INFORMATION TECHNOLOGY IMPACTS ON HEALTHCARE COSTS AND THE QUALITY OF PATIENT CARE

by

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Abstract

Healthcare organizations have been adapting ways to be more efficient and data-driven. The public health relevance of healthcare information technology is that it can help providers access patient information promptly and communicate healthcare information to the patient populations. Many organizations have used healthcare information technology to cope with the rising healthcare cost for over a decade. They use healthcare information technology to improve patient-centered care and reduce medication errors and patient safety events. Overall, there are many known industry benefits of implementing healthcare information technology. However, the use of healthcare information technology is not without its drawbacks and challenges.

First, the essay will examine specific ways and mechanisms of how healthcare information technology can improve healthcare quality outcomes and reduce healthcare costs. At the same time, this essay will also discuss the shortfalls of implementing healthcare information technology. Based on the literature analysis, the essay will identify action steps that would help healthcare organizations to better adopt healthcare information technologies in the future. The future of HITs is promising if healthcare stakeholders can work together to address HITs-related challenges.
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Preface

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1.0 Introduction

After the introduction of Medicare and Medicaid, healthcare organizations have been pressed by government agencies to pursue evidence-based medicine. Appropriate and accurate documentation of the patient's treatment is needed for reimbursements. The new reimbursement model drives the development of healthcare information technology like the Electronic Health Record. Additionally, the traditional paper-based medical record often does not offer a complete picture of the patient's treatments and holistic health. There is also a need for faster sharing of patients' information among healthcare providers and other healthcare stakeholders.

1.1 History of healthcare information technology

In the 1960s and 1970s, government program Medicare and Medicaid started. In order to receive federal program funding, healthcare institutions needed to standardize the patient's medical record. Financial reimbursement system based on accurate and standardized medical record book-keeping. However, computers were not prevalent in the US just yet. Although there were pioneers in developing healthcare information technology, the technology was still in the beta version and not ready for mass adoption. Paper medical records were steadily maintained from the 1920s onward, but the advancing technology of the '60s and '70s introduced the beginnings of a new system. The development of computers encouraged pioneering American universities to explore the marriage of computers and medical records (Brooks, 2015).
In the 1980s, as computers became prevalent in the U.S., technologies were being used for various purposes. Computers could streamline administrative tasks like scheduling, check-in, and check-out. However, hospitals and smaller physician clinics used the new technology primarily for billing and scheduling purposes rather than documentation. The sharing of patient records was limited. The computerization of medical records is mere transportation of paper-based records to the electronic platform.

The healthcare industry usually lags behind other industries in adopting new technologies. The slow adoption is mainly due to government regulations. While technology flourished outside the healthcare industry, computerization within healthcare had hit a roadblock. Healthcare was without a communicative, cross-departmental electronic record system. Nevertheless, the new millennium was about to change all that (Brooks, 2015).

At the beginning of the 1990s, the Institute of Medicine (IOM) published the Computer-Based Patient Record: An Essential Technology for Health Care. This document was the first to comprehensively examine the possibilities inherent in electronic medical records (Ambinder, 2015). The report recommended that CPRs become the primary form for patient records and urged widespread implementation of CPRs within a decade (Detmer, 1996). It provides a great foundation for examining the prospects of HITs that can affect the healthcare industry.

In 1994, the World Health Organization adopted the ICD-10 coding standard. The new standard for diagnosis codes expanded the number of codes that can be used in medical records (Ambinder, 2015).

The Institute of Medicine (IOM) released a report in 1999 entitled "To Err is Human: Building a Safer Health System." The report stated that errors cause between 44,000 and 98,000 deaths yearly in American hospitals and over one million injuries (Bates, 2006). The leading cause
of these deaths is medical errors. The healthcare industry is one of the last industries that ensure safe practices. It contributes to the rising number of preventable deaths, a significant public health concern. All of these factors provide a strong reason for the government to look for ways to reduce medical errors and ensure patient safety. Many healthcare institutions have found that there were many preventable deaths due to the mishandling of patient medical records. Preventable deaths became the driving force for developing federal regulations regarding EHRs.

The Institute of Medicine reported “To Err is Human that building a Safer Health System” cites one of the most extensive adverse drug event studies, the Harvard Medical Practice Study, and notes that 58 percent of adverse events due to errors in the study were preventable, 27.6 percent were due to negligence, and 19 percent were due to drug complications which were the most common adverse event (Ajami, 2013). In order to lower adverse events, medical errors, and drug complications, healthcare information technology can seem promising. The widespread use of EHRs may be essential for raising patient safety and the standard of healthcare, according to the Institute of Medicine and others. Therefore, the "Err is Human" IOM report has encouraged the healthcare industry to make meaningful changes to reduce medical errors contributing to preventable deaths.

In the early 2000s, a significant amount of federal government policies vouched for the development of EHRs. Government sources could not substantiate the statistic, but President George W. Bush called for computerized health records in his 2004 State of the Union Address. The Office of the National Coordinator for Health Information Technology (ONC) was created by President George W. Bush in 2004 to modernize the healthcare industry by integrating digital technology. It has set priorities and has anointed two existing organizations, the Health Information Technology Standards Panel (HITSP) and the Certification Commission for Health Information
Technology (CCHIT), to play significant roles in establishing and promoting the standards necessary to achieve this goal (Simborg, 2008). He also established an objective of ensuring that all Americans should have electronic health records (EHR) within a decade. Although this objective appeared unattainable back then, it turned out to be the case, even though by 2014, about 90% of hospitals and 80% of private offices had some form of EHR.

The White House cited the IOM statistic to support the need for a plan to give most Americans access to electronic health records within ten years (Ambinder, 2015). In 2009, President Barack Obama signed the Health Information Technology for Economic and Clinical Health (HITECH) Act as part of the American Recovery and Reinvestment Act (ARRA) to adopt electronic health records by 2014 and set several stages of electronic health record adoption — referred to as “meaningful use.” (Ambinder, 2015).

The Center for Medicare and Medicaid Services (CMS) developed an EHR accelerator program named the Meaningful Use Program. Its main goal is to facilitate the adoption of healthcare information technology. Physicians who do not participate in MU will face a penalty, which involves a reduction in their Medicare reimbursements. To receive the maximum EHR incentive payment, Medicare-eligible professionals must begin participation by 2012. For 2015 and later, Medicare-eligible professionals who do not successfully demonstrate Meaningful Use will have a payment adjustment to their Medicare reimbursement. The payment reduction starts at 1% and increases to 1% each year that a Medicare-eligible professional does not demonstrate Meaningful Use, to a maximum of 5% (Chin, 2012). Physicians must use certified electronic health records technology (CEHRT) to circumvent the penalty and confirm meaningful use by attesting at the end of each MU reporting period.
The government has identified three stages toward meeting their definition of Meaningful Use. The Stage 1 goal is to capture data electronically. The Stage 2 goal is to expand upon Stage 1 criteria, report health information, and track critical clinical conditions. The Stage 3 goal is to improve quality, safety, efficiency, performance, and health outcomes (Chin, 2012). Healthcare providers were encouraged by the meaningful use program to adopt and efficiently use electronic health records (EHRs) and other HIT systems.

The MU program offered financial incentives to healthcare professionals who satisfied specific criteria for "meaningful" use of EHRs, such as ensuring safety and quality of care. This incentive scheme encouraged the adoption of EHRs and other HIT systems, resulting in a rise in the digitization and faster sharing of medical data throughout the healthcare sector. The program also produced uniform IT standards and procedures for using EHRs, promoting interoperability and information sharing between various healthcare institutions.

Today, the Meaningful Use program is incorporated into the Medicare and Medicaid Promoting Interoperability Program. Instead of using the check-the-box measurements to evaluate provider IT compliance, the new program uses scores to encourage providers to share greater medical data with patients. Providers must demonstrate that they are utilizing certified Electronic Health Record (EHR) technology in a manner that can be evaluated against quality standards. Specific metrics are used to monitor the providers' performance and safety use of HITs.

1.2 The rationale behind the prevalence of healthcare IT

The EHRs adoption rates skyrocketed following a government incentive program. In the United States in 2009, the Health Information Technology for Economic and Clinical Health
(HITECH) Act made incentive payments available to providers who adopted the meaningful use of a certified electronic health record (EHR), stimulating widespread adoption of HIT across various health care settings (Eysenbach, 2018).

As the healthcare industry becomes data-reliant, healthcare organizations search for tools that can harness the power of data. Healthcare information technology, in this sense, can serve as another form of data analytic tool. For instance, it can help track patient safety events that happen to the patients. HITs can help predict the departments with the poorest quality of care based on historical trends.

Advanced medical devices and monitoring tools are catalysts for developing Health Information Technologies. HITs can function as repositories for medical data generated by these high-tech medical machines. Additionally, the need for an interface that connects these medical devices prompts the implementation of HITs.

One widespread use of HITs is alerting healthcare professionals about potential hazards related to patient treatments. Based on this information, HIT can help predict future patient safety events if it can sufficiently analyze the characteristics of past events.

HITs in major academic medical centers can help achieve faster sharing of patient information. Due to the fragmentation issue of healthcare delivery networks, coordination among different healthcare providers can be a daunting task. Mishandling of patient information among these healthcare stakeholders can result in medical mistreatment. HIT can mitigate this problem by providing a seamless way of transporting patient information from one healthcare setting to another.
1.3 Public health relevance of healthcare information technology

Healthcare information technology is essential for public health endeavors. Healthcare information technology has the potential to significantly improve the quality, safety, and efficiency of healthcare delivery. One of its benefits is the elimination of paper-based patient information records, leading to improved administrative efficiency. Moreover, HIT can decrease medical errors by ensuring that all healthcare providers have access to accurate and timely information. This can ultimately lead to better patient outcomes and enhanced patient safety. Overall, health information technology is widely regarded as a promising tool for improving healthcare delivery. Its implementation can improve quality, safety, and efficiency, making it a crucial component of modern healthcare systems.

However, implementations of HITs innately come with drawbacks. These meaningful disadvantages of HITs can impose serious public health threats due to the mass adoption of HITs. Above ninety percent of all healthcare organizations have implemented some form of HIT. Besides the HIT-related issues, the prevalence of healthcare information technology in healthcare systems causes system and individual biases. It prevents us from addressing the challenges that HIT introduces. This belief that health IT, by itself, improves care and reduces costs has not only diminished government responsibility to set data format standards, but it has also caused us to set aside concerns of usability, interoperability, patient safety, and data integrity (keeping data accountable and reliable) (Koppel, 2012).

Nevertheless, the mass adoption of healthcare information technology in the healthcare industry can be devastating if institutions do not manage the shortfalls of HIT. Due to the long commitment period of licensing or purchasing healthcare information technology, organizations
can find themselves stuck with this cumbersome and inefficient technology that can financially burden their organizations.

Despite the shortcomings of implementing HITs, HITs are here to stay. Healthcare information technology (HIT) has become an integral part of modern healthcare delivery. In the future, HITs will continuously evolve. The healthcare sector is the second most prominent focus of capital investments. As new technologies arise and are identified, healthcare organizations are likely to implement more forms of HIT in the future. Since implementations of any technology inevitably introduce new risks and challenges, any efforts that improve HITs shortfalls should be a priority.
2.0 Literature review

Since the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, many studies have examined the costs and benefits of implementing healthcare information technology. This particular literature is designed to summarize and review these published papers with the purpose of reviewing the benefits and costs of healthcare information technology.

Before the implementation of healthcare information technology, the benefits of HITs seem promising. The potential benefits of EHRs include clinical outcomes (e.g., improved quality, reduced medical errors), organizational outcomes (e.g., financial and operational benefits), and societal outcomes (e.g., improved ability to conduct research, improved population health, reduced costs) (Collum, 2011). Besides the benefits, many published papers also discuss the drawbacks of healthcare information technologies. The literature highlights these drawbacks associated with EHRs, which include the high upfront acquisition costs, ongoing maintenance costs, and workflow disruptions that contribute to temporary losses in productivity that result from learning a new system (Collum, 2011).

Why do we need EHR?

EHRs are expected to deliver higher-quality care and reduce patient safety events. EHR systems can include many potential capabilities, but three particular functionalities hold great promise in improving the quality of care and reducing costs at the healthcare system level: clinical decision support (CDS) tools, computerized physician order entry (CPOE) systems, and health information exchange (HIE) (Collum, 2011).

Methodology
The researchers examined the benefits of EHRs, including clinical, organizational, and societal benefits. Clinical outcomes include improvements in the quality of care, a reduction in medical errors, and other improvements in patient-level measures that describe the appropriateness of care (Collum, 2011). Researchers monitor employee and patient satisfaction, financial performance, and operational efficiency to measure organizational outcomes. Lastly, researchers determine societal outcomes by considering whether society is better able to conduct research and improve population health.

Findings

Researchers find many potential benefits of healthcare information technology. EHRs eliminate traditional paper-based patient information documentation. The old way of recording patient medical records is not efficient. It is also hard to track errors if they do occur. Healthcare information technology indirectly improves consumer experience because patients can now spend less time completing documentation on every visit. It also reduces staff workload.

On the clinical level, the clinical decision support system serves as a data analytic tool that helps the physician make treatment decisions. Additionally, the CDS system offers automated alerts that notify physicians about the patient's allergy history and drug reactions. As more and more CDS systems are used, one can expect certain medical errors to be averted and that, overall, the patient will receive more efficient and safe care (Collum, 2011). Other study finds a similar result. A Cochrane systematic review concluded that the use of on-screen reminders for physicians resulted in minor to modest improvements in process adherence, medication ordering, vaccination, laboratory ordering, and clinical outcomes (Alotaibi, 2017).

HIT can reduce patient safety events by minimizing human errors. The electronic conversion of physical patient records replaces manual duplications, which are prone to errors.
Wrongly recorded patient information is the leading contributing factor to patient safety events, such as adverse drug reactions and medication errors.

Healthcare information technology has the potential to reduce healthcare organizations' costs. Since EHRs can provide complete treatment history of patients, healthcare professionals can avoid duplicating treatments, which are both unnecessary and costly for hospitals. If the physicians can access the complete treatment history, a better medical decision can also be made based on this comprehensive clinical information.

From the patient's perspective, they are now more involved in the treatment decision-making processes and improve patient autonomy. Healthcare information technology can allow them to access their patient records and monitor their own health. Patient engagement improves the quality of care and healthcare performance.

Healthcare information technology is also beneficial for the organization and society. In addition to improved clinical outcomes, healthcare information technology can enhance an organization's operational and financial efficiency. As a result of the better operation, high efficiency leads to employee and patient satisfaction. Lastly, societal outcomes include being better able to conduct research and achieving improved population health (Collum, 2011).

**EHR disadvantages**

Despite the potential and testified benefits of healthcare information technology, healthcare information technology has many potential downsides. These include financial issues, changes in workflow, temporary loss of productivity associated with EHR adoption, privacy and security concerns, and several unintended consequences (Collum, 2011).
Despite the potential and testified benefits of healthcare information technology, healthcare information technology has many potential downsides. These include financial issues, changes in workflow, temporary loss of productivity associated with EHR adoption, privacy and security concerns, and several unintended consequences (Collum, 2011).

The up-front cost of healthcare information technology is very high for healthcare organizations, let alone the maintenance and operating costs. Organizations also need to invest in training because staff needs to be educated about operating the new system. The other disadvantage of EHR is the distraction of physicians' clinical time. EHR is the disruption of workflows for medical staff and providers, resulting in temporary productivity losses. This loss of productivity stems from end-users learning the new system and additional time inputting information. It may potentially lead to losses in revenue (Collum, 2011).

Despite the financial benefits of EHRs, the providers who purchase the EHRs are not the actual beneficiaries. The costs of EHR adoption, implementation, and ongoing maintenance are compounded by the fact that many financial benefits of an EHR generally do not accrue to the provider (who is required to make the upfront investment) but rather to the third-party payers in the form of errors averted and improved efficiencies, which translate into reduced claims payments (Collum, 2011). The financial barrier is another challenge in implementing EHRs.

Since EHRs are repositories of patient records and information, they are prone to potential data breaches and privacy issues. As patient information transits from one healthcare setting to another, the transition processes are vulnerable to data breaches and violations of patient privacy rights. Overall, EHRs may cause several unintended consequences, such as increased medical errors, negative emotions, changes in the power structure, and overdependence on technology (Collum, 2011).
2.1 Literature analysis

The study shows several ambiguous and inconclusive findings. For instance, researchers state that EHRs can help physicians adhere to medical practice standards. The data sample is rather narrow. Researchers found that computerized physician reminders increased the use of influenza and pneumococcal vaccinations from practically 0% to 35% and 50%, respectively, for hospitalized patients (Collum, 2011). Influenza and pneumococcal vaccinations represent only a tiny portion of clinicians’ duties. It is premature to conclude that vaccination improvements represent better clinical outcomes. Additionally, the study lacks comparable data. For instance, computerized physician reminders increased the use of influenza vaccinations by 35%. The increase in the number of vaccinations attributed to computerized reminders might be lackluster if other methods can improve vaccination rates by 70%. Adherence to medical guidelines is important for physicians. However, the literature does not seem to measure the clinical outcomes after physicians have followed more guidelines. It is unclear to know whether following guidelines contribute to better clinical outcomes.

With regard to EHRs’ organizational success, the study shows that organizations with EHRs improved revenue, averted costs, and improved regulatory compliance. However, many factors contribute to improved revenue and regulatory compliance. It is questionable to attribute the success to the use of EHR alone. For instance, improved revenue can result from improved cash flow, fewer coding errors, and better operations overall. EHR’s effect on financial success can also be dwindled by the early adoption and implementation fees. Healthcare information technology adoption comes with a massive financial burden for healthcare organizations. Implementation of healthcare IT is usually a large capital investment project for healthcare organizations. It has a significant amount of capital cost or up-front cost. Additionally, full
implementation of healthcare IT involves training the end users. Overall, Health IT can cost hundreds of millions of dollars. A full software package from a top firm for large hospital costs over $180 million and can cost five times that figure for implementation, training, configuration, cross-covering of staff, and so on (Koppel, 2012).

The literature states that HIT can benefit organizations by lowering patient safety events and medication errors. The mechanism of reducing medical errors relies on the reporting system of the EHRs. As EHR systems bring efficiency and convenience, they also bring more data awareness across healthcare organizations. Therefore, many healthcare professionals are now more reluctant to report medical mistakes because they fear the hefty penalties and consequences of medical errors. It causes under-reporting to happen. The HIT reporting system also relies on retrospective data reports made by reporters’ opinions. There are well-known biases and under-reporting in such incident data, making them an unreliable basis for frequency estimation (Wrights, 2020). As a result, the research findings associated with the lowered medical errors might have been inflated.

Implementing healthcare information technology can be promising to reduce medical errors and improve patient safety. At the same time, HITs can also introduce new patient safety concerns. While recent evidence from in-patient settings shows that health IT can make care safer, it can also create new safety issues, some manifesting long after technology has been implemented (Wrights, 2020).

The literature mentions that HITs can often distract providers and result in lost productivity. The study might have underestimated this drawback since distraction and user frustrations can impact physicians downstream. For instance, user frustrations and distraction lead to physician burnout, an ongoing challenge for healthcare institutions. Initially, many healthcare organizations
wanted to implement HIT to streamline physicians' administrative burden. However, the infusion of healthcare information technology nearly backfires. In testing out the severity of HIT-related physician burnout, researchers in one study surveyed 4,197 physicians in Rhode Island to evaluate the stress level of HIT-associated burnout. The result is significant. Seventy percent of all the survey respondents reported HIT-related stress.

According to this statistic, most physicians can hardly cope with the HIT’s related stress. As technology becomes more advanced, it is reasonable to predict that the reported HIT-related stress will continue to increase. There would also be more healthcare data and accounts of information fed into the HITs. Therefore, future HITs will impose newer challenges and even more severe burnout issues.

Although there are myriad potential contributors to burnout, technology, particularly the introduction of the electronic health record (EHR), has been increasingly implicated (Koon, 2021). Physician burnout issue is a highly relevant topic in the realm of public health. Clinician burnout is a growing concern in health care, with affected physicians potentially struggling with emotional exhaustion, cynicism, and a low sense of personal accomplishment from work. Beyond the individual physician, there are impacts on health care delivery, including quality and safety, absenteeism, engagement, and patient care (Koon, 2021). The overwhelming amount of data and ambiguity of current HIT introduce challenges to the already burnout physicians.

According to the literature, healthcare IT can automate clinic processes, improving efficiency. At the same time, the intricate design of the current healthcare IT infrastructure also decreases employee satisfaction. Many physicians report that they must work longer hours because they are buried in the sea of electronic patient information. Additionally, HIT platforms burden physicians with extra administrative tasks which can be done by other staff. The added tasks take
away physicians’ clinical time. Physicians must ignore the patient in front of them while they are obliged to check innumerable boxes on the screen to fulfill requirements that are promoted to ensure "quality care" but often distract from care quality (Koppel, 2012). Consequently, these healthcare information technologies can distract the decision-making process for clinical treatments, which can then lead to poorer treatment outcomes.

Despite HIT's prevalence, the technology is used in a siloed way. There are many different formats and standards of healthcare IT. The lack of healthcare IT standards can bring inefficiency and wasted time. For instance, the patient safety department might need to gain approval from other departments to retrieve various patient information because of this interoperability issue. The approval process often takes five business days or even longer. It prolongs any projects that are involved with analyzing that specific patient data.
3.0 Recommendations

EHRs' upfront and operational maintenance costs can cause financial distress for healthcare organizations. To resolve this issue, negotiations with vendors can potentially help organizations reduce this implementation barrier. Organizational users can also provide feedback to the vendors. It can help facilitate the design of an EHR system that truly aligns with the organizational needs. If the correct use of the application does not support users' goals or existing workflows, then both the software and the workflows need to be reviewed and potentially modified to facilitate safe and effective care (Wrights, 2020).

Risk to patients

As any new type of technology can impose threats and risks to the patients at healthcare organizations, healthcare organizations should assess the potential risks before implementing them. Organizations should be able to derive an overall proactive risk for an error class (e.g., the patient gets the wrong medication due to the selection of the wrong item from a drop-down list, or a patient's diagnosis and treatment are delayed due to failure to follow-up on an abnormal laboratory test result) when severity and likelihood estimates of a potential error are combined (Wrights, 2020).

Safety concerns

To address the safety concerns of healthcare IT, healthcare organizations should implement safety models that monitor the risks of HITs. Advanced data analytic tools can help predict patient safety events related to the misuse of healthcare IT, and constant monitoring can create a safe environment while implementing healthcare IT Organizations today do not have rigorous, real-time, or even close to real-time approaches to routinely assess the safety of their health IT systems.
and identify safety hazards (Wrights, 2020). Incorporating risk prevention measures into HIT models would also help minimize risks and patient safety events. In order to better predict future safety events, EHRs should be equipped with predictive analytics so that they identify medical units or service lines that need patient safety interventions. After the successful identification of these medical units, organizations should educate them in order to best prevent patient safety events from happening in the future.

According to the literature, most HITs alert physicians about potential risks by relying on retrospective data, which is often highly biased. Incorporating a predictive analytic model can be a solution. The model can make the HIT more future-orientated instead of making a prediction based on biased and retrospective data from the past.

**Blame-free environment for error reporting**

Healthcare professionals suffer from psychological difficulty after they contribute to medical mistakes. The fear of legal actions and consequences prevents them from reporting their mistakes. To address the under-reporting issue, healthcare organizations should create a blame-free environment for reporting medical errors. Building a safe environment for analyzing medical errors requires collective efforts. Blaming and punishing error contributors solely does not solve the problem. Therefore, healthcare entities and governments should work collaboratively to foster an environment that encourages medical error reporting. Specifically, healthcare organizations should reward healthcare workers who report near misses and contribute to good catches. It will mitigate the reporters' fears of retaliation and punishment. As a result, the HITs' patient safety data would be less biased. Additionally, it can also lead to more data available for downstream analysis.

**Cloud-based EHR**
With regard to HIT user frustrations, healthcare organizations need uniform healthcare IT standards. Standardization of data formats helps physicians interpret patient information from other facilities more efficiently. It will help address the burnout issues and user frustrations associated with HITs. Technologies like Cloud-based data repositories can help too. The Cloud-based EHR is a promising tool that provides easy access to each department within healthcare organizations. The uniform data format ensures the efficiency of data sharing and transferring across departments. It can help break the silo between each healthcare system's departments, service lines, and even units across the hallway.

Cloud-based EHRs can also provide data safety features that help address the mentioned data privacy concerns. Storing data in secure cloud storage can prevent potential data breaches and other patient privacy concerns. Besides patient data protection offered by Cloud-based EHRs, organizations can use two-factor authentication and encrypt files to strengthen data privacy. Technological tools can make patient information more secure. However, protecting patient information requires multi-party efforts. Healthcare organizations, HIT developers, and public health agencies should collaborate to develop HITs policy involving privacy laws and guidelines. Regulatory agencies and institutions should empower patients to protect their privacy by monitoring their EHRs and letting them know what portions of their data have been shared, with whom, and to what end (Kayaalp, 2018).
3.1 Implications for adopting future HITs

Patient engagement through HITs

It can be inferred from the literature that EHRs improve patient satisfaction as EHRs serve as platforms for better patient communication. More frequent provider-patient communications can help patients relieve the stress of medical uncertainty. Great communications engage the patients and improve patient satisfaction. If patients take ownership of their health, the patient's holistic health statuses can definitely improve. However, healthcare organizations should not solely rely on HITs to engage patients. HIT can be used as an engagement tool. It can be a great foundation for greater patient involvement. In order to maximize the benefits of HITs, providers should use this powerful tool to augment other patient involvement activities. Electronic health records (EHRs) are seen as the basis for greater patient involvement, particularly as they provide the means by which patients can access their own information using a secure electronic patient portal, which, in addition to allowing access to personal information, also facilitates communication with health professionals (Li, 2019).

Reasons for a new policy

As of the end of the meaningful use program in 2018, many healthcare organizations had successfully met the program's standards and received financial incentives for doing so. However, there were also some challenges and criticisms of the program, including concerns about the cost of implementing EHRs and the burden of meeting the program's requirements. Ultimately, the program's success in driving the adoption of health information technology and improving patient care is a topic of ongoing debate and evaluation.

The main objectives of the MU program and other HIT interoperability policies revolve around improving existing levels of patient safety, quality of care, and healthcare efficiency. As
healthcare organizations implement HITs and comply with the policies' standards, it is inevitable that HITs also introduce newer challenges. The current government policies overlook the fact that healthcare organizations should also be encouraged by addressing the drawbacks of HITs and monitoring the safety of using HIT systems. For instance, the MU criteria provide a guideline about how to use HITs so that they can help reduce patient safety events unrelated to HITs. It does not offer any guidance on how to prevent HIT-introduced safety risks. Additionally, these policies do not provide an incentive for providers to monitor HITs actively.

The current challenges imply that government needs to incentivize addressing the challenges of healthcare IT rather than merely rewarding the implementation of healthcare IT. Government can undoubtedly serve as a powerful force to change the landscape of the healthcare industry. Now that more than 95% of healthcare organizations have implemented healthcare IT, the government has essentially met the HIT mass adoption goal. With the presence of HITs drawbacks, the government should help the healthcare industry address the aftermath of HIT implementations. The US faced similar problems before: we had dozens of railroad gauges, hundreds of time zones, and even areas with both left- and right-hand driving rules. In all cases, the federal government established standards, and the people, the economy, and especially the resistant industries flourished (Koppel, 2012).

Although the government contributed to the mass adoption of HITs, there were still no government actions that looked to foster a safe and interfaced environment for healthcare IT practices. The government should pay more attention to the functionality and introduce challenges of healthcare IT instead of the adoption rates. Since HITs are widely adopted, any damage caused by HITs would be amplified. The entire process of developing, implementing, patching, and updating should be error-free. Currently, the health IT industry has not developed fail-safe
software design, development, or testing methodologies for isolated, self-contained systems, let alone the massively interconnected systems that will be required to enable the seamless sharing of patient data across EHRs, organizations, communities, and eventually nations (Wrights, 2020).

The federal government recently recognized the challenges that healthcare IT brings. To help combat the technological problems faced by providers, the federal government, through the HITECH Act, has committed approximately US$650 million for the establishment of a network of up to 70 regional health information technology extension centers (Collum, 2011). However, the effort was not comprehensive enough to solve other types of HIT problems. Moving forward, the government should continue to support combatting HITs challenges. Therefore, the government should promote a policy that galvanizes providers to monitor HITs, address the inevitable challenges introduced by HITs, and prevent patient safety events caused by HITs.

The government should provide fundings that support healthcare organizations in designing educational modules and training programs that teach providers how to efficiently use HITs. In addition to educating end-users on how to comply with government IT policies and guidelines, the training programs can educate providers on how to do so efficiently. It can lead to fewer errors generated by using HITs. The educational programs can indirectly relieve HIT-related physician burnout problems as the providers become efficient users.

The government should work with healthcare providers to address cybersecurity concerns related to healthcare information technology. For instance, the government can reward healthcare organizations that conduct risk assessments to identify vulnerable areas in HIT systems. Providers can then work with IT vendors to improve these weaknesses to have fewer cyberattacks in the future. As more and more HIT-related problems are discovered, the future policy must emphasize
dealing with HIT-introduced issues instead of focusing on using HITs to solve pre-existing healthcare industry problems.

**Proposed policy**

While government policies have been put in place to encourage healthcare interoperability, they have not achieved their goals. There is an array of unsolved HIT-related issues despite the ongoing government efforts. The unresolved HIT issues can mainly be attributed to the lack of innovations. For instance, the main reason for the failure to achieve interoperability and for the information loss, inefficient operations, and huge (and frequently hidden) costs that result is the lack of comprehensive, centrally coordinated, fully validated, traceable, and enforceable medical data collection and transmission standards (Szarfman, 2022). Currently, there is no such standard available for the fast sharing of information. Therefore, we must focus on developing universal standards for the collection and validation of the most clinically important data as they are created (e.g., results from centrally calibrated laboratory tests during the entire course of clinical care). Only when such standards are in place can we ensure that valid information is being correctly captured and delivered (Szarfman, 2022). In the absence of effective standards and innovations that address HIT-related issues, any government standards and requirements mandates would not help solve HIT issues.

In order to solve the HIT issues, there needs to be a policy that promotes innovations and the development of effective standards. This proposed policy also encourages the development of HIT innovations that address other types of HIT issues, such as cumbersome usability, cost, cybersecurity issues, etc. Implementing a policy that improves interoperability by facilitating innovations is important for two reasons. In the past, the HIT policies’ effectiveness has been largely debatable. Many contemporary government policies have been designed to mandate
healthcare organizations to adhere to HIT standards. The non-compliance penalties financially burden healthcare organizations to adhere to HIT guidance and hinder innovations that can potentially solve HIT-related issues. Thus, the proposed policy serves as a remedy for the innovation roadblock placed by the federal government.

Secondly, the proposed policy can foster collaboration among healthcare stakeholders as solving interoperability challenges requires healthcare stakeholders’ collaboration. The proposed policy incorporates flexibility and encourages collaboration. Meanwhile, the previous government policies are tunnel-visioned on the compliance behaviors of healthcare organizations. The current government policies are too prescriptive. They largely ignore the importance of other stakeholders' participation and perspective. The government needs to understand the difference in stakeholders' preferences in driving the development of innovations and fixing HIT issues. For instance, patients are more concerned with whether the innovations can translate to more health gains, while healthcare managers and IT vendors care more about efficiency gains. Without understanding each stakeholder's perspective, it may translate to disagreement between stakeholders on priorities in the implementation process, possibly explaining the slow diffusion of innovations in health care (Lambooij, 2013).

**How should stakeholders collaborate**

In 2015, the ONC published its Interoperability Standards Advisory (ISA), which represents the model in which the office "will coordinate the identification, assessment, and determination of the best available interoperability standards and implementation specifications for industry use toward specific health care purposes." However, the identification processes are largely done by the government agency. If the government works with and encourages the organizations to be part of the identification processes, it can drastically expedite the identification
efforts. Therefore, the government should provide a financial incentive for healthcare organizations to self-test, identify, and pilot new interoperability standards in their unique organizational environments. Therefore, the government should incentivize healthcare organizations to invest voluntarily in healthcare interoperability instead of involuntarily.

Patients should share their health data with healthcare providers and researchers through secure platforms. This can help providers and researchers better understand health trends and identify areas for improvement in HIT. Patients can participate in pilot programs and beta tests of new HIT tools and standards. This can help developers identify and fix issues before they are released to the broader public. Patients should advocate for themselves and their communities by raising awareness about HIT-introduced issues like interoperability issues. The patient can also disseminate information about the new policy in their communities.

Healthcare IT vendors should be more responsive to their client's needs and customer feedback as healthcare organizations test out new standards and tools. Customer feedback is invaluable for the development and improvement of healthcare information technology. In the absence of innovation promoting policy, the designers are not motivated and incentivized to address the concerns of their clients due to the long commitment period. It means their clients would continue using the products due to contractual obligations. Therefore, the new policy should aim to shorten the commitment period. This will encourage the vendors to provide timely customer support and readily update their technologies as the healthcare systems evolve.

The current government HIT standards and policies' requirements apparently do not solve the interoperability challenge, and the policies' benefits are open to discussion. More research and innovation are needed to solve these tenacious HIT-introduced issues. Unfortunately, the
government's HIT policies in the past suppressed the development of innovative approaches to these HIT issues. Therefore, it is time for the government to step in and promote innovations.

**Is the proposed policy feasible?**

This policy is feasible because the government can support research on HIT innovation by funding research directly or by creating partnerships with academic institutions and other research institutions. The government can also provide funding to support HIT innovation through grants or tax incentives. This funding can help support research development and the implementation of new HIT solutions.

The government can provide regulatory support to facilitate the development and approval of innovative healthcare products and services. This can include expediting the regulatory review process, creating fast-track approval pathways, and providing guidance and support to innovators.

The government can encourage collaboration between industry, academia, and government to accelerate the development of innovative healthcare solutions. This can include creating public-private partnerships, funding consortia, and establishing innovation hubs.

**Time frame**

Because the healthcare industry has been a slow adopter of technologies, effective interoperability standards and innovations that address other types of HIT-related challenges should be developed and identified within five years. The development of innovations and research should be fast-tracked to compensate for the slow implementation phase of these innovations spurred by the new policy.

Technologies can improve processes, but technologies themselves also need improvements. The healthcare industry is a multi-player system. If every party (payers, providers, consumers,
government) can learn from the challenges and issues of healthcare IT, healthcare IT can then really start to do its job, which is improving the quality of care and reducing healthcare costs.

Forty years ago, health IT promised to make health care faster, better, safer, universally available, and more clinician-friendly. Since that time, we've achieved marketing overdrive but only halting user enthusiasm (Koppel, 2012). However, there are still opportunities if healthcare organizations, IT vendors, and the government can work collaboratively to innovate and address the mentioned challenges of healthcare ITs.
4.0 Conclusion

Healthcare IT can undoubtedly benefit healthcare delivery systems. Many studies and practical implementations of the technology have shown convincing evidence that proves its beneficial uses. However, HITs also introduce meaningful challenges. These include exacerbated physician burnout, financial distress, distractions from clinical practices, risks of privacy concerns, etc. The future benefits of HITs can still be promising if the federal government implements a policy that encourages the development of innovations and further research to evaluate the present state of the industry, recognize significant HIT-introduced issues, and discover effective techniques and alternative solutions. The government should play an innovation accelerator role that also encourages collaboration between healthcare stakeholders to address the ongoing HIT-introduced challenges.
Bibliography


