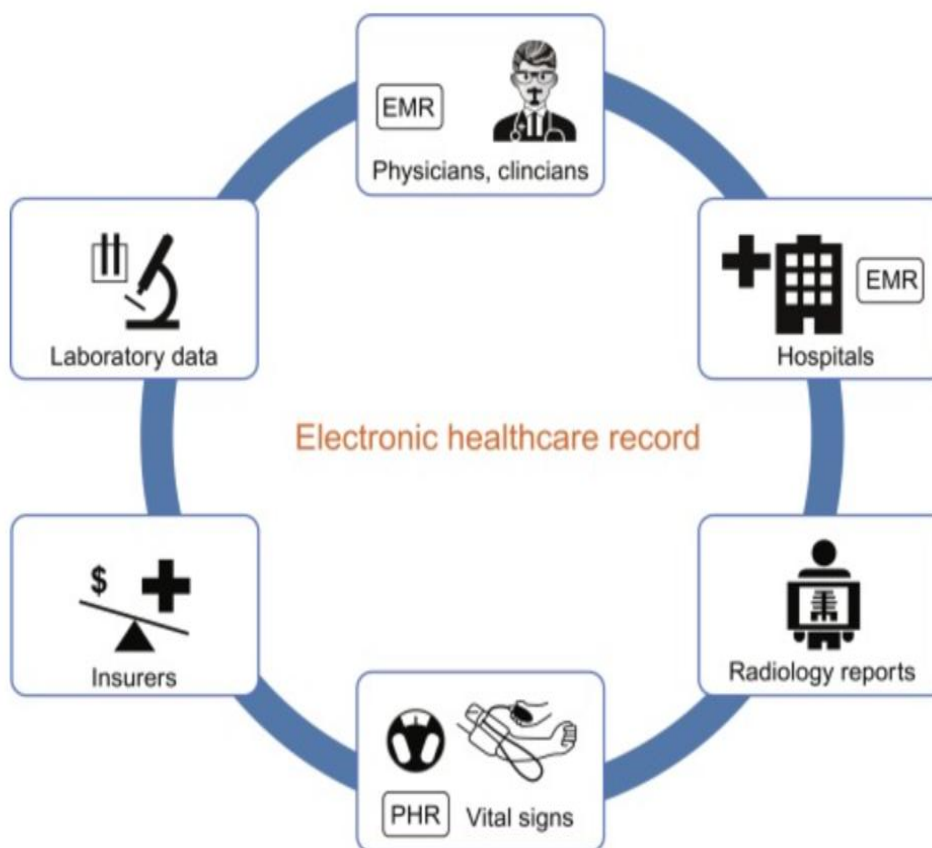


Figure 1.1.1: Electronic Healthcare Record Process

(Source 1: Handbook of Data Science approaches for Biomedical Engineering, 2020)

This research is meant to get staff opinions on the existing documentation process. This will show the hospital management how crucial it is to have a thorough documentation system. Moreover, this research is useful for deciphering the variations between digital and handwritten records. It is commonly agreed that manual descriptions are both error-prone and challenging to read. Electronic records, likewise, do away with such problems. This research aims to analyze the current Electronic Health Record process and identify ways the manual documentation system might be improved by observing the process of documenting existing patient information.

There is an increased need for research based on data, leading to knowledge discovery & creation of new protocols & guidelines, and baseline performance targets. Hospitals around the world started emphasizing moving from paper-based to computer-based systems. (Evans, 2016).

1.2 Study Background

According to Jens-Uwe (2013), Electronic patient and/or treatment case files are what we call cross-enterprise records. As per the words of Poba-Nzaou (2016), The adoption of Electronic Health Records (EHRs) by primary care physicians and hospitals is being spurred by several Government programmes in industrialized nations, including the United States, France, Germany, and the United Kingdom.

Electronic Health Records (EHRs) are a growing phenomenon that is considered the backbone of today's healthcare systems in the digital age, to the point that failure to implement an EHR system may constitute a divergence from the standard of care (Paterick et al., 2018). According to Evans (2016), Even though hospitals account for a major portion of total healthcare costs, there has been little research on EHR implementation in hospital settings.

In order to ensure the delivery of quality health care, any institution that provides health services must implement a health record management system. To achieve their goals and objectives, hospitals require several essential technologies, including health records. The purpose of health record management is to keep data in both paper and digital formats accurate, up-to-date, accessible, valid, and safe (Bouayadet al.). The results of this study were published in 2017.

Clinical outcomes like reductions in medication errors and improved quality of care, organizational outcomes: financial and operational benefits; societal outcomes: improved ability to conduct research, improved population health, and reduced costs are all areas in which electronic health records (EHRs) can potentially improve the health outcomes of both individuals and populations (Tsai et al., 2020). However, the high level of risk associated with EHRs often works to thwart these benefits.

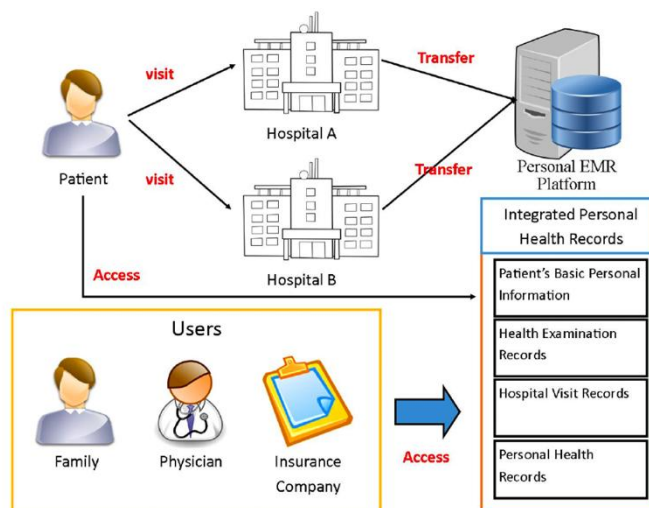


Figure 1.2.1: Electronic Health Records platform
(Source: Google)

A plethora of national and regional healthcare systems have been developed during the past few decades to regulate healthcare expenditures, service quality, and access. This is according to a recent study (Pollack Porter et al., 2018). Competent service delivery and health information management are provided by healthcare providers to maintain low costs, secure patient data, and guarantee compliance in an ever-changing regulatory environment. (Organization for Economic Co-operation and Development, 2018).

Clinical information system implementation, and electronic health record implementation, in particular, has met with only little success. A hospital's ability to reap benefits may be hampered by the failure of an EHR installation or the inefficient management of EHR risk connected with its use, which could endanger patients' lives and waste expenditures. Recent studies show that about 20% of hospitals would like to retire their present EHR and migrate to another system, indicating that inadequate management of EHR risk has resulted in widespread dissatisfaction among hospitals with their EHR systems. (Aguirre et al., 2019). It has resulted in less-than-ideal system usability, fewer available features, less flexibility in adapting to user needs, and greater security and privacy risks. According to Keshta and Odeh (2021), It is important to remember that even when EHRs have been successfully implemented, they have not always provided the long-term benefits hoped for. Thus, it is unsurprising that the potential risks associated with [EHR] have received less attention.

Implementation of EMRs in low-income regions have faced certain challenges due to the lack of proper infrastructural progress. As per Aldredge et al. (2020), low-income economies exhibit the incapacity to include adequate training and funding opportunities along with the lower level of resources that hinders the effective establishment of EMRs. The utilization of EMRs ensures that the existing data management system is integrated with an automated and highly-advanced system with customizable software capable of handling a robust volume of patient data. Furthermore, Stafford and Treiblmaier

(2020), articulated that recent developments in blockchain technology have facilitated a revolutionized system that can process medical data and transmit it without the associated security issues. Use of blockchain technology can be used as an effective solution for resolving the issues of security threats that limits the potential for the adoption of EMRs sustainably within the industry. Mahmoudi et al. (2020) further mention the utility of EMR in association with the predictive model framework which analyses administrative data and provides automated information to the users. However, the currently available predictive models incorporated within the EMRs are not sufficient to meet all the criteria for operations. Therefore, the modeling of an EMR system in low-income economies such as India and its neighboring countries has the potential to improve the overall healthcare sector practices.

1.3 Statement of Problem

The manual medical record-keeping system poses a grave threat to the vital function of medical records, despite their importance. Under this system, clinicians would record patient data manually on paper forms, then file and kept in locked cabinets. It became clear to the researcher that some information was missing.

Requests for medical assistance on a global scale are typically submitted using a standard, structured form. If correctly filled out and managed, it could serve as a trustworthy and useable medical record (MR) for ongoing patient care, protection of the legal rights of the patient, the physician, and the hospital, and compliance with standard and research requirements. (Shah et al., 2022)

Incomplete, unreadable handwriting, unfamiliar abbreviations, and inappropriate requests could diminish the value of medical requests.

1.4 Research Questions

The purpose of this project is to answer the following research questions:

- 1) How widely is the digital record management system utilized in different hospitals across India & neighboring countries?
- 2) What are the advantages of the digital record management system over the conventional paper-based recording system?
- 3) What are the limitations of implementing a digital patient data management system at different medical care facilities?
- 4) How does a digital record management system reduce adverse events and medical errors in a tertiary care facility?

1.5 Aim of the study

The aim of the study is to increase the adoption of digital transformation in the healthcare domain in India & neighbouring countries. This will enable clinicians to make informed decisions by sharing the benefits of the computer-based healthcare management system. This will further support health care professionals in reducing medication errors & drug-related adverse events in medical care facilities.

1.6 Study Objectives

The primary purpose of this research is to conduct an evaluation of digital record management systems in hospitals. The particular goals are as follows:

- a) To analyze the present status of digital transformation in different medical care facilities across India & neighboring countries.
- b) To explore the obstacles preventing the implementation of the digital record management system at Government & Private Hospitals across India & neighboring countries.
- c) To learn how healthcare service delivery can benefit from the increased use of electronic health records.

1.7 Significance of the study

The paper holds significance based on its ability to be implemented in national-level healthcare centres where the manual system leads to errors and delays, limiting the overall efficiency of the healthcare system. The digital transformation trends witnessed in various global sectors illustrate the scope for large-scale development in the efficiency and accuracy of operations. Therefore, establishing logical and practical conclusions upon the current trends of digital transformations in the healthcare sector and its implications presented in this study are significant to create an impact on the current market trends for healthcare-related technology on a national level.

1.8 The Motivation behind the study

The motivation behind the study is the identified issues with the current manual documentation and data management system in the healthcare sector and its negative implications on healthcare practices. As demonstrated by Shahnaz et al. (2019), using blockchain technology for ERS ensures that a protected and integrated system is developed for the secure storage of sensitive information. Hence, the motivation for the study is to

demonstrate the positive aspects related to digital transformation in healthcare security based on the current market trends.

1.9 Scope of the Study

The scope of this is considered based on its practical implications, which can initiate digital transformation in various healthcare institutions on a national level. On the other hand, the scope for practical implementation of the developed theories and recommendations in the paper shows the scope for future implementation on a national level, facilitating a wide-scale positive change. Hence, the scope of the study is widespread and capable of satisfying the sustainable development goals of the healthcare sector.

1.10 Structure of the Study

A systematic structure of the study is presented, divided into various chapters with different headings and subheadings, to provide clarity to the discussion on the topic. Beginning with an introductory chapter, a literature review chapter is presented. Following this, the methodology chapter is presented to illustrate and justify the methods and techniques for data collection and analysis. Furthermore, an analysis chapter is included to illustrate the primary data collection results. A result and discussion chapter are followed by it, which includes a detailed discussion and arguments on the topic based on the collected primary and secondary data. Lastly, a conclusion and recommendation chapter are added.

1.11 Chapter Summary

The above chapter provides a clear outline of the background and problem of the study which motivated the researcher to undertake the research work. The current manual structure for documentation and record-keeping is inefficient and leads to delays and errors. The concerns of information safety are also present in the manual information management system. Considering the current market trends and potential for digital transformation, the aim, objectives, motivation and scope for the study are also discussed in this chapter comprehensively.

2. Literature Review

This chapter defines terminology that is essential to this analysis. Detailed research on EMR adoption and utilization is provided, followed by an explanation and definition of meaningful usage. This chapter also examines a conceptual model tying EMR consumption to patient outcomes. In addition, principles supporting the inclusion and exclusion criteria used for this review are presented.

2.1 Electronic Medical Records

To better manage and enhance the quality of healthcare information, electronic medical records were first implemented in the early 1970s.

Hayrinen et al. (2008) conducted a literature review. They found that EMR users include not only doctors and nurses

but also pharmacists, laboratory technicians, radiologists, office administrators, patients, and in the case of minors, their parents or guardians. Modifying an EMR's settings can improve its usefulness. Complete and secure documentation of patient information allows for better, faster, and more unfettered access, better care coordination, fewer errors, more engaged patients, and streamlined administrative processes thanks to individualized feedback: these are just some of the potential benefits of using these features.

This allows for more efficient handling of patient data in the areas of laboratory testing, imaging analysis, and medication prescriptions by improving the flow of electronic communication between healthcare providers (Tierney et al., 2016). EMR elements also aid primary care practitioners with patient referrals by improving the flow of patients between healthcare sectors.

According to Canada Health Info way, a government-funded non-profit, there are two main distinctions between the three groups: the breadth and depth of the information provided and the people responsible for maintaining and organizing databases. Electronic medical records (EMRs) are kept by the healthcare provider and contain some of the patient's health record information. Electronic medical records (EMRs) provide data on a patient's diagnosis, treatment, and medication prescriptions. According to Adane et al., (2019), Common synonyms for electronic medical records (EMRs) include computerized patient records, computerized medical records, computerized health records, and e-records. Electronic health records (EMRs) were developed to be a reliable tool for managing patient records and facilitating core healthcare operations. Utilizing these EMR features to communicate patient healthcare information is a second approach to gaining from health templates (Quinn et al., 2019).

The health templates feature it easy to store patient data in an organized and secure manner. Health templates handle therapeutically important patient data such as medication lists, patient histories, diagnostic information, and laboratory findings (Sutton et al., 2020). Healthcare practitioners can use the saved patient information and clinical decision support tools to make treatment and prescription decisions.

2.2 Primary Healthcare

As described by Starfield et al. (2005) and the Ontario Ministry of Health and Long-Term Care, community-based healthcare centres that emphasize primary disease prevention, diagnosis, treatment, and management of chronic illness, as well as rehabilitative aid and end-of-life care, are included in the Primary care.

Primary care providers in this system are responsible for coordinating care and encouraging the use of tertiary care providers as necessary. Primary health care is defined as the first level of care and the first point of contact between patients and the healthcare system by the Ontario Ministry of Health and Long-Term Care. Health upkeep and disease avoidance services are included, along with diagnostic

checks (Owusu et al., 2021). It's also responsible for providing treatments like rehabilitation after chronic sickness has been identified. As a result, primary care substantially affects the health of the general public. Macinko et al. found a significant inverse correlation between the robustness of the primary healthcare system and mortality in developed nations in 2005, further demonstrating the need for such a system.

2.3 Effects of EMRS (Electronic Health Records)

The development and introduction of EMRs into primary care came with the hope that they would improve medical quality. Care delivery times may be reduced thanks to the electronic storage of patient information, which allows for quick and prompt remote access to information. Evidence suggests that introducing the EMR decision support feature enhanced patient outcomes by decreasing care-related mistakes. Similar to what was found for preventative and screening tests (Manca and Greiver, 2015a), alerts and reminders were found to aid in getting these procedures done when they were supposed to.

Some of the EMR's features that have the potential to aid in the treatment of chronic diseases include health templates, decision support systems, and alerts and reminders (Lin et al., 2020). So, it stands to reason that if EMRs are used more widely, this will impact data quality and care quality, which in turn may enhance patient health outcomes.

2.4 The State of EMR Implementation and Use

The Indian government is keen on reducing healthcare costs and speeding up the discovery of new medications by using data collected within the country. Digitalizing the healthcare system and expanding access to healthcare for all citizens requires the use of electronic health records (EHR), which India is making strides toward (UHC). India is aware of the benefits of electronic health records (EHRs) in terms of better patient coordination, more patient participation in healthcare decisions, more robust medical research, and lower healthcare costs. According to Mukherjee (2021), The Universal Health Coverage (UHC) Ayushman Bharat Yojana programme was launched in 2018 by the Government of India (GoI). That's according to research.

There are two main parts to our national health insurance programme: (i) the Pradhan Mantri Jan Arogya Yojana (PM-JAY), which seeks to offer INR 5, 000, 000 cover to the bottom 40% of the population for secondary and tertiary care, and (ii) the development of around 1, 500, 000 health and wellness centres across the country for primary care, especially in rural regions. Therefore, the government mandates the digitalization of these records and the construction of EHR systems, and the aforementioned beneficiaries' health data is collected regularly. Several state and federal programmes are currently being developed to create a unified digital health record system across India (Mukherjee, 2021b). One such programme is the National Digital Health Blueprint (2019). Large healthcare networks are making the switch to EHR, with the installation of electronic medical record (EMR)

systems at facilities like Tata Memorial Hospital and Max Hospitals Private Limited. Unfortunately, the rate of EHR adoption is not tracked systematically.

2.5 EMR Usage Barriers

Understanding why there is a gap between acceptance and use requires an examination of the barriers that prevent the full potential of EMR from being realized in primary care settings. Challenges may come in the form of money, technology, or both. Developing strategies to remove barriers to EMR adoption requires thoroughly comprehending these limitations. Major challenges include money, a lack of necessary computer skills, problems with the technical EMR system, ignorance of EMR capabilities, and a lack of time. As described by Ajami and Bagheri-Tadi, (2013a), electronic medical records (EMRs), in particular, may need help gaining widespread use because of their complicated interfaces (EMRs). Usability was not a primary emphasis of our comprehensive analysis, in any case. The disadvantages of Electronic Medical Record Use fall into The Following Groups.

2.5.1 Technical

Potential users lacked knowledge of the EMR's available features and lacked the rudimentary computer skills necessary to operate it. Simple computer skills aren't enough to make good use of these options; users also need to be aware of their availability and have access to guidelines for maximizing their potential. The time it takes for medical professionals who aren't tech whizzes to learn these new skills has also been raised as a source of concern. As described by Ajami and Bagheri-Tadi, (2013b), time disruptions and delays brought on by the use of EMRs in routine processes are another obstacle to their widespread adoption in primary healthcare settings. Thus, the absence of computer skills, the time needed to gain these abilities, and the additional time required to integrate EMRs into the daily responsibilities of primary health care are all technological hurdles to employing EMRs.

2.5.2 Technological

Thus, it is crucial for medical facilities to upgrade their EMRs to incorporate newly developed EMR features

regularly. In addition, as an EMR is a software application, it must be regularly monitored and maintained. As per Shachak et al. (2013), disruptions to the EMR's functionality could adversely affect its utilization and workflow in primary healthcare, delaying the provision of necessary medical attention. For this reason, technological support is crucial to the continued implementation of EMRs in primary care settings.

2.5.3 Financial

One of the biggest barriers to the long-term use of EMRs is the ongoing costs associated with doing so. Among these are the expenses incurred to keep the EMR system up and running and by regulations. Medical facilities will incur additional costs for post-installation technical support and expanded EMR functionality. Anxieties about the burden of ongoing costs are exacerbated by the lack of financial resources and funding incentives to make extensive use of EMRs. Funding is needed to cover the costs of EMR upkeep and upgrades that will allow their users to continue. Research finds that financial constraints prevent the widespread adoption of electronic health records (Electronic Health Records: Overcoming Financial Challenges | Commonwealth Fund, 2022).

2.6 Improving EMR Applications

An increase in effective EMR utilization through increased familiarity with the system's capabilities may have a beneficial impact on medical treatment. When it comes to primary care, implementing EMRs is just the beginning of a potentially positive transition. With the use of the Clinical Adoption Meta-Model (Camm), researchers have analyzed the steps that result in more widespread usage of electronic medical records and how such changes affect patient health outcomes. The Camm divided the use of electronic medical records (EMRs) in primary care into four distinct stages, the first of which is the introduction of the technology itself. Adopting an EMR system is only the first step; actual use of the system is required for improved patient care and results. Increased EMR usage after adoption may cause the third wave of clinical and health behavior improvements, leading to better outcomes in the fourth phase (as shown in Figure 2.6.1).

Figure 1: EMR Clinical Adoption Meta-Model

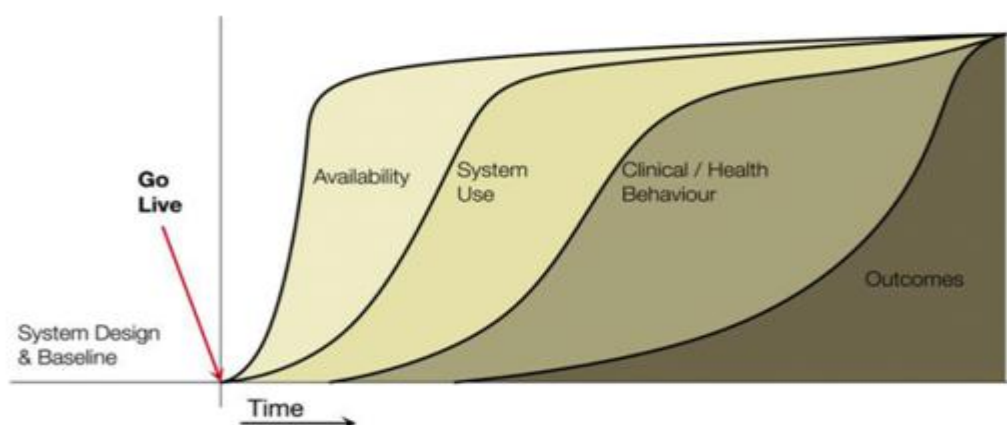


Figure 2.6.1: Application of Electronic Medical Records, the meta model
(Source: Temporal Meta-Model of Clinical HIS Adoption. 2014)

2.6.1 Second Stage: Enhanced Quality

Quality improvement is linked to EMR use because of the benefits of using EMRs for care coordination and the sharing of patient health records. During this time frame, efforts are made to implement and use EMR capabilities to improve care delivery.

As part of Stage 2, healthcare providers must report on ten goals related to meaningful utilization enhancement. Table 1 provides a detailed breakdown of these goals. The goals are designed to increase EMR adoption by encouraging the use of the system's functions such as electronic patient record storage and retrieval, information exchange and referrals, and clinical decision support tools. Also, to qualify as "meaningful users," primary care physicians must use the electronic medical record's capabilities in

laboratory testing, diagnostic imaging, and medication management.

Patients are considered end-users of the EMR and are required to have access to their health records using the EMR's capabilities as part of the meaningful use requirement. Furthermore, it encourages patients to interact with their primary care physicians using the EMR. The ultimate goal of meaningful utilization is to increase participation in the health care system from those who utilize electronic medical record systems. This advancement is made possible by incorporating the data collected and stored by EMR features into the reporting of crucial public health indices. At this point in Meaningful Use, the spotlight shifts to the healthcare provider's ability to use the EMR's specified features.

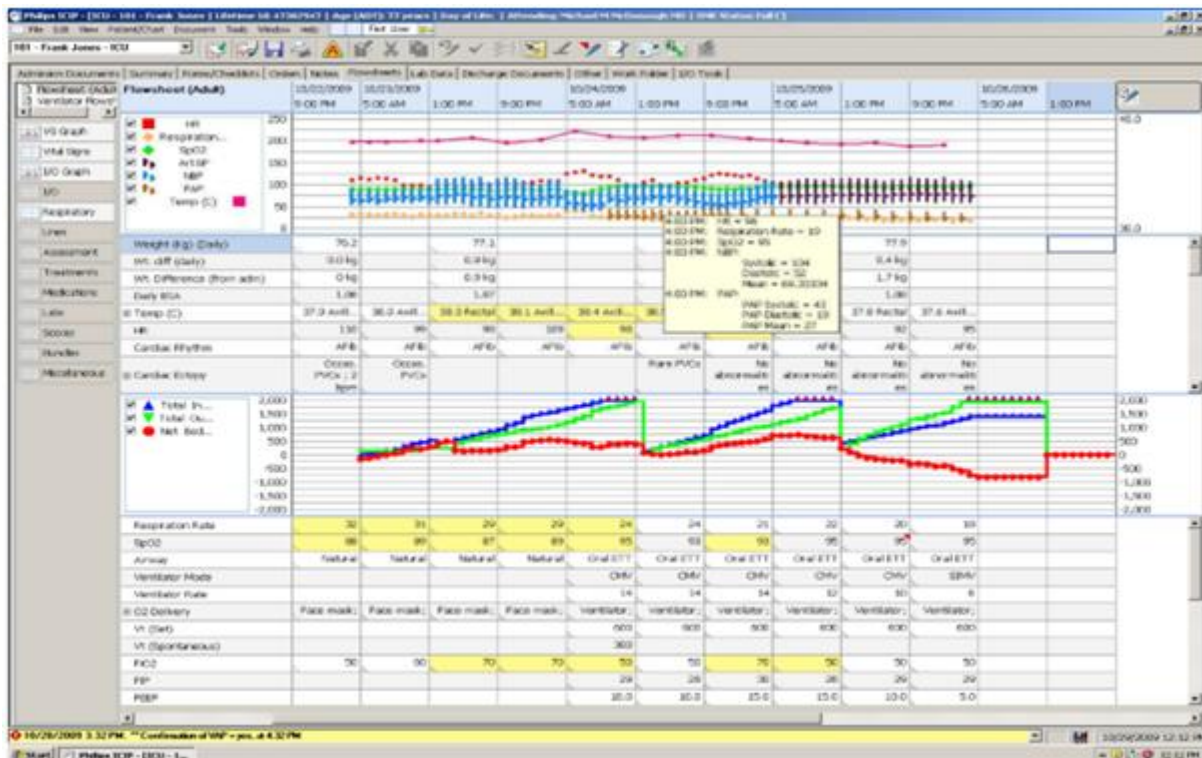


Figure 2.6.1.1: Picture of a Fully Integrated EMR Solution, Source Philips ICCA System (Source: Researcher)

Table 1: Detailed explanation of Meaningful Use Criteria Stage 2 Goals

Stage 2 Goals	Description
Protect patient health information	Ensure updated security measures and identify security downfalls to protect patient health information
Health information	Electronically documenting referrals to other health care

Exchange	Providers
Clinical Decision support	Implementing and using CDS in patient diagnosis and drug interactions in relation to medication prescription
Computerised Provider Order Entry (CPOE)	Using computerised physician order entry (CPOE) to record prescriptions, laboratory orders and diagnostic imaging orders
Electronic prescribing	Accounting for and electronically transmitting prescriptions
Medication allocation	Performing medication reconciliation for new patients
Patient-specific education	Providing patient-specific education resources through the EMR
Patient electronic access (VDT)	Providing patients with timely access to the electronic records, to view their health information online as well as download, and transmit to third party
Secure messaging	Allowing for sending and receiving secure electronic messages between patients and primary health care providers
Public health	Active engagement with a public health agency to report on the following:

- Syndromic surveillance data
- Immunization data
- Specialised registry reporting

As a result, the goals of the meaningful use standards are to 1) enhance health outcomes by increasing the quality, safety, and efficacy of healthcare and 2) increase care coordination by fostering more openness in the storage and exchange of health information. Improved communication between doctors, patients, and family members is one way to accomplish goal 3, and providing information for public health research is another, both of which can be accomplished without compromising patients' right to privacy. According to Manca and Greiver (2015b), meaningful use standards were created to encourage more widespread adoption of electronic medical records (EMRs) in primary care, with the ultimate goal of enhancing patient quality of care.

2.7 Various types of interventions

To increase healthcare professionals' proficiency with computers and understanding of EMR features, interventions would be necessary to mitigate the negative effects of technological barriers to EMR adoption. Having a deeper comprehension of these areas may make it faster and easier to complete daily chores with EMRs. Seminars, conferences, and recommendations for electronic medical record use could all help achieve this goal (Ajami and Bagheri-Tadi, 2013c). Particular and targeted efforts to overcome technological barriers would also help increase EMR adoption.

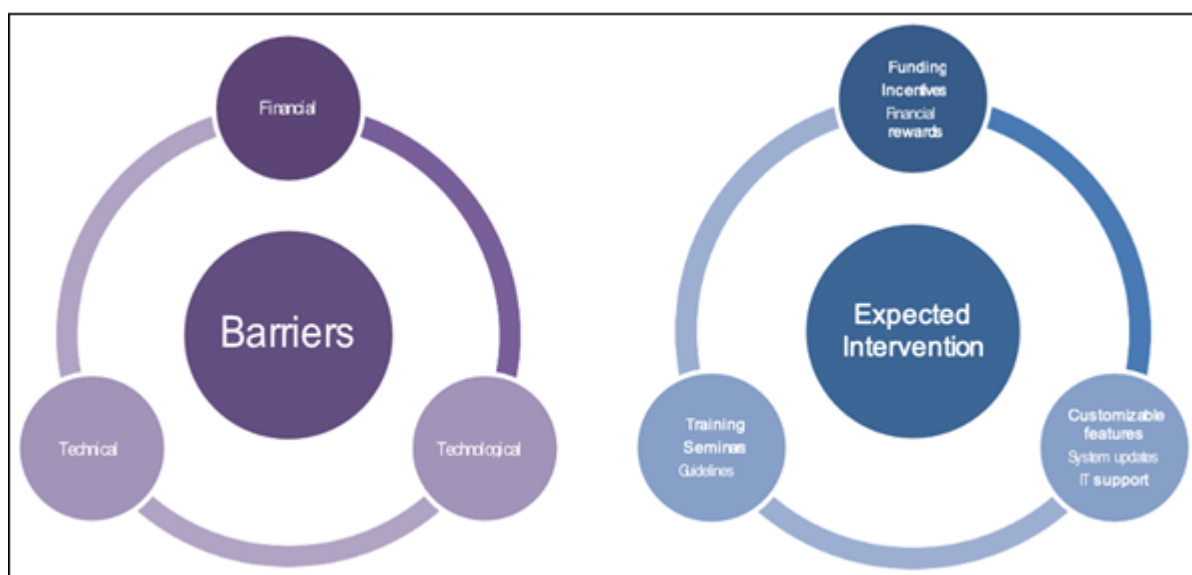


Figure 2.7.1: Predicted Correlation between Obstacles to EMR Adoption and Efforts to Remove those Obstacles (Source: Noura Hamade, 2017)

2.8 Points of Intervention

There could be two kinds of interventions to increase the use of electronic medical records. On the first track, we find actions taken to remove the barriers to EMR adoption. The second, it includes zeroing in on certain parts of healthcare facility operation where EMR use was supposed to make a difference. For the sake of this analysis, these pathways will be regarded as intervention focus areas.

2.8.1 Intervention Goal

Barriers to continued EMR use can be broken down into three categories, each requiring a unique intervention. The first are technical ones, such as users' lack of familiarity with and training in EMRs. Similar to how EMR function issues and other technological impediments could be treated, treatment could focus on overcoming these issues. The third group of difficulties that interventions could overcome is monetary difficulties. The costs of updating and enhancing electronic medical record software are factored in.

2.8.2 Population Intended for Intervention

All efforts to increase electronic medical record (EMR) usage should focus on primary care providers like physicians and nurses. Technicians, secretaries, and clerks in the administrative side of primary care are also included. Patients may sometimes be counted among an EMR's user base. This is a real possibility in primary care settings where patients are actively encouraged to use their electronic medical records to get in touch with their primary care physicians.

2.9 Literature Gap

Based on the above literature review, it can be stated that the existing literature on the topic contributes to the research topic. The market trends and scope for digital transformation can be evaluated based on reviewing the existing literature. However, specific gaps in the literature are identified regarding the lack of research based on primary data. A considerable lack of market trends, specifically in India and the current condition of the Indian healthcare sector are also identified. Thus, these gaps in the

literature are considered while establishing hypotheses for the paper.

2.10 Conceptual Framework

The following conceptual framework illustrates the dependent and independent variables of digital transformation and market trends in the healthcare sector:

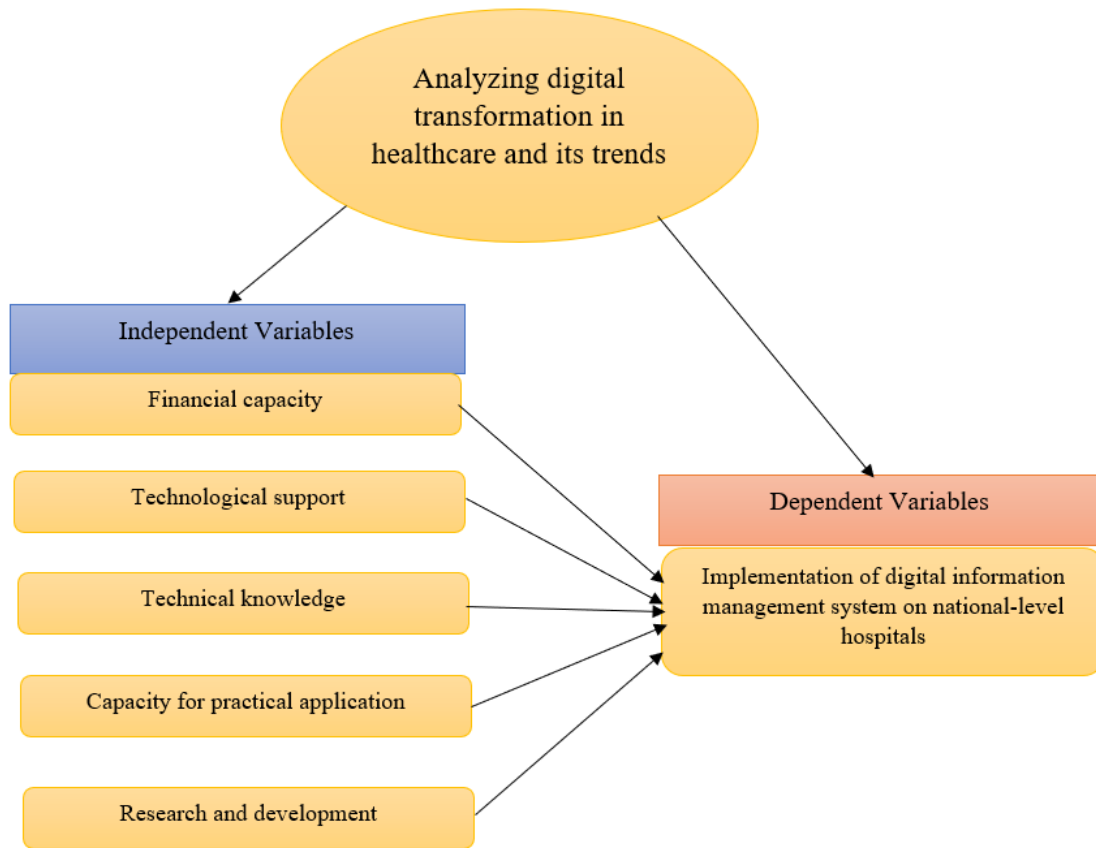


Figure 2.10.1: Conceptual framework (Source: researcher)

2.11 Summary

Discussing the reliability and utility of the provided data is crucial while analyzing EMR implementation. Completeness and accuracy are two metrics that can be used to assess data quality. As a result of its potentially

beneficial effect on patient health, data quality is also a primary focus of initiatives aimed at increasing EMR utilization. In addition, EMRs include many features that make them more useful and effective in supporting primary care offices' daily operations.

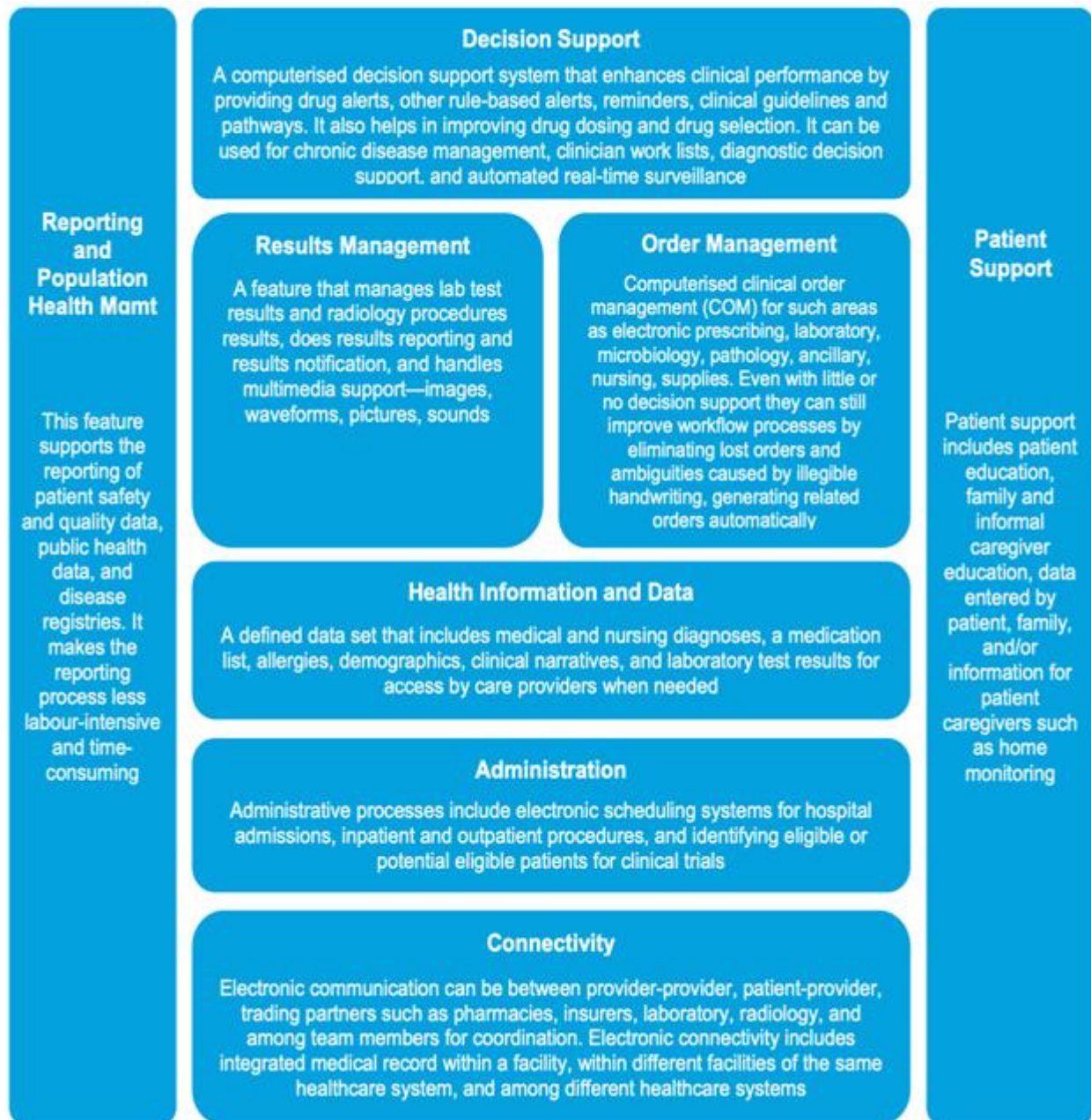


Figure 2.11.1: EMR Utilization across the care continuum

3. Research Methodology

This section explains how the report plans to respond to the research question. Beginning with the research strategy, this section describes the methodology of this work. This chapter then describes the data gathering process, data analysis, and research quality.

3.1 Research Philosophy

The research philosophy adopted for this is the philosophy of positivism. The positivism philosophy enables the researcher to analyze data and identify patterns that are predominantly present in society. As per the words of Corry et al. (2019), the philosophy of positivism helps to guide the development of knowledge based on objective analysis. Preserving objectivity and enhancing the scope for conducting research that can discover new patterns regarding the use of technology for information

management in various national-level healthcare centres are achieved through adopting this particular philosophy.

3.2 Research Approach

The research approach adopted for the study further helped to demonstrate the development of research logically and scientifically. A deductive research approach is undertaken by the researcher to ensure that reasoning and arguments on the chosen topic are conducted based on verified and reliable data. According to Pandey (2019), a deductive research approach enables the study to test hypotheses based on concrete evidence and existing theories. Considering the current market trends for healthcare-related technology, it can be stated that the deductive approach helped to analyze scientific data and make conclusions based on it. In essence, the reasonability and reliability of the hypotheses formed in the paper are adequately supported by qualitative and quantitative evidence.

3.3 Research Strategy

This qualitative and quantitative methodology aligns with the research objective of this work, which is to examine the current status of digital transformation in medical care facilities & advantages of using a computer-based healthcare system over a manual recording system. This particular research strategy is selected as the paper aims at aligning the information gathered from secondary resources with the responses from the survey conducted by the researcher, identifying any discrepancies with the overall agreement on the use of EMRs in healthcare centres for improved outcomes and enhanced efficiency of medical practitioners.

3.4 Research Design

The research design for the study is descriptive, allowing the researcher to comprehensively analyze the gathered data. This particular research design is chosen for the study as it can accommodate both qualitative and quantitative data analysis with objectivity and comprehensibility. The descriptive study design helps build a framework for systematically analyzing collected data. The descriptive research design further helped to incorporate both qualitative and quantitative data and conduct the required analysis to ensure that the findings presented in the study are applicable in real-life hospitals facing difficulties regarding an adequate, efficient, and safe information management system.

3.4.1 Research Environment

The field of study is the healthcare industry, and the research was conducted in India & neighboring countries. India's rapidly expanding healthcare sector is supported by a diverse population, making it a global leader in healthcare research. The investigation followed the methodical, sequential format shown in Table 2, Studying Related Topics.

3.4.2 Methods in Research

The first part of the study is descriptive, while the second part is analytical. All of the preliminary survey data has

obtained through a survey questionnaire. The study's goals inform the development of the questionnaire. Journals, articles, e-books, and websites were mined for secondary data.

The total time commitment for this study was 60 days. Sampling was conducted using a probability-based random sampling technique. Doctors, Medical officers, ward secretaries, billing supervisors, administrators, social workers, and executives from the medical records department are just some of the people who comprised the sample size. Consequently, 254 participants were the study's sample size (Table 2)

A) Sampling Process: Targeted healthcare personnel in different categories of hospitals & clinics, located throughout India and beyond. Samples from a wide range of demographics (including age, education level, work experience, and different departments in a medical care facility). A probability-based random sampling is adopted as it provides sufficient randomization of the population to establish patterns of concerns and opinions with higher level of confidence. In essence, this particular sampling technique for sampling the respondents helps to analyze a population with as much diversity and character as possible to be aligned with a larger population within the industry.

B) Information Gathering Methods:

Primary Data: Quantitative surveys created in Google form were the primary source of information. E-mails, LinkedIn messages, WhatsApp, etc., are used for follow-up.

Secondary Data: Data gathered from sources other than primary sources, such as scholarly articles, company websites, financial records, market studies, business analytics, and news stories sourced from online databases.

C) Methods and apparatuses for gathering information:

Each set of questions is sent and received using the Google form. Information was exported to XL and transformed into tabular representations.

D) Study Design

Table 2: Primary research study flowchart-Phase 1

Total number of experts approached for this study	300
Number of experts who consented to take out the survey	255
The total number of respondents who followed the instructions	254
Origins and experiences of participants	Healthcare professionals with well-known experience and expertise across different type of medical care facilities
Promotional Niches	India and neighbouring countries
Mode of the Survey	Through Google form
Survey Language	English
Type of Questionnaire	<ul style="list-style-type: none"> • Total 40 questions • 1-Mandatory Email • 4-Demographics • 3-Opinion on existing EMR system with-Multiple Options • 32-Questions using the Likert Scale
Sampling	Probability based-random sampling
Period of Study	10 th November, 2022 to 10 th January, 2023

E) Sampling strategies, sample size, and justification:

Participants in this questionnaire-based poll were healthcare professionals who worked directly in different types of medical care facilities and were not affiliated with any third parties. After conducting an exhaustive literature review, a preliminary question model, framework, and pilot/test questionnaire were developed. A pilot/test questionnaire was distributed to a subset of healthcare professionals and approximately 25 experts from the target participants in the associated field to determine whether the questions could aid in obtaining the needed data for the study issue. Based on the feedback received from the experts, the final questionnaire was designed to be more interactive and engaging for the intended respondents. The pilot/test questionnaire took between 8-and 10 minutes of standard testing time. Therefore, the study assumed it would take 10 to 12 minutes to complete and participate in the survey.

3.5 Data Collection

This paper's data was collected using primary and secondary sources, including a literature review, interviews, and a survey. The literature contributed to a greater understanding of the subject and aided in the comprehension of the interview results. According to Saunders, Lewis, and Thornhill (2015), acquiring data from independent sources is best. Since the data in this study were acquired using various techniques, it provides further insight into the phenomenon under investigation. This allows for triangulation (Creswell, 2013)

3.5.1 Secondary Data

To establish a firm foundation of information for the present study, a literature review was performed. The literature review is based on secondary sources such as books and scholarly articles from the selected research fields. The review of the literature also includes research that addressed these concepts in the context of healthcare. These are websites and encyclopaedias owned by the government. Since there was a variance in the dependability of the sources, a variety of literature was analyzed so that only reliable ones could be used.

3.5.2 Data Analysis

Primary data analysis is conducted based on statistical analysis conducted in SPSS. Using SPSS for statistical analysis helps to identify the least significant and most significant variables. According to Roni and Djajadikerta (2021), statistical analysis helps to define the value of each associated variable in a correlational pattern.

SPSS version 23.0 has used for statistical testing. Where 20% of causes determine 80% of issues, Pareto analysis can be a very helpful formal technique. Comparisons and interpretations can be made with relative ease using percentage analysis.

The Chi-Square test was used to see if there was a statistically significant difference between data sets or if the differences were just the result of random sampling.

Applying analysis of variance (ANOVA) to look at the disparities in mean scores between the various groups and finding a statistical connection between two variables through correlation analysis. The significance level will be set at a p-value of <0.05. ;

Analysis of secondary data gathered from various peer-reviewed journals, articles, and other resources is conducted comprehensively as well. The gathered secondary data provides the theoretical background, based on which a logical and comprehensive analysis can be formed.

3.5.3 Hypothesis Testing

The following hypotheses were formulated for the research:

Hypothesis 1:

H1: Employees face difficulty in understanding and managing the manual documentation system used in healthcare.

H0: there is no significant correlation between the difficulty of understanding and managing patient records and the use of manual documentation system used in healthcare.

Hypothesis 2:

H2: There is a significant correlation between incomplete patient record information and the use of manual documentation methods.

H0: There is no substantial correlation between incomplete patient record information and the use of manual documentation methods.

Hypothesis 3:

H3: There is a substantial disparity between the information recorded by the medical care professionals and the actual information of patients.

H0: There is no significant disparity between the information recorded by the medical care professionals and the actual information of patients.

Hypothesis 4:

H4: There is a substantial difference between the time required to document patient records using manual documentation processes and electronic medical record systems.

H0: There is no significant difference between the time required to document patient records using manual documentation processes and electronic medical record systems.

Hypothesis 5:

H5: There is a significant correlation between EMR-reducing medication mistakes and adverse events and the processing time for prescribed medications.

H0: There is no correlation between the EMR reducing medication mistakes and adverse events and reducing the processing time for prescribed medications.

3.5.4 Pareto Analysis

Based on the study's findings, the Pareto analysis was done to determine factors that directly impact the efficiency of the documentation system.

3.6 Conceptual Framework

The following conceptual framework illustrates the hypothetical assertions established by the researcher:

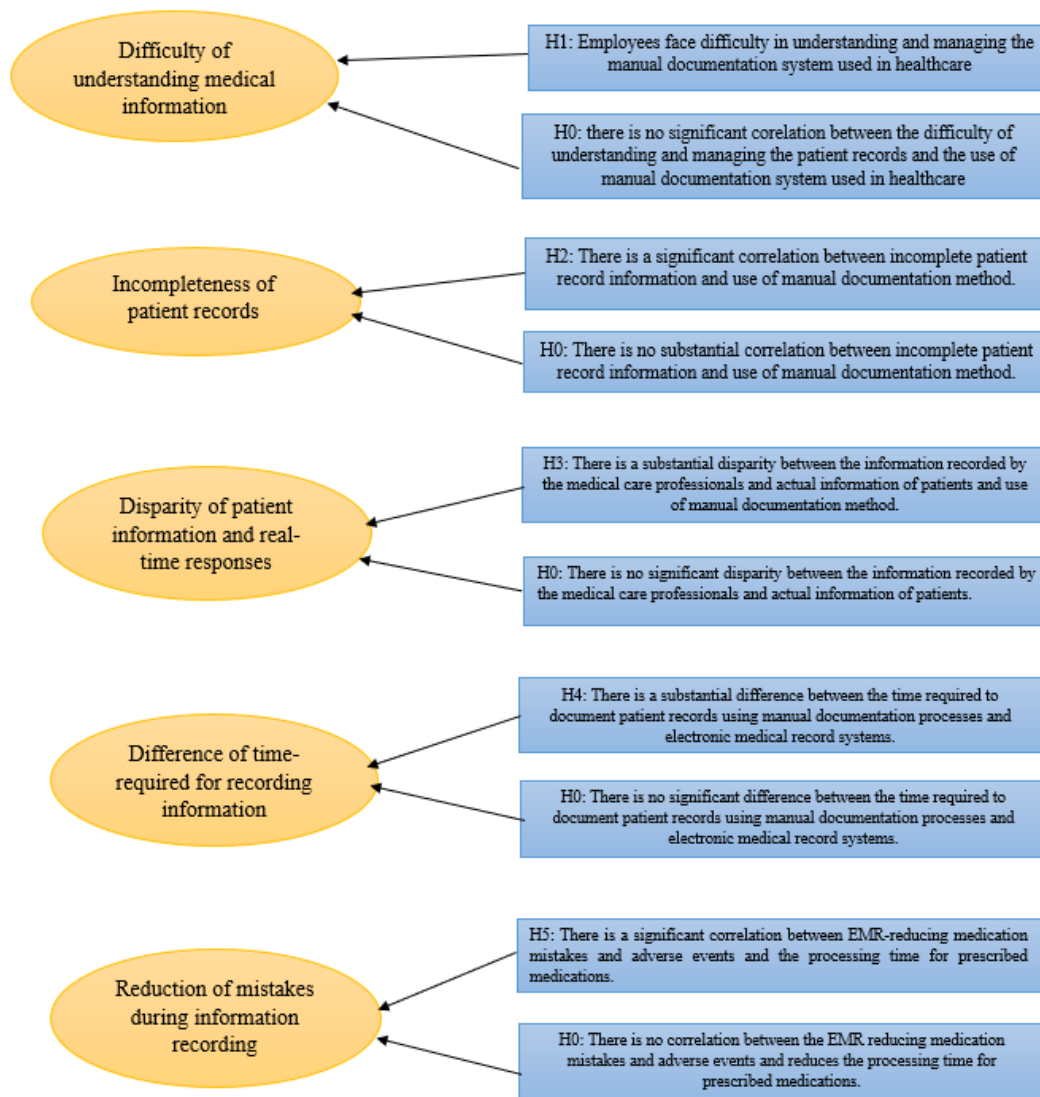


Figure 3.6.1: Conceptual framework
(Source: researcher)

3.7 Research Ethics

The study adhered to the criteria outlined by Liverpool John Moore's University.

- 1) Information demand
- 2) Consent requirement
- 3) Confidentiality mandate
- 4) Good use requirements.

- Participants in the Survey were provided with a brief introduction to the topic, including the merits and cons of the Computerized Patient Centric Healthcare System.
- Participants in the survey were not required to respond and did so voluntarily.
- The survey was conducted with the participant's consent. In addition, participants were provided with additional information through the participant

information sheet to ensure they had further clarity on their involvement in the study.

- The collected data was utilized solely for research purposes. No information was extracted from its context, altered, or disseminated elsewhere.

3.8 Validity and Reliability

Validity and reliability are measured by the consistency and accuracy demonstrated by the paper through the adoption of a proper methodological approach. The measurement of validity and reliability are two major factors that confirm the quality of the paper. Validity and reliability are further demonstrated in the paper by ensuring that conclusions made in the paper are consistent with the analysis of authentic data.

3.9 Chapter Summary

The above methodological chapter outlines the systematic methodological framework adopted for the study to conduct data collection and analysis. The study adopts a positivist philosophy, followed by a deductive approach and a descriptive study design. The survey is conducted in India and neighboring countries. Using SPSS for statistical data analysis, each variable's value is identified and the position of the least and most significant variables. Furthermore, secondary data analysis is also presented to support the identified patterns gathered from the primary survey results. Hence, the overall methodological structure

maintains validity, reliability, and research ethics to ensure that high-quality and authentic research is presented.

4. Analysis/ Implementation

In the following chapter, the results from the survey are presented based on a systematic primary data analysis framework. Results from the quantitative analysis are presented in visual charts to indicate the results and analysis along with the statistical analysis from SPSS.

Primary Data Analysis

Features of Existing EMR Please select the type (s) of medical record system being used
255 responses

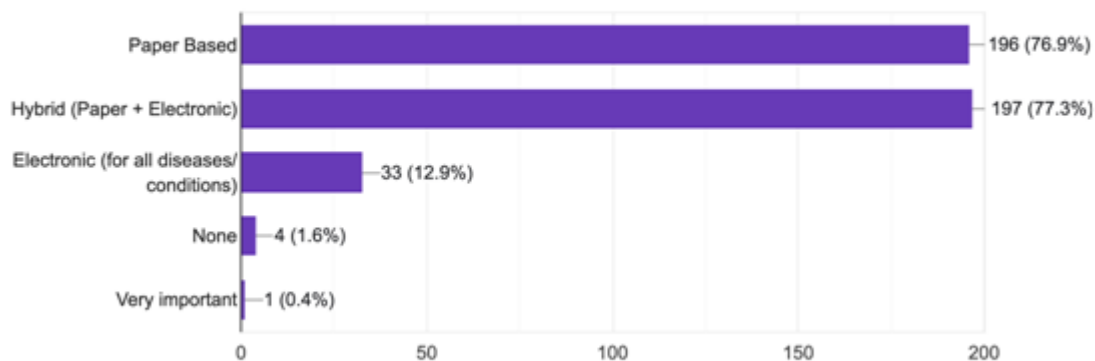


Figure 4.1: Chart based on types of EMR features
(Source: Excel)

Several features are involved in EMR such as holding records 24*7, making communication from provider to patient, and making schedules. Using EMR is much more confident for primary healthcare (Mollart et al., 2021). Some participants stated that EMR is considered a hybrid system, and for this reason, both paper and electronic are involved in providing services in the healthcare sector. Few participants stated that EMR provides electronic features that are used in all kinds of diseases. The above table represents the percentage of individual categories in the utilization of EMR in the healthcare sector. 77.3% of the total participants provided responses that EMR provides both electronic and paper solutions in the healthcare sector, which is found in the above table.

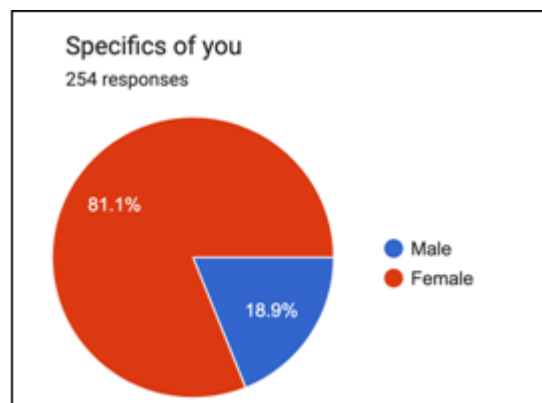


Figure 4.2: Chart based on gender
(Source: Excel)

It is found that 81.1% of the total participants are female. On the other hand, 18.9% of respondents are male in the survey that, as represented by the above table. The conclusion of the above chart is that most of the invited participants are female.

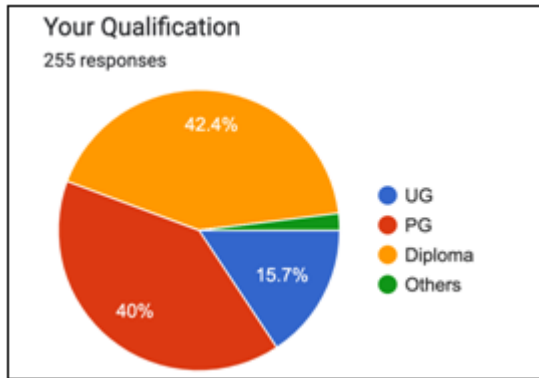


Figure 4.3: Chart based on education qualification (Source: Excel)

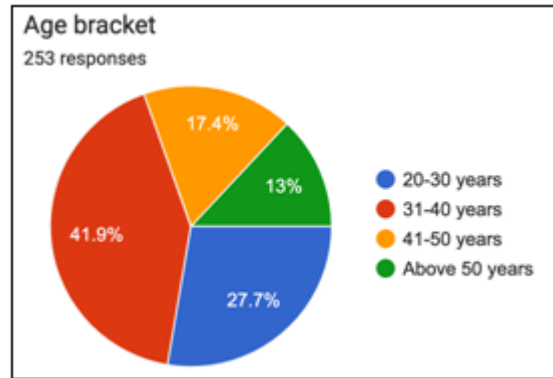


Figure 4.4: Chart based on age (Source: Excel)

The above chart is representative of the percentage of the respondents based on education qualification. 42.4% of respondents who are Diploma holders have participated in the survey. From the above chart, it is found that 15.7% of participants are from UG qualification. 40% of respondents are PG degree holders which are found in the above chart. A small number of participants are from other educational qualifications. The above percentage table of the participants shows that the maximum number of respondents is Diploma qualified nursing personnel.

Respondents who have been invited to the survey are from different age groups, such as 20-30, 31-40, 41-50, and more than 50. The above chart represents the percentages of respondents from different age groups. It is found from the above chart that 41.9% of participants are from the 31-40 years age group. 17.4% of respondents are from the age group of 41-50 years. The percentage of the 20-30 years age group is 27.7% which is found in the above chart. However, 13% of respondents who are above 50 years have participated in the conducted survey. From the above graph, it can be concluded that most participants are from the age group of 41.9 years.

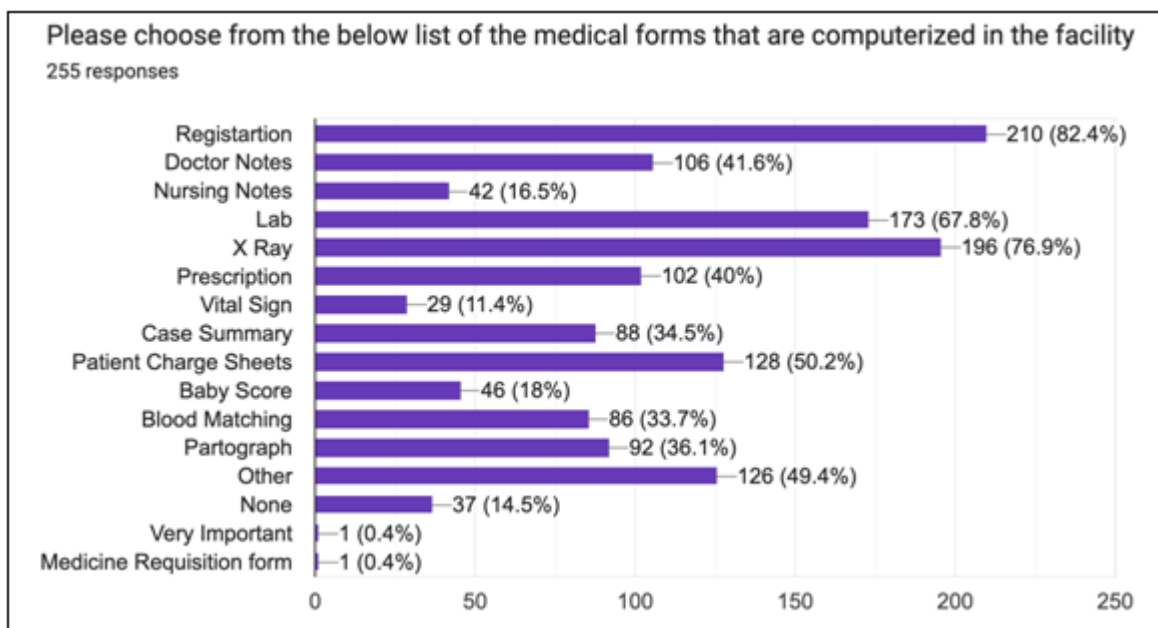


Figure 4.5: Chart based on medical forms (Source: Excel)

Responses have been collected based on the medical forms that are computerized in the facility. The above chart is the representation of the percentage of medical forms used for computerized. In 82.4% of cases, medical forms are computerized for making registration forms. 41.6% of medical forms are used computerized for making doctor notes in the healthcare sector. The above chart shows that 16.5% of medical forms are computerized for making nursing notes. The lab has vast importance in the healthcare sector and different kinds of medical forms are used in medical labs (Kaur et al., 2018). It is found that

67.8% of medical forms are computerized in the lab which is found in the above chart. 76.9% of responses stated that medical forms are computerized for making X-Ray reports. The above chart describes that 40% of forms for medical are computerized for making prescriptions that are used in the healthcare sector for providing medical information to patients. 50.2% of responses stated that medical forms are computerized to make charge sheet of patients. 33.7% of responses come from that medical forms are computerized to make reports for blood matching.

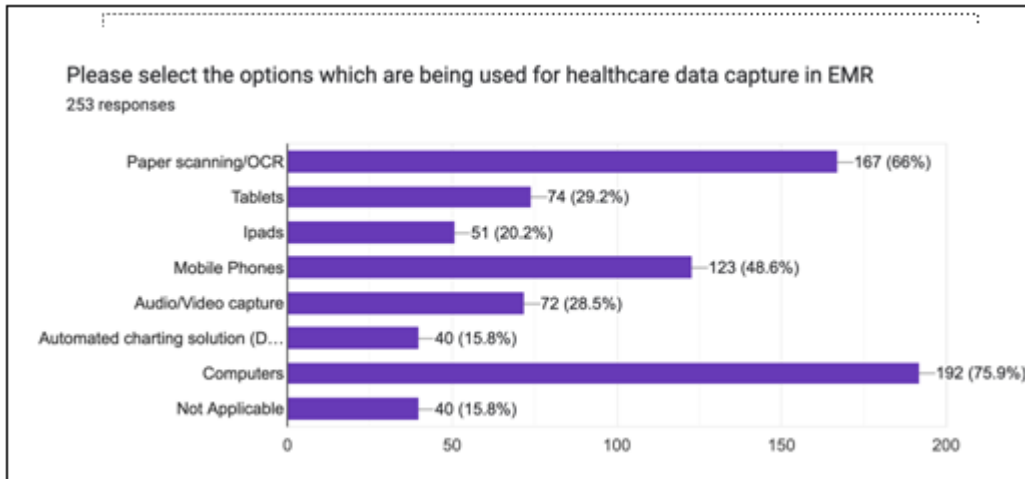


Figure 4.6: Chart based on data capture (Source: Excel)

The above chart represents the percentage of frequency of used electronic gadgets in the healthcare sector. 66% of respondents agreed that OCR is used in the healthcare sector to capture data in EMR. 29% of responses stated that tables are chosen in the healthcare industry to store patient data in EMR. EMR is considered a digital tool for records of patient care data (El Khatib et al., 2022). 20.2% of respondents stated that iPads are mostly used for capturing data in EMR. In recent times mobile phones have been used for the purpose of capturing data in EMR. The above chart shows that 48.6% of responses are from using mobile phones to capture data in EMR. 75% of responses stated that computer is used in the healthcare sector for storing data in EMR related to the patient. The above charts define that, in most cases, computers are used to capture data in EMR.



Figure 4.8: Chart based on the capability of format of patient record (Source: Excel)

Responses collected from the invited participants on patient record format are standardized across the care facility. The above charges represent the percentage of responses on this statement. 37.6% of participants disagreed that patient record format is standardized across care facilities. 11.4% of respondents strongly disagreed with this statement. However, 38.4% of participants agreed that the patient record format is standardized in the entire care facility. The above chart shows that the maximum number of participants agreed with the statement.

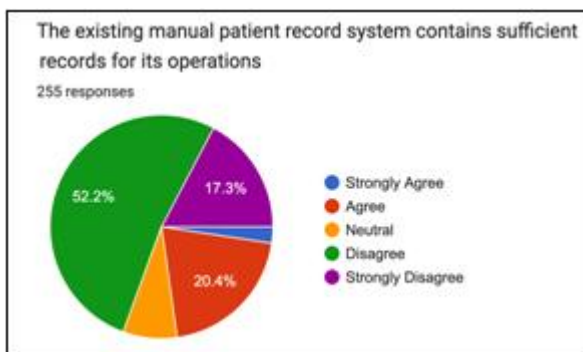


Figure 4.7: Chart based on the capability of manual record system (Source: Excel)

Responses have been collected on the existing manual patient record is sufficient for operations. 52.2% of participants disagreed that the existing record system is sufficient to store patient records. 17.3% of respondents strongly disagreed with the statement that is included in the above chart to collect responses from the invited participants. 20.4% of participants agreed that the existing patient record system is sufficient to store data. A vast amount is available in medical records (London, 2019).



Figure 4.9: Chart based on patient care information (Source: Excel)

51.8% of participants disagreed that full information related to patient care is stored in a manual patient record system. 16.1% of respondents strongly disagreed with the statement, which is found in the above chart. However,

22.4% of participants agreed with the statement. The above chart shows that most invited participants disagreed that complete information related to patient care is captured in a manual patient record system.

The percentage of responses has been analyzed by the above table on the statement is records of patients are signed with time and date. 9.8% of participants hold a neutral position on this statement. 36.5% of respondents disagreed that records of patients are signed with time and date. However, 45.5% of participants agreed with that statement. Analysis of the percentage of responses from the above chart, it is found that a maximum number of participants agreed with this statement.

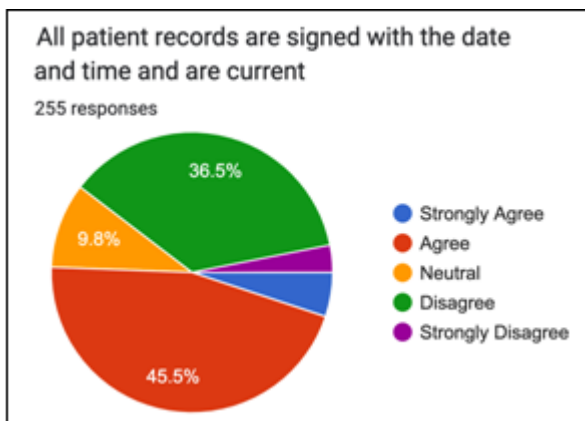


Figure 4.10: Chart based on patient records based on time and date (Source: Excel)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	91.197	1	91.197	60.166	.000 ^b
	Residual	383.485	253	1.516		
	Total	474.682	254			

a. Dependent Variable: manual_patient_record_system

b. Predictors: (Constant), patient_records_standardized

Figure 4.11: ANOVA table (Source: Excel)

The statistics that is found in the ANOVA table is used to test the hypothesis. Values of sum square, mean square, and F are involved in the ANOVA table (Prasad et al., 2020). The value of this value is calculated by the degree of appropriate numbers of freedom. The value of the mean square of the above ANOVA table is 91.197 and 1.516.

The value of the mean square is used for the subsequent test to signify the difference among the mean groups. The value of two mean squares defines that the null hypothesis is true. The above ANOVA table value of the two mean squares is different, which signifies that the alternative hypothesis is true.

		patient_records_standardized				
		Agree	Strongly agree	Neutral	Disagree	strongly disagree
manual_patient_record_system	Agree	Count: 37	5	3	7	0
		% within manual_patient_record_system: 71.2%	9.6%	5.8%	13.5%	0.0%
		% within patient_records_standardized: 37.8%	26.3%	23.1%	7.3%	0.0%
		% of Total: 14.5%	2.0%	1.2%	2.7%	0.0%

Figure 4.12: Chi square (Source: Excel)

From the chi-square mentioned above, it can be observed that patients from some developing countries do still believe that manual patient records can be standardized in the healthcare system. There are near about 71.2% strongly agreed with this manual patient record system. Some individuals are still confused regarding the benefits of

digitalization and manual process, and the percentage of neutral individuals was 5.8% (Coventry and Branley 2018). On the other hand, the percentage of patient record standardized systems are 13.5%, 7.3%, and 2.7%, respectively.

Strongly agree	Count	0	6	0	0	0
	% within manual_patient_record_system	0.0%	100.0%	0.0%	0.0%	0.0%
	% within patient_records_standardized	0.0%	31.6%	0.0%	0.0%	0.0%
	% of Total	0.0%	2.4%	0.0%	0.0%	0.0%
Neutral	Count	9	2	1	8	0
	% within manual_patient_record_system	45.0%	10.0%	5.0%	40.0%	0.0%
	% within patient_records_standardized	9.2%	10.5%	7.7%	8.3%	0.0%
	% of Total	3.5%	0.8%	0.4%	3.1%	0.0%
Disagree	Count	45	2	6	69	11
	% within manual_patient_record_system	33.8%	1.5%	4.5%	51.9%	8.3%
	% within patient_records_standardized	45.9%	10.5%	46.2%	71.9%	37.9%
	% of Total	17.6%	0.8%	2.4%	27.1%	4.3%

Figure 4.13: Chi square
(Source: Excel)

Medical staff are required to access the data of multiple patients at a single time; however, manual data recording processes do not provide facilities for multi-accessing points. On the other hand, electronic health record systems can keep patients' data safe and easily accessible from any other location (Sehet al., 2020). In this way, respondents demonstrated their understanding of the implementation of digital facilities in the healthcare system. More than 45.9% of respondents disagreed with the previous data-keeping process.

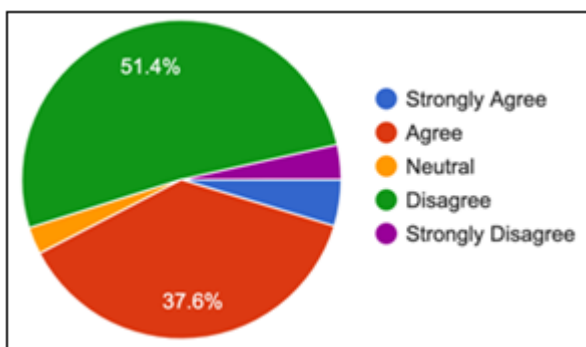


Figure 4.14: Extension of manual record keeping
(Source: Excel)

From the above-mentioned figure, it can be stated that individuals are not satisfied with the current documentation system in the healthcare sector. In the case of many small and medium-sized healthcare organisations, the members are still proceeding with the report formation manually (Rehman et al. 2022). Due to digitalization, the chances of

manual processes in the hospital and healthcare sector may not extend for a long time. In that case, 51.4% of respondents disagreed with the extension of the manual record-keeping process for the future perspective.

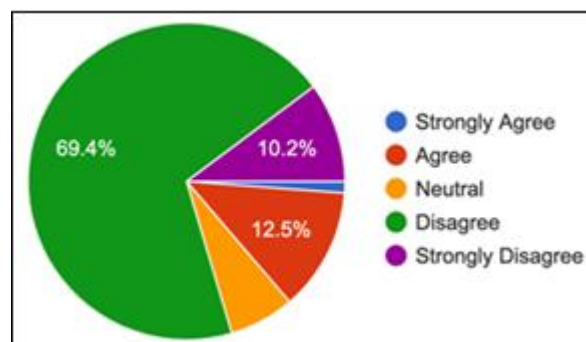


Figure 4.15: Enough space for keeping patient records
(Source: Excel)

In order to conduct the research, a total of 254 respondents were selected, and data were collected depending on their perspectives. The retention for keeping medical records can enhance the confidentiality and security of data. Medical practitioners also follow the rules and guidelines of HIPAA to retain medical records properly. The results depicted that 69.4% of individuals disagreed that there is sufficient space for recording healthcare data for the patients (Höbl et al. 2018). On the other hand, only 12.5% of individuals agreed that the current healthcare system has enough space for keeping patient records.

manual_patient_record_system *
 medical_records_safeguarded_physical_damage

+

Crosstab

		medical_records_safeguarded_physical_damage					
			Strongly agree	Neutral	Disagree	strongly disagree	
manual_patient_record_system	Agree	Count	19	0	7	24	2
		% within manual_patient_record_system	36.5%	0.0%	13.5%	46.2%	3.8%
		% within medical_records_safeguarded_physical_damage	36.5%	0.0%	28.0%	16.6%	6.5%
		% of Total	7.5%	0.0%	2.7%	9.4%	0.8%
Strongly agree	Count	2	2	2	0	0	
		% within manual_patient_record_system	33.3%	33.3%	33.3%	0.0%	0.0%
		% within medical_records_safeguarded_physical_damage	3.8%	100.0%	8.0%	0.0%	0.0%
		% of Total	0.8%	0.8%	0.8%	0.0%	0.0%
Neutral	Count	4	0	1	10	5	

Figure 4.16: Chi square
 (Source: Excel)

As per the previously mentioned figure, it can be stated that the healthcare system is mainly facing issues due to data security and privacy. 2.7% of individuals were neutral regarding the patient’s safety and manual patient record.

Manually conducted processes have a high chance of being errors; therefore, manual processes should not be continued for long term.

Disagree	% within manual_patient_record_system	20.0%	0.0%	5.0%	50.0%	25.0%	
	% within medical_records_safeguarded_physical_damage	7.7%	0.0%	4.0%	6.9%	16.1%	
	% of Total	1.6%	0.0%	0.4%	3.9%	2.0%	
	Count	24	0	13	80	16	
strongly disagree	% within manual_patient_record_system	18.0%	0.0%	9.8%	60.2%	12.0%	
	% within medical_records_safeguarded_physical_damage	46.2%	0.0%	52.0%	55.2%	51.6%	
	% of Total	9.4%	0.0%	5.1%	31.4%	6.3%	
	Count	3	0	2	31	8	
Total	% within manual_patient_record_system	6.8%	0.0%	4.5%	70.5%	18.2%	
	% within medical_records_safeguarded_physical_damage	5.8%	0.0%	8.0%	21.4%	25.8%	
	% of Total	1.2%	0.0%	0.8%	12.2%	3.1%	
	Count	52	2	25	145	31	
		% within manual_patient_record_system	20.4%	0.8%	9.8%	56.9%	12.2%

Figure 4.17: Chi-square
 (Source: Excel)

46.2% of respondents disagreed with the record process manually (Shahnaz et al. 2019). Recording data on paper or files may take lots of time during finding patients' records, it may delay the treatment process. As a result, the productivity rate of the healthcare system will decrease a lot and unavailability of paper records may hamper the further treatment process.

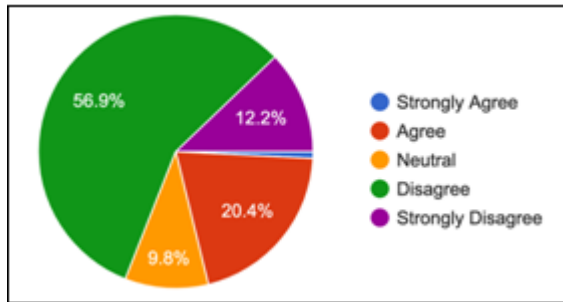


Figure 4.18: Digitalisation can keep data safe
(Source: Excel)

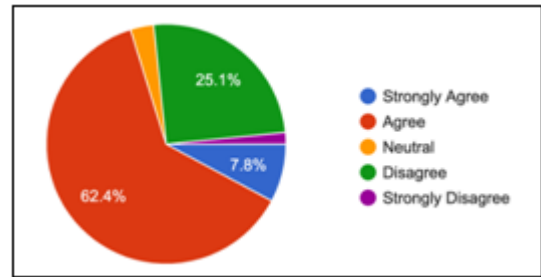


Figure 4.19: EHR have its own policies for person centered approach
(Source: Excel)

In order to keep data more secure, that operating system, further safeguarded with a strong password. An EHR system can easily maintain the record of patients' treatment history and also a proper administration can be possible along with medications, signs and progressive notes (Shi *et al.* 2019). During the analysis of the data, it can be observed that 56.9% of respondents strongly agreed that Digitalisation can keep data safe from any kind of physical damage.

The implementation of EHR has improved the entire healthcare system in a modernized way and provide a proper planning towards the patient centered approach. As a result, routine progress reports can be made by the caregivers, and they can track the health improvement or deterioration after comparing with the previous report (Senthil kumar et al. 2018). 62.4% of respondents have already agreed that EHR have its own policies for person centered approach, in which, they only share specific patients' data.

		EMR_reducing_adverse_events					
		Agree	Strongly agree	Neutral	Disagree	strongly disagree	
manual_patient_record_system	Agree	Count	28	8	8	7	1
		% within manual_patient_record_system	53.8%	15.4%	15.4%	13.5%	1.9%
		% within EMR_reducing_adverse_events	23.3%	13.3%	21.6%	22.6%	14.3%
		% of Total	11.0%	3.1%	3.1%	2.7%	0.4%
Strongly agree		Count	1	3	1	0	1
		% within manual_patient_record_system	16.7%	50.0%	16.7%	0.0%	16.7%
		% within EMR_reducing_adverse_events	0.8%	5.0%	2.7%	0.0%	14.3%
		% of Total	0.4%	1.2%	0.4%	0.0%	0.4%
Neutral		Count	6	7	4	1	2
		% within manual_patient_record_system	30.0%	35.0%	20.0%	5.0%	10.0%
		% within EMR_reducing_adverse_events	5.0%	11.7%	10.8%	3.2%	28.6%
		% of Total	2.4%	2.7%	1.6%	0.4%	0.8%
Disagree		Count	63	31	19	17	3
		% within manual_patient_record_system	47.4%	23.3%	14.3%	12.8%	2.3%

Figure 4.20: Chi square
(Source: Excel)

A rapid monitoring system can help healthcare practitioners to find out the needs of the patient. In this context, almost 53.8% of participants strongly agreed that EMR or EHR can reduce the adverse events that will happen to patients during treatment (Mikula and Jacobsen 2018). Only 0.4% of individuals did not provide any response to the medical care system of, the modern era. Only a few individuals disagreed with the novel digitalization approach in healthcare, and the rate varies between 0.4% to 5%. A regular monitoring of critical cases can provide a proper idea of intervention for those diseases.

Pareto analysis

Based on the above chart, it can be stated that a standardized system for electronic medical records will be beneficial for practical usage, as indicated by the 2.76 mean value presented here. Pareto analysis helps establish an idea that is 80% associated with the overall benefit of the project through the achievement of 20% of the entire project's work. This is particularly used for identifying the weaknesses and strengths associated with a topic. Through the evaluation of Pareto charts, the quality of services can be enhanced as it is a potent decision-making tool.

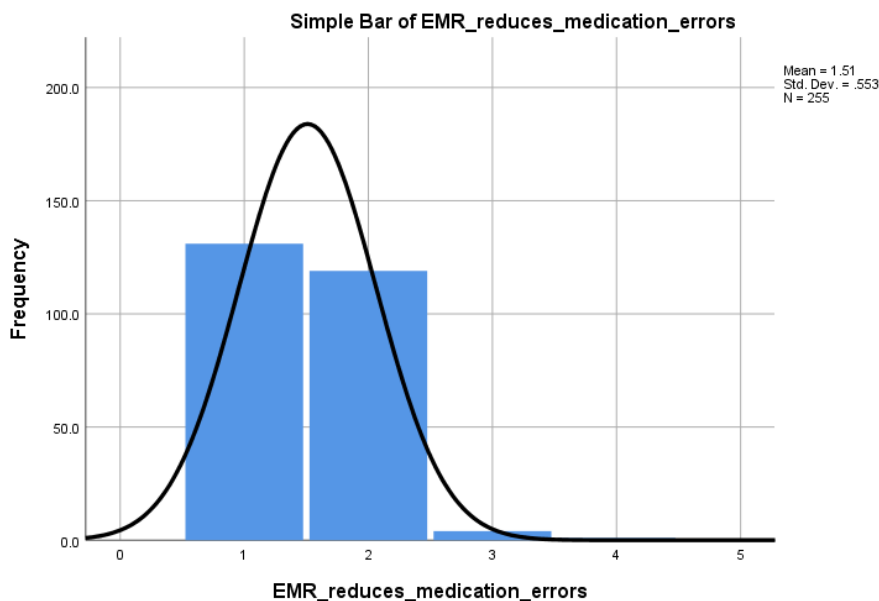


Figure 4.21: Pareto analysis of error factor in EMR
(Source: SPSS)

The prospect of error reduction using EMR is analyzed above that, indicating a mean value of 1.51. The scope for medical errors can be reduced significantly and with

confidence with the help of EMR in the medical sector as it offers the possibility of automated technology implementation.

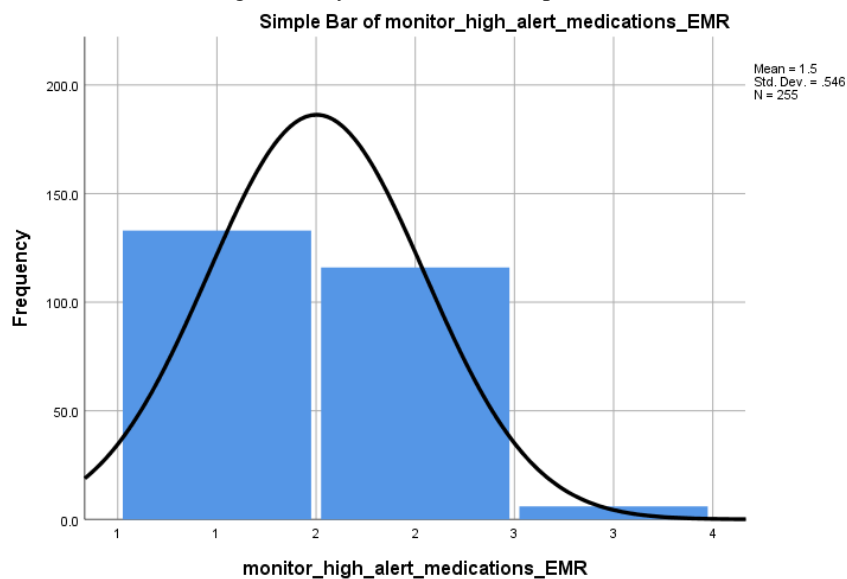


Figure 4.22: Pareto analysis of alert features in EMR
(Source: SPSS)

A mean value of 1.5 is indicated above for alerting medical professionals regarding high-alert medications using EMR. In essence, the automated system can help most critical

cases as it can enhance connectivity and alert medical professionals regarding medicine administration for critical patients.

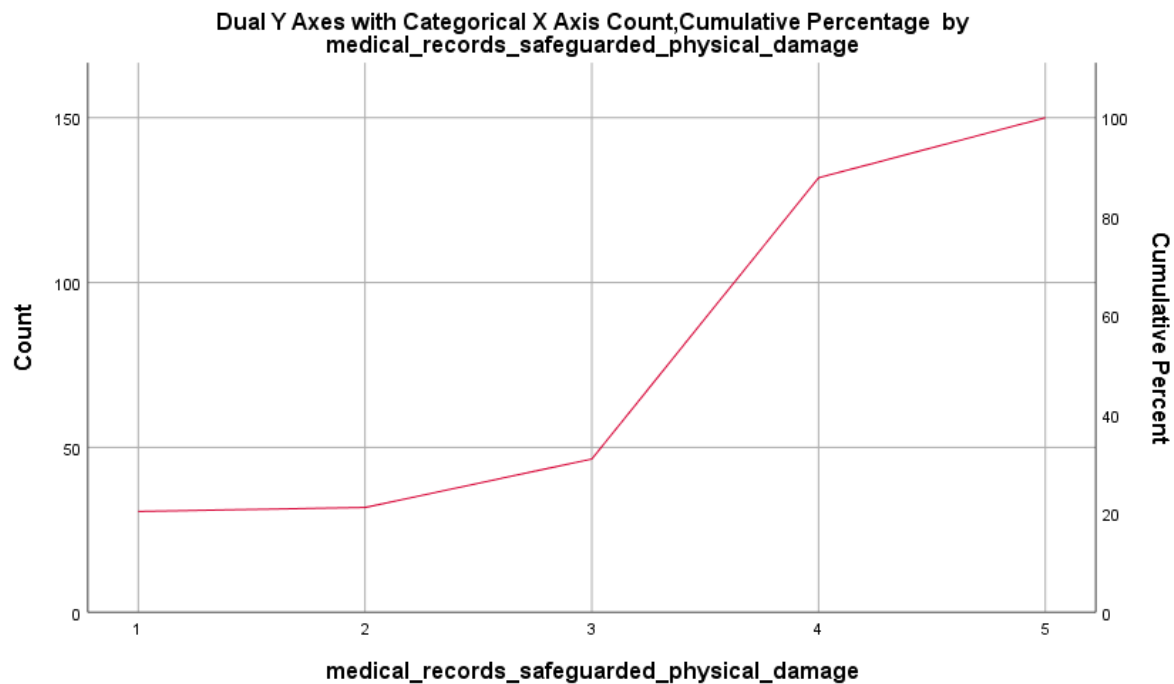


Figure 4.23: Pareto Analysis favoring EMR for Protection against physical damage
(Source: SPSS)

The above chart indicates a rise in the cumulative percentage in favor of using EMR for protection against physical damage to valuable medical records. Using electronic devices instead of paper enhances the overall durability of the medical records that can be stored long-term. Therefore, the Pareto analysis conforms to the significance, reliability, durability, and user advantages of EMR systems. The responses highlight the respondents' inclination toward acknowledging the benefits of digital transformation in the healthcare sector. Thus, 20% of the work can be established as beneficial for 80% of advantages related to the topic.

5. Results and Discussion

5.1 Digital Transformation in Different Medical Care Facilities in India and Neighbouring Countries

Implementation of digital technology for advancing the current operational efficiency has a broader scope for building relationships between society and organizations. According to Nambisan et al. (2019), key characteristics such as affordances, openness, and generativity are implemented to create a platform for facilitating all types of activities. In essence, the prospect of digital transformation in all fields benefits from implementing these key characteristics to enhance consumers' experiences in healthcare settings. In India and its neighboring countries such as Pakistan, Bangladesh, Nepal, Myanmar, Bhutan, China, and Afghanistan, the spread of digital transformation is gradually increasing, especially after the COVID-19 pandemic that forced the healthcare sector to shift to digitally-informed practices to ensure social distance and safety. As stated by Bartsch et al. (2020), a crisis-induced transformation was witnessed in the Indian healthcare sector during the COVID-19 pandemic, leading to the development of virtual and remote

working and record-keeping facilities. Electronic Medical Records (EMR) focuses is used on remote data entry and updates by authorized personnel. In essence, the entire documentation process in the healthcare sector advances in efficiency through EMR implementations.

The financial and technological infrastructure must be considered when analyzing the current state of digital transformation. The lack of proper technological and financial support from the hospital authorities constraints proper transformation. However, the EMR platform implementation is less complex under its integrated and automated nature. As per the words of Yaqoob et al. (2022), electronic databases for information management are constructed to aid the user with easy accessibility. The functionality of such a data management platform helps create specific features for hospitals to aid the documentation process.

The traditional documentation process in healthcare centres can be challenging to understand and manage due to the complexity of its physical structure. Recording large-scale information about patients in papers and filing them in a storage room can be difficult to manage, find and store. External environmental factors such as corruption of paper due to humidity, lack of care, handling damages, and so on can make the contents of the paper indiscernible. As per the words of Shahnaz et al. (2019), traditional information management processes using paper as their primary material are susceptible to damages that cannot be recovered in the future. Employees of various Healthcare centres using manual documentation systems face difficulties in managing and understanding the records due to the largeness of stored content and the inability to manage it based on a specific coding/chronological system. On the other hand, hospital management in India has shown concerns regarding the security and safety of

sensitive and confidential information of patients. The use of technology for promoting consistent electronic solutions for patient-centric practices can lead to the improvement of decision-making processes, as well as enhance autonomy and safety among patients (Timesofindia. indiatimes.com, 2022). The Indian healthcare sector has adopted platforms for digitally informed consent to ensure that safety and confidentiality are maintained while the patient is aware of all the procedures and expenditures required for treatment (Timesofindia. indiatimes.com, 2022). Therefore, the spread of digital platforms for the management of data not only at the hospital management to track its processes and aid its decision-making process but also eliminate higher probabilities of legal issues that are associated with the documentation of sensitive data.

The Eastern Mediterranean Region countries face financial constraints in developing and implementing proper scope for digital transformation in the healthcare setting. As per the words of Pourmohammadi et al. (2018), the average spending of Eastern Mediterranean Region countries on the health sector is 4.87%. The lack of support stands as a barrier to the implementation of new technology. Hence, certain Asian countries such as Qatar cannot gain the advantages of digital transformation, while Jordan portrays a higher level of support for healthcare transformations. On the other hand, Afzal and Arshad (2021) articulated that certain ethical issues related to autonomy and privacy are seen among healthcare workers. Electronic Medical Records (EMR) usage, despite being beneficial to the overall operational efficiency of hospitals, creates moral issues that must be resolved. In essence, patients and practitioners unaware of the specific safety features of EMR feel distrustful of digital transformation. Hence, resistance towards large-scale organizational change is seen in various healthcare centres in India and elsewhere.

The position of India in implementing innovative and effective technology for healthcare management is yet to be strengthened. According to Nomani and Hussain (2020), India holds the 60th position in the Global Innovation Index of 2017 regarding adopting advanced and innovative technology. The prospect of innovation by Indian healthcare companies regarding technological transformation is inadequate. Implementation of proper ICT in the Indian primary healthcare centres can provide wide-scale enhancement of efficiency. Furthermore, Agarwal et al. (2020) stated that the use of technology for telecommunication has increased due to covid-19. Following the guidelines provided by the Medical Council of India 2020, healthcare providers in India have implemented telemedicine to enhance remote care for patients. Through the enhancement of communication, consultations are made widely available for critical patients residing at home. The prospect of digital transformation in India and its neighboring countries is mostly concerned with the development of a technological framework that can accept medical practitioners to deliver high-quality services to patients both in person and virtually.

The use of EMR has been recognized as a large-scale analysis tool. However, the characteristics of EMR are also associated with issues of incompleteness, privacy, and

redundancy that make the process of data mining and information analysis critical. As per the words of Sun et al. (2018), structuring the data based on integration, cleansing, transformation, and reduction helps the EMR to enhance its functionality. Additionally, information management systems may also include RE (relation extraction) and NER (named-entity recognition) to enhance their performance and mitigate the identified issues. The development of an effective EMR system for healthcare requires the establishment of a data management framework that can categorize the data and reduce inconsistency based on historical records.

Data analysis systems based on previous documentation of a patient's condition can help to predict specific health hazards and issues that can be prevalent. As suggested by Lin et al. (2018), electronic medical records are used to analyze large-scale data sets for making accurate predictions regarding myopia among school-aged children in China. The use of real-world data collected from various medical record systems over a period of time can accurately indicate social health issues and provide insight into the solutions required for mitigating potential health hazards on a larger scale. Therefore, data collected through EMR provides efficient control over data recording and management to be used for clinical decision-making processes.

China has also taken significant measures to promote electronic medical records in the healthcare sector. According to Lv and Qiao (2020), cloud-based storage is used for big data storing management and analysis that also enhances the privacy protection of medical data supporting the decision-making process. In essence, electronic medical records are collected and retrieved by medical practitioners based on certain requirements to aid in the treatment process. On the other hand, Guo et al. (2018) articulated that Blockchain technology can be used for electronic health records implementation to promote the restoration and management of the medical data of critical patients. Blockchain technology helps to retrieve lost data and create channels of data storage and distribution based on set authorization protocols to ensure that data privacy is maintained.

Analysis of risk factors regarding a specific physical ailment can be predicted based on EMR. As suggested by Donthineni et al. (2019), conducting a test in an Indian ophthalmology hospital, it is revealed that accurate predictions regarding the onset of dry eye disease (DED) are possible. The data, managed into various categories of age, gender, occupation, and so on, have also helped in developing an understanding of the primary reasons for DED in India. On the other hand, Indian hospitals may also utilize Big Data Analytics technology to ensure that data gathered through EMR systems can be analyzed properly to manage patient health accurately. According to Dhagarra et al. (2019), a framework using blockchain technology and Big Data for healthcare coverage in India. As a developing country, healthcare coverage in India faces discrepancies based on accessibility to primary healthcare. Implementation of a framework for Indian healthcare

centres can help to operate without being constrained by the socioeconomic constraints of the country.

The importance of digital health technology is being acknowledged in Afghanistan and Pakistan as well. As per the words of Zaidi et al. (2020), middle-income countries have recently exhibited their motivation to incorporate mobile health technology which is based on digitised real-time information in Pakistan and Afghanistan to document childcare and maternal services in various remote areas. Community service health workers are important participants in this change, contributing to the development of mobile health based on task technology that helps in monitoring the entire information system. On the other hand, Saeedzai et al. (2019) articulated that based on a cross-sectional study in two districts of Afghanistan indicates that home-based record-keeping systems in low- and medium-income countries can be inaccurate and incomplete. Due to the lack of proper technological support, maternal health records are kept traditionally. Therefore, implementing EMR in low- and medium-income countries such as Pakistan, Afghanistan, India, and so on faces critical issues.

The support of digital transformation in various medical facilities, especially for documentation, helps healthcare providers to analyze patients' medical history swiftly and accurately. This helps in creating a patient-centric healthcare framework. As suggested by Nguyen et al. (2019), developing digital solutions for the healthcare sector ensures that patient-centric treatment is being provided and helps create sustainable solutions to social healthcare issues. Both practical and theoretical implementation of digital transformation in the healthcare sector for India, which has a large population, is helpful in keeping records of each individual by developing a system that can manage robust data without error.

Cloud-based electronic medical records systems provide both storage and security. Electronic health records managed through a secure and remote information

management system help to limit accessibility. Therefore, the probability of misconduct due to unauthorized access to confidential data is minimized significantly. According to Tanwar et al. (2020), the opportunities created based on electronic documentation help to enhance the authority and efficiency of healthcare providers in government-owned and private hospitals. On the other hand, fastness while accessing the data helps to enhance efficiency while treating critical care patients. In India, the support of the government is required to ensure that large-scale implementation of the electronic medical record system is achieved. Private-owned hospitals indicate a significant level of acknowledgement regarding the benefits of such systems. Based on a 2018 report, 94% of hospitals in India use EHR for clinical data management (Healthit. gov, 2022). Hence, technological development in hospitals for India and neighbouring countries is witnessed which is gradually progressing due to the growing market trends. On one hand, the availability of medical technology in the international market provides access to such technology while on the other hand, India and neighbouring countries are motivated to use indigenous technology-based R & D. Therefore, the current use of EMR and EHR is growing steadily among hospitals.

5.2 Identification of Obstacles in Implementing Digital Transformation for Healthcare in India and Neighbouring Countries

Digital transformation aids the communication process between doctors and patients in multiple ways. Healthcare organisations also evaluated the benefits of digital technologies in managing their consumers for business growth. Despite all of these positive aspects, the modern healthcare sector in India has faced lots of challenges and some of the healthcare organisations have already become obsolete due to negative experiences and poor efficiency. Issues can be observed during exchanging of health-related information with the patients and transferring data between two or more devices can be problematic due to software issues.

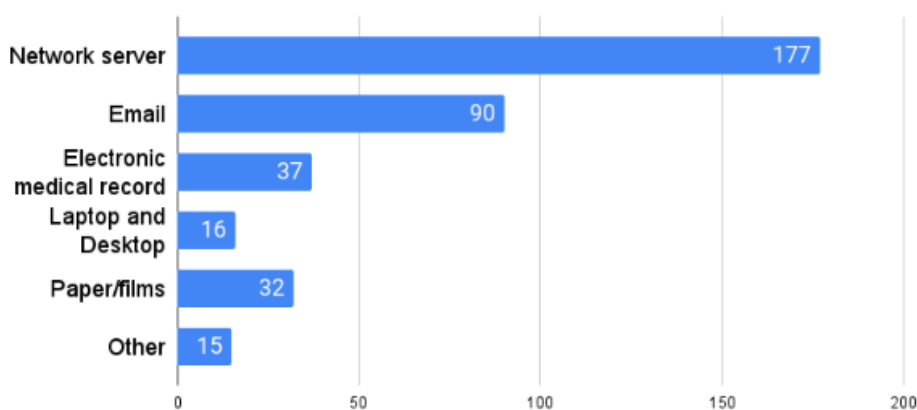


Figure 5.2.1: Electronic medical record market
(Source: Lv and Qiao 2020)

One of the major disadvantages of using EHR is the acquisition cost. Hence it ultimately disrupts the workflow due to the loss of productivity. Therefore, confidentiality can be considered as one of the essential components of the modern healthcare sector. EHR can easily share health-

related information. However, non-providers can easily hack those data in an illegal way for their own benefit. Transferring data from a secured system to devices like smartphones can be risky, and it can be considered as the primary source of privacy breaches (Hasselgren et al.,

2020). According to the report from different healthcare sectors from all over the world, in the year 2018, the approximate number of data breaches in healthcare was 2216 among 65 different countries. As per the report of IBM, the cost of a data breach in the healthcare sector can be evaluated at a rate of \$3.92 million by the year 2019, and it has already extended up to \$6.45 million in 2022 (Atella et al. 2019). The data breach record of the USA is the highest in comparison with the other countries, and the cost is near about \$15 million. Between the years 2014 to 2019, it can be observed that the average data breach in the healthcare sector has enhanced by upto 12%. Therefore, the privacy of health-related data is more confidential, and organizations have been concerned about this matter.

As per the report from US-based organizations, the Indian healthcare system is going to face several problems due to the rapid data breaches worth more than 68 lakhs. On the other hand, an analysis has been conducted by the members of HIPAA, and according to them, in the initial phase of the year 2022, a total of 20.2 million data breach records were found (Lehneet al. 2019). According to HIPAA, the Indian government should pay more attention to keeping the health care record safe. Due to the absence of proper planning and a strong protection-related management system in India, health-related information gets easily hacked, leaked, or hacked by cyber attackers. Therefore, the Indian government required strong planning and caution for Cyber security before going to a fully digitalised system in the healthcare sector of India.

HEALTHCARE RECORDS BREACHED (IN MILLION)

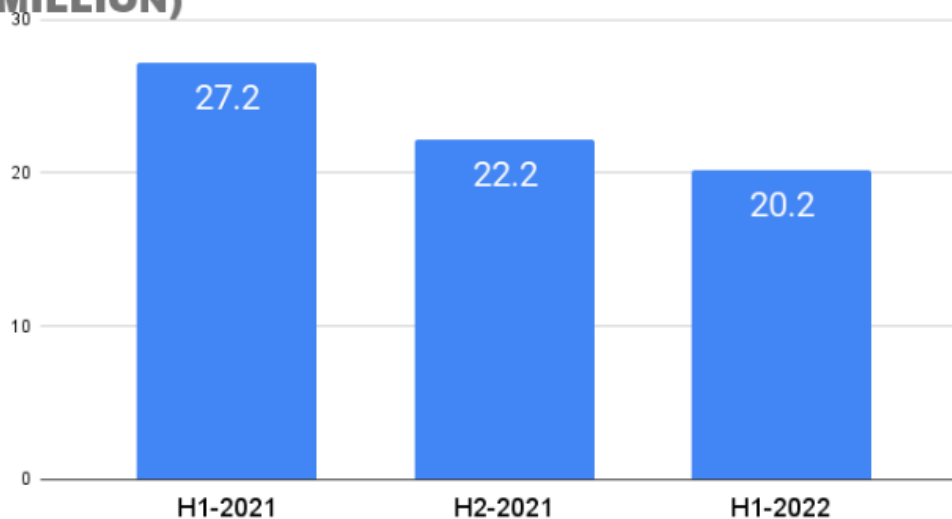


Figure 5.2.2: Data breaches (Source: Hobensacket al. 2021)

In the 21st century, healthcare has become more dependent on information technologies, which may lead them to make decisions after gathering data from online sources. According to the report of the “Health Information Technology for Economic and Clinical Health” (HITECH) act has fuelled the rapid enhancement of using “Electronic health records” for data available in the healthcare sector (Abul-Husn and Kenny 2019). The previous way of keeping data has already lost its fame due to the benefits of using EHR in healthcare. According to the journal published by BMJ quality and safety, there are near about 237 million medical errors occurring every year in

England. Further estimation shows that more than £98 million in medical consequences are occurring in the UK (Kruse et al. 2018). Therefore, a minimum of 54% of administration errors occur due to excessive alternation in the healthcare sector in the UK and all over the globe. In 2018, the resort can estimate that the rate of global medication error is worth more than 326 million US dollars. On this note, it can be stated that most of the errors occur due to a lack of knowledge regarding medical equipment and digitalized tools in healthcare. As a result, in the US there are more than 98,000 individuals due to errors in the healthcare system.

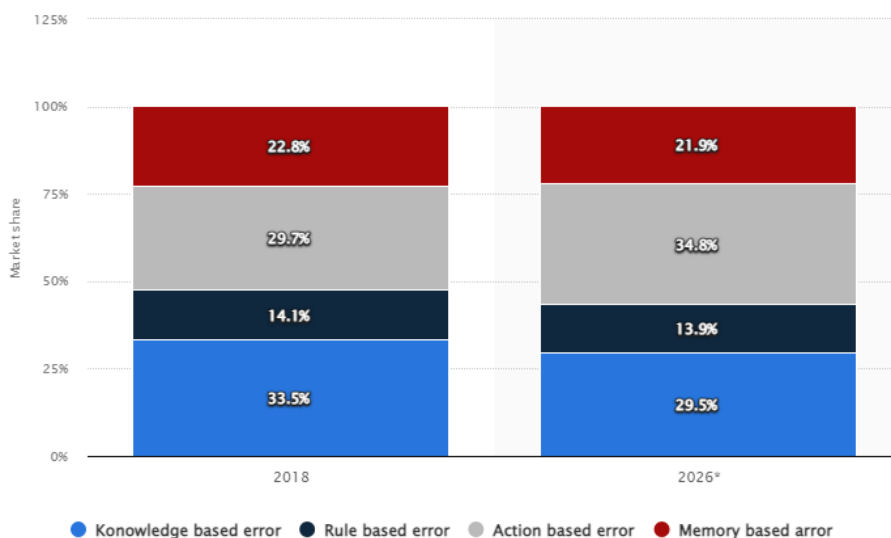


Figure 5.2.3: Factors Influencing Errors (Source: Kruse et al. 2018)

Apart from all of this, another identical issue is the “cost” that healthcare organizations can face while implementing EHR in their system. For instance, a California-based healthcare system have estimated that the implementation cost of EHR can reach up to \$182 million. After adding the extra expenses, it may double in volume. Hence the ultimate worth of the entire process will be \$386 million (Atasoyet al. 2019). While buying EMR software, sometimes organizations do not understand what will be beneficial for them.

5.3 Benefits of Digital Transformation in the Healthcare Sector

Digitalization in the healthcare sector of a developing country already brings the transformation toward the patient-centered care approach. In this way, patients from India can use some specific online applications to learn more about medicines, appointments, and the best doctors in the country. Additionally, patients can easily track data on their heart rate and blood pressure after wearing electronic bands. The rapid advancement of technologies has paved the path for the healthcare sector to deliver real-time information with the help of artificial intelligence.

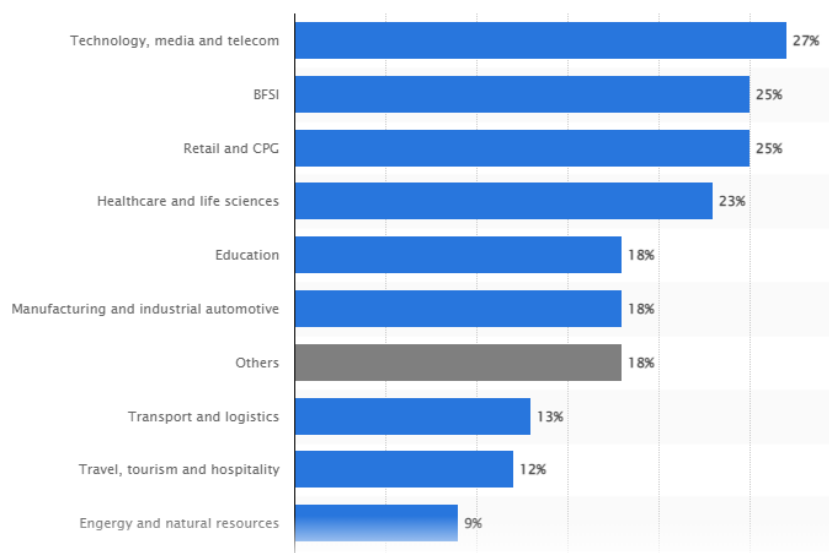


Figure 5.3.1: Digital market (Source: Shiet al. 2020)

In the year 2021, the Indian healthcare sector applied artificial intelligence at the rate of 23%. As per the further prediction, it can be estimated that by the year 2025, the usage of artificial intelligence will add at least 500 billion dollars to the GDP of the Indian economy (Hobensack et al. 2021). Some of the benefits of digital transformation in the healthcare sector are coordination between healthcare

practitioners and patients, data security, and automated collaboration. On the other hand, the digital health market of a fully developed country like the UK includes some connectable mobile health apps to provide assistance to individuals from the country. At the end of the year 2022, it can be predicted that the digital health market of the UK will be US\$3.56bn (Shiet al. 2020). By the year 2027, the

annual growth of digital transformation in the health sector will reach US\$5.75bn. The further utilization of Big data in the healthcare sector of India can be considered as one of the promising steps to preventing diseases and also decrease the maximum cost of treatment. In contrast, it can be stated that healthcare practitioners can communicate better with the help of IoT and provide the best assistance to patients.

Manual documentation records can also lead to incomplete patient records as this method needs more efficiency and functionality. According to Al-Rayes et al. (2019), medical professionals are required to handle large-scale patient records every day, which are managed digitally nowadays. It is essential to note that a digital system for information management has autofill and suggestion features, making the documentation process easier. On the other hand, the slowness of recording patient data manually can lead to this priority between the information recorded by medical care professionals and the account of actual patients. The primary reason related to this challenge is associated with

the lack of correspondence and communication. The swiftness and efficiency of EMRs enable medical professionals to record patient information in real-time which contributes to the mitigation of challenges regarding error and disparity. EMR integrated with deep learning algorithms and AI features can also reduce the number of errors as it can rectify information quickly and sufficiently.

Structure-based information is accessed by EHR and for this reason; information related to patient care can be accessed easily on an immediate basis. Doctors can take enough steps on the basis of structured information. The country has set a target to provide EHR access for around 90% population by the year 2025. However, Vietnam has also aimed to implement information technology in the healthcare sector for all kinds of communities. The country has implemented hospital information systems in around 25% of hospitals to improve healthcare infrastructure. This implementation helps to make seamless patient-doctor collaboration that plays an important role in providing effective healthcare facilities for all kinds of people.

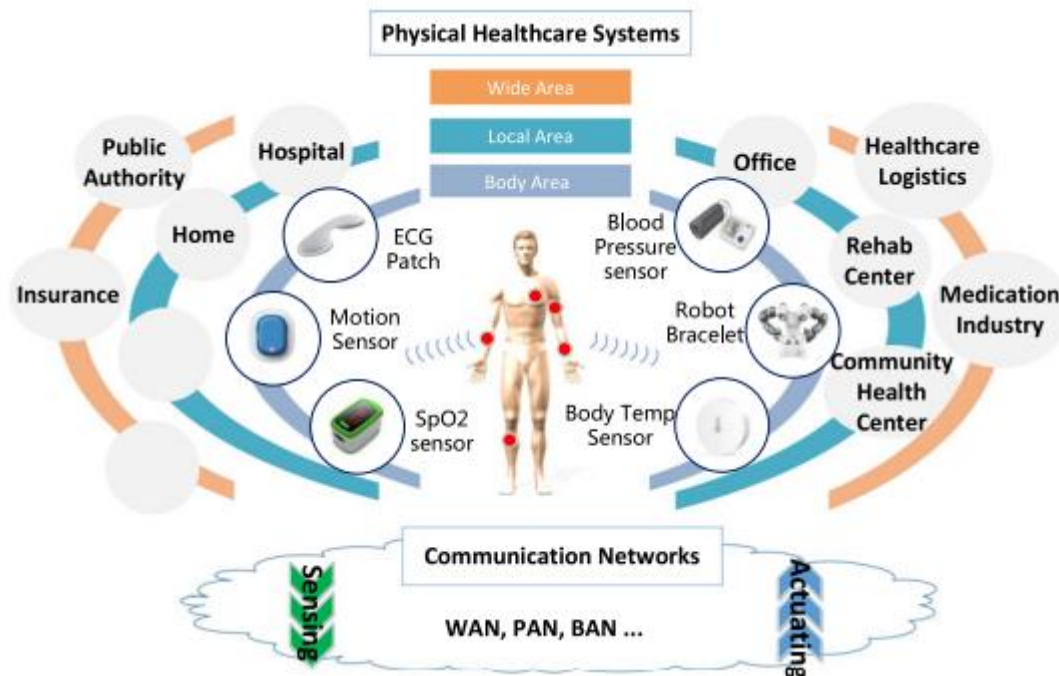


Figure 5.3.1: Physical healthcare system (Source: Panget al., 2018)

The revolution of industry 4.0 has introduced a smart distribution ecosystem that helps to deliver healthcare products to required places smoothly. IoT, AI, and cloud computing are involved in the industrial revolution 4.0 that provides smooth delivery of healthcare goods. Better communication has built among the involvements in the healthcare sector through the technologies which are involved in industry revolution 4.0. Effective communication is built among the elements of the physical healthcare system.

The benefits of digital transformation are acknowledged worldwide. Digital health technologies available in the current market support the healthcare system by enhancing patient-related care systems. Healthcare workers can use various digital health technologies to develop their skills to improve overall health outcomes. As stated by Machleidet

al. (2020), digital literacy and competencies are essential for implementing and facilitating the benefits of digital technology for health.

The advent of advanced technology in the medical sector also benefits business and research development. The digital transformation in the medical sector has seen rapid growth due to market trends. According to Massaro (2021), blockchain technology implemented for digital transformation has significant potential that can help to develop a research-based practice for generating new knowledge that can be implemented in the future for resolving large-scale and critical health issues. The development of digital documentation and an information management system using blockchain technology provides a higher degree of data security and storage capacity. In comparison to the traditional system for information

management, the implementation of blockchain technology can contribute to the reduction of issues related to security, stability, and authorization.

The preferred benefits of digital transformation in the healthcare system of India and its neighboring countries are especially connected with managing robust and large-scale data as these countries are high in population. According to Gopal et al. (2019), the architect created for managing diverse medical records is integrated into a network that can be customized based on organizational goals. The advantages of such a customizable and flexible system with the integration of IoT ensure that the prospects of digital transformation align with the hospital's short-term and long-term goals. Creating a network for enhanced connectivity provides efficiency and swiftness in the decision-making process for medical professionals. As per Kraus et al. (2021), enhancing communication is an advantageous feature associated with digital transformation. Communication is a vital aspect of enhanced performance efficiency. Integrating an electronic medical records system for a hospital enhances connectivity among medical professionals based on authorized accessibility to information. In essence, communication is also enhanced as the process as the documented information can be reviewed by physicians and shared with other medical professionals in order to manage patients in different locations. The benefits of digital transformation are undeniable, and it aids the processes of medical operations adequately. Therefore, the above-mentioned benefits help to produce a patient-centric care system that can contribute to the revolutionization of the current healthcare system in India and its neighbouring countries.

5.4 Strategies adopted for digital transformation in the healthcare sector for India and neighbouring countries

The financial and technological constraints faced by India and its neighboring countries regarding the implementation of digital transformation, especially for the process of documentation in the healthcare process, can be resolved through the implementation of various strategies. These strategies are based on the goals and trends of the market. In the era of globalization and digital transformation in every sector, strategic frameworks are adopted to enhance an organization's capacity. According to Herrmann et al. (2018), digital transformation in practice must be based on the ability to emerging technologies. Digital technologies for healthcare increase the potential for real-time usage. Therefore, the strategies implemented by the hospital should be in alignment with its practical goals.

On the other hand, support from the government is essential to implement innovative technology into the healthcare system. According to Kapoor et al. (2020), Digital DHIS2-based solutions were implemented during the COVID-19 pandemic to ensure that remote tracking of patient information is possible. The global crisis has contributed significantly to the development of digital market trends that aids the overall efficiency of the healthcare sector.

Government strategies provide sufficient support to the prospect of digital transformation. The Indian government has also introduced The Ayushman Bharat Digital Mission (ABDM) to aid the digital infrastructure of the healthcare sector in India as an integrated framework for bridging the gap between various stakeholders within the healthcare ecosystem (Abdm. gov. in, 2022). In essence, the government strategies help Indian hospitals to develop the capacity for integrating healthcare technologies. Additionally, the government of India has also introduced the "MyHealth App" and a dedicated portal for digital health in India to enhance the reach of telemedicine and e-governance (Main. mohfw. gov. in, 2022). In essence, the government support seen in the Indian healthcare system helps to define the probability of graph and transformation despite the infrastructural challenges that are identified in the study.

In OECD countries Big Data technology is used for keeping medical records. Despite certain challenges in the implementation process, the explicit benefits of digital record-keeping are undeniable. According to Colombo et al. (2020), patient experiences and outcomes are being benefited in the OECD countries as a coherent and standardized system for EMR is introduced. The strategic framework implemented for digital transformation is related to data governance and standardization. In essence, through proper governance, the entire documentation process can be made safer. Furthermore, accessibility to the data helps to facilitate a supportive environment for enhancing functionality. Certain factors related to the adoption of EMR must also be investigated in order to identify the most efficient strategy. As mentioned before, an EHR system consistently contributes to the enhancement of patient care quality. As per the words of Spataret al. (2019), the adoption of technology is highly dependent on various factors such as technology diffusion and infusion, satisfaction among users and its overall impact on the quality of treatment and care. The strategy implemented for accommodating the user and system-related factors simultaneously impacts the adoption process positively. It also helps to connect various hospitals and healthcare sectors to organize the gathered medical records and help with research-based analysis of healthcare issues. Flexibility and adaptability are essential for the development of a framework that can mitigate the issues of ethical usage and safety while documenting confidential and sensitive data through a specified information management system.

Based on the above analysis it can be stated that the strategies developed for the adoption of a wide-scale digital transformation within the healthcare sector are highly dependent on the infrastructure of hospitals. Flexibility and satisfaction among users are also necessary for promoting innovative technology. India and its neighboring countries facing technological and financial challenges may implement EMR systems using blockchain, and Big Data Analytics technology to fulfill its long-term health goals as well as enhance its performance efficiency. Therefore, a lean management strategy can be beneficial and practical based on the healthcare goals of these countries.

5.5 Discussion

Based on the above results, it can be stated that the Indian healthcare sector deals with a large number of patients every day in both urban and rural areas. Traditionally, the documentation process for each patient can be highly complex, time-consuming, and prone to human errors. The current market trends globally indicate that medical technology is rapidly transforming and being adopted to enhance efficiency. Implementing an EMR or EHR system for robust data management and analysis can provide scope for a patient-centric framework. Currently, a large number of hospitals in India use EHR for clinical record keeping. However, barriers regarding financial and technological support constrict the ability of hospitals to implement proper EMR systems. Thus, employees can rely on the EMR system in order to keep record of medical data and thus hypothesis 1 is established here.

On the other hand, using blockchain technology for the development of a digital information management system provides safety and security to confidential data. Patient-centric care is one of the main benefits that are associated with digital transformation within the healthcare sector. Both critical and primary healthcare benefit from the possibility of recording large-scale data and gaining the capacity to access and analyze it as per the requirements of patient care. Multi-dimensional benefits are obtained through a hybrid architectural framework of the EMR system. Communication of confidential data is also associated with ethical issues, which are addressed in the EMR system using blockchain technology. Additionally, digital transformation helps to enhance the quality of patient care while simultaneously reducing the cost of treatment. In India, digital technology is also used for spreading knowledge and awareness among patients and generating a framework that supports informed-consent regulations.

The prospect of innovation and implementation of new technology is associated with the overall digital transformation in the healthcare sector, especially for India and its neighbouring country. According to Nomani and Hussain (2020), India holds the 60th position in the Global Innovation Index of 2017 regarding the adoption of advanced and innovative technology. Innovation is required in the Indian market to create efficient information management systems that can enhance the efficiency of healthcare professionals. Errors and the possibility of misconduct are also decreased with the use of EMR systems with biometric or password-based authorisation protocols. The development of an effective EMR system for healthcare requires the establishment of a data management framework that can categorise the data and reduce inconsistency based on historic records.

Analysis of data through electronic documentation can be used for research and predictions regarding a large-scale healthcare issue. For example, accurate predictions regarding the onset of dry eye disease (DED) are possible based on a test in an Indian ophthalmology hospital (Donthineniet al. 2019). Data regarding myopia among

Chinese school-aged children are also accurately analysed and predicted with the help of Data Analytics and EMR systems. The mistakes related to manual process of keeping patient record and prescribing medications have been remarkably decreased with the implementation of IMS. However, security issues and the possibility of data breaches are identified that can negatively impact the implementation of innovative technology. For example, the data breach record of the USA is the highest in comparison with the other countries and the cost is near about \$15 million. Between the years 2014 to 2019, it can be observed that the average data breach in the healthcare sector has increased to 12%. The requirement for a strong and secure server for operating the EMR system is important. However, it has been identified that EMR technology framework reduces the chances of mistakes regarding medications and make the processing of prescribing medication fast which established hypothesis 5 over null hypothesis. Thus, all the formulated hypotheses have been testified and established in this report which reflects that the application of EMS can improve the employee performance in keeping records of patients and medical data instead of manual process.

The benefits of digital documentation in comparison to the traditional documentation process are associated with its accuracy, accessibility, consistency and capacity. The scope of communication is enhanced and evidence-based research and collaboration are made possible. Seamless patient-doctor collaboration is achieved through EMR adoption. Coordination among healthcare professionals is also increased with the adoption of EMR systems that enables them to access and share required patient information. Establishment of a network that can accommodate large-scale data based on cloud storage helps to accommodate the hospitals situated in high-population countries such as India. The traditional record-keeping system is also inadequate to reach remote areas of India. The process of documentation using machine learning and deep learning Technology can also contribute to bridging the information gap. Therefore, this technology can help transform the current scenario and facilitate healthcare on a wider scale.

6. Conclusion and Recommendations

6.1 Conclusion

From the above-mentioned parts of the study, it can be observed healthcare is highly associated with treatment, injury, sickness, diagnosis, and different types of disabilities. In that case, healthcare practitioners are mainly responsible for delivering the best practices to their patients. Digitalization has altered the infrastructure of the healthcare sector, which may overcome multiple obstacles occurring within the industry. Some of the most used digital technologies are automation, big data, artificial intelligence, robotics and communication technologies. Hospitals can be considered as one of the most reliable diagnostics treatment sectors which provide medical facilities to the facilities. Within hospitals, doctors, nurses, and professionals serve patients on a regular basis. Hospitals are also focusing on the services such as in-

patient and outpatient services and are required to keep records of every patient in a systematic way. Previously, health record information was stored in paper-based files with the help of a manual process. In this way, record tracking of patients' documents becomes hazardous in nature because the hospital authority is required to conduct the billing process in a huge way. Electronic healthcare Records can be considered as the backbone of the entire system of healthcare. One of the fundamental objectives of the implementation of EHR is to keep data safe, accurate, and easily accessible. The study also demonstrated one of the fundamental issues of the manual system, and it must be a threat to keep recording data of the medical records. In that case, staff also faced lots of difficulties in saving patients' data from any type of breach. The study successfully depicted the importance of digital transformation in the healthcare domain of India. Innovation in the healthcare system can deliberately decrease the chances of medication errors by healthcare practitioners from Hospitals.

The processes in the healthcare system in India are gradually shifting towards digital transformation, supported by various government policies as well as demonstrated by the acceptance among users. Providing a secure and safe system for confidential data management in various hospitals helps to create a patient-centric environment. Quality of treatment is improved, and long-term health issues are also addressed based on critical analysis conducted on the gathered data. The technology used for large-scale data storage and management can help facilitate high-quality patient care. It is also indicated that Medical Research and accurate predictions can be made based on the collected data that is both accurate and diverse. Considering the current government support, such as The Ayushman Bharat Digital Mission (ABDM), the use of EHR is increasing. Hence, a flexible and adaptable system for electronic medical record management has diverse potential for improvement.

This type of technology is being promoted by various national and international organizations such as the World Health Organisation, United Nations, and so on. The covid-19 crisis had a significant impact on promoting technologically advanced and remote systems for medical record management in order to ensure that patient safety is maintained. Despite the current technological and financial challenges faced by India as an economically developing country, the influence of the global market has created considerable demand for medical technology. Enhancing efficiency among medical professionals with the help of EMR systems that can conduct hybrid operations and create collaboration and connectivity among patients and doctors are the major advantages of digital transformation. Digital transformation in India's healthcare sector, which has a large population, is helpful in keeping records of each individual by developing a system that can manage robust data without error. Therefore, the advantages of digital transformation are further highlighted by the global market trends and international support, projecting the necessity to develop a hybrid EMR system using advanced blockchain technology for a stable, secure and accessible system.

6.2 Linking With Objectives

The hypotheses are also proved based on the primary and secondary research conducted in the paper. The difficulty of understanding the information from the traditional information system is due to the lack of accuracy and scope for error and misconduct. On the other hand, a significant correlation is identified between employees' reliance on the traditional data-keeping system and incomplete data among patients. The traditional system cannot bridge the gap in information due to the lack of proper machine learning algorithms and AI-based data analytics. Disparities are also evident in the traditional record-keeping system along with the influence of time. The hypothesis indicates the correlation between EMR contributing to the reduction of medical mistakes and processing time for prescribed medicines.

The implementation of electronic medical records in the healthcare system can trigger better management of the healthcare system. Therefore, EMR helps in keeping the real time health related data of patients along with treatment, medical prescription, and diagnosis. Additionally, EMR can be easily managed by the patient's families and the technology provides facilities to monitor the data of patients up to their lifetime. Some of the essential features of EMR include the formation of an alert system that fosters the further administration of medicines, screening and laboratory system. The Ministry of healthcare system also focused on the community healthcare system approach along with rehabilitation, treatment, and chronic illness for primary care. One of the major benefits of the Electronic Health Records system is to centralization of the patient care process, and healthcare practitioners can take decisions regarding patients' health. According to the HITECH act, it can be observed that EMR has been utilised in the primary healthcare system. Therefore, the fundamental responsibility of the EMR system is to check patients' health on a routine basis. It can be observed that there are near about 68% of EMR users are present at the United Kingdom and the lowest usage of EMR can be observed in Canada.

Based on the comprehensive analysis presented in this paper, the objectives are also met with evidence-based analysis and investigation. The benefits of digital transformation using a hybrid EMR system with the integration of blockchain, AI, big data analytics, cloud storage and so on in various government and private hospitals of India are identified. On the other hand, the support of the government also contributes to the development of market trends that support digital transformation.

Conclusion on Hypotheses

Based on the primary and secondary data analysis hypothetical testing is conducted in this paper. The first hypothesis related to the correlation between the reliance of employees on the present manual documentation method and its associated difficulties in understanding the information is tested. It is indicated that 52.2 % of participants disagree with the existing capacity of the

manual patient record system. On the other hand, 36.5% of participants disagree with the records being updated on time using manual methods. Furthermore, the majority of participants disagree with the current storage of manual record-keeping systems. Therefore, it can be said that the reliance of employees on the present manual documentation method is reduced due to the inefficiency of the system.

On the other hand, the second hypothesis is not proven as the substantial correlation between incomplete patient record information and employee reliance on the correct manual documentation system is established. As reliance on the current documentation system is signified by its efficiency and safety, employees are more inclined to use digital systems. The third hypothesis related to the correlation of discrepancy between the patient care information contained in patient records and the respondent's designation for documentation of the information is tested. In 82.4% of cases, medical forms are computerized for making registration forms. 41.6% of medical forms are used computerized for making doctor notes in the healthcare sector. A moderate relationship between these two variables is projected in the paper. The medical professionals directly related to the documentation process are more aware of the insufficiencies of the current information management system. In contrast, awareness among other medical professionals is based on sporadic experiences.

The fourth hypothesis is tested based on the responses gathered from the survey. The correlation between the time required to document patient records and the time required to designate the respondent is significant. 51.8% of participants disagreed that information related to patient care is stored in a manual patient record system. The manual documentation process takes more time for medical professionals to operate. Finally, the correlation between EMR in reducing medication mistakes and adverse events and the processing time for prescribed medications are also significant. 51.4% of respondents already disagreed with the extension of the manual record-keeping process for the future perspective. Therefore, it can be concluded that hypothesis 5 has the strongest correlation, and the adoption of the digital system can contribute to the development of higher efficiency in the health sector

6.3 Recommendations

The recommended strategic framework for the digital transformation of the Indian healthcare sector should be based on specific goals for healthcare. A flexible and customizable system can be recommended to ensure that the robust data of patients can be stored without error. As a largely populated country, it is essential that hospitals use EMR systems that can accommodate the daily input of large-volume data. As per the words of Liu et al. (2019), an information management system accommodating daily updates and storage of large-scale data helps to create a platform for organizations that can fulfill customer demands. The data storage system adopted for EMR must integrate cloud-based and protected storage systems to

ensure that safe input and management of confidential patient data is being achieved.

On the other hand, the protocols for safety and security regarding data accessibility are also to be enhanced due to the risks of data breaches and cybercrimes. According to Pachano and Bandera (2021), multi-step authentication processes are adopted to protect against unauthorized access to information management systems. The recommendations for enhancing the security of EMR platforms are likely to inspire users' confidence and reduce misconduct risks. Additionally, the EMR system adopted for most hospitals in India is recommended to enhance its capacity by introducing hybrid features. As stated by Kukkala et al. (2018), advanced features for data management systems help facilitate smoother and faster operations. In essence, providing scope for the simultaneous use of a singular platform helps to enhance the performative efficiency among medical professionals. Medical professionals can rely on the EMR system and contribute to a patient-centric approach to treatment. Therefore, these strategic recommendations can enhance the efficiency of EMR systems and improve the healthcare sector significantly.

6.4 Limitations of the Study

The paper provides a comprehensive analysis of the current digital technologies that are used for EMR systems. A specific investigation of the Indian healthcare system is also conducted in the paper. Both primary and secondary analyses of the study helped in highlighting the benefits and challenges associated with the addition of EMR systems. However, certain limitations have been faced due to the lack of a comparative analysis between India and other countries on a global scale that could have provided further strength to the argument.

6.5 Future Scope of the Study

The future scope of the study can incorporate an analysis based on the global market technological trends along with a meta-analysis of the emerging technologies that can benefit the documentation system. Technological implementation in other areas of the healthcare sector may also be analyzed in the future based on a comprehensive analysis of primary data based on an interview process.

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Appendixes

Appendix A: Research Proposal

[Research Proposal](#)

Appendix B: Ethics Forms

[Ethics form for Primary Research](#)

[Ethics form for Secondary Research](#)

Appendix C: Survey Questionnaire

Part-1: Demographics & details about the existing system

1. What is your gender?	Male
	Female
2. what is your qualification?	PG
	UG
	Diploma
	Other
	Cardiology
3. What is your department?	ICU/CCU/NICU/SICU/PICU/ITU
	Hospital Management
	Operation Theatre
	General Ward
	Emergency
	Orthopaedics
	Others
4. What is your age?	20-30 years
	31-40 years
	41-50 years
	Above 50 years
5. What is the feature of existing	Hybrid (Paper + Electronic)

EMR?	Electronic (for all diseases/conditions)
	Paper Based, Hybrid (Paper + Electronic)
	Paper Based
	None
6. Please choose from the below list of the medical forms that are computerized in the facility	Registrations, Lab, X Ray, Case Summary, Patient Charge Sheets
	Registrations, Doctor Notes, Lab, X Ray, Case Summary, Patient Charge Sheets
	Doctor Notes, Nursing Notes, Lab, X Ray, Patient Charge Sheets, Baby Score, Blood Matching
	Other
7. Please select the options which are being used for healthcare data capture in EMR	Computers
	Tablets, Mobile Phones, Automated charting solution (Device integration)
	Paper scanning/OCR, Computers
	Not Applicable

Part-2: Effectiveness of manual documentation of patient records

How much do you agree or disagree with the following statements?

	Strongly Agree =1	Agree =2	Neutral =3	Disagree =4	Strongly Disagree =5
8. The existing manual patient record system contains sufficient records for its operations					
9. The format of the patient records is standardized across the care facility					
10. All information related to patient care is contained in the manual patient records					
11. You can determine who entered any particular patient information					
12. All patient records are signed with the date and time and are current					
13. Depending on the requirements, the current documentation system has rules to preserve patient records for more extended periods					
14. There is sufficient space to retain patient records					
15. The medical records are safeguarded from physical damage					
16. There are policies available to determine which patient information must be shared					
17. You can view historical patient records whenever necessary					
18. Using a patient's UHID, it is possible to collect patient information for you					
19. You are able to make judgments about patient care using available manual patient records					
20. When it comes to auditing, manual patient records are the best option					
21. You have standard procedures for referring old patient records in the Medical Records Department					
22. Disclosure of patient information to other parties occurs only with the patient's consent					
23. Time required to document patient records	Too long=1	Long=2	Optimum=3	Short=4	
24. It's easy to digitize patients' records from the paper-based system	Most of the details=1	Some of the details=2	All the details=3	Very few details=4	
25. The patient records are examined for accuracy	Rarely=1	Occasionally=2	Frequently=3	Very frequently=4	

Part 3: Problems in the existing documentation system

How much do you agree or disagree with the following statements?

	Rarely=1	Occasionally=2	Frequently=3	Frequently=3
26. Do you find difficulty in understanding the information in the manual patient records?				
27. Do you find difficulty in using computer whenever you need it?				
28. Do you find it challenging to manually file case sheets?				
29. You identify any inaccuracies & repetitive information in manual patient records				
30. You will depend on existing manual documentation system				
31. Do you find maintaining patient data without damage is challenging task?				

Part 4: Opinion on new/existing Electronic Medical Records

How much do you agree or disagree with the following statements?

	Strongly Agree =1	Agree =2	Neutral =3	Disagree =4	Strongly Disagree =5
32. EMR reduces medication errors					
33. EMR reduces paperwork					
34. E-Rx/EMR reduces time in processing drug administration					
35. You can monitor high-alert medications by EMR					
36. EMR supports in reducing adverse events					
37. If the manual documentation is removed, can resources be utilised to improve patient care in critical care areas?					
38. Given a choice, would you be comfortable shifting to paperless documentation systems in the critical care areas?					
39. EMR reduces call-backs related to clarification on drugs prescribed					