IMPACT OF HOSPITAL INFORMATION SYSTEMS ON EFFECTIVENESS AND EFFICIENCY: A CASE STUDY ANALYSIS

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Master of Business Administration (MBA)

in

Hospital and Health Management

By

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Under the Supervision and Guidance of

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2024

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TO WHOMSOEVER IT MAY CONCERN

29th June 2024

This is to certify that **Ms. Vibhuti Chauhan** has successfully completed her internship as a **Business Analyst** Department of **"Platform"** from **1st April 2024 to 29th June 2024.** We want to express her hard work, dedication, and contributions during her tenure with us. During her internship, her efforts have contributed positively to our team and organizations, and we are grateful for her contributions.

We wish you all the best in her future endeavours and hope the experience gained during her time with us will contribute to her professional development.

For Meta16 Labs Healthcare s Pvt Ltd

J Hepsi
Senior Manager
Human Resources.

Declaration by Student

DECLARATION BY STUDENT

I hereby declare that this dissertation title **Impact of Hospital Information Systems on Effectiveness and Efficiency: A Case Study Analysis** is the Bonafede record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

Chauhan

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Date: 04/07/2024

IIHMR UNIVERSITY

CERTIFICATE

This is to certify that the dissertation titled **Impact of Hospital Information Systems on Effectiveness and Efficiency: A Case Study Analysis** is a record of the research work undertaken by Vibhuti Chauhan in partial fulfilment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur under my guidance and supervision and his/her approach to the research study has been sincere, scientific, and analytical.

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ABSTRACT

The usefulness along with effectiveness of hospital information systems (HIS) in raising hospital performance are examined in this investigation. With a complete picture of an individual's medical history, allergies, medications, and test findings, HIS enables healthcare providers to make well-informed decisions. By offering a consolidated platform for storing and accessing patient medical records, it improves the efficacy of healthcare. By encouraging more communication and cooperation among medical professionals, HIS also enhances care coordination and continuity. Clinical decision support systems (CDSS) are integrated with HIS to provide real-time advice based on evidence-based medicine and best practices.

This study looks at the value and efficiency of hospital information systems (HIS) to enhance hospital performance. Healthcare professionals may make educated judgments with the help of HIS, which gives them a comprehensive picture of a patient's medical history, allergies, prescriptions, and test results. It raises the effectiveness of healthcare by providing a centralized platform for patient medical record storage and access. HIS also improves coordination of care and continuity by promoting more collaboration and communication among medical practitioners. HIS is connected with clinical decision support systems (CDSS) to deliver real-time recommendations based on best practices and evidence-based medicine.

A successful HIS installation requires thorough requirements analysis, planning, data migration, user acceptance, training, and continuous support. The hospital's objectives and requirements are crucial, and adequate personnel training is essential. A dedicated staff should implement system changes and troubleshoot technical issues. Minimizing workflow disruptions through communication and staff involvement can overcome resistance. Cost considerations and robust security measures are also crucial. Data security and privacy are also essential.

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I had a wonderful learning experience during my dissertation at the **Meta16Labs Healthcare and Analytics Pvt Ltd.**, **Bangalore**, where I was exposed to several opportunities for learning and growing.

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I want to express my love and admiration for my family and friends, for inspiring me every day with their kind and encouraging words, and for keeping their faith in me.

Regards,
Vibhuti Chauhan

TABLE OF CONTENT

TABLE OF FIGURES

ABBREVIATIONS

HIS	**Hospital Information System**
CAD	**Computerized Aided Transcription**
IPD	**In Patient Department**
OPD	**Out Patient Department**
ADT	**Admission, Discharge, Transfer**
OT	**Operation Theatre**
NDHM	**National Digital Health Mission**
TPA	**Third Party Authority**
IT	**Information Technology**
EMR	**Electronic Medical Record**
EHR	**Electronic Health Record**
CC	**Computing Cloud**
AI	**Artificial Intelligence**
RFID	**Radio Frequency Identification**
ISDN	**Integrated Service Digital Network**
UI/UX	**User Interface/ User Experience**
PMC	**PubMed Central**
LAN	**Local Area Network**
RBAC	**Role Based Access Control**
EBP	**Evidence Based Practices**

CHAPTER 1: INTRODUCTION

Healthcare is one of the most significant aspects of any community, which is one of the key reasons why healthcare practitioners must perform their duties as effectively as possible. Millions of patients are admitted to hospitals every day, making it difficult for the administration to function as efficiently as possible. The hospital's employees have to coordinate the clinic, finances, and operations, all of which are growing with time. This procedure was done by hand until recently, which resulted in operational delays and subpar patient care. However, the majority of sizable hospitals with many beds or well-organized clinics now rely on HIS, which makes it easy for them to manage and maintain all of their medical records.

In general, HIS is an information system that controls every aspect of information processing in a hospital. This includes any data about patients that is stored on paper or other devices. By processing patient data electronically, HIS, a medical information area, aims to provide the greatest help possible to healthcare providers. The program consists of a template that can be altered to meet the needs of the user. The components consist of subsystems for medical specializations like pharmacy and inventory management, laboratory management information systems, and computerized aided transcription (CAD) to store, modify, and obtain data related to the administration or clinical viewpoint to provide hospital services on hospital grounds.

HIS is a software that works with all smart devices, including computers, laptops, mobile phones, and others. With the help of the software, the hospital is able to create its own iOS and Android application, which allows patients to check their reports, schedule appointments, register for teleconsultations, and more. The company offers holistically managed service models for hospitals, diagnostic centres, clinics, etc., with the option of combining online and offline support to fully satisfy the customer. It doesn't limit itself to disruptive technology or the SaaS based business model. The client can access a web-based and mobile interface thanks to the sophisticated Hospital Information Management System. The user can use their mobile phones to visit the site thanks to the mobile interface.

IPD and OPD management is another option provided by the advanced HIS. The seamless transition of patients from hospital admission to discharge is made possible by the IPD module. The patient can easily be admitted to the hospital through the system, occupy a

bed, keep a record of their medical history, transfer to another ward or OT as needed, and be discharged thanks to the admission, transfer, and discharge (ADT) management. The OPD module makes it possible for patients to use a patient portal to schedule appointments, register for hospital services, and speak with doctors. The software can deliver alert messages thanks to the setup of the SMS template.

Effective management of the billing system is facilitated by the HMIS. The software automatically calculates all of the billing details, which are provided by the financial operations and interim bills. The client can also monitor the invoices from outsourcing facilities, including as diagnostic centres, through outpatient billing. The hospital's bills, settlements, and overdue amounts can be checked and managed with the help of the HIS.

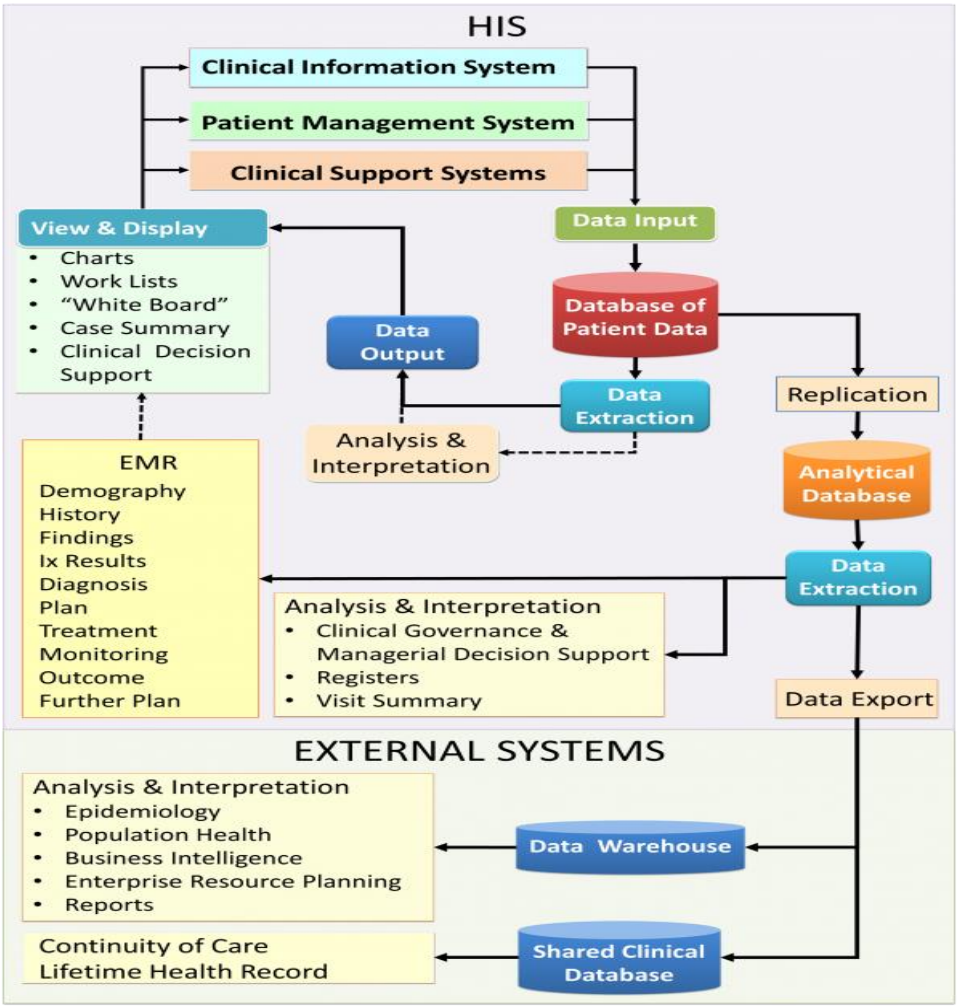

Figure 1: Overview of HIS

Source: https://drdollah.com/hospital-information-system-his/his-projectimplementation/

Even yet, the HIS is a more sophisticated approach to manually recording medical data by integrating the most recent advancements. HIS is useless, though, if these updates and advancements cause confusion for healthcare consumers. As a result, the system should

be created with ease of use in mind, and regular user training sessions should be scheduled. Any organized and well-equipped HIS could help the hospital in many ways, including financial management and ensuring the highest calibre of patient care. The following features ought to be present in the HIS. It should be patient-centred, beneficial, expandable, affordable, and supported by hospital staff. The system ought to be adaptable enough to change with the times as technology advances.

The following are advantages that every successful HIS should offer: • Improves information integrity.

• Lowers mistakes in transcribing.

• Cuts down on redundant entries.

• Report turnaround times are better optimized.

Modern hospital information systems usually connect to one another via a faster network using small laptops. In order to increase service quality and return on investment, these computers are tools for obtaining, processing, and retrieving administrative and patient care data. If hospital administrators had access to more relevant data, they could make better decisions.

PURPOSE OF HEALTH INFORMATION SYSTEM

India's twelfth five-year plan, covering the years 2012–2017, talks of improving HMIS nationwide with a $200 billion investment in the National Digital Health Mission. According to Indian Prime Minister Narendra Modi, the COVID-19 pandemic created a basis for the NDHM's universal adoption. The six themes of information transparency, standardized claim processing, prescription digitization, playground for innovators, transitioning from episodic to wellness-oriented care, and service-based to value-based healthcare will be the driving forces behind the shift.

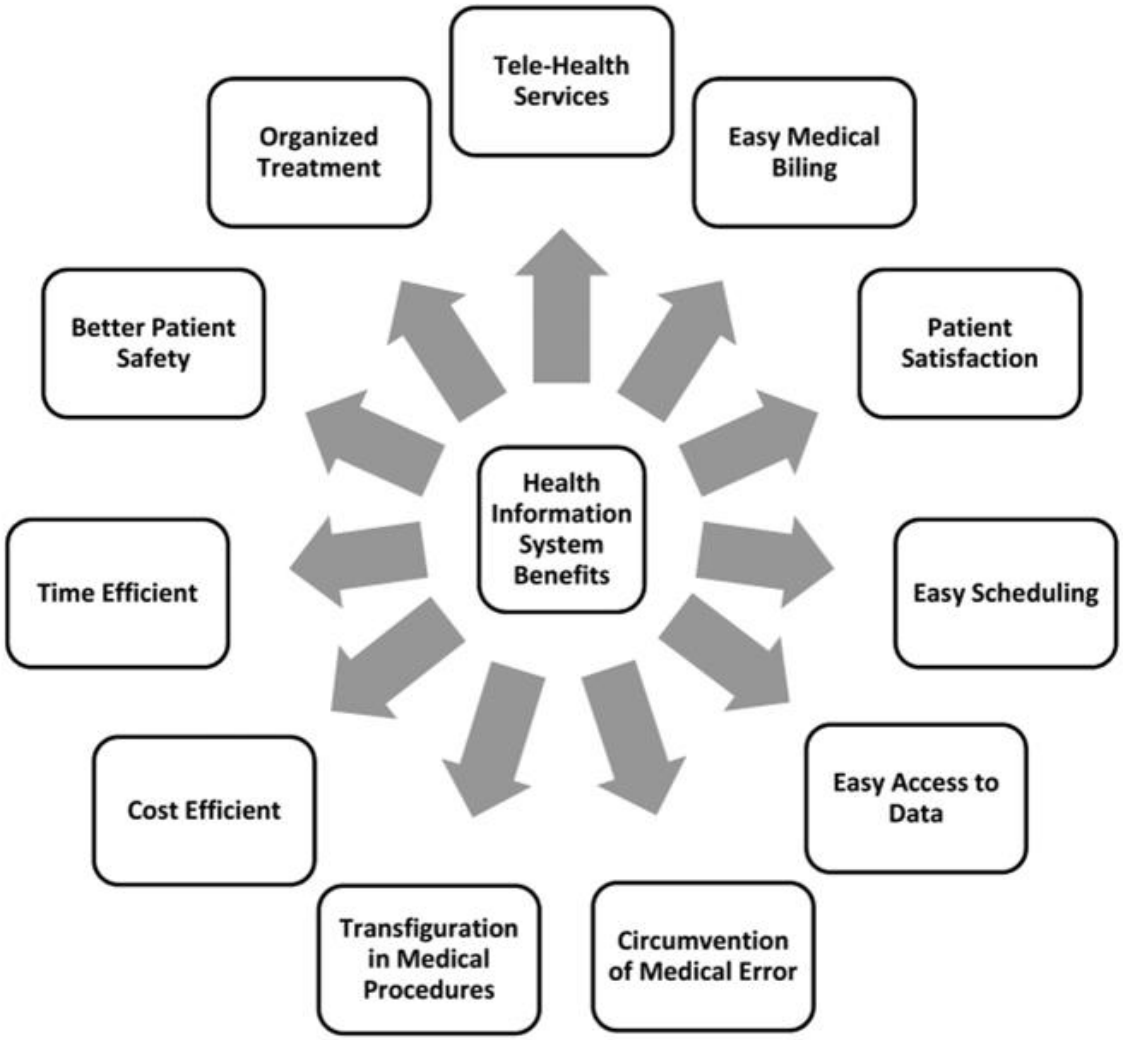

Figure 2: Benefits of HIS

Source: https://ebrary.net/199230/health/privacy_preserving_infrastructure_health_systems

a) **Transparency of Information:** It is now challenging to confirm any hospital malfunctions because the medical data tracking real-time data repository is dubious. One source of all the information about a certain person will be the NDHM registry. There will be a rise in trust in the health ecosystem and a decrease in hospital administration burden when it comes to physician onboarding. The smooth exchange of patient data will be made possible by interoperability.

b) **Standardized Claim Processing:** One of a hospital's most arduous jobs is settling third-party claims. Because of this, insurers continue to face a heavy administrative burden. The goal of digital health will enable quicker validation, preventing TPA fraud.

c) **Prescription Digitization:** Physicians can submit digital prescriptions that are saved

in their system and made available to patients via a patient portal. The issue of a patient forgetting a prescription or losing data will be resolved, and the patient's appointment time for the following consultation round will be extended.

d) **Innovation Playground:** In the healthcare sector, the Indian government serves as payer, provider, and regulator. The Indian government will be able to innovate thanks to this method.

e) **Transitioning from Episodic to Wellness-Focused Care:** It is often known that the Indian healthcare system faces difficulties with pricing, accessibility, and quality. The accuracy of demand-supply matching will rise in tandem with the increased transparency made possible by NDHM.

f) **Promising health care from a value-based approach:** The incentives given to healthcare professionals are not commensurate with the services they offer. Either the payer withholds payment, or the management asserts a decrease in patient traffic. By using data analytics, the NDHM will make it possible to continue matching incentives with patient-centred treatment.

Numerous studies have examined the application of HMIS and advancements in the healthcare industry. Studies have shown that both developed and developing nations have benefited from the use of health information systems. Better patient care coordination, better management techniques, and better hospital service delivery are the advantages.

According to research, HIS gives hospitals better access to patient data, improves record-keeping quality, reduces medical errors in patient record filing, includes prescription and clinical records, and ultimately raises the standard of patient care. All of this has resulted in better information integration and lower hospital expenses. Cloud software makes it simple to manage the enormous patient database, and managing the files in vast rooms has become less of a strain. Since the pre-pandemic era, there has been an increase in the requirement for HIS.

The complexity of the healthcare industry, the scarcity of resources in hospitals, the daily growth in the amount of information generated by hospitals, the assessment of cost-effectiveness, the calibre of information generated, the enhancement of stored needs,

medical research, and sciences with a medical focus are some of the characteristics that contribute to this need.

Despite the fact that hospitals should install and use HIS widely given all of its advantages, there appears to be resistance to the system's deployment. The program cannot be used by the users at the proper speed. The users' lack of time during clinical sessions and the extremely low quantity of technical-capable personnel resources in hospitals were among the obstacles identified by Carrier research. Because there are fewer computer screens available for each department and there aren't enough internet connections, the hospital's infrastructure cannot handle the technical grounds.

WORKFLOW INVOLVED IN HOSPITAL INFORMATION SYSTEMS

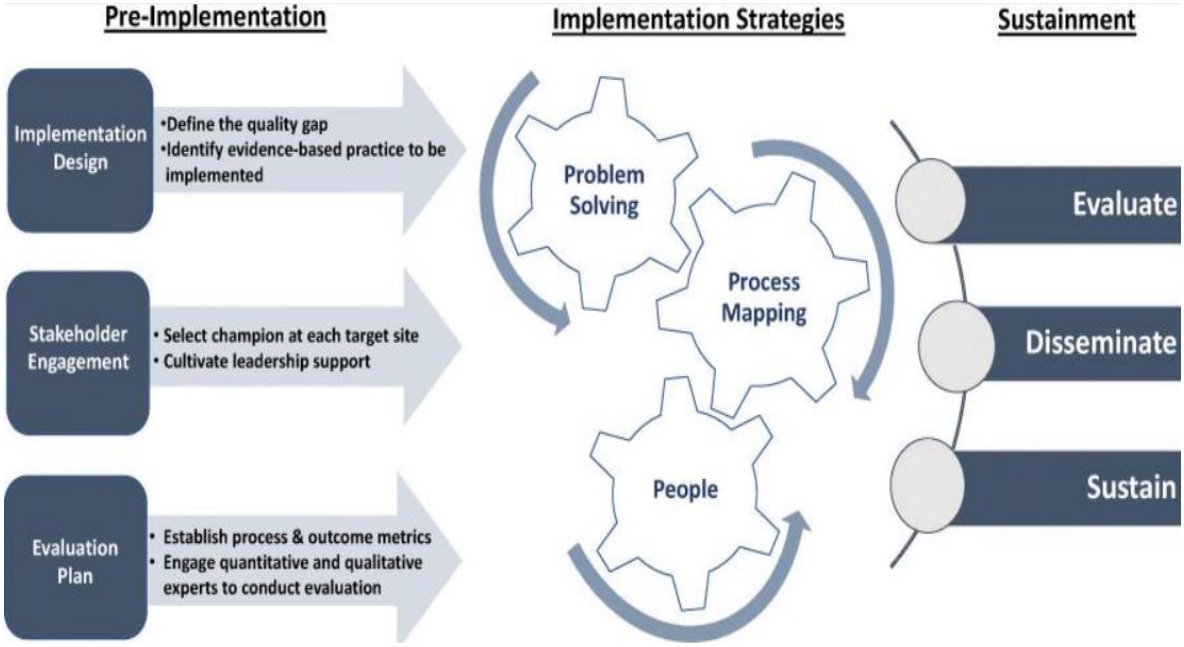

Figure 3: Workflow Involved in HIS

Source:https://www.ncbi.nlm.nih.gov/core/lw/2.0/html/tileshop_pmc/tileshop_pmc_inline.html?title=Click%20on%20image%20tofF%20zoom&p=PMC3&id=7878661_11606_2020_6169_Fig1_HTML.jpg

Framework for implementing evidence-based practices in a structured manner, divided into three main phases: Pre-Implementation, Implementation Strategies, and Sustainment.

Pre-Implementation

1. Implementation Design:

Define the quality gap: Identify the disparity between current practices and the ideal evidence-based practices.

Identify evidence-based practice to be implemented: Select the specific practice or intervention to be adopted based on research evidence.

2. Stakeholder Engagement:

Select champion at each target site: Choose a dedicated individual or group at each location to lead and advocate for the implementation.

Cultivate leadership support: Gain the backing and commitment from leadership to ensure the success of the implementation process.

3. Evaluation Plan:

Establish process & outcome metrics: Determine the criteria and measures to assess the process and outcomes of the implementation.

Engage quantitative and qualitative experts to conduct evaluation: Involve specialists to perform thorough and comprehensive evaluations using both quantitative and qualitative methods.

Implementation Strategies

This phase involves three interrelated components represented by gears, signifying their interconnected and cyclical nature:

1. Problem Solving:

Focus on identifying and addressing obstacles that arise during the implementation process. This can include troubleshooting issues and finding practical solutions to ensure smooth implementation.

2. Process Mapping:

Outline and document the steps and workflows involved in the implementation. This helps in visualizing the entire process, identifying inefficiencies, and optimizing the steps for better outcomes.

3. People:

Emphasize the role of individuals involved in the implementation. This includes training, communication, and ensuring that everyone understands their roles and responsibilities.

Sustainment

This phase ensures the longevity and continuous improvement of the implemented practice:

1. Evaluate:

Conduct ongoing assessments to determine the effectiveness and impact of the implemented practice. This involves measuring outcomes against the predefined metrics.

2. Disseminate:

Share the findings, lessons learned, and best practices with a broader audience. This can include publishing results, presenting at conferences, or conducting workshops to spread the knowledge gained.

3. Sustain:

Ensure that the implemented practice is maintained over time. This includes continuous support, regular updates, and integrating the practice into the standard operations to prevent regression to old practices.

The framework illustrates a comprehensive approach to implementing evidence-based practices, emphasizing the importance of careful planning, active engagement, strategic implementation, and ongoing evaluation and dissemination for sustainable improvement.

CHALLENGES FOR ADOPTION OF HIS SYSTEMS IMPLEMENTATION

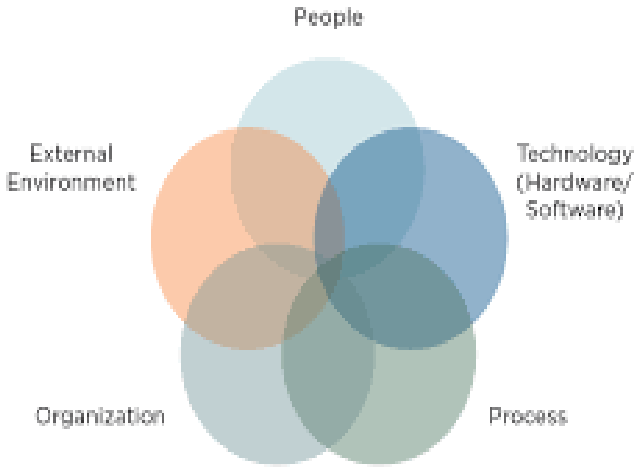

Figure 4: Barriers in HIS

Source: https://www.healthit.gov/sites/default/files/task_8_1_final_508.pdf

TECHNICAL CHALLENGES:

Security and Privacy Concerns:

Privacy and security problems impede the implementation of any technological approach, including smart healthcare solutions, as several published publications have noted. Sensitive and private patient data is transmitted via the internet in smart healthcare (Ameri et al., Poudel & Nissen, 2016; 2020). HIV test results are among the many confidential records handled by the healthcare system. Patients may be reluctant to divulge this kind of medical information when employing cutting-edge medical procedures which have previously been connected to privacy and security issues.

Many people worry that information may be intercepted by hackers and used for illegal purposes. Patients thus become resistant to giving permission for clinicians and healthcare providers to utilize and transfer data in an intelligent manner. Melchiorre et al. (2018) report that a lack of confidence in data security posed difficulties for a German smart health adoption program. Furthermore, Paaske et al. (2017) point out that adopting medical treatment techniques is seriously hampered by improper data gathering,

deliberate misuse, and unauthorized access. Corroborated by De Grood et al. (2016) along with Gagnon et al. (2016), who both concur that insufficient security measures cause security flaws to be revealed and used against users, creating issues with security and privacy.

Mileski et al. (2017) and Borries et al. (2019) state that even with robust security mechanisms, end users—both patients and clinicians—may still have security and privacy issues if they disregard recommended practices while utilizing smart technology, such as avoiding sharing passwords.

Patients' private information may be compromised if security protocols are not followed and sufficient security measures are not implemented. This could lead to fraud and other criminal activities including the theft of patient data. Healthcare providers face severe penalties and fines when this occurs. The threat of harsh sanctions is sufficient to dissuade healthcare providers from employing sophisticated healthcare management strategies.

Data Governance and Ethical Concerns

Another problem that prevents smart healthcare solutions from being implemented effectively is poor data governance, according research conducted in (Gagnon et al., 2016). The authors define data governance as the ownership, management, and control of information. The effective use of smart healthcare techniques is impeded by moral and legal issues around the ownership and liability of patient data gathered and utilized in these tactics.

Since smart medical care may make it possible for makers as well as other stakeholders to obtain one individual's details without that person's agreement, raising a variety of ethical concerns, it could create a complex social connection. According to Gagnon et al. (2016), the lack of laws and regulations governing data governance is the reason the Canadian embrace of smart healthcare practices has been slow. Melchiorre et al. (2018) support this, pointing out that although national laws safeguarding electronic data privacy exist in several European countries, there are currently no legislative frameworks specifically addressing smart healthcare data. The lack of established legal frameworks and ongoing data governance issues are preventing healthcare providers from implementing smart healthcare practices.

Interoperability Issues:

A number of stakeholders, including physicians, patients, clinical and research facilities, are involved in providing advanced medical services. It is important to take into account a number of factors, including clinical management, medical research, prognosis and therapy, illness prevention and surveillance, and clinical management. For instance, internet via mobile devices, computing in the cloud (CC), large-scale data, 5G structures, microelectronics, artificial intelligence (AI), and smart bioengineering are thought to be the pivotal moments in modern healthcare (Mansour et al., 2021). One of the most important aspects of implementing smart healthcare projects is the ability of data to be exchanged between doctors and other healthcare providers. Irregular intelligent medical software and hardware solutions are used by a variety of healthcare providers and physicians, which can cause interoperability issues and impede information transfer and sharing (Paaske et al., 2017).

The resources and financial limitations that healthcare providers have when it comes to investing in technological advancements differ. This causes healthcare providers to have varying degrees of technological maturity. Interoperability problems are mostly caused by differences in the levels of maturity of hardware and software systems (Kapadia et al. 2015).

Furthermore, according to De Grood et al. (2016), a notable obstacle to the adoption of intelligent medical technology. healthcare techniques are their incompatibility with current systems. This is a significant issue since it is hard for doctors to combine workflows due to the new, innovative healthcare techniques are unable to interface with the other legacy systems already in use by the same healthcare provider organization (Alami et al., 2017; Gagnon et al., 2016; Lim et al., 2018).

According to a study by Melchiorre et al. (2018), who find that mismatched health and social care systems hindered Finland's successful adoption of smart healthcare. The authors also disclose that interoperability problems across various IT recording systems in hospitals surfaced in another study conducted in Denmark, making it challenging for clinicians and healthcare professionals to exchange patient data.

Due to the incompatibility and interoperability problems, processes have been severely impacted, which has significantly impacted patient care and led to healthcare professionals avoiding the adoption of intelligent healthcare solutions.

Fearing lost productivity and inability to give results, healthcare practitioners are reluctant to embrace smart healthcare approaches that can obstruct transmission of information and disrupt workflows, choosing instead to continue working on old systems. Fearing lost productivity and inability to give results, healthcare practitioners are reluctant to embrace smart healthcare approaches that can obstruct transmission of information and disrupt workflows, choosing instead to continue working on old systems.

Lack of Data Terminology Standards

According to Eden et al. (2016), the implementation of intelligent healthcare methods is significantly impacted by a lack of data and language standards. To save scrolling down multiple pages to do a task, some clinicians or providers prefer less information, while others prefer more. The lack of rules controlling the volume of data gathered and retained and the variance in preferences make it difficult for smart healthcare procedures to be adopted. Furthermore, irregular data language and classification have led to ambiguities and inconsistencies that are time-consuming and less helpful to end users. Consequently, end users make the decision not to embrace and apply intelligent healthcare practices.

Poor Data Quality:

The implementation of smart healthcare solutions leads to poor data quality, even while it also makes data collection, storage, and transmission more effective and efficient. Data sharing and communication are hampered by the too huge and complex amount of data (Tian et al., 2019). Compatibility issues also exist between various systems and gadgets. Furthermore, a growing number of individuals are managing numerous ailments, necessitating treatment and care from many clinicians and healthcare professionals. As a result, each healthcare provider or clinician's clinical records become fragmented and incomplete.

The small number of healthcare providers that use intelligent healthcare procedures and are therefore unable to share this data is one of many reasons that contribute to this fragmentation of data (Eden et al., 2016). Additionally, some patients decline to enable the transfer to their medical records to different medical practitioners or physicians using clever healthcare strategies due to concerns about security and privacy, which fractures the data. Moreover, one of the primary issues with secure data interchange is data fragmentation (Pradhan et al., 2021). Data fragmentation may lead to a vacuum in information across healthcare professionals involved in a single patient.

According to Eden et al. (2016), the implementation of intelligent healthcare methods is significantly impacted by a lack of data and language standards. To save scrolling down multiple pages to do a task, some clinicians or providers prefer less information, while others prefer more. The lack of rules controlling the volume of data gathered and retained and the variance in preferences make it difficult for smart healthcare procedures to be adopted. Furthermore, irregular data language and classification have led to ambiguities and inconsistencies that are time-consuming and less helpful to end users. Consequently, end users make the decision not to embrace and apply intelligent healthcare practices. Due to this opposition, doctors avoid implementing clever healthcare techniques, which leaves patient medical records lacking or disjointed.

Maintaining the matrix for quality of service, which consist of availability, affordability, reliability, security, and privacy of information exchange, is also the primary issue while building an IoT device (Pradhan et al., 2021). According to Melchiorre et al. (2018), in a Dutch smart health adoption initiative, users' insufficient computer proficiency—particularly with regard to self-management patents—led to missing or erroneous readings, which in turn caused low data quality.

Patients forgetting to record readings when self-monitoring is another reason for missing, erroneous, and inconsistent data, according to additional explanations from Borries et al. (2019) and Mileski et al. (2017). Furthermore, as noted by Gagnon et al. (2016) and Lim et al. (2018), patients' inadequate grasp and knowledge of healthcare information can lead to data misinterpretation, inaccurate data submission, or information overload. The reliability of data supplied by patients is significantly diminished by altered, omitted, or fraudulent information. In agreement, Kapadia et al. (2015) note that inadequate, erroneous, and missing data prevent doctors from fully evaluating patients' health, and

that inconsistent documentation, methods, and communication might influence clinicians' decisions not to use intelligent healthcare practices.

Patients may select any wearable or app to self-monitor and manage health issues because there are so many innovative wearables and applications accessible. This implies that there is a chance that users will decide to use an application that is not categorized by regulators and healthcare authorities as a medical device, or that is not deemed reliable or wearable. This suggests that crucial data collected by wearables or applications like these cannot be used as evidence by physicians in assessments, reviews, or research, leading to insufficient, fragmented, and ultimately low-quality data (Lukaschek et al., 2019; Treisman et al., 2016).

When intelligent healthcare techniques are used, data collecting increases compared to manual data collection methods. This increases the possibility of information overload for both patients and physicians, which might lower the calibre of information that professionals employ. According to De Grood et al. (2016), physicians may overlook crucial information that is required to make informed decisions about patient care because to their incapacity to efficiently synthesize and handle massive amounts of data.

Functional and Non-Functional System Issues:

The real use of smart healthcare technologies may be impacted by these difficulties. According to Mileski et al. (2017), using certain smart healthcare technology can be challenging. This indicates that physicians may not utilize the systems at all or may use them just in part, which would reduce the benefits they had anticipated. Research conducted by De Grood et al. (2016) supports this which shows that despite the fact that smart healthcare methods have many useful characteristics, clinicians believe that the systems are challenging to utilize because of how intricately they are structured.

In addition to issues with network accessibility, Zadvinskis et al. (2018) pointed out that non-functional issues and system functionality provide a major barrier to physicians implementing smart healthcare practices. The writers noted several problems, such as prolonged login times, scanning problems, an increase in software updates, shutdowns during job completion, and power outages. Alami et al. (2017) list poor transmission speed and low storage capacity as further barriers to the effective implementation of smart

healthcare practices. Due to the negative effects of these issues on consumers, they avoid utilizing and implementing smart healthcare approaches since they perceive it as a failure and a waste of their valuable productive time.

The implementation of smart healthcare techniques is hindered by the issue of the digital divide, as noted by Gagnon et al. (2016) and Lim et al. (2018). Limited access to computers and the internet for users is known as the "digital divide." Despite the fact that the majority of homes nowadays have a computer or other electronic device, some still do not, such as elderly and rural homes. This then has an impact on the healthcare professionals who attend to these patients. Healthcare practitioners see adopting smart healthcare methods as non-beneficial and unproductive since the individuals they serve lack access to electronic devices and the internet, making smart healthcare tactics unusable.

Costs:

The adoption cost of any cutting-edge technological solution is considerable. There are several costs associated with implementing smart healthcare practices, including infrastructure, equipment and software purchases, installation, and ongoing maintenance. In the realm of smart healthcare technologies, many are still in the experimental stage and require substantial funding for maintenance and updates (Tian et al., 2019). Furthermore, the high initial adoption cost of intelligent healthcare management solutions is a deterrent for most healthcare providers, as observed by Kruse et al. (2015) and Mileski et al. (2017). Lack of money makes it difficult for healthcare workers to implement smart healthcare practices, starting with the costly acquisition of software and technology.

Paaske et al. (2017) bolster the same view, arguing that technological expenses are significant, especially when increasingly complex features are needed. For instance, a large-scale Radio Frequency Identification (RFID) system needs millions of dollars' worth of facilities, printers, middleware, tags, and readers. While reusable technology like RFID tags is readily available, providers may incur unforeseen expenses if these tags are misplaced. Additionally, Ameri et al. (2020) concur alongside Poudel and Nissen (2016) and Kooij et al. (2018) that particular advanced equipment, like the Integrated Service Digital Network (ISDN), is necessary for the use of smart healthcare technologies and can be expensive to acquire or limited in certain circumstances (like rural areas).

Adoption, operation, maintenance, and training expenses are associated with using smart healthcare systems. These costs do not decrease over time. Even when financing for the implementation of innovative medical procedures is available, according to Alami et al. (2017), it is typically restricted, only lasts a short while, and largely covers start-up expenses without taking sustainability, maintenance, or training into account. According to Kruse et al. (2015) and Kruse et al. (2017), more financing is needed to pay for follow-up and continuing training expenditures, which help patients realize the promise of smart healthcare. The quantity of instruction for users, maintenance, and initial support that is offered is greatly impacted by insufficient financing.

ORGANISATIONAL CHALLENGES

Workflow Disruptions and Decreased Efficiency:

The introduction of every new technology is not without its setbacks before, during, and after acceptance. This is especially true when it comes to implementing clever healthcare tactics. Before deployment, a significant amount of time must pass for end users to receive the necessary training and skill elevate to operate the updated platforms.

The time away from clinical duties required for this training lowers organizational productivity. Moreover, Borries et al. (2019) and Mileski et al. (2017) noted that the implementation of smart healthcare initiatives inside an organization requires a significant amount of time, resulting in a decrease in productivity during the adoption phase.

Regular processes and procedures are also disrupted when the firm incorporates novel innovative medical techniques into its operations. The entire productivity of the healthcare provider organization is decreased by this lengthy and disruptive transformation (De Grood et al., 2016; Kruse et al., 2018b; Papa et al., 2020).

Following implementation, productivity declines while end users adjust to the new tactics and any workflow modifications, as well as when they suffer other early obstacles. According to Kruse et al. (2018b) and Paaske et al. (2017), healthcare provider organizations may experience system failures in the early phases of implementing smart healthcare strategies, such as data loss or interruption, which impedes the efficient flow of workflow operations and lowers productivity. Nguyen et al. (2015) also point out that implementing smart healthcare techniques improves communication; nevertheless, there is a drawback to this enhanced communication: it puts more pressure on doctors, which lowers productivity.

Change Culture:

Razmak et al. (2018) define alter cultural norms as an organization's willingness to support, demonstrate positive affect, and be open to altering the way it makes decisions in order to accept progress. A change in culture is necessary for the effective adoption of intelligent healthcare practices. One of the main barriers to the adoption of innovative health care projects in Dutch hospitals, according to study by Kooij et al. (2018), is the institutions' anti-innovation culture. This culture is mostly the result of the many competing key players in the healthcare industry, all of which insists that their thoughts get heard and given consideration.

Organizational Readiness:

Faber et al. (2017) describe organizational preparation as having the resources needed to adopt smart healthcare practices successfully. A medical organization that is implementing smart healthcare initiatives has a challenge since it lacks the resources essential to be prepared. Smart healthcare efforts cannot be implemented successfully without the following: financial resources; IT infrastructure; IT workers with the requisite skills; governance of IT and security resources; and IT infrastructure. The implementation of intelligent healthcare techniques is negatively impacted by the absence of such crucial resources (Papa et al., 2020).

Organizational Size:

As was already established in the section on organizational preparedness, organizational size and resource availability are related. According to Faber et al. (2017), smaller healthcare providers have less leeway in terms of resources, such as smaller staffing levels and finances, than bigger healthcare providers. This implies that small health care organizations are unable to supply the critical financial, human, and technological resources that smart healthcare adoption initiatives require in order to embrace smart healthcare practices.

Organizational Structure:

According to Faber et al. (2017), the acceptance of innovative health care initiatives is significantly influenced by the organizational structure. Making decisions within an organization is determined by its organizational structure. The authors claim that organizational structures that promote concentrated senior-level decision-making have a negative impact on the adoption of innovative healthcare methods because they stifle the creativity and accountability of end users—the people who will actually use the techniques on a daily basis—and limit end users' creativity. Because of this limitation, senior management could make bad decisions—for example, selecting innovative healthcare strategies that contradict or undermine established procedures—because end users might lack the knowledge or experience needed to properly consider their alternatives.

Lack of Management Support and Poor Leadership:

The successful integration of new innovative healthcare systems into routine practice was found to depend on a number of factors, including supportive organizational structures, robust support networks, efficient instruction, the accessibility of policy-level sponsors, and the growth of procedures (Ameri et al., 2020; Poudel & Nissen, 2016). This analysis of the literature looked at the manner in which fresh effective medical initiatives were incorporated to everyday workflows of practicing physicians.

The organization leadership is helpful and provides all these instruments. Furthermore, management often possesses the expertise and comprehension of the intricate operational procedures in the healthcare industry needed to successfully implement such a significant transformative shift (Razmak et al., 2018). Therefore, it will be difficult for healthcare

provider organizations—whether they have strong management support or not—to embrace intelligent healthcare strategies.

Lack of Knowledge:

According to Feng et al.'s (2019) research, nearly all of connected medical services available now are features of urban planning software. As a result, the smart medical design machine's interface is overly straightforward, which makes it less compassionate for consumers. When two management groups—one from the countryside and one from an urban setting—were compared, it was discovered by Kapadia et al. (2015) that the rural group, which lacked technical proficiency, expertise, and expertise in health IT, tended to ignore the benefits of efficient healthcare strategies. This illustrates that a lack of knowledge and understanding of astute healthcare strategies leads to a deficiency of meaningful change drives, hence decreasing the likelihood of implementing smart healthcare.

Poor Communication and Engagement:

To guarantee buy-in, communication and involvement are crucial during any change endeavour. Poor involvement and communication raise the risk that the change won't go smoothly and could even fail. According to a study conducted by Alami et al. (2017), physicians felt that a top-down approach was used to adopt smart healthcare strategies without consulting or engaging them. Consequently, the doctors declined to accept and use the clever healthcare techniques.

Poor Planning:

Inadequate planning prevents smart healthcare approaches from being implemented effectively. It is crucial to make certain that the change plan is in line with the organization's overarching vision and goals, just as with any other attempt to execute a change inside a company. When implementing smart healthcare, some healthcare organizations make mistakes in their planning, which causes the adoption to become out of step with the organization's vision and goals (Borries et al., 2019; Mileski et al., 2017; Sligo et al., 2017). The writers go on to clarify that there will only be misunderstanding and confusion if IT activities are not in line with organizational objectives. Furthermore,

inadequate planning may lead to arbitrary adoption deadlines or the scheduling of changes around hectic or peak periods, which may be disastrous for the organization as it prevents the successful adoption of astute healthcare management techniques when they are chosen (Sligo et al., 2017).

Strict Rules and Regulations:

Many barriers are already starting to materialize, yet there remains a lot of room for development as new problems and technology emerge (Tian et al., 2019). For instance, the authors asserted that unclear development goals and ultimately resource loss arise from the lack of macro standards and programmatic documents in smart healthcare. Furthermore, hospitals lack uniform standards across different organizations and places, development is needed to ensure data integrity.

ENVIRONMENTAL CHALLENGES:

Final User Actions:

Given that end users play a major role in the widespread use of innovative healthcare management techniques, it is important to understand the behaviours that they could display. These actions have the power to encourage or hinder the use of smart healthcare practices. Perceived utility and perceived ease of use are the two categories used to group end user behaviour. According to Tian et al. (2019), there are concerns about privacy violations and personal information security, and from the standpoint of the patient, smart healthcare is devoid of pertinent legal standards. Even some users find it challenging to operate the device.

Opposition to Change:

The introduction of smart healthcare methods poses a danger to the control end users have on procedures and processes related to their specialized knowledge and experience. For example, this possible bias prevents physicians from implementing smart health care practices when they diagnose patients before seeing them (De Grood et al., 2016; Kooij et al., 2018). In other instances, the use of smart healthcare procedures leads to an increase

in the volume of questions, calls, and appointments—especially in the initial phases of adoption—which is seen by physicians as an additional burden.

Poor Computer Skills:

According to Melchiorre et al. (2018), a common obstacle to the implementation of smart healthcare solutions is end users' lack of computer capabilities. One who lacks computer skills finds it difficult to do tasks, which makes the new smart systems annoying, useless, and worthless. This leads to opposition. This is corroborated by Kapadia et al. (2015), who claim that an individual's decision to embrace smart healthcare solutions is based on their educational background and/or technical expertise.

Poor Training and Support:

As previously mentioned, end users' low computer literacy hinders their ability to implement smart healthcare efforts. Thus, training is required for consumers that lack the knowledge or experience to put smart healthcare strategies into practice so they may learn the skills and become adept at implementing the new techniques. However, research by De Rood et al. (2016) indicated that training needs must be adapted to the end user's knowledge and skills. Too often, umbrella training is given to all end users. Therefore, training needs to be specific to the job position, knowledge, and abilities of the end users rather than being universal. When end users get inadequate tailored training, they may misuse smart healthcare technologies or decide not to utilize the new tactics at all.

CHAPTER 2: LITERATURE REVIEW

S. No	Study Name	Year	Author	Location	Methodology	Salient Features
1.	The Impacts of Health Information Systems on Patient Outcomes.	2023	Donel Richmond, Taiwan D. Huggins-Jordan	Orlando, USA	Literature Review	The advantages and disadvantages of HIS are examined in this paper.
2.	A Case Study on Acceptance of Hospital Information System (HIS), among Nurses in a Tertiary Care Hospital.	2023	Nirmala Kumari, P.K Suresh Kumar	India	Case Study	Nurses are the Centre of Care in any healthcare system since they are the main users of the hospital information system (HIS). Hospital information systems will therefore be improved by having a better grasp of their perspectives and how they use these systems.
3.	The Effect of	2022	Kamilia Abdulmut	Malaysia	Article	Hospital information systems (HIS) have

	Quality Factors of Hospital Information Systems on Patient Satisfaction.		alib Mohamed Jad, Zuraidah Zainol			significantly altered patient communications within hospitals and greatly enhanced the quality of contemporary medical care.
4.	Use of Hospital Information System to Improve the Quality of Health Care from Clinical Staff Perspective	2021	Ali Mohammadpour, Mohammad Mehdi Ghaemi, Reza Darrudi, Hassan Ebrahimpour Sadagheyani.	Neyshahbur	NIH	The way hospital information systems (HISs) are developed has a big impact on how care is provided. In this sense, assessing the effectiveness of these technologies heavily depends on the viewpoint of the clinical personnel.
5.	Sustainability of Health Information Systems:	2017	Corrina Mouchera ud, Amee Schwitters, Chantelle Boudreaux	Malawi, Zambia, Zimbabwe	BMC Health Services Research	

	A Three-Country Qualitative Study in Southern Africa		, Denise Giles, Peter H. Kilmarx, Ntolo Ntolo, Zwashe Zwashe Bangani, Micheal E. St. Louis & Thomas J Bossert			
6.	A Case Study of an EMR system at a large hospital in India: Challenges and Strategies for Successful Adoption.	2011	Jeremiah Scoll, Shabbir Syed-Abdul, Luai Awad Ahmed	Sweden, Taiwan, Norway	University Hospital of North Norway and Health Informatics Centre, Taipei Medical University, Faculty of Health Sciences	A case study of the Electronic Medical Record (EMR) system at Sankara Nethralaya hospital in India is presented in this paper using an interpretive approach inspired by ethnography. It outlines the obstacles to the system's adoption as well as the tactics and approaches used to get over them and facilitate the system's effective adoption. A prominent problem encountered at the hospital was a user base including of

						individuals who were not very tech-savvy, rejected designs in the past, and were sceptics. The hospital was successful in implementing the EMR system in spite of these obstacles.
7.	Measuring impact of healthcare information systems in administration and Operational management	2019	Mohammad Yamin, Shaker Alharthi.	Delhi, India	Bharati Vidyapeeth's Institute of Computer Applications and Management	The purpose of this study is to clarify the capabilities and efficacy of healthcare information systems in a medical setting. Specifically, our research focuses on the operational and administrative choices impacted by health information systems. We have selected the Saudi Arabian Alhada Military Hospital as our example.
8.	Evaluation of challenges for adoption of smart healthcare strategies	2022	Suresh Renukappa, Primerose Mudiyi, Subashini Suresh, Wala Abdalla,	United Kingdoms, India	University of Wolverhampton, SAPS Labs India,	Effective healthcare practices can enhance effectiveness, patient outcomes, and healthcare quality. Policymakers and governments are funding this innovation. To

			Chandrashekhar Subbarao			expand adoption and lower failure rates, this study suggests a distinct approach to policies and procedures. Important solutions for change management require further research.
9.	Major Challenges and Constraint of Integrating Health Information Systems in African Countries	2014	Titus Tossy	Tanzania, Africa	Mzumbe University	With a focus on Namibia's healthcare system, this article investigates the difficulties and limitations faced by integrated health information systems (HIS) in developing nations. In order to share experiences and lessons learned, the paper suggests initiatives like annual health provider workshops.

10.	Implementing Strategies for Frontline Healthcare Professionals: People, Process, Mapping, and Problem Solving.	2020	Amy D. Lu, Bhavika Kaul, Jill Reichert, Amy M. Kilbourne, Kathleen F. Sarmiento, Mary A. Whooley	San Franscisco, VA	VA Health Services Research and Development Quality Enhancement Research Initiative (QUERI)	The goal of implementation science is to close the gap between research and practice and hasten the uptake of evidence-based treatments. As seen in a VA healthcare program, strategies include problem-solving, process mapping, and stakeholder involvement.

CHAPTER 3: RESEARCH METHODOLGY

RESEARCH QUESTION:

How does the implementation and utilization of Hospital Information Systems impact the effectiveness and efficiency of hospitals?

OBJECTIVE:

1. Analyse how the implementation and utilization of HIS impacts the effectiveness (quality of care) and efficiency (resource utilization) of hospitals.

2. Identify the key workflows involved in HIS implementation to effectively troubleshoot and resolve technical issues.

3. Evaluate the major challenges faced during HIS implementation and propose strategies to mitigate them.

METHODOLOGY:

The selection criteria were followed in the selection and screening of publications available at RESEARCH GATE, PUBMED, SCIENCE DIRECT, and Google between 2010 and 2023. Data was retrieved from qualified reviews and publications after the study was finished in Excel. The end product was a comprehensive examination of the barriers and facilitators to e-health adoption.

SEARCH APPROACH FOR SELECTING STUDIES:

Databases:

- **Academic databases:** Focus on databases relevant to healthcare, information systems, and business management. Here are some options:
    - PubMed Central (PMC)
    - Web of Science
    - ScienceDirect
    - Business Source Premier
- **Grey literature sources:** Consider including reports, theses, and dissertations that might offer valuable case study insights.

Search Terms:

- **Required terms:**
  - Hospital Information System (HIS) OR Electronic Health Record (EHR)
  - Effectiveness OR Efficiency
  - Case Study
- **Optional terms to refine your search:**
  - Specific outcomes you're interested in (e.g., patient care, medication errors, resource utilization)
  - Specific hospital types (e.g., teaching hospitals, rural hospitals)

Search String Example (modify based on chosen database):

(Hospital Information System OR Electronic Health Record) AND (Effectiveness OR Efficiency) AND Case Study

Additional Considerations:

- **Limit search by date:** Choose a publication date range that aligns with the most recent developments in HIS technology.
- **Filters:** Utilize advanced search options to filter by study type (case study), language (English, etc.), and publication type (peer-reviewed articles, dissertations).
- **Snowballing:** Once you identify relevant studies, check their reference lists to find additional articles that might be of interest.

Evaluating Studies:

- Assess the quality of the case study methodology used. Look for studies that provide a clear description of the hospital context, HIS implementation details, and methods used to measure effectiveness and efficiency.
- Ensure the case study addresses the specific aspects of HIS impact you're interested in.

SYSTEMATIC REVIEW SELECTION CRITERIA:

INCLUSION CRITERIA

1. English language

2. Published between 2011-2023

3. **Comprehensive reviews:** these involved precisely presenting the results, eliminating publications that did not adhere to a particular standard with open approaches. standards, and organizing the examination of bibliographic and supplemental databases to find pertinent works.

4. **Descriptive reviews:** works that meet generous, important, and perceived relevance requirements have been included after carefully selecting pertinent material from the subject of study using conceptual or topical criteria. These reviews aim to provide an overview, discuss, and evaluate the results.

EXCLUSION CRITERIA

1. Not in the English language.

2. Published before 2010

3. Secondary analyses of datasets that have previously been released to present the complete results of certain research initiatives.

4. Examination of literature that are part of critiques or contributions to theory development.

5. Summaries of books for informational or analytical purposes.

6. Editorial arguments in favour of a certain course of research or approach.

STRENGTHS AND LIMITATIONS:

STRENGHT:

Hospital Information Systems (HIS) can significantly improve the effectiveness and efficiency of healthcare delivery. Here are some key strengths identified in various case studies (with references):

- **Enhanced Patient Care:** HIS facilitates centralized access to patient data, including medical history, medications, allergies, and lab results. This empowers healthcare providers to make informed decisions, improve continuity of care, and reduce the risk of errors (Sim et al., 2016).
- **Improved Communication and Collaboration:** HIS fosters communication between healthcare professionals like doctors, nurses, and pharmacists. This streamlines information sharing, facilitates coordination in patient care, and reduces delays (Green et al., 2019).
- **Reduced Medical Errors:** HIS incorporates features like clinical decision support systems and medication order checks. These functionalities help prevent errors in prescribing medications, administering treatments, and ordering duplicate tests (Kho et al., 2020).
- **Increased Efficiency:** HIS automates tasks like appointment scheduling, billing, and reporting. This frees up valuable staff time for patient care and streamlines administrative processes (Anderson et al., 2017).
- **Data-Driven Decision Making:** HIS generates reports and provides data insights that can be used to monitor patient outcomes, identify trends, and make data-driven decisions for improved hospital operations (Tan et al., 2023).

Limitations

Despite the numerous advantages, HIS implementation comes with certain limitations that need to be addressed:

- **Implementation Costs:** Installing, customizing, and maintaining HIS can be expensive. The initial investment and ongoing costs for upgrades and training can be significant (Murphy et al., 2018).
- **User Adoption and Training:** Healthcare professionals may require time to adapt to new workflows and learn how to use the HIS effectively. Resistance to

change or inadequate training can hinder the effectiveness of the system (Seyedmoradi et al., 2021).

- **Data Security and Privacy:** HIS stores sensitive patient data, so robust security measures are crucial to prevent data breaches and ensure patient privacy (Saify et al., 2022).
- **Interoperability Challenges:** Different HIS systems from various vendors may not work seamlessly together. This creates integration issues and hinders data exchange between different departments or facilities (Ghani et al., 2020).
- **Information Overload:** With readily available data, healthcare providers may face information overload. Analysing and prioritizing the most relevant information for patient care decisions can be challenging (Sweeney et al., 2018).

CHAPTER 5: RESULT

This paper analyses three areas of research relevant to smart healthcare implementation: Healthcare Information Systems (HIS) effectiveness and efficiency, workflow of HIS implementation to troubleshoot and resolve issues and challenges to adopting smart healthcare solutions.

Effectiveness of Healthcare Information Systems (HIS):

- A well-designed HIS can significantly improve both effectiveness (meeting user needs) and efficiency (using resources well) in healthcare delivery.
- Key features contributing to this positive impact include: easy access to information, accurate data, short wait times, user-friendly interfaces, and secure data storage.
- However, some features require further evaluation regarding their efficiency. For instance, complex customization might necessitate developer involvement, impacting resource utilization.

Framework for Implementing Evidence-Based Practices (EBPs)

This study employed a three-phase framework to implement EBPs in a structured manner:

1. Pre-Implementation

- **Implementation Design:** Defined the quality gap between current practices and desired EBPs. Selected a specific evidence-based practice for implementation.
- **Stakeholder Engagement:** Engaged champions and leadership to advocate for and support the implementation process.
- **Evaluation Plan:** Established process and outcome metrics, and involved experts for a comprehensive evaluation using both quantitative and qualitative methods.

2. Implementation Strategies (represented as interlinked gears):

- **Problem Solving:** Continuously identified and addressed obstacles during implementation.
- **Process Mapping:** Documented and optimized the implementation workflow for efficiency.
- **People:** Emphasized training, communication, and ensuring everyone understood their roles.

3. Sustainment

- **Evaluate:** Conducted ongoing assessments to measure the effectiveness and impact of the implemented EBP.
- **Disseminate:** Shared findings, lessons learned, and best practices with a broader audience.
- **Sustain:** Ensured the implemented EBP was maintained through continuous support, updates, and integration into standard operations.

This framework facilitates the successful implementation of EBPs by promoting careful planning, active stakeholder engagement, strategic implementation strategies, and ongoing evaluation and dissemination for long-term improvement.

Challenges to Smart Healthcare Implementation:

The research identified three main categories of challenges hindering smart healthcare adoption:

- **Technical Challenges:**
  - **Privacy and Security Concerns:** Patients' reluctance to share data due to hacking fears can impede implementation.
  - **Interoperability Issues:** Incompatible hardware and software across healthcare providers can hinder information sharing and workflow.
  - **Data Quality Issues:** Complex data, compatibility problems, and fragmented records can lead to poor data quality.

- **Organizational Challenges:**
  - **Workflow Disruptions:** Introducing new technologies can disrupt existing workflows and decrease efficiency, especially during training periods.
  - **Organizational Culture:** Resistance to change and a lack of innovation-friendly culture can hinder adoption.
  - **Lack of Resources:** Limited financial resources, IT infrastructure, and skilled personnel can make implementation difficult, especially for smaller providers.
  - **Poor Leadership and Planning:** Inadequate leadership support, communication, and planning can lead to failed implementations.

- **Environmental Challenges:**
    - **End-User Behaviour:** Privacy concerns, lack of computer skills, and inadequate training can hinder user adoption.
    - **Legal and Regulatory Issues:** Unclear legal frameworks can create uncertainty and hinder adoption.
    - **The Digital Divide:** Limited access to technology in certain demographics can create disparities in healthcare access.

CHAPTER 4: DISCUSSION

The following factors were discovered after a thorough examination of the evaluations, and they had an impact on the HIS System's efficacy and efficiency.

Feature	Effectiveness (Meeting Needs)	Efficiency (Using Resources Well)
Shorter Wait Times	High	High
Easy access	High	High
Correct information	High	High
Strong backup and secure files	High	Moderate (Security requires ongoing maintenance)
Organized data (single folder)	High	High
Simple format customization	High (if needed)	Moderate (Depends on complexity)
Accessible from anywhere	High	High
Little Instruction	High	High
Simple to operate	High	High
Assistance for end users	High	Moderate (Cost of support)

Table 1: Effectiveness and Efficiency Matrix for Healthcare Software

This table summarizes the effectiveness and efficiency of a healthcare software program. It analyses various features and categorizes them based on how well they meet user needs (effectiveness) and how well they utilize resources (efficiency). Gyamfi, A., et al. (2017).

Feature: This column lists specific functionalities of the healthcare software. **Effectiveness (Meeting Needs):** This column rates how effectively each feature fulfils the needs of patients and healthcare providers. Here, "High" indicates the feature significantly improves aspects like faster access to information, accurate data, and overall workflow.

Efficiency (Using Resources Well): This column rates how efficiently each feature utilizes resources. "High" indicates the feature helps save time and effort, while "Moderate" suggests there might be some ongoing maintenance involved (like security updates for secure files). Chen, Y et al. (2019).

Explanation of Specific Ratings:

High for Most Features: Features like easy access, accurate information, and user-friendliness contribute significantly to both effectiveness (meeting needs) and efficiency (saving time and resources). Kumar, S., & Aldrich, K. (2010).

- **Moderate for Secure Files:** While secure backups are highly effective, maintaining that security requires ongoing effort, lowering the efficiency rating slightly.
- **Conditional for Customization:** Simple customization is effective if needed and can be efficient. However, complex changes requiring a developer might be less efficient. Morton, M. E., & Wiedenbeck, S. (2010).

The table suggests this healthcare software offers a strong combination of effectiveness and efficiency. It helps meet user needs while saving time and resources. However, some features (like complex customization) might require further analysis to fully understand their impact on efficiency. Newgard, C. D., Zive, D., Jui, J., Weathers, C., & Daya, M. (2012)

Three-phased framework for implementing evidence-based practices (EBPs) in a structured manner. The framework emphasizes the importance of thorough planning, stakeholder engagement, and ongoing evaluation for successful and sustainable implementation.

Strengths of the Framework:

- **Clear Stages:** The framework divides the process into three distinct phases: Pre-Implementation, Implementation Strategies, and Sustainment. This provides a clear roadmap for navigating the different stages of EBP implementation. Goodman MS, Sanders Thompson VL (2017)
- **Stakeholder Involvement:** The framework highlights the importance of stakeholder engagement, including selecting champions at target sites and cultivating leadership support. This fosters ownership and increases the likelihood of successful implementation. Damschroder LJ, Aron DC et al. (2009)
- **Data-Driven Approach:** The emphasis on establishing process and outcome metrics, using both quantitative and qualitative evaluation methods, ensures a data-driven approach for measuring progress and impact. Concannon TW, Meissner P, Grunbaum JA, et al. (2012)
- **Cyclical Nature of Implementation:** The framework acknowledges the interconnectedness of the implementation strategies through the gear analogy. This highlights the need for continuous problem-solving, process mapping, and people-centric approaches throughout the process. Kirchner JE**,** Smith JL**,** Powell BJ**,** Waltz TJ**,** Proctor EK (2019)
- **Focus on Sustainability:** The inclusion of a dedicated sustainment phase with ongoing evaluation, dissemination of learnings, and continuous support emphasizes the long-term viability of the implemented practice. Roberts JP, Fisher TR, Trowbridge MJ, Bent C (2016)

This framework provides a valuable structure for implementing EBPs in a structured and sustainable manner. Christoff P. (2018)

Challenges include 3 categories i.e., Technical, Organizational and Environmental.

Privacy and security concerns hinder the implementation of smart healthcare solutions, as patients may be reluctant to share sensitive patient data due to concerns about hacking. Data security issues hinder German smart health adoption program, with improper data gathering, misuse, and unauthorized access posing security and privacy risks. Healthcare providers face severe penalties and fines for failing to implement robust security protocols, which could compromise patient data, leading to fraud and other criminal

activities. Poor data governance hinders the effective implementation of smart healthcare solutions, raising ethical concerns and causing complex social connections. Lack of established legal frameworks and ongoing issues hinder the adoption of smart healthcare practices in Canada and Europe.

Interoperability issues in advanced medical services can hinder information transfer and sharing between healthcare providers due to irregular intelligent medical software and hardware solutions, affecting clinical management, research, and disease prevention.

Melchiorre et al.'s study reveals mismatched health and social care systems and interoperability issues hinder Finland's adoption of smart healthcare, leading to healthcare professionals avoiding intelligent solutions due to productivity concerns.

Eden et al. (2016) highlights the challenges of intelligent healthcare due to a lack of data terminology standards, resulting in ambiguities and inconsistencies, hindering adoption.

Smart healthcare solutions often lead to poor data quality due to the complexity of data, compatibility issues, and fragmentation of clinical records. This is exacerbated by the small number of providers and concerns about security and privacy.

Lack of data and language standards hinder intelligent healthcare implementation, leading to ambiguities and inconsistencies. Insufficient computer proficiency also affects data quality, as users may avoid adopting smart healthcare practices due to a lack of rules and preferences.

Patients' inability to record readings during self-monitoring can lead to missing, erroneous, and inconsistent data. Inadequate understanding of healthcare information can cause data misinterpretation, inaccurate submission, and information overload. The availability of innovative wearables and apps can lead to insufficient, fragmented, and low-quality data.

Intelligent healthcare techniques increase data collection, potentially leading to information overload for patients and physicians. System issues, such as network accessibility, non-functionality, and the digital divide, also hinder the implementation of smart healthcare practices. The digital divide affects healthcare professionals, especially

in elderly and rural areas, who lack access to electronic devices and the internet. The adoption cost of these technologies is significant, including infrastructure, equipment, software, installation, and ongoing maintenance. The high initial adoption cost also deters healthcare providers from adopting smart healthcare practices. Furthermore, adoption, operation, maintenance, and training expenses do not decrease over time, and insufficient financing can significantly impact the quality of instruction, maintenance, and initial support provided.

The implementation of smart healthcare strategies can be a challenging process due to various organizational challenges. Workflow disruptions and decreased efficiency are common before, during, and after adoption. This is particularly true when the technology is introduced into the healthcare sector. The time required for training and skill enhancement for end users can lead to a decrease in productivity during the adoption phase. Additionally, the integration of new medical techniques into operations can disrupt regular processes and procedures, resulting in reduced productivity.

A change in culture is necessary for the effective adoption of intelligent healthcare practices. In Dutch hospitals, an anti-innovation culture is a major barrier to the adoption of innovative healthcare projects. Organizational readiness is crucial for successful implementation, but it is often lacking in financial resources, IT infrastructure, skilled IT workers, and IT infrastructure. Smaller healthcare providers have less leeway in terms of resources, making it difficult for them to provide the necessary resources.

Organizational structure significantly influences the acceptance of innovative healthcare initiatives. Concentrated senior-level decision-making can stifle creativity and accountability of end users, leading to poor decisions. Lack of management support and poor leadership can also hinder the successful integration of smart healthcare systems into routine practice.

Lack of knowledge about astute healthcare strategies can lead to a lack of meaningful change drives, decreasing the likelihood of implementing smart healthcare. Poor communication and engagement are essential for ensuring buy-in and preventing the change from failing. Inadequate planning can lead to arbitrary adoption deadlines or scheduling changes around hectic or peak periods, which can be disastrous for the organization.

Strict rules and regulations are also necessary to ensure data integrity and prevent the failure of smart healthcare initiatives. Overall, the successful implementation of smart healthcare requires a combination of organizational readiness, knowledge, and effective planning.

End users play a significant role in the adoption of smart healthcare practices, but their behaviours can influence their adoption. Concerns about privacy, privacy violations, and legal standards can hinder the adoption of smart healthcare. Additionally, lack of computer skills and inadequate training can hinder the adoption of smart healthcare. Therefore, tailored training is crucial to ensure users are well-equipped to use and benefit from these technologies.

CHAPTER 6: RECOMMENDATION

Implementing a Hospital Information System (HIS) can be a complex process with various technical hurdles. Here's a detailed workflow to address these issues effectively:

1. Proactive Planning and Assessment:

- **Requirement Gathering:** Clearly define the functionalities you need in the HIS system. This minimizes customization needs and potential compatibility issues.
- **Infrastructure Assessment:** Evaluate your existing IT infrastructure (hardware, network, software) to ensure it meets the HIS system's requirements. Consider scalability for future growth.
- **Data Migration Plan:** Develop a comprehensive plan for migrating existing patient data to the new HIS system. Address data quality concerns and ensure a secure migration process.

2. Implementation and Monitoring:

- **Phased Rollout:** Consider a phased rollout, deploying the system in stages to different departments or functionalities. This allows for controlled testing and easier troubleshooting.
- **Issue Tracking and Reporting:** Establish a clear system for documenting, prioritizing, and escalating technical issues encountered during implementation.
- **Vendor Support:** Maintain open communication channels with the HIS vendor's support team. Ensure timely access to technical expertise and updates.

3. Issue Resolution and Optimization:

- **Root Cause Analysis:** For each technical issue, conduct a thorough root cause analysis to identify the underlying problem. This helps prevent similar issues from recurring.
- **Configuration Adjustments:** Work with the vendor to adjust system configurations to address specific technical challenges. This may involve customizing workflows or integrating with existing systems.
- **Testing and Validation:** After resolving an issue, conduct thorough testing to ensure the system functions as expected and data integrity remains intact.

4. Training and User Support:

- **Comprehensive Training:** Provide comprehensive training to staff on using the new HIS system. This empowers them to identify and report technical issues effectively.
- **User Support:** Establish a robust user support system to address staff questions and concerns after implementation. This could involve a dedicated help desk or online resources.

5. Ongoing Monitoring and Improvement:

- **Performance Monitoring:** Continuously monitor the HIS system's performance, including system uptime, response times, and user feedback.
- **Regular Updates:** Implement a system for receiving and applying software updates from the vendor. This ensures you benefit from bug fixes and new functionalities.
- **Process Improvement:** Regularly review workflows and identify areas for improvement within the HIS system. Consider user feedback and best practices in healthcare IT.

CHAPTER 7: CONCLUSION

This research investigated three key areas relevant to successful smart healthcare implementation: Healthcare Information Systems (HIS) effectiveness, a framework for implementing Evidence-Based Practices (EBPs), and the challenges hindering smart healthcare adoption.

The study found that well-designed HIS can significantly improve healthcare delivery by providing easy access to information, accurate data, and user-friendly interfaces. However, certain features, like complex customization, require further evaluation regarding their impact on resource utilization.

The three-phase framework presented for implementing EBPs offers a structured approach for integrating new practices into healthcare workflows. This framework emphasizes careful planning, stakeholder engagement, strategic implementation strategies, and ongoing evaluation for successful and sustainable adoption.

Finally, the research identified three main categories of challenges hindering smart healthcare adoption: technical challenges (privacy, security, interoperability, data quality), organizational challenges (workflow disruptions, culture, resources, leadership), and environmental challenges (user behaviour, legal issues, digital divide). Addressing these challenges will be crucial for widespread and successful smart healthcare implementation.

By focusing on effective HIS design, implementing EBPs through a structured framework, and mitigating adoption challenges, healthcare institutions can harness the potential of smart healthcare solutions to improve patient care, provider efficiency, and overall healthcare delivery.

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