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DELIVERING EQUITABLE HEALTHCARE THROUGH TECHNOLOGY

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ATTESTATION

I do hereby attest that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where states otherwise by reference or acknowledgment, the work presented is entirely my own.

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DEDICATION

I dedicate this thesis to my mother who never had the opportunity to attend school but devoted her life to educate her children. To my lovely wife and the mother of my two boys, my source of inspiration, wisdom, knowledge and understanding. She has been the source of my strength throughout this program and beyond.

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ABSTRACT

In the modern world, providing equitable healthcare is a fundamental aspect of progress. The provision of healthcare is not a privilege but a human right that should be enjoyed by all. Healthcare technology can play a crucial role in delivering equitable healthcare, particularly in areas where access to healthcare services is limited. However, this technology also poses a significant risk, as healthcare organizations are vulnerable to cyberattacks due to the valuable data they hold.

The COVID-19 epidemic has highlighted some of the flaws in our healthcare system. The system's vulnerabilities and dysfunction have led to a loss of trust in the government and hindered economic progress. Technical debt in healthcare technology infrastructure has worsened the situation, resulting in a missed opportunity to transform the pandemic into a manageable crisis.

Moreover, the pandemic has widened the gap in access to healthcare, particularly in developing countries. The lack of technological infrastructure in these countries has resulted in a far and deep divide between those who have access to healthcare and those who do not. It is essential to address the issues facing healthcare technology infrastructure, particularly in light of the ongoing pandemic. By investing in healthcare technology, healthcare organizations can improve access to care while protecting patient data. Additionally, improving healthcare technology infrastructure can support economic progress by improving public health outcomes.

Overall, the provision of equitable healthcare is a human right that should be enjoyed by all. Healthcare technology plays a crucial role in delivering equitable healthcare, but it also poses a risk. The COVID-19 epidemic has revealed flaws in our healthcare infrastructure, including the

technical debt in healthcare technology infrastructure. Addressing these issues is critical to improving access to healthcare and supporting economic progress.

The research aimed to explore the potential of technology in delivering equitable healthcare. It identified several research questions, including the barriers to utilizing technology for delivering equitable healthcare, the effectiveness of telemedicine and remote monitoring technologies in improving access to healthcare for marginalized communities, and the influence of the COVID-19 pandemic on technology adoption. To achieve its objectives, the research assessed the current state of technology-based initiatives aimed at increasing equitable access to healthcare and analyzed the role of governments and healthcare organizations in promoting and implementing technology-based solutions. The study also evaluated the impact of the digital division on contact to technology-based healthcare solutions and studied the ethical and privacy concerns surrounding the use of technology in delivering healthcare.

Despite the potential benefits of technology in delivering equitable healthcare, the research identified several limitations. These included the cost of advanced technology, the need for specialized equipment, and the lack of access to technology and internet connectivity, which can perpetuate disparities in access to healthcare. Additionally, the research identified concerns over the security and privacy of sensitive medical information, the risk of perpetuating existing biases and discrimination, and the technical complexity of deploying and using technology in healthcare. Finally, the study recognized the importance of patient acceptance of technology in healthcare, as the use and acceptance of technology can vary among patients.

Overall, the research shed light on the potential of technology in delivering equitable healthcare and identified strategies for ensuring that all individuals have access to quality care.

The findings will contribute to the development of evidence-based policies and strategies for promoting equitable access to healthcare through technology.

The selected case of Toronto General Hospital and its affiliated institutions might be involved in developing and implementing technology-based solutions to address the challenges of the digital divide and ensure equitable access to healthcare. As a research institution, it might also be conducting research on how technology can be used to improve healthcare delivery, including issues related to privacy, security, and patient acceptance of technology. Moreover, as a healthcare provider, the hospital must address cybersecurity to protect patient data and ensure safe and effective care delivery.

The integration of technology in healthcare has the potential to improve access to healthcare services, increase efficiency and effectiveness of healthcare delivery, and revolutionize clinical research. However, the digital divide, referring to the unequal distribution of technology and access to the internet, presents a major challenge to ensuring equitable access to technology-driven healthcare. Standardization and interoperability of technologies are necessary for healthcare providers to access and exchange information from different technology systems, enabling the secure and efficient sharing of patient information between different healthcare organizations. It is important to address data quality, safety, and privacy, as well as the significance of regulation and the possibility of unintended bad effects in order to guarantee that digital health tools are used in a safe, ethical, and effective manner.

Research has shown that the usage of electronic health records (EHRs) can lead to improved patient outcomes, increased efficiency in healthcare delivery, and improved patient engagement and satisfaction. However, the implementation and use of EHRs can also present

challenges, including increased time spent on documentation and issues with interoperability and data sharing between different EHR systems.

Telehealth and telemedicine technologies have also been shown to improve access to care, generate cost savings, and increase provider satisfaction. However, barriers to adoption still exist, and the impact of rapid adoption of telehealth during the COVID-19 pandemic on healthcare delivery and patient outcomes requires further research.

Cybersecurity is also a critical issue in the healthcare industry, as healthcare organizations are more vulnerable to cyberattacks than other industries due to the large amount of valuable data they possess. It is important to address cybersecurity to ensure patient safety and care delivery.

CHAPTER 1: INTRODUCTION

The preservation and development of physical and mental health, particularly through the avoidance and management of sickness and harm, is referred to as healthcare. It is an industry that provides various medical services, products, and technologies to individuals, families, and communities. Healthcare services are provided by a wide range of professionals including doctors, nurses, pharmacists, therapists, and other healthcare workers.

The healthcare industry is undergoing significant transformation as technology continues to advance and show an increasingly significant role in delivering quality care. The usage of technology has likely to revolutionize healthcare by improving access, efficiency, and outcomes, particularly for underserved populations (Sikandar et al, 2022).

Healthcare is an essential aspect of modern society as it plays a crucial role in promoting and maintaining the physical and mental well-being of individuals and communities (Jain et al, 2021). The importance of healthcare can be seen in several key ways. Firstly, healthcare helps to improve and preserve individual health by providing preventive measures, early detection, and effective treatments for illnesses and injuries. This not only enhances the quality of life but also contributes to increased longevity. Secondly, healthcare helps to prevent the spread of diseases and control outbreaks through measures such as vaccination and screening programs. This helps to protect public health and reduces the burden on healthcare systems.

The widespread adoption of technology in healthcare has the potential to provide equitable access to quality care, regardless of an individual's socio-economic status. By leveraging technology, healthcare providers can improve access to services and information, streamline processes, and provide personalized care that is tailored to individual needs. Additionally,

technology can play a critical role in reducing healthcare disparities by addressing barriers to care, such as geographic isolation, cultural and linguistic differences, and economic constraints (Sikandar et al, 2022).

Given the tremendous potential of technology to improve healthcare and reduce disparities, it is imperative that we prioritize initiatives that leverage technology to deliver equitable care. This research aims to provide a comprehensive analysis of the relationship between technology and healthcare equity, and to identify opportunities for improving the delivery of healthcare through technology. The results of this research will be useful for policymakers and healthcare providers, as they seek to develop targeted interventions and programs to improve the quality of healthcare services for all individuals.

According to Forbes Tech Council (2022), the proper use of technology can play a crucial role in delivering equitable healthcare by addressing many of the challenges faced by healthcare providers and patients. Setting up effective technology systems and networks that allow for real-time sharing of information across care facilities and settings is critical to ensure that the most vulnerable patients receive the care they need. For instance, an interoperable technology infrastructure can give healthcare providers a clear view into a patient's care journey, making it easier to manage their care, improve access to services, and prevent unnecessary readmissions. This is especially important for patients with multiple providers across different care settings and healthcare entities.

Moreover, integrating real-time insights into clinicians' workflows can improve clinical efficiency and make it easier for providers to identify and treat patients with rapidly rising care needs. By providing critical context, such a system can also ensure that all care team members are working from the same page.

Finally, the implementation of efficient patient engagement practices that incorporate both care events and social determinants of health (SDoH) is crucial. This requires investment in care coordination strategies and approaches that can help providers support proactive patient engagement and care interventions, particularly for high-risk, high-utilization populations. Such an approach can streamline follow-up workflows, improve patient experiences and outcomes, and reduce the administrative burden. Moreover, according to RTI International (2022), Digital literacy and Internet connectivity have become increasingly important in today's healthcare landscape as the industry shifts towards a more digital approach to delivering care. These factors have been referred to as "super social determinants of health" due to the increasing reliance on digital or web-based technologies in the delivery of healthcare services.

The application of linked care technologies such as patient dashboards and remote patient tracking (RPM), has made it easier for patients to access their health information and receive care from the comfort of their own homes. Electronic directions, digital therapeutics, and post-visit notes also offer patients greater convenience and a more streamlined experience. SMS or text reminders and online forms further enhance the efficiency and convenience of healthcare delivery. However, the reliance on these digital technologies highlights the importance of digital literacy and Internet connectivity in ensuring that all individuals have access to quality healthcare. Those without these skills or access to technology may be left behind and face barriers in accessing healthcare services.

American Hospital Association (2022), in the pursuit of delivering equitable healthcare through technology, it is important to approach the implementation of digital solutions through a health equity lens. This means considering the accessibility and health literacy levels of potential solutions, as well as their ability to stratify data by demographic factors such as race, ethnicity,

language, and gender. The technology must also be designed to be inclusive and take into account any barriers that patients may face in using it, such as lack of internet connectivity or data plans.

In order to improve access to digital healthcare, it may be necessary to provide technology directly to patients and to use more simple and cost-effective solutions. Boston Medical Center, for example, collaborated with Rimidi purpose of providing blood pressure cuffs and an online interface to track hypertension in postpartum moms. The program was intended to operate on local cellular networks and was manned by high-risk OB nurses who provided assistance and screening. Similarly, Get Well's Docent digital patient guidance solution, which offers a text-based tool to link moms to patient navigation services across the whole of and after pregnancy, is used by Common Spirit.

Healthcare organizations can also engage with diverse patients and communities to improve digital health literacy and tailor services to meet their specific needs. This includes partnering with community-based organizations and to evaluate the perspectives of minority patients and carers the accessibility and understandability of digital solutions. Additionally, tracking patient involvement with online technologies can assist in measuring success and determining scale, as seen with the results from Boston Medical Center and Common Spirit. The high utilization of these programs, particularly in Hispanic communities, can be credited to their ability to provide services in the spoken language and dialect that preferred by patients.

The purpose of this study is to look into the potential of technology to deliver equitable healthcare and to evaluate the initiatives that are currently being undertaken to ensure that all individuals have access to quality healthcare services through technology. The research will analyze the impact of technology on healthcare equity and explore the strategies and solutions that are necessary to leverage technology in a way that benefits all individuals, regardless of their socio-

economic status, race, or location. The purpose of this study is to offer insights and suggestions to healthcare groups, technology providers, and policymakers to help advance the use of technology to improve healthcare equity and access.

1.1 Background of the Research

The healthcare industry has undergone significant technological advancements in recent years. The widespread adoption of digital technologies such as telemedicine, remote patient monitoring, and electronic health records has made it possible to provide quality care to patients regardless of their location or mobility. With the increasing availability of technology, the healthcare sector has the potential to make healthcare services more accessible and equitable, particularly for communities that have traditionally faced barriers to access (Sikandar et al, 2022).

However, while technology has the potential to bridge the gap in healthcare access, it is also important to consider its impact on health equity. There are still disparities in healthcare access and outcomes between different communities, particularly marginalized populations. This highlights the need for a more intentional and inclusive approach to technology adoption in healthcare that prioritizes health equity.

In light of these challenges, it is essential to conduct research on how technology can be leveraged to deliver equitable healthcare. This research aims to explore the impact of technology on healthcare access and equity, with a focus on identifying best practices and initiatives that can help to address existing disparities and promote health equity. The ultimate goal of this research is to provide a roadmap for healthcare organizations and technology partners to ensure that technology-enabled healthcare is accessible and equitable for all individuals.

According to Hollis et al, (2015), technology's rapid advancement, especially mobile digital media and communication future technologies, has had a considerable influence on how people interact, access information, and conduct transactions. In the UK, almost three-quarters of people use the internet on a regular basis and a similar percentage have purchased goods or services online. The use of mobile phones to access the internet has more than doubled in the past few years, and a majority of UK adults now own a smartphone. This widespread adoption of technology has also as a result of which there has been a rise of people using the World Wide Web for health-related material, with 43% of adults seeking such information online. These trends indicate a growing comfort and familiarity with technology for a range of purposes among large sections of society.

E-health and m-health, also known as connected health, allude to the computerized administration of healthcare via a variety of devices such as mobile phones, remote tracking devices, and other wireless connections (Lareyre et al, 2022; Sikandar et al, 2022),. By enabling more adaptable and customized service delivery, these digital innovations have the potential to significantly enhance access to mental healthcare and raise treatment efficacy. There are currently several more new opportunities to involve and encourage patients in their mental health path, thanks to recent developments in sensing technology, online psychological treatment, remote video advice, mobile applications, and entertainment. These innovations offer novel methods to both mental health evaluation and intervention, and they have the possibility of significantly enhancing the standard of mental health treatment (Hollis et al, 2015).

According to HIMSS, Healthcare technology has the potential to revolutionize the way care is delivered and make it more accessible to everyone. However, there is a growing digital divide, with some individuals and communities still lacking access to the technology they need to

take advantage of these advancements. This gap in access can exacerbate existing health disparities and leave vulnerable populations without the care they need.

To ensure that everyone has equal access to quality healthcare, it is essential to prioritize initiatives that bridge this digital divide. This could involve making digital access a basic right, similar to electricity and heat, and providing the necessary infrastructure and support to ensure that everyone has the ability to connect. The healthcare industry must also work to ensure that technology is used in a way that is equitable and does not perpetuate existing disparities (Sikandar et al, 2022).

The COVID-19 pandemic has highlighted the importance of digital technology in delivering care, with many patients and healthcare providers relying on remote communication and virtual consultations. However, it has also shown that there are still significant barriers to accessing technology and digital healthcare, particularly for marginalized populations. By addressing these barriers and ensuring equitable access to technology, we can help to ensure that everyone has the care they need to stay healthy (HIMSS).

1.2 Research Questions

Technology development has the ability to significantly enhance the availability of healthcare and ensure that all individuals have the care they need. However, without careful planning and implementation, technology-based solutions for healthcare can perpetuate existing inequalities and fail to reach those who need it most. To fully realize the benefits of technology in healthcare, it is essential to prioritize initiatives that leverage technology to deliver equitable access to quality care. The following research questions aim to explore the current state of technology in

healthcare, the challenges to delivering equitable care, and the strategies for ensuring that all individuals have access to the healthcare they need.

- What technology-based initiatives exist to increase equitable access to healthcare?
- What are the barriers to utilizing technology for delivering equitable healthcare, and how can they be overcome?
- How effective are telemedicine and remote monitoring technologies in improving access to healthcare for marginalized communities?
- What role can governments and healthcare organizations play in promoting and implementing technology-based solutions for equitable healthcare?
- How can the digital divide be addressed to ensure that technology-based healthcare solutions are accessible to all individuals, regardless of socioeconomic status?
- How can healthcare providers ensure that the use of technology in delivering care is ethical and protects patient privacy and autonomy?
- What impact has the COVID-19 pandemic had on the adoption and implementation of technology-based healthcare solutions, and what are the lessons learned?

1.3 Research Objectives

The study goals that might have been derived from the research summary are as follows:

- To assess the current state of technology-based initiatives aimed at increasing equitable access to healthcare.
- To identify and analyze the barriers to utilizing technology for delivering equitable healthcare and potential solutions to overcome these barriers.

- To evaluate the effectiveness of telemedicine and remote monitoring technologies in improving access to healthcare for marginalized communities.
- To explore the role of governments and healthcare organizations in promoting and implementing technology-based solutions for equitable healthcare.
- To examine the impact of the digital division on contact to technology-based healthcare solutions and strategies for addressing it.
- To study the ethical and privacy concerns surrounding the use of technology in delivering healthcare and potential solutions to mitigate these concerns.
- To analyze the consequences of the COVID-19 epidemic on the adoption and implementation of technology-based healthcare solutions and the lessons learned.

1.4 Rationale

The rationale for conducting research on delivering equitable healthcare through technology is rooted in the growing recognition that technology has the potential to greatly improve access to quality care. With the increasing use of digital devices, the internet, and telemedicine, technology has the potential to break down traditional barriers to healthcare access and provide more flexible, personalized care to patients. However, without careful planning and implementation, technology-based solutions for healthcare can perpetuate existing inequalities and fail to reach those who need it most.

Given the rapid pace of technological change, there is a need to understand the current state of technology-based initiatives aimed at increasing equitable access to healthcare and identify any challenges that need to be addressed. This study seeks to fill that void by evaluating the impact of

technology on the delivery of healthcare and identifying strategies for ensuring that all individuals have access to the care they need.

Moreover, with the COVID-19 pandemic, the use of technology-based solutions for healthcare has increased dramatically, providing valuable insights into the potential benefits and challenges of these solutions. By examining the impact of the pandemic, this research will shed light on the role of technology in delivering equitable healthcare in the future.

In conclusion, the research on delivering equitable healthcare through technology is critical in understanding how technology can be used to guarantee that all people, regardless of socioeconomic position or location, have access to excellent care. This research will contribute to the development of evidence-based policies and strategies for promoting equitable access to healthcare through technology.

1.5 Limitations of the Research

The advancement of technology has been touted as having the potential to revolutionize healthcare and provide equitable access to quality care. However, there are several limitations to consider in order to achieve this goal. Firstly, the cost of advanced technology and the need for specialized equipment can limit access to healthcare for individuals in lower-income communities. This is particularly true for marginalized populations who may already face barriers to accessing care. Additionally, the lack of access to technology and internet connectivity can perpetuate disparities in access to healthcare. Concerns have been raised about the confidentiality and safety of sensitive medical information as a result of the pervasive use of technology in healthcare. There is also a risk that the development and deployment of technology in healthcare may perpetuate

existing biases and discrimination, leading to unequal access to care and outcomes. The technical complexity of deploying and using technology in healthcare can also limit its widespread adoption and use, particularly for those without specialized training and support. Integrating different technologies and systems across healthcare organizations can also be challenging and limit the effective use of technology in delivering equitable healthcare. Finally, patient acceptance of technology must be considered, as the use and acceptance of technology can vary and efforts to leverage technology must take into account patients' preferences and comfort levels.

1.6 Hypothesis

The following hypothesis is proposed can be generated based on the study queries and goals:

- Hypothesis 1: The utilization of technology-based initiatives can increase equitable access to healthcare.
- Hypothesis 2: The barriers to utilizing technology for delivering equitable healthcare can be overcome through effective planning and implementation.
- Hypothesis 3: Telemedicine and remote monitoring technologies are effective in improving access to healthcare for marginalized communities.
- Hypothesis 4: Governments and healthcare organizations play a critical role in promoting and implementing technology-based solutions for equitable healthcare.
- Hypothesis 5: Addressing the digital divide can ensure that technology-based healthcare solutions are accessible to all individuals.
- Hypothesis 6: The use of technology in delivering care can be made ethical and protect patient privacy and autonomy through effective policies and guidelines.

- Hypothesis 7: The COVID-19 epidemic has improved the adoption and implementation of technology-based healthcare solutions.

1.7 Nature of the Study

The nature of the study is qualitative in nature and will be guided by a critical and interpretive approach. The study will use a multi-method approach, including literature review, expert interviews, and case studies, to explore the current state of technology-based initiatives aimed at increasing equitable access to healthcare and the challenges to utilizing technology for delivering equitable care. The study will also evaluate the effectiveness of telemedicine and remote monitoring technologies in improving access to healthcare for marginalized communities and examine the role of governments and healthcare organizations in promoting and implementing technology-based solutions for equitable healthcare. Additionally, the study will address the impact of the digital divide and ethical and privacy concerns surrounding the use of technology in delivering healthcare. The findings from this study will contribute to the development of evidence-based policies and strategies for promoting equitable access to healthcare through technology.

1.8 Definition of Terms

- ***Telemedicine***: The delivery of medical care or consultation through telecommunication and information technologies.
- ***Remote Patient Monitoring:*** A way of providing healthcare that employs technology to watch patients outside of conventional care settings.
- ***"Electronic Health Records" (EHR):*** A digital form of a patient's medical background and documents.

- ***Health Equity:*** A condition in which all people, regardless of race, ethnicity, or socioeconomic position, have the chance to reach their maximum health potential..
- ***Connected Health:*** The computerized distribution of healthcare via different gadgets like cell phones, remote tracking devices, and wireless connections.
- ***E-Health:*** The delivery of healthcare services through electronic means, such as through the internet or electronic health records.
- ***M-Health:*** The use of mobile phones or other mobile devices to access healthcare services or information.

1.9 Assumptions of the Research

The study operates under several key assumptions. Firstly, it is assumed that access to technology-based healthcare solutions is not evenly distributed across different populations and communities, leading to disparities in access to quality care. Secondly, the study assumes that while technology has the potential to improve access to healthcare, careful planning and implementation are essential to ensure that these benefits are realized for all individuals. Additionally, the study assumes that telemedicine and remote monitoring technologies can effectively improve access to healthcare for marginalized communities, but barriers to adoption and implementation need to be addressed. The study also assumes that governments and healthcare organizations have a crucial role in promoting and implementing technology-based solutions for equitable healthcare. Furthermore, the study assumes that the digital divide and ethical and privacy concerns surrounding the use of technology in delivering healthcare must be addressed to ensure equitable access to technology-based healthcare solutions for all individuals. Lastly, the study assumes that the COVID-19 pandemic has accelerated the adoption of technology-based

healthcare solutions, providing valuable insights into the potential benefits and challenges of these solutions. By exploring the current state of technology-based initiatives aimed at increasing equitable access to healthcare and the challenges to utilizing technology for delivering equitable care, this research will contribute to the development of evidence-based policies and strategies for promoting equitable access to healthcare through technology.

1.10 Significance of the Research

The significance of this investigation lies in its contribution to the understanding of how technology can be leveraged to improve access to healthcare and guarantee that all people, no matter their socioeconomic position or location, have access to high-quality treatment. With the rapid pace of technological change, it is critical to assess the current state of technology-based initiatives aimed at increasing equitable access to healthcare and identify any challenges that need to be addressed. This research will fill this gap by evaluating the impact of technology on the delivery of healthcare and identifying strategies for ensuring equitable access to care.

Moreover, the COVID-19 pandemic has highlighted the importance of technology-based solutions for healthcare and the need for equitable access to these solutions. The reading of the effect of the epidemic on the adoption and implementation of technology-based healthcare solutions and the lessons learned will provide valuable insights into the role of technology in delivering equitable healthcare in the future.

In conclusion, this research has the potential to inform the development of evidence-based policies and strategies for promoting equitable access to healthcare through technology, addressing the current disparities in access to quality care. The results of this study will be of interest to

healthcare providers, governments, policymakers, and the general public who are concerned with ensuring equitable access to quality healthcare for all individuals.

CHAPTER 2 LITERATURE REVIEW

The integration of technology into healthcare has been a subject of great attention and discussion in recent years, particularly in light of the growing need for more accessible, affordable, and equitable healthcare (Senbekov et al, 2020). With the rapid advancement of digital technologies, there is significant potential for these technologies to transform the healthcare landscape and improve health outcomes for individuals and communities.

Studies have shown that technology can help to improve access to healthcare, particularly in underserved and rural areas. For example, telemedicine and remote monitoring technologies have been found to be effective in delivering health services to patients who live in rural or remote areas, reducing the need for travel and increasing access to specialized care (Sharma et al, 2018). Additionally, Technology has the ability to enhance the efficiency and usefulness of healthcare delivery. Electronic health records (EHRs) have been demonstrated to increase precision and completeness of patient information, enabling healthcare providers to make informed decisions and giving a more complete picture of a patient's medical background (Senbekov et al, 2020).

Despite these potential benefits, there are still many challenges that must be addressed to ensure that technology-driven healthcare is equitable and accessible to all. One major challenge is the digital divide, which refers to the unequal distribution of technology and access to the internet. This divide can limit access to digital health services for individuals and communities in low-income or rural areas. Another challenge is the need for standardized and interoperable technologies. In order for technology to truly revolutionize healthcare, it must be possible for healthcare providers to access and exchange information from different technology systems. This requires the development of standardized protocols and data exchange mechanisms that ensure

that patient information can be securely and efficiently shared between different healthcare organizations (Senbekov et al, 2020). Overall, while technology has the potential to deliver equitable healthcare and improve health outcomes, it is essential that we prioritize initiatives that focus on addressing the challenges of digital divide and interoperability. These initiatives must be designed to ensure that technology-driven healthcare is accessible, affordable, and equitable for all individuals, regardless of their income, location, or other factors.

According to Sharma et al, (2018), Digital health tools have the potential to change clinical research. By streamlining processes, lowering expenses, and hastening the implementation of outcomes. They have the potential, in particular, to simplify randomized clinical trials (RCTs) that have grown increasingly costly, complicated, and time-consuming to complete. However, the incorporation of digital health tools into clinical studies has yet to be thoroughly investigated, and there are several challenges that need to be addressed. One of the main challenges is data quality, safety, and privacy, as digital health technologies generate a large amount of sensitive patient data. This data must be protected and managed in a secure and responsible manner to ensure patient privacy.

Another issue is the lack of regulatory oversight, as the use of digital health technologies in clinical study is not yet completely standardized. Policymakers need to safeguard that digital health technologies are used in a safe and ethical manner, while also protecting the interests of patients, researchers, and the broader healthcare system. There is also the potential for digital health technologies to have unintended negative consequences (Sharma et al, 2018). For example, they may lead to a decline in patient-physician interaction, as more tasks are automated and patients are increasingly interacting with technology rather than with healthcare providers.

Additionally, the incorporation of digital technologies into clinical processes may result in a paradoxical decline in output.

2.1 Electronic Health Records (EHR) can play even a stronger role delivering equitable Healthcare

EHR (Electronic Health Record) refers to a digital form of a patient's medical data. An EHR is a complete, long-term document of a patient's health information, which includes data, medical history, medicines, blood test results, radiology pictures, and other information (Tran Ngoc et al, 2018). When compared to conventional paper-based medical records, EHRs are stored electronically, making it simpler for healthcare providers to view and exchange patient information. EHRs have the potential to enhance the accuracy, speed, and safety of healthcare administration and help to upkeep better decision-making and coordination of care as according to Therapy Brands (Rafi, 2022).

An example of an EHR in use is as follows:

A patient visits their primary care physician for a check-up. During the visit, the physician updates the patient's EHR with information about their symptoms, vital signs, and any other relevant information (Rafi, 2022). The physician also orders laboratory tests and prescribes medication, which is recorded in the EHR. Later, the patient visits a specialist for a follow-up appointment. The specialist is able to access the patient's EHR and see a complete and up-to-date a complete image of the patient's health, including medical background, medications, and test findings, any other relevant information (Cantor & Thorpe, 2018). Based on this information, the

specialist is able to provide informed and effective care, without the need for additional testing or duplicating information.

This example demonstrates the efficiency and improved care that can result from the use of an EHR. By having access to a comprehensive and up-to-date medical record, healthcare providers can make informed treatment decisions, avoid medical errors, and improve patient outcomes (Cantor & Thorpe, 2018).

An EHR provides many benefits to both patients and providers. Some of the benefits of EHRs include:

- Improved patient care: EHRs provide a complete and accurate picture of a patient's health history, which can help providers make informed treatment decisions and avoid potential medical errors (Tran Ngoc et al, 2018).
- Increased efficiency: EHRs automate many administrative tasks and eliminate the need for manual charting, freeing up providers to spend more time with patients.
- Better communication: EHRs facilitate the exchange of patient information among clinicians, increasing care collaboration and lowering the risk of information overlap or omission.
- Improved patient engagement: Patient portals are frequently included in EHRs, allowing patients to examine their health information, interact with their providers, and control their own wellbeing (Cantor & Thorpe, 2018).
- Improved population health management: EHRs can be used to identify and track public health trends, improve disease management and prevention, and facilitate research.

Overall, EHRs have the ability to enhance healthcare service quality, protection, and effectiveness. However, it is important to note that the implementation and use of EHRs can be challenging and requires significant resources, including funding, training, and support.

According to EHR Intelligence, The quote "You need a really good idea about the patient's journey through the medical system to be able to make informed decisions" by John Van Reenen emphasizes the significance of having a comprehensive understanding of a patient's medical history and treatment journey. By having access to all relevant information, healthcare providers can make more accurate recommendations and provide better care (Rafi, 2022).

By giving a full and up-to-date account of a patient's health information, "electronic health records" (EHRs) can play a critical role in enabling this knowledge. EHRs can assist in making sure that all pertinent information, such as data, medical history, medicines, blood test results, radiology pictures, and more, is readily available and shared among healthcare professionals. Furthermore, specialty EHRs, which are intended to record data pertinent to particular groups or health conditions, may offer a more complete and accurate image of a patient's health. This can lead to improved decision-making and better health outcomes for patients, especially those from underrepresented and marginalized communities (Cantor & Thorpe, 2018).

The quote by "Laurie Zephyrin, MD, MBA, MPH, Vice President of Delivery System Reform at the Commonwealth Fund", highlights the important role that data plays in understanding and addressing healthcare disparities (Tran Ngoc et al, 2018). The quote states that data allows us to understand "where the inequality is" and to "target the intervention." This means that having access to accurate and complete data can help healthcare providers and system administrators identify areas of inequality in the healthcare system and develop targeted interventions to address these issues (EHR Intelligence).

Healthcare disparities refer to differences in access to care and quality of care experienced by different population groups. These disparities can be based on various factors such as race, ethnicity, socioeconomic status, and geography. Addressing healthcare disparities is an important goal in improving overall healthcare quality and ensuring that all individuals have access to the care they need. However, addressing healthcare disparities can be a complex and challenging task. Without accurate and complete data, it can be difficult to identify the root causes of disparities and develop effective solutions. Data allows healthcare providers and system administrators to gain a deeper understanding of the healthcare system and the barriers that prevent certain population groups from accessing quality care (Tran Ngoc et al, 2018).

2.2 Interoperability

Interoperability is a crucial aspect of healthcare information technology. It pertains to the capacity of various information systems, platforms, and apps to share and use data in a seamless manner (Belchior et al, 2021). This is important in the healthcare industry because it enables healthcare providers to access and share patient records across groups and systems to improve patient treatment quality (HIMSS). For example, when a patient visits a specialist for the first time, the specialist may need access to the patient's medical history, lab results, and other important information. If the professional's EHR system is compatible with the EHR system of the patient's primary care provider, the specialist will be able to access this information in real-time, improving the quality of care the patient receives (Zeng, 2019).

Interoperability also helps to optimize the health of individuals and populations by allowing healthcare providers to access information from various sources, such as public health agencies and data registries, to better understand the health of a particular population and develop

targeted interventions to improve health outcomes (Belchior et al, 2021). To achieve interoperability, healthcare organizations must adopt shared exchange of data architectures, application interfaces, and criteria. This ensures that statistics can be shared and accessed securely and appropriately through different organizations consisting various systems. It is also important to have the necessary security measures in place to protect the privacy and confidentiality of patient information (Zeng, 2019).

Interoperability is the ability of various connected healthcare information systems, allowing them to work together to exchange seamless data transmission, the interoperability of these systems is divided into four levels, each with its own set of requirements and standards (HIMSS).

- The first level, called the Foundational (Level 1), focuses on ensuring secure communication between different systems. It establishes the technical requirements for data exchange, such as secure communication protocols, data encryption, and authentication (Belchior et al, 2021).

- The second level, called the "Structural" which is (Level 2), deals with the syntax and format in organizations in terms of data exchange. This level defines how data is organized and structured, ensuring that data can be interpreted correctly by different systems.

- The third level, called the Semantic (Level 3), ensures that data has a common understanding between different systems. This level focuses on the use of standardized data elements with shared definitions, allowing data to be interpreted consistently across different systems (Zeng, 2019).

- The fourth and final level, called the Organizational (Level 4), considers the governance, policy, social, legal, and organizational aspects of data exchange. This level helps to ensure the secure and seamless communication of data between organizations, entities, and individuals, and enables integrated end-user processes and workflows.

Interoperability, as defined by the Primary Care Development Corporation, is the capacity of various computer systems to access, exchange, and use data in a coordinated way. Despite the benefits it provides, implementing interoperability is not a straightforward task. According to a recent report by the Center for Connected Medicine, fewer than 40% of health systems are currently successful in sharing their data with other systems (Belchior et al, 2021).

One of the main challenges in achieving true interoperability is the use of a mix of cloud APIs and interfaces. APIs (Application Programming Interfaces) are sets of protocols and tools for building software applications (Leal et al, 2019). They allow different systems to communicate with each other and share data. However, these APIs can vary greatly between systems, making it difficult for them to communicate with each other effectively. Interfaces, on the other hand, are the points of interaction between systems, and can also pose challenges to interoperability if they are not designed to be compatible with each other (Leal et al, 2019). In order to overcome these challenges and achieve interoperability, healthcare organizations need to adopt common data standards, invest in secure data sharing infrastructure, and establish policies and guidelines to ensure the safe and secure exchange of patient data (Belchior et al, 2021). Only then can they achieve the benefits of interoperability, such as improved patient care, reduced healthcare costs, and increased efficiency in the healthcare system (Zeng, 2019).

Interoperability in healthcare, according to Cardoso (2018), refers to the capacity of various health information systems to work together and share data smoothly. This is an important issue

because in many healthcare facilities, staff use a variety of independent technologies that may cause difficulty in exchanging information between systems. The electronic health record (EHR) is a critical component in healthcare that provides a horizontal view of medical records and helps in problem solving, decision making, and information exchange. However, the complexity of different health information systems makes the development of a global information system difficult and incomplete (Leal et al, 2019). The “Health Level Seven International” (HL7) was established in 1987 to provide a complete structure and related standards for digital health information interchange, integration, sharing, and retrieval in order to meet the challenges of interoperability. HL7 has evolved over time and currently, the emphasis is on semantic interoperability, which includes the proper use of sharing information in the context of the talking application's behavior (Zeng, 2019).

Intelligent agents have emerged as a promising technology for interoperability in healthcare. Agents are computational beings that have characteristics such as agency, communication, response, proactivity, and psychological state. Agent-based systems can address issues related to diversity, distribution, as well as participation by enabling contact between various health information systems (Leal et al, 2019). In conclusion, interoperability is essential for the delivery of high-quality healthcare and must be given high priority in the development of health information systems. The use of HL7 standards and intelligent agents can help address the challenges of interoperability in healthcare.

The “Agency for Integration, Diffusion, and Archive of Medical Information” (AIDA) is a solution aimed at solving the problem of heterogeneous and distributed health information systems (HIS) that use different protocols and languages (Zeng, 2019). AIDA's aim is to integrate various information sources to offer a unified strategy to managing and archiving medical

information. AIDA is built on the multi-agent system idea, which provides a novel and suitable method of creating complex systems in flexible and changing environments. The use of intelligent agents in AIDA enables the modelling of human decision-making in the healthcare profession, making it simpler to watch healthcare personnel's behavior and having a significant influence on the process of gaining and verifying knowledge. AIDA also provides for the administration of the agent's complete life cycle, as well as the distribution of HIS modules.

The HL7 standard is critical to the application of interoperability in AIDA because it provides standardization of medical reports into "eXtensible Markup Language" (XML) frameworks as well as a lexicon definition for communications and clinical records (Leal et al, 2019). HL7 services can be applied in AIDA through using agent model, which provides broad compatibility and can be combined with more specialized behaviors such as machine learning and AI methods (Zeng, 2019).

AIDA is a multi-agent system (MAS) that consists of different categories of agents such as "proxy agents" (PAs), "decision agents" (DAs), "computing agents" (CAs), "resource agents" (RAs), and "interaction and explanation agents" (IEAs) (Zeng, 2019). These agents interact with each other through messages and perform various tasks such as providing bridges between users and the system, accepting tasks from PAs, processing tasks assigned by DAs, accessing specific information resources, and acting based on argumentative processes (Leal et al, 2019). The AIDA database is constructed on an "Oracle Real Application Clusters" (RAC) System and seems to have a data guard system in place to guarantee data access, dependability, and catastrophe recover. A fault forecasting system is required to anticipate and avoid faults, and the operation of the database must be watched to accomplish this objective. By monitoring the database's performance, a forecasting model can be adapted to the database context (Belchior et al, 2021).

2.3 Cyber-Security and it's rising threat and government policy needs to provide equitable Healthcare

Cyber security is a critical issue that can have a significant impact on patient safety in the healthcare industry. According to John Riggi, senior adviser for cybersecurity and danger at the "American Hospital Association", hospital senior managers should regard cybercrime as a patient safety, business risk, and strategic concern that should be incorporated into the hospital's current risk-management structure. (AHA).

Healthcare organizations are more vulnerable to cyberattacks than other industries because they possess a large amount of valuable data, such as patients' protected health information (PHI), financial information, and medicine research-related intellectual property and innovation. According to the AHA, stolen health records can trade for up to ten times the price of stolen credit card information on the dark web, as well as the cost to rectify a compromise in healthcare is nearly three times higher, reaching $408 per stolen health record versus $148 per stolen non-health record (Munyolo, 2021). Therefore, it is crucial for healthcare organizations to prioritize cybersecurity measures to protect patient safety and ensure the continuity of effective care delivery. By aligning cybersecurity and patient safety initiatives, healthcare organizations can mitigate the risk of data breaches and other disruptions that can negatively impact clinical outcomes (Nalven et al, 2022).

Cyberattacks can have a significant impact on the healthcare industry and its patients. A recent study found that the most frequent consequence of such attacks is the delay of procedures and tests. This leads to longer patient stays, resulting in decreased efficiency in the healthcare system and reduced quality of care for patients. These consequences highlight the importance of implementing strong cybersecurity measures in healthcare organizations to prevent such attacks and protect patient safety (Kumar et al, 2022). Universal Health Services, a healthcare chain, faced

a cybersecurity incident in 2020 that resulted in substantial financial losses and operational disruptions. The cost of the incident was estimated to be $67 million, as the company had to redirect ambulance traffic and schedule patient procedures at alternative healthcare facilities (Munyolo, 2021). This incident highlights the far-reaching impacts that cybersecurity incidents can have on healthcare organizations, and the importance of taking proactive measures to prevent such incidents from occurring (Nalven et al, 2022). By investing in robust cybersecurity systems, healthcare organizations can minimize the risk of downtime, financial losses, and other consequences associated with cybersecurity incidents. Additionally, having robust incident response plans in place can help organizations quickly recover from any security breaches and minimize the impact on patient care (Kumar et al, 2022).

The COVID-19 pandemic has accelerated the trend of healthcare becoming more accessible from anywhere, as patients can access medical services from the comfort of their own homes through telehealth. Elizabeth Butwin Mann, the strategy and execution leader for EY's Americas Technology Consulting business, highlights that telehealth has created new opportunities for remote access to medical devices, connectivity to healthcare professionals, and the entire care ecosystem (HealthITSecurity). However, as telehealth usage continues to rise, it has become increasingly important for the healthcare sector to address the security and privacy risks that come with it. The security of electronic medical records (EMRs) has never been more crucial, especially as telemedicine continues to grow and Retailers start providing healthcare services like blood tests, immunizations, and medical screening.

Additionally, according to HealthITSecurity, patients are now able to receive more personalized healthcare options, such as precision medicine, where treatments are customized to particular patient categories based on variables such as age, genetics, or health conditions. To

ensure patient privacy and safety, it is vital that all connected organizations prioritize security when dealing with sensitive patient data (Nalven et al, 2022).

Healthcare cyber security is a critical issue that needs to be addressed to ensure the safety and privacy of patients. There are several challenges that healthcare organizations face in this area, some of which are discussed below.

1. Patient Privacy Protection: One of the primary concerns in healthcare cyber security is protecting patient privacy. Healthcare organizations store sensitive information about patients, such as their personal health information, financial data, and other confidential information. Protecting this information is essential to ensure that patients' rights are not violated, and their information is not misused.
2. Vulnerabilities of Legacy Systems in Healthcare: Many healthcare organizations still use legacy systems that are vulnerable to cyber-attacks. These systems often lack the latest security features and are not designed to handle the current threat landscape. Upgrading these systems is crucial to reduce the risk of cyber-attacks.
3. Challenges of IT in Healthcare: Another issue faced in healthcare cyber-security is the integration of information technology into the healthcare industry. Health IT systems often involve multiple stakeholders, including hospitals, clinics, and health departments, making it challenging to standardize and secure the systems (Neo, 2021).
4. Security Breaches in Healthcare: Despite the efforts to secure healthcare systems, security breaches still occur. These breaches can lead to the exposure of sensitive information, which can have serious consequences, including reputational damage, financial losses, and lawsuits.

5. To mitigate these issues, healthcare organizations need to modernize their systems to reduce the risk of cyber-attacks and improve care outcomes. This can include implementing advanced security measures, such as encryption and multi-factor authentication, and regularly updating their systems to ensure that they are protected against the latest threats (Munyolo, 2021). Additionally, organizations should develop a comprehensive cyber-security strategy that aligns with their overall business objectives, taking into account the unique needs and challenges of their organization (Aman & Al Shukaili, 2021).

The use of technology in healthcare is rapidly growing and is seen as a method to advance the excellence of care and reduce risk. With technology, medical professionals are able to communicate more easily with patients and other healthcare providers through the use of smartphone apps, telehealth software, and texting (Munyolo, 2021). These tools help to facilitate better and more efficient communication between healthcare providers, allowing for better patient care.

Patients also benefit from the use of technology in healthcare, as digital health apps and patient portals provide them with more control over their own health. These tools allow patients to check on test results, schedule appointments, and manage their medication regimens, making healthcare more accessible and convenient (Aman & Al Shukaili, 2021). Furthermore, technology has the potential to improve the operations of healthcare facilities. By automating processes and reducing administrative workload, technology can improve the efficiency of healthcare facilities and lead to better care delivery. In addition, the implementation of technology can help to reduce costs and increase revenue by streamlining processes and reducing the need for manual labor (Nalven et al, 2022).

According to Tully, (2020) preventing and responding to disasters, both natural and man-made, is a crucial aspect of public health. Governments at all levels in the US have been responsible for leading disaster preparation and response efforts through policy and asset management for over a century. The field of disaster medicine has developed simultaneously to address the human injury and death that often results from disasters. The 9/11 assaults were the most important catalyst for improvements in disaster drug and public health policy. The technological advances in healthcare has totally transformed the administration of medical treatment in current history. Clinicians today rely heavily on computer-based systems and connected technology in healthcare organizations, as well as electronic medical records and a variety of other tools for maintaining the present level of service (Munyolo, 2021). While traditional disaster drug focuses mainly on natural disasters, the growing reliance on technology in healthcare poses a new challenge with in face of disease breakouts, mass fatalities, or terrorist strikes (Neo, 2021). Because of weaknesses in cybercrime, technical developments that have enhanced medical crisis reaction and care delivery are currently at danger becoming the root cause

of new disasters. The field of cybersecurity seeks to safeguard computer-based new tech from disruption caused by tampering with software, hardware, or internet connectivity (Nalven et al, 2022). Healthcare cybersecurity is in a vulnerable situation, according to a 2017 survey by the "Department of Health and Human Services". This is because of things like a lack of information security researchers, out-of-date legacy equipment, overly connected technology, and the prevalence of software bugs (Tully, 2020). On May 12, 2017, the WannaCry virus hit computer systems in over 150 countries and caused widespread disruption, particularly in the UK's "National Health Service" (NHS). The malware, a form of ransom-ware, attacked machines by exploiting a software flaw in earlier versions of Windows. This data being encrypted on the computer implied that now the data was unavailable unless a ransom in the form of bitcoin was paid. The NHS assault interrupted the usual activities of over 80 hospitals for four days, causing thousands of planned procedures and clinical visits to be postponed, medical equipment to be incapacitated, and vehicles to be redirected. While there was no rise in overall mortality, the NHS believes that the assault cost £92 million ($115 million).

In the US, healthcare computer systems largely escaped the effects of the WannaCry virus but were not immune to other ransomware attacks, such as the one that occurred at Hollywood Presbyterian Hospital in California in 2016. The hospital was forced to pay a ransom of $17,000 in bitcoin to the attackers, who held its information hostage for 10 days. These types of attacks have resulted in significant financial and reputational consequences for affected hospitals, including fines and litigation, as well as harm to patients due to breaches of protected health information and delays in medical care (Munyolo, 2021). Despite the fact that computer weaknesses pose a public health risk, little peer-reviewed research on the consequences of these events has been released. Previous research on comparable care delays, however, has shown that

adverse effects on patient populations are probable. Breach of private health information has also been linked to a rise in mortality risk from cardiac attacks.

Various government organizations in the United States oversee and lead catastrophe and emergency response activities, including the “Departments of Defense”, “Home Affairs”, and “the departments of health and human services”. There are also a number of public and private alliances and information exchange groups that offer advice on best practices for healthcare protection (Munyolo, 2021). The "Framework for Improving Critical Infrastructure Cybersecurity", published by the “National Institute of Standards and Technology” in 2018, is the most commonly used template for improving vital infrastructure information security in healthcare.

At the state level, there are various departments, agencies, and organizations responsible for disaster preparedness and response, with overlapping jurisdictions and responsibilities. In addition, there are private entities and hospitals that have developed disaster plans and conducted drills to prepare for cyber disasters. These efforts aim to reduce the impact of cyberattacks on public health and healthcare delivery. The main regulation regarding public health cybersecurity is from the “Centers for Medicare and Medicaid Services” (CMS) under the “Department of Health and Human Services” (Neo, 2021). The CMS has mandated that healthcare institutions install security software to protect against malware infections and cyber-attacks. However, due to outdated tools and running systems, software upgrades can be difficult, as seen with the WannaCry ransomware infection. The “Health Insurance Portability and Accountability Act” (HIPAA) also tackles cybercrime, but it is primarily concerned with reporting events that result in the disclosure of more than 500 people' data (Munyolo, 2021). HIPAA's guidance on how to adopt steps to avoid such exposures is vague and allows space for interpretation. CMS and HIPAA laws both require each healthcare establishment to designate an emergency manager to supervise the creation of

disaster response and recovery plans strategies, including cybercrime plans (Neo, 2021). However, there are fewer resources available for developing cybersecurity-specific plans compared to other types of disasters, and the scarcity of skilled cybersecurity employees is a barrier to widespread adoption.

2.4 Telemedicine and Telehealth

According to Anaya, (2022) the current telemedicine/telehealth policies across states are focused on determining which services, professionals, and settings are eligible for reimbursement. The specific services and reimbursement methods vary greatly from state to state. Since May 2020, all Medicaid programs allow for the delivery of general care services via technology, and 31 states also allow for the delivery of prenatal services via telehealth. 18 states permit reimbursement for telephone services (Krupinski & Bernard, 2014). The "Centers for Medicare & Medicaid Services" (CMS) just made variations to their Medicare payment policies, requiring the inclusion of certain services, such as behavioral health care services, through December 31, 2023 (Kvedar et al, 2014). However, there are still ongoing barriers to accessing telehealth services, even as Medicare continues to expand their telecommunication technologies. As during COVID-19 epidemic, employees of a low-income family medical staff and limited English proficiency (LEP) patients reported difficulty in accessing telehealth services (Ganesh et al, 2020).

The rise of telemedicine has brought with it several benefits, especially for lower-income patients who might not be able to skip work for in-person visits. The use of technology, such as smartphones, has helped to bridge the gap in access for under-resourced communities (Ganesh et al, 2020). However, not all states or insurance providers currently cover phone visits as a form of telemedicine. Philanthropic organizations have stepped in to provide support, but there is still a

long way to go to ensure equitable access to telemedicine (Anaya, 2022). Despite its advantages, telemedicine still faces several challenges in terms of equity. Many people who are neglected and under-resourced do not have access to technology and may struggle with digital literacy. Additionally, telehealth platforms are primarily English-only, which presents difficulties for patients with limited English proficiency. Furthermore, low-income patients may not have access to private space for virtual visits, and limited home broadband access can also impact the quality of their experience (Krupinski & Bernard, 2014).

To address these structural barriers, policy solutions are needed. These could include expanding digital skills training, using communication applications that are already widely used, and ensuring telehealth platforms are available in multiple languages. States and the Centers for Medicare & Medicaid Services can also consider solutions to improve access to technology and private area for virtual meetings for low-income patient populations (Kvedar et al, 2014). To create a telehealth ecosystem that provides equal access to care, it is important to adopt inclusive technology, ensure that all patients have equitable access to the necessary technology and internet, and help patients with using telehealth networks. The following recommendations are provided for national and state policy considerations to build a telehealth ecosystem that provides equitable access to care (Krupinski & Bernard, 2014). These suggestions include financing for improvements, continuing investment in telehealth systems, and modernization, with a focus on including traditionally marginalized patients as well as people with restricted digital skills. To ensure that the software used by federally funded groups is accessible and useful, it should be tested for accessibility and usability, particularly by those who experience disadvantages in using current telehealth systems. Telehealth interfaces used in safety-net clinics should also be user-friendly and accessible to the patients they serve (Kvedar et al, 2014). Organizations that receive

government money should follow the “Office of Disease Prevention and Health” Promotion's suggestions for user-friendly digital health tools. In instances where telehealth methods do not show accessibility and usefulness, health care systems can implement platforms, media, and practices that their customers already use (Ganesh et al, 2020). Telehealth platforms should be offered in numerous languages and accessible to people with literacy levels at or below the sixth grade. Incentives should be provided to software makers to provide international technology, and the “National Assessment of Adult Literacy” could be revised to include a digital health literacy exam. Hardware access, like non-emergency medical transit, should be made accessible to eligible low-income people (Kvedar et al, 2014). Broadband growth and internet connectivity could perhaps reach economically disadvantaged communities by providing free Wi-Fi sites and encouraging telco companies to forego data and minutes utilization for low-income people using telemedicine services.

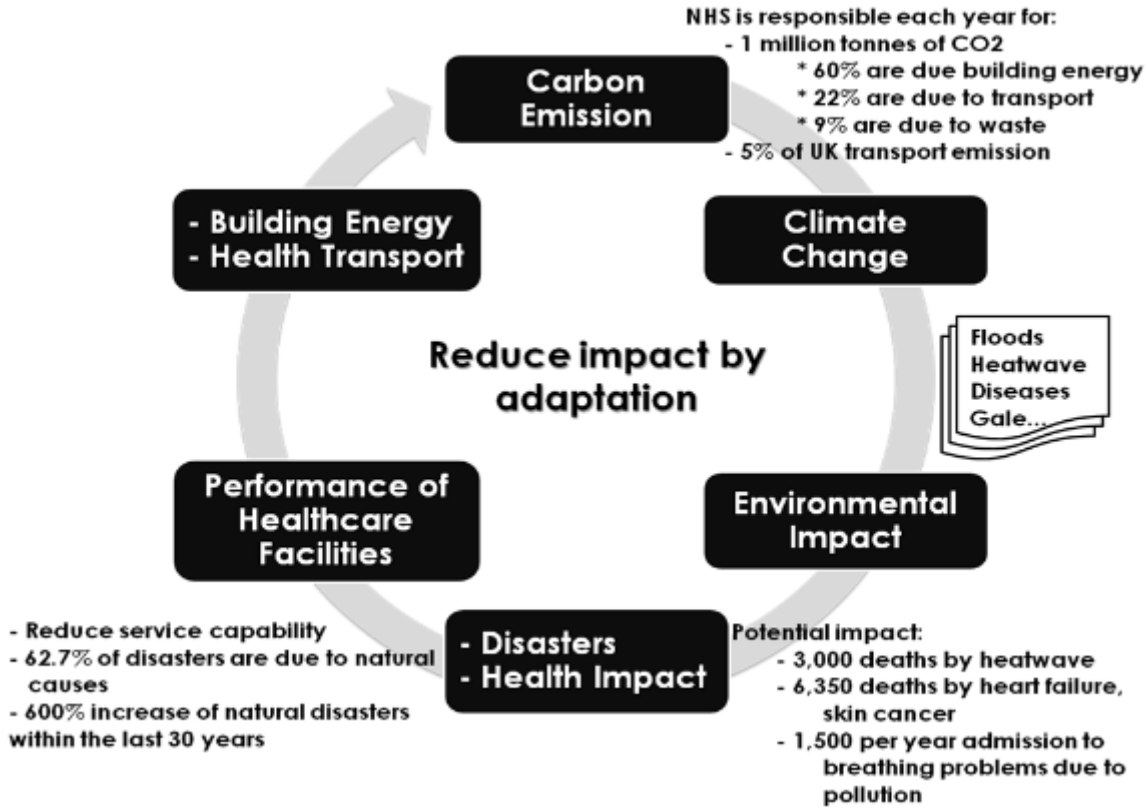
According to Kaplan, B., & Litewka, S. (2008) the ethical challenges posed by telemedicine and telehealth. They point out several design issues in telehealth such as conflicts between technology and privacy, accuracy and security of information, user-friendliness, data standards and integration, quality of online information, and usability for different populations and settings. They also highlight the challenges posed by different disciplines involved in telehealth, as well as the influence of values and the goals of those who create these structures (Krupinski & Bernard, 2014). In addition, the authors point out that Different people may interpret the same technology differently and that cultural differences must be considered in the design and implementation of telehealth. Finally, the authors note that evaluations of telemedicine and telehealth rarely consider ethical issues, such as values and how the technology is deployed and used (Ganesh et al, 2020).

Informed consent in telehealth involves ensuring that patients are aware of the benefits and burdens associated with the use of new technologies, including any potential risks that may be difficult to anticipate. This can be challenging when the new technologies raise ethical issues, such as inducing guilt to change behavior or using persuasive technologies that may manipulate patients (Ganesh et al, 2020). There are also considerations of autonomy and independence, as patients may be forced to choose between independence and social support in order to maintain their health and well-being. Patients should be told of any possible emotional or psychological reactions they might experience when using new technologies in order to ensure that written consent is genuinely informed, as well as the potential for manipulation and the mixing of economic interests with healthcare information (Kaplan., 2008).

The use of telemedicine and telehealth tools has the ability to alter patient-provider or cares interactions in a variety of ways. On the one hand, tele-applications may result in "educated consent" or "informed liberty," in which patients have the ability to receive data and assistance that will assist them in making healthcare choices (Kvedar et al, 2014). On the other hand, the use of telemedicine technologies can lead to a depersonalization of the provider-patient relationship, as the human touch and nonverbal communication that are important in face-to-face encounters are missing in remote care (Krupinski & Bernard, 2014). There are also concerns about the impact of these technologies on privacy and security of data and equity in access to healthcare services, particularly for those who live in remote areas or are from lower socioeconomic groups. These considerations highlight the importance of paying attention to the impact of telemedicine and telehealth on relationships and the need for a balanced approach to these issues (Ganesh et al, 2020).

2.5 Building Resilience infrastructure to deliver equitable healthcare

According to Achour., (2010) the need for the National Health Service (NHS) in the United Kingdom to implement measures aimed at improving the durability of healthcare institutions against natural and man-made catastrophes while decreasing their carbon impact. The research used a qualitative method and performed semi-structured conversations with medical facilities and emergency personnel to better understand the emergency response tactics in place (Salas et al, 2020). The research acknowledges that the NHS is a significant contributor to climate change and emphasizes the need for a complete adaptation plan that tackles the interdependence of disaster reduction and environmental sustainability. The research emphasizes the importance of working with the government to enhance key infrastructure resistance to natural disasters and raise the UK government's readiness to react to these catastrophes (Atallah et al, 2018).



Extreme weather occurrences, such as snowfall, have had a major effect on healthcare institutions in the United Kingdom (Atallah et al, 2018). The early and late 2009 snowstorm exposed the fragility of UK healthcare, resulting in the suspension of many outpatient care due to staff shortages and the need to dedicate available resources to emergency responders (Salas et al, 2020). The report on the knowledge gained from the springtime 2007 flooding experiences illustrates several weak points faced by hospitals, including interruptions in utility supply, isolation of amenities, inaccessibility to facilities, ineffective coordination between facilities and distributors, staffing issues, and insufficient staff facilities on medical centers (Achour., 2010). The Pitt Review found additional issues, such as the number of individuals seeking medical attention for bodily and psychological health issues caused by inundation.

Natural catastrophes on a global scale frequently result in the interim or permanent disruption of hospital services due to harm to their infrastructure or exterior infrastructure and applications (Salas et al, 2020). Many healthcare institutions have invested in alternative supply channels to improve their resilience, but poor equipment selection and system interdependence have resulted in delays and evacuations. Inaccessibility is frequently a significant issue following natural disasters, which is a complicated issue linked to massive infrastructure preparedness (Achour, 2010). Extreme weather events tend to have a larger effect on unprepared nations, resulting in significant interruptions of services, whereas well-prepared countries are able to maintain often these services operational.

The COVID-19 pandemic has highlighted the interconnections between health systems, domestic economies, and governance. Governments have acted a serious role in shaping the responses to the pandemic, including decisions around lockdown measures, access to treatment and medication, health coverage, and financing. To address the crisis, many countries took a

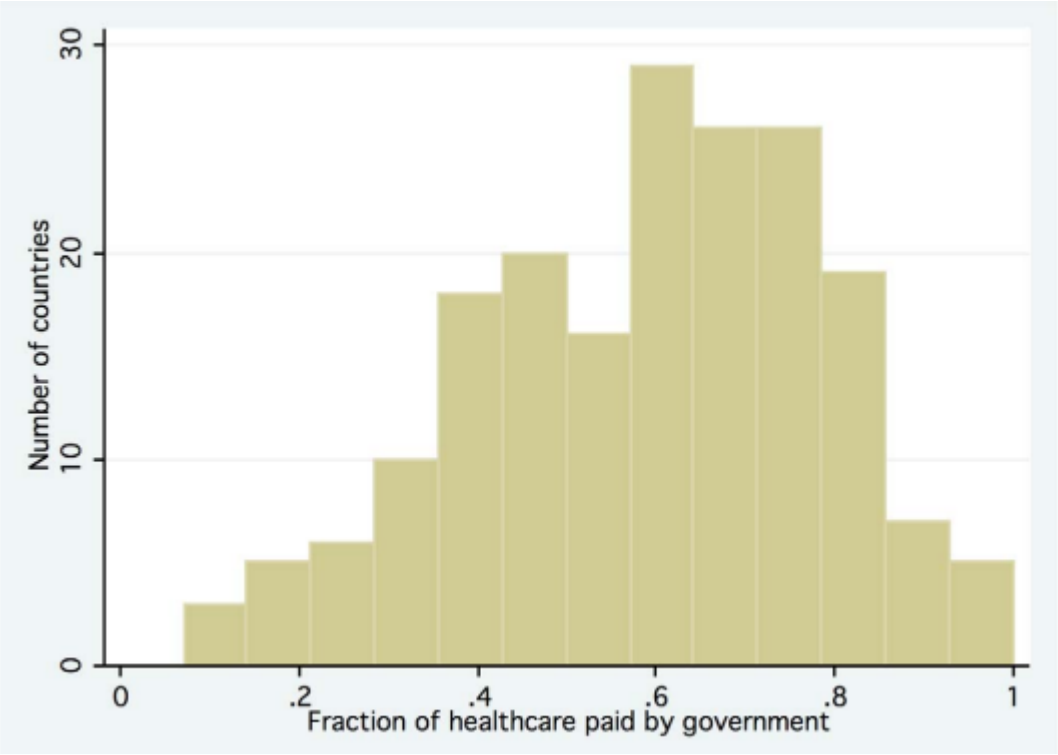
whole-of-government approach, which involved multiple ministries and relied on evidence-based research to inform policymaking (Achour., 2010). The COVID-19 response also required financing and healthcare infrastructure, including supplies and workforce. To help businesses and households, many countries provided fiscal support, including relief packages.

Community involvement is an important component of robust health systems, and several nations evaluated involved community health workers in order to promote full involvement in COVID-19 reactions. These employees assisted in contact tracing attempts, offered critical health services, and checked quarantine adherence (Atallah et al, 2018). Some nations performed public opinion polls and used channels on social media to involve communities.

To grow up their infrastructure, health systems around the world have taken three approaches: building new treatment programs, converting public spaces, and reconfiguring current health clinics (Salas et al, 2020). The majority of systems took a less resource-intensive strategy, converting conventional healthcare facilities into specialized COVID-19 care centers, while others depended on home treatment for individuals with moderate to serious COVID-19. Most elective procedures were cancelled in order to guarantee system capability for COVID-19 treatment. Overall, the COVID-19 response has emphasized the importance of inter-sectoral collaboration, community engagement, and resilient health systems that can effectively respond to public health emergencies (Salas et al, 2020).

The debate between private and public healthcare systems has become increasingly intense in recent years due to the global economic recession starting in 2007 and its impact on government budgets. This recession has put significant constraints on government funding, which is the main source of healthcare expenditures in many countries (Basu et al, 2012).

In response to this situation, as part of loan requirements, the "International Monetary Fund" (IMF) has suggested that nations expand private sector participation in healthcare. This recommendation is aimed at reducing government debt by transferring some of the financial burden of healthcare provision from the government to the private sector (Atallah et al, 2018).



Proponents of private healthcare argue that it is more efficient and provides better quality care compared to public healthcare. They claim that private healthcare providers have a greater financial incentive to improve their services and are able to make use of the latest technologies and treatments (Salas et al, 2020). Additionally, private healthcare providers have more control over the allocation of resources, which can lead to more efficient utilization of resources and lower costs (Basu et al, 2012). On the other hand, supporters of public healthcare argue that it is a fundamental human right for all citizens to have access to quality healthcare, regardless of their financial situation. They argue that a publicly funded healthcare system ensures that everyone has

equal access to healthcare services, and that the government has a responsibility to provide for the health of its citizens. Furthermore, public healthcare systems typically have a wider range of services available, including preventive and preventive health services, and they can often be more comprehensive in their coverage (Salas et al, 2020).

In conclusion, the debate between private and public healthcare systems is complex and multifaceted, with valid arguments on both sides (Salas et al, 2020). Ultimately, the most effective healthcare system will depend on the specific context and needs of each country. It is important for policymakers to carefully consider the advantages and disadvantages of each system and to strike a balance that meets the health needs of their citizens while also being financially sustainable (Atallah et al, 2018).

2.6 Artificial intelligence-enabled healthcare delivery

Healthcare delivery is facing numerous challenges in recent times, including changing demographics, increasing morbidity, workforce shortages, and rising demands for administrative efficiency and better information technology. These difficulties have sparked increased interest in the application of artificial intelligence (AI) in healthcare, as well as predictions that AI will eventually take over some of the duties presently done by "clinicians and healthcare administrators" (Gambhir et al, 2016). However, Topol (2015) points out that there is a great deal of speculation regarding AI's powers in healthcare, and some are even saying that AI will ultimately supplant human doctors entirely. This is not a realistic perspective, as AI systems currently have significant limitations that need to be addressed (Kuziemsky et al, 2019).

If we take a more balanced view of the limitations and potential of AI in healthcare, we can acquire a greater grasp of which fields of healthcare are going to be affected by these advancements in the immediate future. It is also worth mentioning that there is a dearth of debate in scholarly literature and public policy about how Ai technologies can be integrated into healthcare service in an efficient and responsible way (Pradhan et al, 2021). Therefore, it's crucial to approach AI in healthcare with a realistic perspective, taking into account its limitations and the potential benefits it can bring to the industry (Kuziemsky et al, 2019). This will help us to better understand the role of AI in healthcare distribution and how it can be incorporated in a way that benefits both patients and healthcare providers (Diprose and Buist, 2016).

The possible uses for artificial intelligence in healthcare service and medical study are becoming clearer. Numerous studies have proven the efficacy and promise of AI-powered healthcare technology (Sarbadhikari & Pradhan, 2020). These advances have resulted in significant expenditure in AI in healthcare by states, technology firms, and regulatory groups such as the United States "Food and Drug Administration" (FDA), which would be actively supporting the market launch of Intelligence medical equipment (Agah A, 2017).

Based on current trends and research, it's likely that AI will have the greatest impact in four key areas of healthcare delivery;

- Healthcare Administration: AI can streamline administrative tasks, reducing the burden on healthcare providers and improving efficiency in areas such as appointment scheduling, patient data management, and billing (Ramesh et al, 2004).

- Clinical Decision Support: AI can provide clinicians with real-time data and insights to assist them make better-informed choices about medical treatment. This can improve the accuracy and efficiency of diagnosis and treatment planning (Kuziemsky et al, 2019).

- Patient Monitoring: AI can be used to monitor patients remotely, providing real-time data on their health status and helping to identify potential issues early on. This can improve patient outcomes and reduce the need for hospital visits (Pradhan et al, 2021).

- Healthcare Interventions: AI can be used to develop and deliver personalized, evidence-based interventions that can help patients manage their health and prevent disease (Gambhir et al, 2016).

Overall, AI has the potential to bring significant benefits to the healthcare industry, but it's important to approach these developments with caution and consideration for their limitations (Sarbadhikari & Pradhan, 2020). By focusing on these four key areas of healthcare delivery, we can ensure that AI is used to improve patient outcomes and support healthcare providers in delivering the best possible care (Pradhan et al, 2021).

According to Reddy et al, (2019), while the possible benefits of AI in healthcare distribution are significant, there are also several challenges that need to be addressed in order to ensure that these technologies are used effectively and responsibly. Some of the key challenges include:

- Data Privacy and Security: Medical artificial intelligence necessitates access to large quantities of confidential patient information. Ensuring the privacy and security of this data is a major challenge that needs to be addressed in order to protect patient rights and maintain trust in the healthcare system.

- Data Quality and Bias: AI algorithms rely on the quality and accuracy of the data they are trained on. If the data is biased or unreliable, this can lead to incorrect or biased results from the AI system. Addressing these issues will require robust data management processes and ongoing monitoring and evaluation of AI results (Pradhan et al, 2021).

- Regulation and Standardization: The regulation and standardization of AI in healthcare is still in its early stages, and there is a need for clear guidelines and standards to ensure the safe and effective use of these technologies (Kuziemsky et al, 2019).

- Integration with Existing Systems: AI technologies need to be integrated with existing healthcare systems and processes in a way that supports and improves existing workflows, rather than disrupting them.

- Ethical Considerations: Utilizing artificial intelligence for healthcare poses significant ethical concerns, such as the possible for AI to be used to make decisions that have significant impacts on patient lives. Ensuring that AI is used in an ethical and responsible manner will require careful consideration of these issues and ongoing engagement with stakeholders (Sarbadhikari & Pradhan, 2020).

In conclusion, while the likely benefits of artificial intelligence for healthcare delivery are significant, there are also several challenges that need to be addressed in order to ensure that these technologies are used effectively and responsibly (Pradhan et al, 2021). Addressing these challenges will require ongoing collaboration and cooperation between stakeholders, including healthcare providers, technology companies, regulators, and patients themselves.

CHAPTER 3 MATERIALS AND METHODS

3.1 Research Design:

The research design for this study will be a qualitative secondary data analysis. This approach involves analyzing existing qualitative data from multiple studies to develop a comprehensive understanding of the research topic. In this study, we will analyze existing qualitative research studies to examine the factors that influence equitable access to telemedicine services among different groups of people.

Manning, (2016) discusses the different purposes of secondary qualitative analysis, the typical data types used for this type of analysis, and the advantages and challenges associated with it. The author highlights that there are three main purposes for conducting secondary qualitative analysis: exploring new questions, contrasting findings from extensive analysis with original analysis for verification, rejection, and revision, and performing a meta-study incorporating prior research findings. Scholarly research data, reliable current and past textual or visual information, and non-research data are common data categories for this form of analysis. The author also discusses the benefits of secondary qualitative approach, such as efficiency gains and the ability to obtain in-depth data on tough or controversial subjects. However, the author acknowledges that there are practical as well as moral issues to consider, such as the chance that current data may not be appropriate for the new research topic, as well as how to balance security concerns when eliminating allusions to people, places, and objects. The text provides recommendations for researchers who plan to conduct secondary qualitative analysis projects. Before finding and analyzing data, one suggestion is to establish a clear goal or purpose in mind. Another requirement

is to think about the moral ramifications of using current data, as well as to adhere to all applicable permissions and laws.

3.2 Research Paradigm

The constructivism model is a philosophy strategy that stresses the concept that people build their own knowledge and awareness of the world by witnessing things and meditating on those experiences. This paradigm depicts learning as happening only when the student finds knowledge through experimenting and doing, as opposed to conventional teaching, in which knowledge is handed down through lessons. Constructivism aims to engage learners and enable them to personally discover knowledge through experimentation. Scholars who have advocated for constructivism include "Jerome Bruner, Jean Piaget, Lev Vygotsky, and John Dewey". The two main processes through which knowledge is constructed in constructivism are accommodation and assimilation. Accommodation occurs when a person shapes their mental picture of the outer environment to suit new experiences, whereas assimilation occurs when new experiences are incorporated into an already current structure of old life experience without altering that framework.

According to constructivism, learning is not just a matter of memorizing facts or formulas, but a process of constructing meaning through the active exploration of concepts and ideas. Learners are encouraged to experiment, question, and reflect on their experiences in order to build their own thoughtful of the globe around them.

In the classroom, the constructivist approach emphasizes student-centered learning, where the teacher serves as a facilitator rather than a lecturer. Instead of simply transmitting information

to students, the teacher creates opportunities for students to explore and discover knowledge for themselves. This can be done through group projects, experiments, debates, and other hands-on activities that encourage students to collaborate, think critically, and problem-solve. The constructivist approach can be applied in many different fields, from science and mathematics to literature and the arts. It is particularly well-suited to subjects that require creative and critical thinking, where students are encouraged to explore and discover new ideas and concepts for themselves (Oluwatayo, 2016).

3.3 Data Selection:

We will use a purposive sampling technique to select qualitative research studies that address the research question. The studies will be selected based on their relevance, rigor, and quality of data. The studies will be selected from academic databases such as PubMed, MEDLINE, CINAHL, and PsycINFO.

According to Salmi, (2021) qualitative evidence synthesis, which entails combining data from numerous studies to obtain a comprehensive grasp of complex events and study participants' perceptions. Although qualitative data synthesis is still rare when compared to formal evaluations of intervention efficacy, it is becoming more common. However, including a large number of original studies in such compilations is not always beneficial because it can make the transition from descriptive to analytical analysis challenging. Sampling for qualitative findings syntheses is still a novel methodological strategy, and there is no consensus among review writers and methodologists on the ideal path. Different methods for purposively selecting studies are suggested, but it is unclear which techniques are best adapted to particular kinds of syntheses as well as research topics. The paper offers a completed example of choosing for a Cochrane

qualitative data synthesis on parents' and caretakers' perspectives and experiences with dialogue about regular childhood vaccination.

Purposive sampling is a useful approach in qualitative research because it allows researchers to select participants, cases, or studies that are most relevant to the research question and can provide the richest and most informative data. By selecting specific cases or individuals that are most relevant to the research question, researchers can increase the likelihood of obtaining data that is informative, in-depth, and meaningful. The type of Purposive sampling that will be used is the snowball sampling. Each approach has its own strengths and limitations, but all aim to select participants or cases that are most relevant to the research question and can provide the richest and most informative data. Overall, purposive sampling can improve the quality and relevance of qualitative research by enabling researchers to select participants or cases that are most relevant to the research question and can provide the richest and most informative data.

3.4 Sampling Approach

According to Salmi, (2021) Snowball sampling is a qualitative research technique commonly used in fields such as sociology, psychology, and management studies. It is especially useful when the population being studied is difficult to define or rare, such as homeless individuals or people with rare diseases. This method is best suited for studying behaviors, perceptions, and customs of particular groups, rather than attempting to generalize findings to the entire population. Snowball sampling is not intended to estimate the characteristics of the general population, but rather to gain insights into the characteristics of hidden populations that are difficult to identify or study. Hidden populations may include groups that are unobserved, unregistered, or under the radar due to social stigmatization, legal status, or lack of visible consequences. There are methods

available to reduce subjectivity in snowball sampling, including the ascendant and descendant methodology, inductive analysis, and quantitative methods that incorporate the use of computers.

3.5 Data Collection

Data for this learning will be calm through a review of existing qualitative research studies. We will use a systematic approach to search and select relevant studies. The studies will be screened using inclusion and exclusion criteria, and those that meet the criteria will be included in the review. The studies will be analyzed for relevant data on the following:

Factors that influence access to telemedicine services (e.g., cost, technology, awareness, transportation, and language barriers).

- Perceived barriers to accessing telemedicine services.
- Satisfaction with telemedicine services.
- Perception of equity in access to telemedicine services.
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3.6 Data Analysis

Thematic evaluation is a qualitative research technique that is used to methodically arrange and evaluate complex data sets by finding themes that encapsulate the narratives in the data. It is a versatile method that can be integrated into any qualitative study to investigate complicated research problems. However, there is no clear direction for early career scholars to perform thorough theme analysis, and its technique is not often explicitly documented despite being extensively used in qualitative studies. Thematic analysis may be performed in both inductive as well as deductive ways, with themes emerging from the data or being led by the researcher's theory

interest. To keep the required rigour in the analysis process, a continuous comparative technique requiring reviewing and rereading the recordings is used.

Thematic analysis will be used to find trends and patterns that emerged during the data gathering. We will use a coding process to identify and label data that relate to the research questions. The codes will be organized into categories and themes. We will use software such as NVivo to facilitate the analysis process. We will then use a narrative synthesis approach to summarize the findings and develop an understanding of the factors that influence equitable access to telemedicine services (Bostancı, 2021).

3.7 Ethical Considerations

Creswell, (2018) highlights six important ethical issues, informed permission and willing involvement, anonymity and security, telephone contact, possible harm, power differentials, and cultural awareness are all factors to consider. The research will be carried out in accordance with ethical standards and rules. Participants in the research will be informed about the study's goal, their rights, and the privacy of their information. Full consent will be sought from all subjects before they commence the poll. An "Institutional Review Board" (IRB) will evaluate and accept the research protocol before data collection starts.

1. Informed consent and voluntary participation: Participants must be provided adequate knowledge about the study, comprehend the material, and have the flexibility to determine if they want to participate. They should be told that they can refuse to join or withdraw from the research at any moment without consequence. Before the interview, prospective subjects were provided a patient records sheet and signed informed permission was

acquired. Participants were told that their involvement was entirely optional and that they could opt out of the research at any moment.

2. Anonymity and confidentiality: To protect participants' anonymity and secrecy, their names and profiles should not be disclosed during data gathering, analysis, and reporting of research results. Privacy and secrecy of the interview setting were handled closely during telephone contact, interview meetings, data analysis, and sharing of the results.

3. Telephone communication: Safeguards were taken during telephone communication to protect the participants' privacy and confidentiality. In instances where the phone was received by the third person, the purpose of the call was not disclosed, and the contact number was left for the participant to call back.

4. Vulnerability of participants: Vulnerable participants, such as those with postnatal depression, may become agitated while sharing their emotions during the discussion. The researcher should be aware of this and take appropriate steps to manage the situation, such as providing a comfortable and private environment for the interview.

5. Role of the researcher: The researcher should maintain a professional relationship with the participants, avoid any form of exploitation or coercion, and respect their autonomy and privacy.

6. Data protection and storage: The data collected during the study should be stored securely to protect the participants' privacy and confidentiality. Only authorized employees should also have access to the data, which should be retained for a set amount of time before being erased.

3.8 Validity and Reliability

The notions of reliability and validity have been discussed in qualitative research, with some contending that they are unsuitable in the setting of qualitative research. The scientific element of dependability is flawed because it implies that repeated measurements of an event using objective measures establish the truth of the results, whereas human behaviours and interactions are never steady. Validity, on the other hand, is described generally as the condition of being well anchored or justifiable, pertinent, meaningful, logical, or conforming to accepted principles, or the character of becoming sound, just, and very well established. However, validity in studies has to do with the precision and truthfulness of scientific results, and some qualitative studies have claimed that it is not relevant to qualitative research and has been linked to words such as quality, rigour, and trustworthiness. In overall, both validity and trustworthiness are overarching constructs that may be employed appropriately in both quantitative and qualitative methods, but it is important to build methods to guarantee rigour into the qualitative research process instead of just applying the criteria for evaluating rigour after the study has ended (Leever, 2017).

Qualitative research is subject to debates on the definition of quality, with some scholars proposing different criteria to ensure rigor. While reliability and validity are well-defined concepts in quantitative research, they were not considered relevant to qualitative research in the past. However, scholars have acknowledged the significance of assuring the validity and reliable nature of qualitative studies over the past few years, particularly given the potential for respondent subjectivity to impact data interpretation. It is critical to pay careful attention to these variables because study results are frequently met with scepticism from the science establishment. (Leever, 2017).

In conclusion, this study will use a cross-sectional design to examine the prevalence of equitable access to telemedicine services among different groups of people in the United States. Stratified random sampling will be used to select the sample, and data will be collected through an online survey. Data analysis will involve descriptive and inferential statistics, and ethical considerations will be taken into account throughout the study.

CHAPTER 4 CONTENT AND RESULTS

The integration of technology in healthcare can improve access to healthcare services for patients, particularly those in rural or remote parts, and increase competence and effectiveness of healthcare delivery. The digital divide, referring to the unequal distribution of technology and access to the internet, is a major challenge that must be addressed to ensure equitable access to technology-driven healthcare. Standardization and interoperability of technologies are necessary for healthcare providers to access and exchange information from different technology systems, enabling the secure and efficient sharing of patient information between different healthcare organizations. Digital health technologies have the potential to revolutionize clinical research by optimizing processes, reducing costs, and accelerating the implementation of results into practice, particularly through the streamlining of randomized clinical trials. Data quality, safety, and privacy, as well as the need for regulation and potential unintended negative consequences, are important challenges that need to be addressed to ensure that digital health technologies are used in a safe, ethical, and effective manner.

According to research, the use of electronic health records (EHRs) can result in better patient results and greater efficiency in healthcare administration. According to a research released in the "Journal of the American Medical Informatics Association", the use of EHRs was linked with fewer medication mistakes, better adherence to clinical standards, and better chronic disease management. Another research released in the "Annals of Internal Medicine" discovered that using EHRs was linked to a substantial decrease in diagnostic testing and imagery.

EHRs have also been shown to improve patient engagement and satisfaction. Patients who used an EHR patient interface were more likely to be involved in their own treatment and pleased

with their healthcare experience, according to a study that appeared in the "Journal of Medical Internet Research". Furthermore, according to a study that appeared in the "Journal of General Medical Science", patients who had access to one's EHRs were more likely to stick to drug regimes and attend follow-up visits.. Specialized EHRs designed to capture data relevant to specific populations or health conditions have also been shown to be effective in improving health outcomes. A study published in Diabetes Technology & Therapeutics found that the use of a specialized EHR for diabetes care was associated with improved glycemic control and reduced hospitalizations among patients with diabetes.

However, the implementation and use of EHRs can also present challenges. According to a research released in the "Journal of the American Medical Association", EHR use was linked to more time spent on paperwork, which could contribute to physician burnout. Additionally, issues with interoperability and data sharing between different EHR systems can limit the effectiveness of EHRs in improving healthcare delivery. In conclusion, although the implementation of electronic health records has the ability to enhance healthcare delivery and patient results, the difficulties connected with EHR adoption and use must be addressed. Continued research and innovation in this area can help to optimize the benefits of EHRs while minimizing the challenges.

There have been numerous research studies conducted on the use of telehealth and telemedicine technologies, exploring various aspects of their impact on healthcare delivery and patient outcomes. Some key findings from recent studies are:

- Improved access to care: Telehealth has been shown to improve access to care, particularly for patients who live in remote or underserved areas. A study conducted in rural Texas found that telehealth improved access to specialty care, reducing travel time and costs for patients and their families (Chen et al., 2017).

- Positive patient outcomes: Several investigations have found that telehealth improves patient results, including improved clinical outcomes, better patient satisfaction, and reduced hospital readmissions. A systematic review of telehealth interventions for heart failure patients found that telehealth was associated with a significant reduction in all-cause mortality and heart failure-related hospitalizations (Lin et al., 2017).
- Cost savings: Telehealth has the potential to generate cost savings for both patients and healthcare providers. A study conducted in California found that telehealth consultations resulted in an average cost savings of $2,393 per patient compared to in-person consultations (Cheek, 2021).
- Provider satisfaction: Providers who use telehealth technologies have reported high levels of satisfaction with the technology and its impact on patient care. A survey of primary care providers in Vermont found that 86% of respondents reported being satisfied or very satisfied with the telehealth system (Yuen et al., 2015).
- Barriers to adoption: Despite the potential benefits of telehealth, there are still significant barriers to its adoption, including concerns about privacy and security of data, regulatory barriers, and lack of reimbursement for telehealth services. A study conducted in Australia found that while telehealth had the potential to improve access to care, there were still significant barriers to adoption, including a lack of technological infrastructure and concerns about the quality of care provided (Kruse et al., 2016).
- Impact of COVID-19: The COVID-19 virus has increased the use of telemedicine tools significantly as healthcare providers have had to shift to remote care to reduce the risk of transmission of the virus. A study conducted in the US found that the use of telehealth increased by 154% in the first quarter of 2020 compared to the same period in the previous

year (Avena et al., 2021). However, the rapid adoption of telehealth has also highlighted the need for further research to understand its long-term impact on healthcare delivery and patient outcomes.

Research findings suggest that cybersecurity is a critical issue in the healthcare industry that can have a significant impact on patient safety and care delivery. Healthcare organizations are more vulnerable to cyberattacks than other industries due to the large amount of valuable data they possess, including patients' protected health information, financial information, and intellectual property linked to medical study and development. Stolen health data can trade for up to ten times the price of fraudulently obtained credit card numbers just on dark web, and the expense of remediating a healthcare breach is nearly three times greater.

The consequences of cyberattacks on the healthcare industry include delays in procedures and tests, longer patient stays, decreased efficiency in the healthcare system, and reduced quality of care for patients. The Universal Health Services incident in 2020 highlights the far-reaching impacts that cybersecurity incidents can have on healthcare organizations, resulting in substantial financial losses and operational disruptions. Therefore, it is crucial for healthcare organizations to prioritize cybersecurity measures to protect patient safety and ensure the continuity of effective care delivery.

The COVID-19 pandemic has accelerated the trend of healthcare becoming more accessible from anywhere through telehealth. Telehealth has created new opportunities for remote access to medical devices, connectivity to healthcare professionals, and the entire care ecosystem. However, telehealth usage has also increased the security and privacy risks associated with it. Patients are now able to receive more personalized healthcare options, such as precision medicine, where treatments are tailored to specific groups of patients based on factors like age, genetics, or

risk factors. To ensure patient privacy and safety, it is vital that all connected organizations prioritize security when dealing with sensitive patient data.

Several challenges that healthcare organizations face in cybersecurity include patient privacy protection, vulnerabilities of legacy systems, challenges of IT integration in healthcare, and security breaches. To mitigate these challenges, healthcare organizations need to modernize their systems to reduce the risk of cyberattacks and improve care outcomes. This can include implementing advanced security measures, such as encryption and multi-factor authentication, and regularly updating their systems to ensure that they are protected against the latest threats. Additionally, organizations should develop a comprehensive cybersecurity strategy that aligns with their overall business objectives, taking into account the unique needs and challenges of their organization. Overall, the findings suggest that healthcare cybersecurity is a critical issue that needs to be addressed to ensure the safety and privacy of patients, and that healthcare organizations need to take proactive measures to prevent cybersecurity incidents from occurring.

WannaCry virus is a type of ransomware that hit computer systems in over 150 countries on May 12, 2017. The virus infected computers by taking advantage of a software vulnerability in older versions of Windows. This encryption of information on the computer meant that the data was inaccessible unless a ransom was paid in the form of cryptocurrency. The attack on the healthcare sector disrupted the normal operations of over 80 hospitals for 4 days, causing thousands of scheduled surgeries and clinical appointments to be cancelled, medical equipment to be disabled, and even ambulances to be diverted. The attack on the UK's National Health Service (NHS) caused significant financial and reputational consequences, including fines and litigation, as well as harm to patients due to breaches of protected health information and delays in medical care. Although the US largely escaped the effects of the WannaCry virus, other ransomware attacks

have resulted in similar consequences for affected hospitals, such as the attack that occurred at Hollywood Presbyterian Hospital in California in 2016.

Telemedicine policies vary across states, with differences in services, professionals, and settings eligible for reimbursement. In May 2020, all Medicaid programmes permitted telemedicine for general care facilities, and 31 states permitted telehealth for prenatal services. Despite the benefits of telemedicine, there are still ongoing barriers to accessing telehealth services, particularly for underserved and under-resourced patients. This includes lack of access to technology, limited digital literacy, language barriers, and lack of private space for virtual visits. The COVID-19 pandemic has highlighted the importance of telemedicine in providing access to healthcare for low-income patients who may be unable to skip work for in-person visits. However, not all states or insurance providers currently cover phone visits as a form of telemedicine.

Philanthropic organizations have stepped in to provide support for telemedicine, but policy solutions are needed to address structural barriers to equitable access. This could include expanding digital skills training, using communication applications that are already widely used, and ensuring telehealth platforms are available in multiple languages. States and the Centers for Medicare & Medicaid Services can also consider solutions to improve access to technology and private place for general visits for less income patients. This could include providing funding for technology infrastructure and subsidies for broadband access, as well as addressing language barriers through multilingual telehealth platforms.

The National Health Service (NHS) in the UK needs to adopt strategies to increase the flexibility of healthcare facilities against natural disasters and man-made disasters, while reducing their carbon footprint. The vulnerability of UK healthcare was highlighted during extreme weather events such as snowfall, leading to the cancellation of many outpatient services due to the lack of

staff and the need to devote maximum resources to emergency services. The COVID-19 pandemic has highlighted the interconnections between health systems, domestic economies, and governance, and the importance of inter-sectoral collaboration, community engagement, and resilient health systems that can effectively respond to public health emergencies. During the COVID-19 epidemic, health systems around the world used three common methods to scale up their infrastructure: building new treatment facilities, transforming public locations, and rearranging existing medical facilities. As part of loan terms, the IMF has suggested that nations expand private sector participation in healthcare, with the goal of lowering government debt by shifting some of the financial weight of healthcare supply from the government to the privatize sector.

The need for the National Health Service (NHS) in the UK to adopt strategies to increase the flexibility of healthcare facilities against natural disasters and man-made disasters, while reducing their carbon footprint. Extreme weather events, such as snowfall, have significantly impacted healthcare facilities in the UK, leading to the cancellation of many outpatient services due to the lack of staff and the need to devote maximum resources to emergency services. The COVID-19 pandemic has highlighted the interconnections between health systems, domestic economies, and governance, and the importance of inter-sectoral collaboration, community engagement, and resilient health systems that can effectively respond to public health emergencies.

The debate over private versus state healthcare systems is complicated and nuanced, with legitimate points on both sides. Finally, the most efficient healthcare system will be determined by each country's unique context and requirements. The research highlights that the healthcare industry is facing numerous challenges, such as changing demographics, increasing morbidity, workforce shortages, and rising demands for administrative efficiency and better information

technology. These difficulties have sparked increased interest in the application of artificial intelligence (AI) in healthcare, as well as predictions that AI will eventually take over some of the duties presently done by clinicians and healthcare administrators. However, it is critical to understand that there is a lot of publicity regarding AI's powers in healthcare, and AI systems presently have important shortcomings that must be addressed. Multiple studies have demonstrated the efficacy and possibility of AI-powered health technologies, and the potential applications of AI in healthcare administration and medical study are becoming increasingly obvious.

Based on current trends and research, AI is likely to have the greatest impact in four key ranges of healthcare delivery such as Healthcare management, clinical decision assistance, monitoring patients, and healthcare treatments are all examples of healthcare interventions. While the potential benefits of AI in healthcare delivery are significant, there are also several challenges that need to be addressed to ensure that these technologies are used effectively and responsibly. These challenges include data privacy and security, data quality and bias, regulation and standardization, and integration with existing systems. Overall, the research highlights the need to approach AI in healthcare with a realistic perspective, taking into account its limitations and potential benefits, and to focus on the areas of healthcare delivery where AI can have the greatest impact while addressing the challenges that arise in implementing these technologies in a responsible and effective manner.

CHAPTER 5 DISCUSSION

The digital divide refers to the unequal distribution of technology and access to the internet, which can impact access to digital health services. For example, in rural or remote areas with limited access to the internet or technological infrastructure, patients may not be able to access telehealth services or online medical records. This can create disparities in healthcare access and outcomes, particularly for vulnerable populations such as low-income or elderly patients.

To address this challenge, efforts are being made to improve access to technology and internet infrastructure, such as the Federal Communications Commission's Rural Health Care Program, which provides funding to support broadband connectivity for rural healthcare providers. Additionally, healthcare providers are exploring innovative solutions, such as mobile clinics equipped with telehealth technology, to reach patients in remote areas.

Standardization and interoperability of technologies are also crucial for healthcare providers to access and exchange information from different technology systems. For example, if a patient sees multiple healthcare providers or visits different hospitals, their medical records should be accessible and shareable across different systems. This requires the implementation of standards and protocols for data exchange and interoperability.

Digital health technologies also have the potential to revolutionize clinical research by optimizing processes, reducing costs, and accelerating the implementation of results into practice. For example, the use of electronic health records and real-time data analysis can help identify patterns and trends in patient outcomes, leading to more efficient and effective interventions. Additionally, digital health technologies can streamline randomized clinical trials by enabling remote monitoring and data collection, reducing the need for in-person visits and accelerating the

speed of research. However, the use of digital health technologies also presents challenges related to data quality, safety, and privacy. For example, the collection and storage of large amounts of patient data require robust data management processes to ensure data quality and integrity. Additionally, the use of digital health technologies raises concerns about data privacy and security, as sensitive patient information may be vulnerable to cyber attacks or breaches. To address these challenges, regulatory frameworks and ethical guidelines are needed to ensure that digital health technologies are used in a safe, ethical, and effective manner.

Additionally, Electronic health records (EHRs) have the potential to improve healthcare delivery and patient outcomes, as they enable healthcare providers to easily access and share patient information, streamline clinical processes, and improve communication among healthcare team members. The studies mentioned in the prompt provide evidence for the benefits of EHRs, such as decreased medication errors, improved adherence to clinical guidelines, and improved chronic disease management.

EHRs can also improve patient engagement and satisfaction by allowing patients to access their own health information and communicate with their healthcare providers. Patients who have access to their EHRs can better understand their health conditions, medications, and treatment plans, leading to improved adherence to medication regimens and follow-up appointments. Furthermore, specialized EHRs designed for specific populations or health conditions can improve health outcomes, as demonstrated in the study on diabetes care.

However, the implementation and use of EHRs can also present challenges. One of the major challenges is the time spent on documentation, which can potentially lead to physician burnout. This challenge can be addressed through training programs that teach healthcare providers

how to use EHRs efficiently and effectively, as well as through the development of technologies that streamline documentation processes.

Another challenge is interoperability and data sharing between different EHR systems, which can limit the effectiveness of EHRs in improving healthcare delivery. To overcome this challenge, standardization and interoperability of EHR systems are necessary to enable the secure and efficient sharing of patient information between different healthcare organizations. while the use of EHRs has the potential to improve healthcare delivery and patient outcomes, it is important to address the challenges associated with EHR implementation and use. Continued research and innovation in this area can help to optimize the benefits of EHRs while minimizing the challenges.

The use of telehealth and telemedicine technologies has emerged as an increasingly popular method of healthcare delivery in recent years. Telehealth has been shown to improve access to care, particularly for patients who live in remote or underserved areas. This is a significant benefit, as lack of access to healthcare services has been shown to negatively impact health outcomes for these populations.

In addition to improved access, telehealth has also been linked to positive patient outcomes, including improved clinical outcomes, better patient satisfaction, and reduced hospital readmissions. This is an encouraging finding, as improved patient outcomes are a key goal of healthcare delivery. Telehealth has also been shown to generate cost savings for both patients and healthcare providers, which is an important consideration given the rising costs of healthcare.

Providers who use telehealth technologies have reported high levels of satisfaction with the technology and its impact on patient care. This is important, as provider satisfaction can influence the adoption and success of new healthcare technologies. However, despite the potential

benefits of telehealth, there are still significant barriers to its adoption, including concerns about privacy and security of data, regulatory barriers, and lack of reimbursement for telehealth services. These barriers must be addressed to fully realize the potential benefits of telehealth.

The COVID-19 pandemic has led to a significant increase in the use of telehealth technologies, as healthcare providers have had to shift to remote care to reduce the risk of transmission of the virus. This rapid adoption of telehealth has highlighted its potential to improve healthcare delivery during a public health crisis, but also the need for further research to understand its long-term impact on healthcare delivery and patient outcomes.

Overall, the use of telehealth and telemedicine technologies has the potential to significantly improve healthcare delivery and patient outcomes, particularly for remote or underserved populations. However, the barriers to adoption must be addressed, and further research is needed to fully understand the long-term impact of telehealth on healthcare delivery and patient outcomes.

The WannaCry virus attack on healthcare organizations highlights the critical need for healthcare cybersecurity measures to protect patient safety and ensure effective care delivery. This attack resulted in significant operational disruptions, including the cancellation of thousands of scheduled surgeries and clinical appointments, and medical equipment being disabled. These disruptions had significant impacts on patient care and safety, as well as on healthcare organizations' financial and reputational consequences.

The attack on the UK's National Health Service (NHS) also led to breaches of protected health information, which further compromised patient privacy and safety. Moreover, the attack demonstrated the severe consequences of relying on outdated and legacy systems that are more vulnerable to cyberattacks. The WannaCry attack was possible due to a software vulnerability in

older versions of Windows, which highlighted the need for healthcare organizations to modernize their systems and regularly update their software to protect against the latest threats.

Ransomware attacks like WannaCry are becoming increasingly common in the healthcare industry, with the potential to cause significant disruptions and harm to patients. It is crucial for healthcare organizations to implement advanced security measures, such as encryption and multi-factor authentication, to mitigate these risks. Moreover, organizations should develop a comprehensive cybersecurity strategy that aligns with their overall business objectives and accounts for the unique needs and challenges of their organization. In summary, the WannaCry attack on healthcare organizations highlights the need for healthcare cybersecurity measures to ensure the safety and privacy of patients and the continuity of effective care delivery. Healthcare organizations must take proactive measures to prevent cyberattacks from occurring, such as modernizing their systems, implementing advanced security measures, and developing a comprehensive cybersecurity strategy.

Telemedicine has the potential to increase access to healthcare services, particularly for underserved and under-resourced patients who face challenges in accessing traditional in-person appointments. However, there are still barriers to accessing telehealth services, particularly for those who lack access to technology, have limited digital literacy, or face language barriers. One positive development is that as of May 2020, all Medicaid programs allow for primary care services to be delivered through telemedicine, and many states also permit other services, such as maternity care, to be provided via telehealth. This can help to increase access to care for those who may not have the ability to attend in-person appointments. However, there are still significant barriers to accessing telemedicine services, particularly for low-income patients. These include lack of access to technology, limited digital literacy, and lack of private space for virtual visits. In

addition, not all states or insurance providers currently cover phone visits as a form of telemedicine, which can be a barrier for patients who may not have access to reliable internet or video-conferencing technology.

To address these barriers, philanthropic organizations have stepped in to provide support for telemedicine, but policy solutions are also needed. This could include expanding digital skills training programs and using communication applications that are already widely used, such as text messaging or WhatsApp. Telehealth platforms should also be available in multiple languages to address language barriers and ensure that patients are able to understand their medical care and treatment. States and the Centers for Medicare & Medicaid Services can also play a role in improving access to technology and private space for virtual visits for low-income patients. This could include providing funding for technology infrastructure and subsidies for broadband access, as well as addressing language barriers through multilingual telehealth platforms. By addressing these barriers, policymakers can help to ensure that all patients, regardless of income or location, have access to quality healthcare services through telemedicine.

The points raised highlight the need for the UK's National Health Service (NHS) to adopt strategies that increase the resilience of healthcare facilities against natural and man-made disasters while also reducing their carbon footprint.

- Firstly, the vulnerability of UK healthcare facilities during extreme weather events such as snowfall raises concerns about the ability of the NHS to maintain continuity of care during such events. The NHS needs to adopt strategies that ensure the availability of adequate staffing and resources during such emergencies.

- Secondly, the COVID-19 pandemic has highlighted the need for inter-sectoral collaboration, community engagement, and resilient health systems that can respond

effectively to public health emergencies. This includes the need for preparedness planning, surveillance, and early warning systems to detect and respond to emerging infectious diseases.

- Thirdly, health systems globally have employed different approaches to scale up their infrastructure during the COVID-19 pandemic. The NHS needs to learn from these experiences to ensure that it is prepared for future emergencies and has the capacity to handle large numbers of patients.

- Lastly, the IMF's recommendation to increase private sector involvement in healthcare provision raises concerns about the potential impact on equitable access to healthcare, as the private sector tends to focus on profitable areas of healthcare provision. Therefore, the NHS needs to ensure that any private sector involvement in healthcare provision is balanced against the need for equitable access to healthcare for all.

Overall, the points raised highlight the need for the NHS to adopt strategies that increase the resilience of healthcare facilities against natural and man-made disasters while also reducing their carbon footprint. This requires a multi-sectoral approach that involves collaboration and engagement with communities, preparedness planning, and investments in healthcare infrastructure.

The resilience of healthcare facilities against natural disasters and man-made disasters is crucial in ensuring the continuity of care and the safety of patients and healthcare workers. The vulnerability of healthcare facilities in the UK during extreme weather events such as snowfall highlights the need for the National Health Service (NHS) to adopt strategies to increase their resilience. Such strategies could include improving infrastructure and emergency response

systems, ensuring adequate staffing levels, and developing contingency plans to address potential disruptions to healthcare services.

The COVID-19 pandemic has further emphasized the importance of resilient health systems that can effectively respond to public health emergencies. The pandemic has highlighted the interconnections between health systems, domestic economies, and governance, and the need for inter-sectoral collaboration and community engagement. The pandemic has also highlighted the importance of investing in public health and preparedness, including the development of robust surveillance systems and supply chains.

The debate between private and public healthcare systems is complex and multifaceted. Supporters of private healthcare systems argue that they can lead to greater efficiency, innovation, and patient choice. However, critics argue that private healthcare systems can lead to inequalities in access to care and that profit-driven healthcare can prioritize financial gain over patient outcomes. Ultimately, the most effective healthcare system will depend on the specific context and needs of each country. Many countries have a mixed healthcare system that combines elements of both public and private healthcare. The key is to ensure that the healthcare system provides access to high-quality care that is affordable and equitable for all. This includes investing in public health, improving access to care for underserved communities, and addressing structural barriers to health equity.

The use of artificial intelligence (AI) in healthcare has generated a lot of excitement in recent years, with predictions that it will revolutionize the industry. While AI has the potential to address some of the challenges faced by healthcare providers, it is important to recognize that there are significant limitations to AI systems, and that the hype surrounding their capabilities needs to be approached with a realistic perspective. The findings highlights that the greatest impact of AI

in healthcare is likely to be in four key areas: healthcare administration, clinical decision support, patient monitoring, and healthcare interventions. By automating administrative tasks and providing clinicians with real-time decision support, AI can increase efficiency and improve patient outcomes. In addition, AI-powered patient monitoring systems have the potential to improve patient safety and reduce the burden on healthcare providers.

However, the implementation of AI in healthcare is not without challenges. One of the biggest challenges is ensuring data privacy and security, as the use of AI requires access to large amounts of sensitive patient data. Data quality and bias are also concerns, as AI systems are only as good as the data they are trained on, and biased data can lead to biased outcomes. Furthermore, there is a need for regulation and standardization of AI systems to ensure that they are safe and effective, and that they do not exacerbate existing inequalities in healthcare.

In order to realize the potential benefits of AI in healthcare while addressing these challenges, it is important to take a responsible and realistic approach. This involves focusing on the areas of healthcare delivery where AI can have the greatest impact, while also addressing the challenges that arise in implementing these technologies in a safe, ethical, and effective manner. Ultimately, AI should be seen as a tool to support healthcare providers, rather than as a replacement for human expertise and judgment.

CHAPTER 6 CASE STUDY

The Toronto General Hospital is a teaching hospital affiliated with the University of Toronto and is part of the University Health Network (UHN), which is a group of hospitals and healthcare facilities in Toronto, Canada. The Toronto General Hospital is located in downtown Toronto and is one of the oldest and largest hospitals in the country, providing specialized care in areas such as cardiovascular surgery, transplantation, and critical care. The University Health Network is a group of hospitals and healthcare facilities in Toronto that includes Toronto General Hospital, Toronto Western Hospital, Princess Margaret Cancer Centre, Toronto Rehabilitation Institute, and Michener Institute of Education at UHN. The network is affiliated with the University of Toronto and is a leading research and teaching institution, providing advanced care to patients with complex medical conditions. In addition to its outstanding medical services, the Toronto General Hospital is known for its commitment to research and innovation. The Toronto General Research Institute (TGRI) is the hospital's research arm, and it focuses on developing new treatments and therapies for a range of medical conditions. The institute is affiliated with the University of Toronto, and it collaborates with other research institutions and hospitals around the world to advance medical knowledge and improve patient care.

The hospital is also involved in many community outreach and education programs. It offers a variety of resources and services to help patients and their families better understand their medical conditions and treatment options. The hospital also hosts many events and educational programs throughout the year to raise awareness about important health issues and to promote healthy living.

Over the years, the Toronto General Hospital has received many awards and honors for its outstanding medical care and research. In addition to being ranked first for research in Canada by Research Infosource for nine consecutive years, it has also been recognized by organizations such as Newsweek, which ranked it as one of the world's best hospitals in 2021. The hospital has also received recognition for its commitment to sustainability and environmental stewardship, earning LEED Gold certification for its Peter Munk Cardiac Centre and other buildings on its campus.

Together, the Toronto General Hospital and the University Health Network are committed to providing exceptional patient care, conducting groundbreaking research, and educating the next generation of healthcare professionals.

Based on the UHN's 2019-2023 Strategic Plan and the progress made so far, a strategic plan for Toronto General University Health Network (TGH) could be developed with the following priorities:

Inspire, invent and deliver tomorrow's care: TGH will focus on transforming the patient experience through innovative and personalized care that leverages technology and patient-centered care models. This could include implementing virtual care and remote monitoring programs, investing in digital health technologies, and enhancing patient engagement and communication.

Empower and invest in a diverse TeamTGH: TGH will prioritize diversity, equity, and inclusion in all aspects of its operations, including hiring practices, professional development, and leadership development. This will enable TGH to create a culture that values and leverages the diverse backgrounds and experiences of its employees.

Drive the convergence of care, research, and education: TGH will continue to invest in research and education that informs and enhances clinical care. This will include partnerships with universities and research institutions to advance cutting-edge research, the development of new educational programs, and the integration of research findings into clinical practice.

Unleash the power of technology and innovation: TGH will prioritize the use of technology and innovation to improve patient outcomes and enhance operational efficiency. This could include the development of new digital health solutions, the use of artificial intelligence and machine learning to improve patient diagnosis and treatment, and the implementation of predictive analytics to optimize hospital operations.

Elevate Canada as a world destination for commercialization and discovery: TGH will continue to invest in commercialization and innovation strategies to promote the development and commercialization of breakthrough healthcare technologies. This could include partnerships with venture capitalists, startups, and industry partners to bring new products and services to market, and the development of a robust commercialization pipeline to support the growth of Canadian healthcare innovation.

CHAPTER 7 CONCLUSION

Technology has the potential to improve access to quality healthcare and reduce disparities, particularly for underserved populations. However, the implementation of technology in healthcare must be approached through a health equity lens to ensure that all individuals have access to the benefits that technology can provide. This chapter will discuss the relationship between technology and healthcare equity and explore the opportunities for improving healthcare delivery through technology.

One of the key benefits of technology in healthcare is that it can improve access to healthcare services. Telehealth, for example, has made it easier for individuals to receive medical care from the comfort of their own homes. This is particularly important for individuals living in rural or remote areas, who may have limited access to healthcare services.

Telehealth has also been shown to improve access to care for individuals with disabilities or mobility limitations, who may have difficulty traveling to a healthcare facility. Additionally, telehealth has the potential to reduce wait times and increase efficiency in healthcare delivery, which can be especially beneficial for individuals with limited time or resources. However, it is important to note that access to technology and digital literacy can be a barrier to accessing telehealth services. Individuals who lack access to technology or the internet may be unable to access telehealth services, and those who lack digital literacy may have difficulty navigating digital healthcare platforms.

Health Information Technology (HIT) is another area where technology has the potential to improve healthcare equity. HIT can improve care coordination, reduce medical errors, and improve patient outcomes. For example, Electronic Health Records (EHRs) can provide a

comprehensive view of a patient's health history and care journey, making it easier for healthcare providers to provide personalized care. Additionally, HIT can improve access to health information for patients, empowering them to take an active role in their healthcare. Patient portals, for example, allow patients to access their health information, schedule appointments, and communicate with their healthcare providers. However, it is important to ensure that HIT is accessible and user-friendly for all individuals, including those with disabilities or limited digital literacy. HIT systems should be designed with inclusivity in mind and should be tested with diverse populations to ensure that they are accessible and effective for all.

Technology can also improve healthcare equity by improving health education and disease prevention. Digital tools, such as mobile apps, can provide individuals with information about healthy behaviors, disease prevention, and management of chronic conditions. Moreover, technology can also be used to provide tailored health education and disease prevention interventions that take into account an individual's cultural background and language preferences. This is important because individuals from different cultural backgrounds may have different health beliefs and practices that need to be considered when developing health education interventions. Finally, technology can play a critical role in addressing social determinants of health, which are factors outside of the healthcare system that can impact health outcomes. For example, lack of transportation or access to healthy food can impact an individual's ability to maintain good health.

Technology can be used to address these social determinants of health by providing individuals with resources and information to address these challenges. For example, a mobile app could provide individuals with information about local food banks or transportation services. However, it is important to ensure that these resources are accessible to all individuals, including

those with limited access to technology or digital literacy. Additionally, it is important to ensure that technology solutions do not perpetuate existing inequities and that they are designed with the needs of underserved populations in mind.

Despite the potential benefits of technology in healthcare, there are also barriers to its implementation. One of the main barriers is the cost of technology, which can be prohibitive and satisfaction with digital solutions can help healthcare providers identify areas for improvement and ensure that technology is being used in a way that meets patients' needs and preferences. Overall, technology has the potential to significantly improve healthcare equity by increasing access to care and improving outcomes for all individuals, regardless of their socio-economic status. However, it is important to approach the implementation of technology in healthcare through a health equity lens, taking into account the accessibility, inclusivity, and effectiveness of digital solutions for all patients, particularly those who are most vulnerable or underserved. This research aims to provide a comprehensive analysis of the relationship between technology and healthcare equity, identifying opportunities for improving the delivery of healthcare through technology, and providing insights that can help policymakers and healthcare providers develop targeted interventions and programs to improve the quality of healthcare services for all individuals. In the following chapters, we will explore the various ways in which technology is being used in healthcare to improve equity, as well as the challenges and opportunities associated with these approaches.

REFERENCES

Forbes Tech Council. (2022, December 15). Delivering Equitable Healthcare Through Technology. Retrieved from https://www.forbes.com/sites/forbestechcouncil/2022/12/15/delivering-equitable-healthcare-through-technology/?sh=4b8ccded276e

RTI International. (2022, November, 03). Improving Digital Health Equity with Technology. Retrieved from https://healthcare.rti.org/insights/improving-digital-health-equity-with-technology?gclid=Cj0KCQiAlKmeBhCkARIsAHy7WVt7OezZIPEE926t4ckfYCWHYMlVJuvbA5XAy_OvsHjd9foZPsyrI78aAi6xEALw_wcB

American Hospital Association. (2022, July 15). Four ways to improve digital health equity. Retrieved from https://www.aha.org/news/blog/2022-07-15-four-ways-improve-digital-health-equity

Jain, A., Hassard, J., Leka, S., Di Tecco, C., & Iavicoli, S. (2021). The role of occupational health services in psychosocial risk management and the promotion of mental health and well-being at work. *International Journal of Environmental Research and Public Health*, *18*(7), 3632.

Sikandar, H., Abbas, A. F., Khan, N., & Qureshi, M. I. (2022). Digital technologies in healthcare: A systematic review and bibliometric analysis. *International journal of online and biomedical engineering*, *18*(8), 34-48.

Hollis, C., Morriss, R., Martin, J., Amani, S., Cotton, R., Denis, M., & Lewis, S. (2015). Technological innovations in mental healthcare: harnessing the digital revolution. *The British Journal of Psychiatry*, *206*(4), 263-265.

Himss. (n.d.). Moving Toward Health Equity: Innovation and Collaboration. Retrieved from https://www.himss.org/resources/moving-toward-health-equity-innovation-and-collaboration.

Lareyre, F., Behrendt, C. A., & Raffort, J. (2022). e-Health in vascular diseases: integrating digital innovation in everyday clinical practice. *Journal of Clinical Medicine*, *11*(16), 4757

Achour, N., & Price, A. D. (2010). Resilience strategies of healthcare facilities: present and future. International Journal of Disaster Resilience in the Built Environment.

AHA. (n.d.). The Importance of Cybersecurity in Protecting Patient Safety. [online] Available at: https://www.aha.org/center/cybersecurity-and-risk-advisory-services/importance-cybersecurity-protecting-patient-safety

Aman, W., & Al Shukaili, J. (2021). A classification of essential factors for the development and implementation of cyber security strategy in public sector organizations. International Journal of Advanced Computer Science and Applications, 12(8).

Anaya, Y. B. M., Mota, A. B., Hernandez, G. D., Osorio, A., & Hayes-Bautista, D. E. (2022). Post-pandemic telehealth policy for primary care: an equity perspective. The Journal of the American Board of Family Medicine, 35(3), 588-592.

Basu, S., Andrews, J., Kishore, S., Panjabi, R., & Stuckler, D. (2012). Comparative performance of private and public healthcare systems in low-and middle-income countries: a systematic review. PLoS medicine, 9(6), e1001244.

Cardoso, L., Marins, F., Quintas, C., Portela, F., Santos, M., Abelha, A., & Machado, J. (2018). Interoperability in healthcare. In Health Care Delivery and Clinical Science: Concepts, Methodologies, Tools, and Applications (pp. 689-714). IGI Global.

EHR Intelligence. (n.d.). Combating health inequities through EHR data collection. [Online article]. Retrieved from https://ehrintelligence.com/features/combating-health-inequities-through-ehr-data-collection

HealthITSecurity. (n.d.). Top Healthcare Cybersecurity Predictions for Next Year. Retrieved from https://healthitsecurity.com/features/top-healthcare-cybersecurity-predictions-for-next-year

HIMSS. (n.d.). Interoperability in Healthcare. Retrieved from https://www.himss.org/resources/interoperability-healthcare

Kaplan, B., & Litewka, S. (2008). Ethical challenges of telemedicine and telehealth. Cambridge Quarterly of Healthcare Ethics, 17(4), 401-416.

Kumar, A., Singh, A. K., Ahmad, I., Kumar Singh, P., Verma, P. K., Alissa, K. A., ... & Tag-Eldin, E. (2022). A novel decentralized blockchain architecture for the preservation of privacy and data security against cyberattacks in healthcare. Sensors, 22(15), 5921.

Primary Care Development Corporation. (n.d.). Impact of EHR Interoperability. Retrieved from https://www.pcdc.org/impact-of-ehr-interoperability/

Therapy Brands. (n.d.). How specialized EHRs facilitate health equity. [Blog post]. Retrieved from https://therapybrands.com/blog/how-specialized-ehrs-facilitate-health-equity/

Tully, J., Selzer, J., Phillips, J. P., O'Connor, P., & Dameff, C. (2020). Healthcare challenges in the era of cybersecurity. Health security, 18(3), 228-231.

Sharma, A., Harrington, R. A., McClellan, M. B., Turakhia, M. P., Eapen, Z. J., Steinhubl, S., ... & Peterson, E. D. (2018). Using digital health technology to better generate evidence and deliver evidence-based care. Journal of the American College of Cardiology, 71(23), 2680-2690.

Senbekov, M., Saliev, T., Bukeyeva, Z., Almabayeva, A., Zhanaliyeva, M., Aitenova, N., ... & Fakhradiyev, I. (2020). The recent progress and applications of digital technologies in healthcare: a review. International journal of telemedicine and applications, 2020.

Gambhir, S., Malik, S. K., & Kumar, Y. (2016). Role of soft computing approaches in healthcare domain: a mini review. Journal of Medical Systems, 40, 1-20. https://doi.org/10.1007/s10916-016-0651-x

Topol, E. (2015). The patient will see you now: The future of medicine is in your hands. Basic Books.

Diprose, W., & Buist, N. (2016). Artificial intelligence in medicine: Humans need not apply? New Zealand Medical Journal, 129, 73-76.

Agah, A. (2017). Medical applications of artificial intelligence. CRC Press.

Ramesh, A. N., Kambhampati, C., Monson, J. R. T., & Drew, P. J. (2004). Artificial intelligence in medicine. Annals of the Royal College of Surgeons of England, 86, 334-338.

Reddy, S., Fox, J., & Purohit, M. P. (2019). Artificial intelligence-enabled healthcare delivery. Journal of the Royal Society of Medicine, 112(1), 22-28.

Creswell, J. W., & Poth, C. N. (2018). Ethical considerations in qualitative study. [Conference presentation]. In J. W. Creswell (Chair), Issues and Best Practices in Qualitative Research: Plenary Panel Discussion. Sage Research Methods Cases. https://www.researchgate.net/publication/328019725_Ethical_Considerations_in_Qualitative_Study

Manning, C., & Leatherwood, C. (2016). Educators' perceptions of the impact of mobile devices on teaching and learning in rural schools. The Qualitative Report, 21(9), 1715-1731. Retrieved from https://nsuworks.nova.edu/tqr/vol21/iss9/5

Oluwatayo, J. A., & Adeyemi, T. O. (2016). Constructivism philosophical paradigm: Implication for research, teaching and learning. European Journal of Education Studies, 2(9), 197-207. https://doi.org/10.5281/zenodo.192977

Salmi, A., & Boussalia, Z. (2021). The effect of the COVID-19 pandemic on e-learning: A case study of Arab Open University. Retrieved from https://core.ac.uk/download/pdf/229607586.pdf

Bostancı, Ö. (2021). Thematic Analysis Approach: A Step-by-Step Guide for ELT Research Practitioners. ResearchGate. https://www.researchgate.net/publication/350975059_Thematic_Analysis_Approach_A_Step_by_Step_Guide_for_ELT_Research_Practitioners

Leever, A. M. (2017). Rigor or reliability and validity in qualitative research: Perspectives, strategies, reconceptualization, and recommendations. Dimensions of Critical Care Nursing, 36(4), 253-263. https://doi.org/10.1097/DCC.0000000000000253

Avena, N. M., Simkus, J., Lewandowski, A., Gold, M. S., & Potenza, M. N. (2021). Substance use disorders and behavioral addictions during the COVID-19 pandemic and COVID-19-related restrictions. *Frontiers in Psychiatry*, *12*, 653674.

Kruse, C. S., Bouffard, S., Dougherty, M., & Parro, J. S. (2016). Telemedicine use in rural Native American communities in the era of the ACA: a systematic literature review. *Journal of medical systems*, *40*, 1-9.

Yuen, E. K., Gros, D. F., Price, M., Zeigler, S., Tuerk, P. W., Foa, E. B., & Acierno, R. (2015). Randomized controlled trial of home-based telehealth versus in-person prolonged exposure for combat-related PTSD in veterans: Preliminary results. *Journal of Clinical Psychology*, *71*(6), 500-512.

Cheek, C. K. (2021). Emergency Triage, Treat, and Transportation Model (ET3) if Successfully Implemented in North Carolina: A Simulation Based on 2017 Medicare Billing Data.

Lin, M. H., Yuan, W. L., Huang, T. C., Zhang, H. F., Mai, J. T., & Wang, J. F. (2017). Clinical effectiveness of telemedicine for chronic heart failure: a systematic review and meta-analysis. *Journal of Investigative Medicine*, *65*(5), 899-911.

Chen, E. T. (2017). Considerations of telemedicine in the delivery of modern healthcare. *American journal of management*, *17*(3), 20-28.

Rafi, W. (2022). Academic Health Science Centers and Health Disparities: A Qualitative Review of the Intervening Role of the Electronic Health Record and Social Determinants of Health.

Cantor, M. N., & Thorpe, L. (2018). Integrating data on social determinants of health into electronic health records. Health Affairs, 37(4), 585-590.

Tran Ngoc, C., Bigirimana, N., Muneene, D., Bataringaya, J. E., Barango, P., Eskandar, H., ... & Olu, O. (2018, August). Conclusions of the digital health hub of the Transform Africa Summit (2018): strong government leadership and public-private-partnerships are key prerequisites for sustainable scale up of digital health in Africa. In BMC proceedings (Vol. 12, No. 11, pp. 1-7). BioMed Central.

Belchior, R., Vasconcelos, A., Guerreiro, S., & Correia, M. (2021). A survey on blockchain interoperability: Past, present, and future trends. *ACM Computing Surveys (CSUR)*, *54*(8), 1-41.

Leal, G. D. S. S., Guédria, W., & Panetto, H. (2019). Interoperability assessment: A systematic literature review. *Computers in Industry*, *106*, 111-132.

Zeng, M. L. (2019). Interoperability. *KO Knowledge Organization*, *46*(2), 122-146.

Nalven, A., Wright, C., Zeitouni, J. L., Thompson, N., Ferdousi, S., & Saxena, S. (2022). Technology Roadmap for Standards of Healthcare Data Cyber Security: Influence of Public Policy on Consumer Healthcare Cyber Security Protections.

Neo, C. M. (2021). The Rising Threat of Maritime Cyber-attacks: Level of Maritime Cyber-security Preparedness along the Straits of Malacca and Singapore.

Munyolo, G. N. O. (2021). *Cyber-security in E-health: a Critical Analysis of the Regulatory Framework in Kenya* (Doctoral dissertation, University of Nairobi).

Krupinski, E. A., & Bernard, J. (2014, February). Standards and guidelines in telemedicine and telehealth. In *Healthcare* (Vol. 2, No. 1, pp. 74-93). MDPI.

Kvedar, J., Coye, M. J., & Everett, W. (2014). Connected health: a review of technologies and strategies to improve patient care with telemedicine and telehealth. *Health affairs*, *33*(2), 194-199.

Ganesh, D., Seshadri, G., Sokkanarayanan, S., Bose, P., Rajan, S., & Sathiyanarayanan, M. (2020, October). Autoimpilo: Smart automated health machine using iot to improve telemedicine and telehealth. In *2020 International Conference on Smart Technologies in Computing, Electrical and Electronics (ICSTCEE)* (pp. 487-493). IEEE.

Salas, R. N., Friend, T. H., Bernstein, A., & Jha, A. K. (2020). Adding A Climate Lens To Health Policy In The United States: Commentary explores how health care policy makers can integrate a climate lens as they develop health system interventions. *Health Affairs*, *39*(12), 2063-2070.

Atallah, D. G., Djalali, A., Fredricks, K., Arlington, L., Bussio, M., & Nelson, B. D. (2018). Developing equitable primary health care in conflict-affected settings: expert perspectives from the frontlines. *Qualitative Health Research*, *28*(1), 98-111.

Kaur, B. (2020). Disasters and exemplified vulnerabilities in a cramped Public Health Infrastructure in India. *International Journal of Disaster Risk Management*, *2*(1), 15-22.

Kuziemsky, C., Maeder, A. J., John, O., Gogia, S. B., Basu, A., Meher, S., & Ito, M. (2019). Role of artificial intelligence within the telehealth domain. *Yearbook of medical informatics*, *28*(01), 035-040.

Sarbadhikari, S. N., & Pradhan, K. B. (2020). The need for developing Technology-Enabled, safe, and ethical workforce for healthcare delivery. *Safety and Health at Work*, *11*(4), 533-536.

Pradhan, K., John, P., & Sandhu, N. (2021). Use of artificial intelligence in healthcare delivery in India. *J Hosp Manag Health Policy*, *5*, 1-10.