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in Acute Care Hospitals after the HITECH Act**

by

Andrea Mignott

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Andrea Mignott

Chairperson: Dr. Kit Simpson, Ph.D.
Committee: Dr. Douglas Sloan, DHA
Dr. Godwin Odia, RHIA

Abstract

This report reviews the improvement in accessibility of POLST in United States hospitals since the implementation of the HITECH Act in 2009. An analysis and compilation of available information was conducted from all US acute care hospitals responding to the Information Technology Supplement to the annual American Hospital Association (AHA) survey. The survey was voluntary including non-members of the association. The total number of hospitals that participated in 2009 were 2903 while 2782 in 2018. From the results, there was slight increase in hospital beds in 2019 compared to 2018. In 2009, 64% of the hospitals were private nonprofit, 25% government hospitals and 11% were private for-profit hospitals while in 2018, most were private nonprofit at 66%, government at 22% and private for profit 12%. The report showed a significant improvement (42%) in the hospitals capability to fully implement advanced directive (DNR) across every unit by 2018.

The study shows smaller hospitals recorded much improvements in DNR by 2018 as opposed to larger hospitals. This was similar to government and For-profit hospitals unlike nonprofit hospitals that realized insignificant improvements. Besides a hospitals intent to apply for CMS payments in 2009 had no significant effect in DNR availability in 2018. It was found that HITECH has greatly enhanced the availability of POLST information especially for emergency situations.

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Chapter I: Introduction

The Health Information Technology for Economic and Clinical Health (HITECH), part of the American Recovery and Reinvestment Act of 2009 (ARRA) passed in 2009 was focused on improving adoption and meaningful use of electronic medical records in hospitals. However, it is not clear how much this broad set of incentives affected the availability of information such, as advanced directive (AD), that are needed only in relatively rare cases, but when needed is often urgently required. Advanced directives, such as “Do Not Resuscitate” (DNR) orders are important expressions of patient wishes. Their availability in the medical record is essential to inform time-critical decisions at a time where the patient cannot be consulted.

The concept of advanced directives is rooted in the ethical principles aimed at protecting patients' autonomy, where they formally specify their "living will" or a clear illustration of healthcare decisions at the end of life (CDC, 2019). It is well established that physicians should respect patient's autonomy as expressed in oral statements. However, important decisions concerning care at the end of life cannot always be expressed verbally. Thus, it is important to have this information documented in writing and readily available to the care team. Advanced directives may exist in three forms; a “living will”; "durable power of attorney for health care"; and "Physician orders for life-sustaining treatment" (POLST). The availability of POLST forms are most often time sensitive for hospital decisions related to emergency events, thus they must instantaneously available as a patient is transferred from emergency, to operating room, to the intensive care settings. Legally, POLST information stipulating the appropriate medical interventions can be available online on medical society Websites (CDC, 2019), but this venue may not be easily accessible in an emergency. Hospital adoption of the “meaningful use initiatives” (now renamed as the Promoting Interoperability Programs) defined in 2009 in the (HITECH) Act was expected to increase the use of

Electronic Health Record (EHR). In April 2018, the Centers for Medicare and Medicaid Services (CMS) renamed “Meaningful Use” program to “Promoting Interoperability Programs.” According to CMA, the change “will move the programs beyond the existing requirements of meaningful use to a new phase of EHR measurement with an increased focus on interoperability and improving patient access to health information. (CMS, 2018). The use of EHR through promoting interoperability program should make POLST documentation widely available in hospitals as part of the mandate to improve quality, efficiency, and safety of care delivery, better coordination, and ensuring maximum availability and protection for individual health records (CDC, 2019).

This study will examine the change in availability of advanced directive from the time of implementation of the HITECH Act in 2009 compared to reported rates in 2018 for US acute care hospitals.

The American Hospital Association (AHA) Annual Survey, Information Technology Survey responses from 2009 and 2018 surveys to assess the change in the rate of “Full implementation (FI) across all units” from survey respondents. The following study questions will be answered:

1. What are the reported FI rates for AD in 2009 and 2018?
2. Are there differences in this change by hospital characteristics (bed size, ownership, state, region)?
3. Are there differences in this change by primary inpatient EHR/EMR system in place in 2010?
4. Did this change differ by a hospital’s stated intent in 2010 to apply for Medicare or Medicaid incentive payments for meaningful use of health IT?

Chapter II: Literature Review

2.1 HITECH and Meaningful EHR Use

After passing the (HITECH) Act in 2009, there was a sustainable increase in the adoption of the EHRs by both hospitals and individual physicians. By the end of 2009, about one in five privately practicing physicians and one in eight acute care hospitals had installed a basic EHR system (CDC, 2019). Later on, the EHR Incentive programs under the meaningful use objectives facilitated the adoption of the certified EHRs, thus promoting the accessibility of EHRs functions. From the survey data, in 2009, the adoption of basic EHRs by hospitals, including acute care hospitals, was more than triple, which increased from 12% to 44%. The survey results in 2012 indicated that hospitals that had adopted certified EHRs technology had risen by 18 percent as compared to 2009 through 2011 data, which showed the highest growth from 2008 through 2012 by 167 percent (CDC, 2019).

2.2 Advanced Directives and EHR Implementation

According to the American Hospital Association (AHA), the adoption of advanced directives changed the operation in many healthcare systems. Accessibility of patient information has been the most significant improvement with the use of EHRs, as observed in acute care settings. One of the achievements of the EHR is the code status and resuscitation options. According to Bhatia et al. (2015), the unavailability of a documented code-status can lead to unnecessary interventions. The documentation of code-status and making it available in electronic records make it easier and efficient for care providers to refer. The study by Bhatia et al. (2015) indicated that 71 percent of adult patients had documented code-status. The availability and documentation of code-status in EHRs were also influenced by the severity and age of the illness. The code-status adoption in EHRs has changed acute care hospitals, especially in cardiopulmonary arrest situations, and inconsistencies or incomplete records may result in unnecessary interventions and procedures in acute care settings.

Another change in the health care setting was a tremendous effort in making decisions regarding their advance directives. According to Sehgal, & Wachter, (2007), the health care providers should elicit and advocate the directives to ensure they comply with patients' wishes in mind. Some of the directives that have benefited from the adoption of EHRs include Do not Resuscitate (DNR) and end of life whose patterns from 2009 through 2018 has changed. Availability of the e-records has made it easier for physicians across different acute care hospitals.

The full implementation of EHRs from 2009 through 2018 experienced some barriers which included limited access to capital, especially in hospitals located in the remote areas. Again, inadequate staff experience significantly contributed to the inconsistencies observed across different hospitals as well as limited technical resources. Another barrier that has affected the adoption of EHRs is the scarcity of IT workforce to support the systems and ensure their security. The above factors have contributed to the differences by hospitals, as stated by the incentive program outcomes. Meaningful use of health IT, therefore, involves the availability of support systems, competent staff, and technical resources to facilitate e-records updates. With the advancement in technology, the current EHRs have the capabilities to be updated and aligned with the current or future devices (Sullivan, et al., 2017).

As such, the increasing importance of advanced directives in health care is based on the availability of EHRs, where physicians can access this information within the shortest time possible. In end-of-life situations, the advanced directions are essential because they indicate an individual wish and choice of treatment. In other cases, a documented code-status is a critical tool for healthcare practitioners when attending to emergencies. Although there are few challenges in the use of EHRs systems such as limited technical resources and scarcity of IT workforce, the adoption of advanced directives has improved service delivery, especially in acute care units.

Literature portrays a narrative that the HITECH Act's goal of increasing the meaningful use of EHRs in hospitals may be successful. Since 2009, there are multiple studies surveying different types of medical facilities that have decided to switch from paper-based record keeping methods or improve their usage of currently installed EHR resources. However, the current literature's narrative rarely makes an explicit mention about the HITECH Act and its desire to help hospitals and other healthcare facilities increase their meaningful use of EHRs.

Some papers study academic medical centers that strive to teach the next generation of healthcare professionals and decision makers. However, the decisions made by some of these medical centers come from a place of convenience and not a desire to adhere to federally mandated policy. In other cases, the optimization of EHR usage comes from the mindset of controlling costs for both healthcare providers and their patients. In this scenario, the healthcare providers desire to use their EHRs to identify patients that may be in need of advanced care services more than others. This quick identification would allow them to begin advanced care planning discussions with patients and identify their end of life care goals and code status during the meeting.

This literature review will discuss these scenarios and the others that present themselves within literature. The commentary provided by various authors discusses long-term goal setting measures that fall in line with the goals of the HITECH Act. The results of the studies performed by the authors also shows that the optimized usage of EHR systems can help create increased access to advanced care planning services for patients.

2.3 HITECH and Meaningful EHR Use

After passing the HITECH Act in 2009, there was a sustainable increase in the adoption of the EHRs by both hospitals and individual physicians. By the end of 2009, about one in five privately practicing physicians and one in eight acute care hospitals had installed a

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2.3.1 How hospital leaders and professionals utilize EHR resources to administer advanced care procedures and decision making.

Executives working in the medical and nursing fields were surveyed by Sehgal and Wachter (2007) during their research. During the data collection phase of their study, Sehgal and Wachter surveyed 127 nursing executives that worked within the University Health System Consortium (UHSC). According to their paper, the UHSC is an alliance of academic medical centers. The purpose of the survey was to ask the nursing executives about their current practices related to the identification of patient's DNR orders. After administering the surveys, it was found that 56% of hospitals use paper only documentation systems to identify and record DNR orders. In comparison, only 16% of hospitals used electronic records to identify these requests and 25% reported that they used color coded patient wristbands in order to augment their paper and/or electronic recordkeeping systems.

Sehgal and Wachter (2007) conclude that the use of color-coded wristbands to help augment a paper or electronic DNR recordkeeping system may confuse those who have to interpret them correctly. Later in their paper, Sehgal and Wachter go on to write that the use of confusing or deficient DNR recordkeeping systems can undermine the great efforts that patients and their families go through when trying to determine the best advanced care directives for their situations. When writing about the issues that they found during their

research, Sehgal and Wachter write that the high amount of variability seen within nursing executives and their facilities can put patients at risk. As a result, these authors recommended that a national mandate be created that limits the amount of indications that can be used and standardizes DNR order taking methods.

Sullivan et al.'s (2017) study finds that nurse leaders should utilize the data found within their study to identify dramatic increases in medical expenses and, in turn, the optimal time to begin discussing advanced care plans with patients. In addition, putting measures in place that will allow nurse leaders to predict when to do these things may also help them realize when to enact a patient's wishes. When discussing which measures nurse leaders can implement within their facilities, Sullivan et al. write that nurse leaders will be able to advocate for the use of systematic processes like decision making tools and EHR alert systems within their facilities. These systematic tools can identify high risk patients, patients that are close to the end of their lives, and the patients that may be best suited for financial support at some stage of their health care (p. 549). As a consequence, nurse leaders may also be able to use EHR systems to advocate for certain patients and solicit funds, services, and other resources from health care industry professionals that may believe in easing the financial burden that some end of life patients will experience.

2.3.2 How the intent to apply for or benefit from Medicare or Medicaid incentive payments impacted the meaningful use of health IT.

Sullivan, Wu, Li, and Hewner's (2017) paper discussed whether or not patterns of medical monthly expenses could be used to identify patients that were at risk of dying. The purpose of this discussion and the research associated with it was to identify which patients may benefit from proactively engaging in advanced care planning discussions. To perform their research, Sullivan et al. analyzed data from 2008. This data was from the Centers for

Medicare & Medicaid Services and was kept within a large health care organization's database.

Within the analyzed data, there were 53,219 different beneficiaries of Medicaid or Medicare. Of these 53,219 beneficiaries, 2335 of them had died. Of these 2335 decedents, 500 were removed from the study because they had died suddenly according to the records. Thus, the remaining 1835 decedents were divided into three different categories that separated the perished patients according to them having died from a chronic disease, system failure, or cancer (Sullivan et al., 2017, p. 546).

After sorting through this data and statistically analyzing it further, Sullivan et al. (2017) found that the cost of care for decedents that had Medicare increased steadily as they got closer to the end of their lives. According to the authors, this information, combined with knowledge of the type of disease that a patient is suffering from, can be used to place patients into different "cost trajectories" (p. 548). Thus, this ability to classify patients can help hospital leaders and professionals identify which patients to begin having advanced care planning discussions with.

One key limitation of this study is that Sullivan et al. (2017) could not pinpoint the length of time certain patients utilized hospice care services. The inability to do so meant that the true costs of hospice care could not be accounted for within this particular study. The authors recommend that future researchers discover a way to properly find and implement hospice care data into a study so the full scope of cost and cost increase can be documented in a related study.

When concluding their article, Sullivan et al. (2017) write that the last three months before death is a critical time for patients and the total price of their care. Because of this, the authors determined that determining high risk cases as early as possible can help patients make better end of life decisions and, possibly, help their families and care providers create

an appropriate advanced care plan. This conclusion is important because the authors found earlier in their background research that providers were approved to bill for reimbursement after engaging in these types of discussions. This approval came in 2016 after the Centers for Medicare & Medicaid Services deemed that it was a “national priority” to give patients improved access to end of life care (p. 545). While still deemed to be a low value service that may not end in a profit for providers, this information hints that there could be a relationship between the ability to be reimbursed by Medicaid and Medicare for these discussions and a better utilization of EHRs. This relationship could be manifested within physicians’ use of advanced care planning and a renewed intent to properly use EHR systems to identify which patients are best suited to receive advanced care planning services.

3.1 Data related to EHR use and successful advanced care outcomes.

Literature compiled during research describes the changes that have occurred from 2009 to 2018 in hospitals. Weinerman, Dhalla, Kiss, Etchells, Wu, and Wong (2015) write that incomplete and inconsistent code status documentation was found frequently amongst the hospitalized patients sampled in their study. In the academic medical centers examined, code documentation occurred in 5 different ways. These ways included: 1) progress notes, 2) paper and computerized physician orders, 3) electronic sign-out lists, 4) nursing care plans, and 5) DNR order sheets (p. 492). Weinerman et al. found that only 38 patients had complete and consistent code documentation during the duration of the study. 27 of the patients sampled has no code status documentation whatsoever. The remaining 122 patients sampled in the study had at least one code documentation inconsistency (p. 492).

Lakin, Isaacs, Sullivan, Harris, McMahan, & Sudore (2016) surveyed 70 emergency department physicians from tertiary and country emergency departments. 54% of the emergency department physicians were women and the mean age of the physicians surveyed was 36. Of the entire population of emergency department physicians studied, 55% of the

physicians stated that they were “very/extremely confident” when using advance care planning electronic medical records (ACP EMR) to care for their patients (p. 632). Despite this figure, however, 74% of emergency department physicians in the study used ACP EMRs more than 1 time a week. Along with this group, 43% used them more than 5 times a week.

While using the ACP EMR resources in their emergency departments, physicians stated that code status orders, Physician Orders for Life Sustaining Treatment, and durable power of attorney for health care were “very/extremely useful” (p. 632). Unfortunately, the results of Lakin et al.’s (2016) eventually found that EMR systems were not being optimized within emergency departments. Because of this lack of optimization, emergency department physicians that lack confidence in their abilities to use ACP EMR resources in their emergency departments were unable to access critical information whenever they needed it. In response to this, many of the emergency department physicians surveyed in Lakin et al.’s study expressed that they want critical information on their EMRs’ main/home screens. As a result, Lakin et al. expressed agreement with the physicians they surveyed and recommended that having critical information on EMR resources’ main screens may deliver improved ACP delivery and results.

Bhatia et al.’s (2015) article examined a tool that could optimize code status documentation in EHR systems. Before the administration of their study, Bhatia et al. found that many of the code status documentation that took place in medical facilities was largely paper based. Thus, the aim of their study was to study how the new tool could affect the use of digital code status documentation resources in a large teaching hospital. The teaching hospital studied was the Vanderbilt University Medical Center (VUMC). Bhatia et al. write that VUMC utilized paper-based code status documentation procedures that resulted in decision making processes becoming slower and more difficult. In 2012, VUMC introduced the new tool into its facility so that electronic code status documentation could be used for

new incoming patients (p. 2). After performing their initial data collection and research, Bhatia et al. saw that adult patients with code status documentations (2.6) experienced more interactions than those without them (1.5).

Patients that had DNR codes were often older than those with FULL CODE statuses. In Bhatia et al.'s (2015) study, FULL CODE statuses were given to those that required the complete standard of care; meaning that they desired full resuscitation in the event that they were near death or in a critical situation. Meanwhile, the LIMITED code was given to patients that allowed certain interventions to be declined by their families. After establishing these benchmarks, Bhatia et al. found that patients with DNR codes (2.2) had less encounters than FULL CODE coded patients (3.1). When explaining the significance of this data, Bhatia et al. write that over 2/3 (two-thirds) of the patients that died within their study period had DNR codes on their records. Meanwhile only 2% of the patients sampled during the study that had a FULL CODE on their record ended up passing away during the study.

Pediatric patients sampled during the study had identical codes and study metrics included within their populations. In the group of pediatric patients that died during the course of Bhatia et al.'s (2015) study, a quarter of them had a DNR or LIMITED code status on their record. Of the pediatric patients that had a DNR code on their record during the study, 71% of them passed away. In comparison, only 11% of pediatric patients with a FULL CODE status died during the duration of Bhatia et al.'s study.

Demographically, Bhatia et al. (2015) state that "men were more likely than women to have a code status documented" (p. 4). Meanwhile, Hispanic people and patients that lived further away from VUMC were respectively less and more likely to have a code status documented. For the pediatric patients studied, Hispanic children were also less likely to have a code status on record. Keeping with the pattern the adult patients established, pediatric patients that lived further from the hospital had a higher likelihood of having a code status

recorded as well. Unlike the adult patients, however, race and gender did not seem to have any statistically significant relationship amongst this population of patients.

2.3.1 How this data influences end of life advanced care and decision making. Along

with the aforementioned consequences and benefits of using EHRs to perform and give advanced directives, there are other discussions that have taken place in literature about how facilities have utilized EHRs. Bhatia et al. (2015) write that screening for advanced directives is actually performed for every patient that can into VUMC. However, once the screening was done, the act of assigning a code status to patients is what became time consuming and costly. For some patients, assigning a code status is impossible due to their mental state. Besides this, Bhatia et al. write that assigning a code status to every patient that comes into a facility could be emotionally distressing to patients that only came into the hospital for a minor procedure.

However, there are some instances where those that do not have any access to a hospital's EHRs are the ones that have to make a decision and decide whether or not split-second decisions like performing CPR are beneficial or not to themselves or their family members. Yuen, Reid, and Fetters (2011) write that the practice of CPR is something that has become a serious topic of discussion over the past 20 years. While discussing the practice, the use of CPR to assist patients that have DNR orders has been a serious problem. When CPR is performed on patients that have DNR orders, the patients and their families may suffer from serious emotional distress. Also, the use of CPR on DNR coded patients also negates the benefits and use of EHR systems and their ability to prevent low benefit procedures and the humiliation one may experience after not being able to die on their own terms (Yuen et al., 2011).

What becomes apparent in situations like these is that the issue of whether or not CPR is beneficial and/or valuable to a patient is subject to the personal opinion of their care

provider. Yuen et al. (2011) state that the President's Commission for the Study of Ethical Problems in Medicine gave physicians the authority to determine whether or not CPR would be valuable or not to a patient themselves (p. 791). While physicians often make these decisions with their previously completed medical assessments in mind, the values of one physician may not be the same as another; which is one of the primary reasons why the use of EHRs for advanced care decision making has become so important.

In many cases, physicians are left wondering if the decisions they made aligned with the goals that they and their patients set in the beginning stages of care provision. Halpern (2019) writes that there is no generalized method present that allows physicians to see whether or not their actions helped their patients achieve their goals. One of the reasons why checking actions against patients' goals is so difficult is because patients' goals can change over time the longer they are under inpatient care. Another reason why this trend is apparent is because determining whether or not a patient's personal experiences aligned with their personal goals is a challenge within itself.

When explaining this, Halpern (2019) writes that patients often give favorable responses when asked about their care experiences. This leads to a lack of differentiation when examining the effects of different interventions and caregivers being unable to assess their goal matching for their deceased patients due to recall bias (p. 1603). Later in their paper, Halpern writes that categorizing goals based on their priority while using EHRs may be a way to help physicians and other professionals determine which actions will help patients achieve their goals. In situations where there are no previous goals present for a patient, Halpern states that physicians and nurses can simply elicit new goals from a patient and record the goals down themselves (p. 1605).

2.4 AHA's Annual Survey Information Technology Supplement

The background and technical notes of the AHA's (2009b) Annual Survey Information Technology Supplement explains the information that was collected and presented by a questionnaire that the organization administered to various hospitals within the United States. According to the Technology Supplement, the data collected in 2009 is meant to represent hospital environments within the year 2010. The primary categories of data collection that the annual survey covered were:

- Inventory of the hospital's computerized system capabilities
- Meaningful Use Functionalities
- Health Information Exchange Functionalities
- EHR System and IT Vendors [sic] (p. 1)

While the data categories themselves have remained consistent over time, the AHA (2009b) states that the questions included within the survey may change during any given year. Confirming this statement, the Technology Supplement states that the 2009 version of the survey is expanded from the 2008 version of the survey. Specifically, the 2009 survey "measured] progress of additional information technology functionalities" (p. 1). Along with providing this clarity, the Information Technology Supplement also explains which files and datasets are included in the final product the AHA releases. The Information Technology Supplement reports that 3,615 hospitals responded to the survey and are included within the 2009 excel data file for the survey.

The actual 2009 AHA survey contains six different rates of implementation that respondents can choose from when determining how their facility applies to a certain metric. These six different rates are: 1) full implementation across all units, 2) full implementation in at least one unit, 3) beginning to implement in at least one unit, 4) having resources in place to implement in one year, 5) not having any resources in place but at least considering

implementation, and 6) having no resources in place and not considering implementing any at all (AHA, 2009a, p. 1). When clarifying what full implementation meant, the AHA (2009a) states that this metric only includes facilities that have completely replaced their paper record keeping methods with completely electronic EHR systems (p. 2).

The AHA's (2009a) survey asked 13 different questions related to facilities' use of IT within the workplace. The questions included within this survey include inquiries about facilities' computer systems, which tasks and decision making processes these computer systems allow facilities to perform, who is vending EHR services to facilities, whether or not there is two factor authentication within the EHR systems, and which meaningful uses are the most important to health care Chief Information Officers (CIOs). At the end of the survey, the instrument asks a question related to whether or not a CIO or principal IT professional was the one who completed the survey for a given facility. Research has focused on how EHRs and EHR based decision making affects executives, nurse executives, nurse leaders, and other healthcare professionals. However, CIO and principal IT professionals may be the ones providing training to nurses, nurse executives, executives, and other professionals in their facilities on how to properly use EHR systems and maintain their own professionals and histories within them.

2.5 Discussion

The data and information provided in literature presents a narrative that many facilities and hospitals are aware that they need to optimize their use of EHRs. The AHA's (2009s; 2009b) 2009 annual survey includes questions that ask facilities whether or not they are using EHR resources, plan to use them, or do not plan to use them at all in the near future. While each case is unique, it would appear that past literature and research shows that moving away from paper only patient recordkeeping should be a high priority for many facilities. However, articles like Yuen et al.'s (2011) shows that some facilities may need to

determine how physicians can better acquiesce to the requests and wishes of their patients. When saying this, there are instances where physicians perform life saving measures like CPR on patients that may have DNR orders on their file. Whether these orders are on paper or electronic records, they are often still present before a physician may need to decide whether or not to save a patient.

The overall narrative that facilities are interested in using EHRs to make better advanced care decisions could be a sign that the HITECH Act is accomplishing some of the goals it set forth. It has been confirmed that EHR installation, implementation, and use increased after the HITECH Act was passed (CDC, 2019). However, many pieces of research published after 2009 do not mention the HITECH Act being a reason why they wanted to implement EHR resources into their practices. Many of the facilities mentioned in this paper thus far were either using paper recordkeeping measures before the studies that were done on them or using EHR resources in a way that did not optimize their high priority decision making processes. In the case of VUMC, the academic medical center was using paper-based record keeping measures up until they decided to implement a new tool that would help them better utilize EHR resources (Bhatia et al., 2015). Bhatia et al. (2015) state that this decision was made by VUMC because paper-based records became “elusive” once it was time to use them for decision making (p. 2).

Other facilities sampled within the studies cited within this paper had other reasons for deciding to improve their use of EHRs. For some, they wanted to determine how they could best help their physicians, nurses, and other professionals better identify which patients had DNR orders and which did not. In other cases, executives may have wanted to use EHRs to determine which patients should receive end of life discussions about advanced care directives and how they wanted their care providers to proceed. Continuing with this reasoning, Sullivan et al. (2017) write that the facilities that were interested in this may have

been interested in using EHRs to determine how they could provide financial support to certain patients.

Sullivan et al.'s (2017) article also looked at how Medicare and Medicaid may affect physicians' decision making when using EHRs to categorize and identify patients that may need advanced care planning services. Even with the possibility of being reimbursed for these services by the Centers for Medicare and Medicaid Services, having discussions with patients about their end of life care choices is something that is still costly. Knowing this, utilizing EHRs to determine how and when these discussions should be had does not explicitly relate to the HITECH Act itself.

2.6 Summary

This literature review analyzed past research and commentary on the use of EHRs in hospitals and other types of healthcare facilities within the United States. Literature creates a narrative that executives and physicians want to optimize the use of EHR resources within their facilities. The majority of the literature cited included some mention of using EHRs to make better decisions within the workplace. Specifically, executives and their facilities wanted to make better decisions within the workplace because they found that patients were being underserved while under their care.

However, because this study aims to explore the availability of advanced care directives after the enactment of the HITECH Act, the cited literature may show that the HITECH Act has been very beneficial to patients that are in need of advanced care services. When looking specifically for the availability of advanced care services for patients, it appears that facilities are actively desiring to make these services more present for their patients. Also, for the facilities that still have not digitized their record keeping practices, there are discussions taking place about how DNR discussions can take place more frequently and, after these discussions are had, how DNR orders can be properly carried out in times of

distress or death. This information is useful when analyzing the results of the AHA's (2009a; 2009b) 2009 annual survey and shows that the healthcare facilities may be responding favorably to the HITECH Act whether they have responded to the survey instrument or not.

In conclusion, the increasing importance of advanced directives in health care is based on the availability of EHRs, where physicians can access this information within the shortest time possible. In end-of-life situations, the advanced directions are essential because they indicate an individual wish and choice of treatment. In other cases, a documented code-status is a critical tool for healthcare practitioners when attending to emergencies. Although there are few challenges in the use of EHRs systems such as limited technical resources and scarcity of IT workforce, the adoption of advanced directives has improved service delivery, especially in acute care units.

Chapter III: Methods

3.1 Objectives and Design

The availability of POLST forms are most often time sensitive for hospital decisions related to emergency events, thus they must instantaneously available as a patient is transferred from emergency, to operating room, to the intensive care settings. Hospital adoption of the “meaningful use initiatives” defined in 2009 in the Health Information Technology for Economic and Clinical Health (HITECH) Act was expected to increase the use of Electronic Health Record (EHR) technology to make POLST documentation widely available in hospitals. However, little is known about the extent to which the HITECH Act affected the availability of POLST at the bedside. This retrospective study will use archival survey data to describe the change in availability of advanced directive in 2009 compared to reported rates in 2018 for US acute care hospitals.

3.2 Data Sources

The data is from the American Hospital Association (AHA) Annual Survey Information Technology Survey responses from 2009 and 2018 surveys to assess the change in the rate of “Full implementation (FI) across all units” from survey respondents. The American Hospital Association (AHA) has surveyed all acute care hospitals in the US, regardless of AHA membership status, since 1980 and provided supplementary data on IT issues since 2007. The survey is voluntary survey with a response rate of about 85% and represents the most credible, consistent, and comprehensive data about hospitals in the US. The IT Supplement Surveys for the years used here, was sent to the chief executive officer of each hospital regardless of their membership status with the AHA. The individual with the most familiarity with the hospital’s health information technology was asked to complete the survey based on the current environment at the time of response. The 2017 Survey was in the field from January 2018 to May 2018 and represents the most recent data on IT

implementation in US acute care hospitals. To assure study validity, only survey questions that are identical in the 2009 and 2018 survey will be used in this study.

3.3 Study Questions

The 2009 and 2018 responses to the survey will be used to answer the following study questions:

1. What are the reported rates of full implementation for AD in 2009 and 2018?
2. Are there differences in this change by hospital characteristics (bed size, ownership, state, region)?
3. Are there differences in this change by primary inpatient EHR/EMR system in place in 2010?
4. Did this change differ by a hospital's stated intent in 2010 to apply for Medicare or Medicaid incentive payments for meaningful use of health IT?

3.4 Measurement of Variables

3.4.1 Primary Outcome Measure

The primary study measure is survey responses to Question 1a, sub-question g for 2019 and 2018 will be compared on the rate of hospitals responding: *“Fully Implemented Across all Units”*

In response to the question: *“Does your hospital have a computerized system which allows for electronic clinical documentation of Advanced Directives (e.g. DNR)?* Hospital descriptive variables of size, ownership status, region and intention to apply for Medicare or Medicaid incentive payments for meaningful use of health IT and Vendor for primary inpatient EHR system. A copy of the survey instrument for 2009 is provided in Appendix A.

3.4.1.1 Exclusion Criteria

Non-response to the primary question or missing data on size and ownership.

3.4.1.2 Statistical Analysis Methods.

Annual number of respondents and response rates will be described using tables and comparisons of rates by chi-square statistics. The question of interest in this study is one of observing change across the US health care system. Thus, we will include valid responses for each year. To preserve maximum sample size, we will not attempt to match hospitals in 2018 to their responses in 2009. Multivariable logistic modeling will be used to assess influences of hospital characteristics on changes in rates of complete adoption between the two survey years. The data will be analyzed using SAS version 9.4.

Chapter IV Results

4.1 Introduction

This purpose of this study was to examine the increase in number of implementations of EHR systems with the capacity to document advanced directive from the time of implementation of the HITECH Act in 2009 compared to reported rates in 2018 for US acute care hospitals. Specifically, the American Hospital Association (AHA) Annual Survey, Information Technology Survey responses from 2009 and 2018 surveys were used in order to assess the change in the rate of “Full implementation (FI) across all units” from survey respondents. The following study questions were addressed:

5. What are the reported FI rates for AD in 2009 and 2018?
6. Are there differences in this change by hospital characteristics (bed size, ownership, state, region)?
7. Are there differences in this change by primary inpatient EHR/EMR system in place in 2010?
8. Did this change differ by a hospital’s stated intent in 2010 to apply for Medicare or Medicaid incentive payments for meaningful use of health IT?

What now follows are descriptive statistics of the sample utilized in this study. This will be followed by the results of Chi-Square analysis conducted to address study questions. The chapter will end with a summary of the result.

4.2 Descriptive Statistics of the Sample

4.2.1 Analysis of results

Descriptive statistics were generated in order to answer this first research question:

4.2.1.1 Research Question 1: What are the reported FI rates for AD in 2009 and 2018?

As presented earlier in the chapter, in 2009, 1,256 (43%) of the hospitals were fully implemented EHR with the capacity to add DNRs orders across all units. In 2018, 2,363 (85%) were fully implemented. This was an increase in implementation by 42%. A 42% increase in less than a decade shows that the acute care sector of hospitals had an added incentive to improve their health IT operations and their adherence to their patients' DNR orders. There may have been other industry specific factors that contributed to the increase in FI rates over time. However, the information shown in Table 1 mirrors the results that legislators desired from the HITECH Act when it was enacted.

The 2009 survey consisted of 2,903 respondents with 2,782 shown from the 2018 survey. The mean number of beds increased from the year 2009 ($M = 181.6$, $SD = 201.5$) to 2018 ($M = 193.3$, $SD = 219.1$). Regarding the distribution of bed size in 2009, most were between 100 – 249, 843 (29%). This was followed by < 50, 836 (29%); 50-99, 498 (17%); 250-449, 475 (16%); and >450, 251 (9%). In 2018, the distribution of bed sizes consisted mostly of < 50, 821 (30%). This was followed by 100-249, 777 (28%); 250-449, 471 (17%); 50-99, 423 (15%); and > 450, 290 (10%). Regarding hospital ownership, most were private non-profit in 2009, 1844 (64%). This was followed by government, 726 (25%); and private for profit, 333 (11%). In 2018, most were private non-profit, 1832 (66%). This was followed by government, 614 (22%); and private for profit, 336 (12%). In 2009, 1256 (43%) of the hospitals were fully implemented advanced directive (DNR) across all units. In 2018, 2363 (85%) were fully implemented.

Table 1 below depicts characteristics of number of beds, hospital ownership, full implementation of EHR systems across all units, and intention to apply for Medicare and Medicaid promoting interoperability of health IT.

Table 1

Characteristics of Acute Care General Hospitals Responding to the 2009 and 2018 AHA Information Technology Supplement Annual Surveys

<i>Variable</i>	<i>2009 Respondents</i>	<i>2018 Respondents</i>	<i>Notes</i>
Total Respondents	2,903	2,782	
Mean number of Beds (SD)	181.6 (201.5)	193.3 (219.1)	SD = Standard Deviation
Distribution by Bed size: N (%)			N = sample size
< 50	836 (29)	821 (30)	N (%)
50-99	498 (17)	423 (15)	N (%)
100-249	843 (29)	777 (28)	N (%)
250-449	475 (16)	471 (17)	N (%)
≥450	251 (9)	290 (10)	N (%)
Hospital Ownership: N (%)			N (%)
Government	726 (25)	614 (22)	N (%)
Private Non-profit	1,844 (64)	1,832 (66)	N (%)
Private for profit	333 (11)	336 (12)	N (%)
Fully implemented advanced directive (DNR) across all units; N (%)	1,256 (43)	2,363 (85)	N (%)
Intends to apply for Medicare and Medicaid meaningful use of health IT	2,416 (83)	NA	N (%)

Table 2 depicts hospital ownership, with most listed as private non-profit in 2009, 1844 (64%). This was followed by government, 726 (25%); and private for profit, 333 (11%). In 2018, most were private non-profit, 1832 (66%). This was followed by government, 614 (22%); and private for profit, 336 (12%). In 2009, 1256 (43%) of the hospitals with the capability to fully implemented advanced directive (DNR) across all units. In 2018, 2,363 (85%) were fully implemented.

Table 2

Descriptive Statistics for the Responding Hospitals

Hospital Ownership	2009	2018	N(%)
Government	726 (25)	614 (22)	N(%)
Private Non-profit	1,844 (64)	1,832 (66)	N(%)
Private for Profit	333 (11)	336 (12)	N(%)
Fully implemented advanced Directive (DNR) across all units; N (%)	1,256 (43)	2,363 (85)	N(%)
Intends to apply for Medicare and Medicaid meaningful use of health IT	2,416 (83)	NA	N(%)

Table 3 below depicts %EHR with the capacity to add DHR by hospital size and type. Percent DNR was greatest for <50 size category (30%). This was followed by 50-99 (30%); 100-249 (28%); 250-449 (17%); and >450 (10%). Regarding hospital type, the greatest DNR% was found in for profits (45%); and government (45%). Non-profit had the least rate of implementation of DNRs.

Table 3

%DNR-Cross Tabulations by Size and Hospital Type

Variable	2009 Respondents	2018 Respondents	Notes
Total Respondents	2903	2782	
Mean number of Beds (SD)	181.6 (201.5)	193.3 (219.1)	SD=Standard Deviation
Distribution by Bed Size N (%)			N = Sample size
< 50	839 (29)	821 (30%)	N (%)
50-99	498 (17%)	423 (30%)	N (%)
100-249	843 (29%)	777 (28%)	N (%)
250-449	475 (16)	471 (17%)	N (%)
≥ 450	251 (9%)	290 (10%)	N (%)

Hospital type	
Government	45%
Non-Profit	40%
Profit	45%

Figures 1 and 2 depict the percentage of hospitals utilizing specific EHR systems for 2009 and 2018, along with differences in changes by hospital characteristics, respectively. The EHRs in the other category decreased from 40% in 2009 to 10% in 2018. A few new entrants (EHRs) in the market in 2018 could account for the reduction in the "other" category. Additionally, EPIC grew from 6% in 2009 to 30% in 2018.

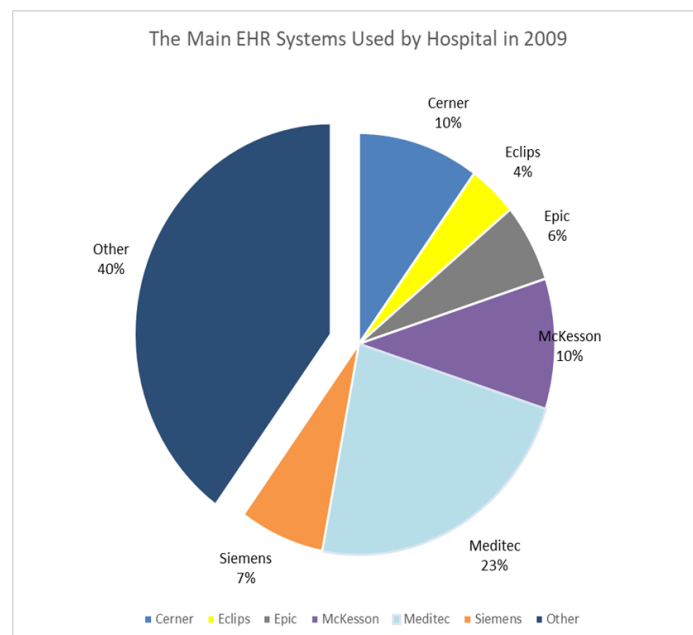


Figure 1. Analysis of American Hospital Association Annual Survey Data, 2009 and 2018 for Acute Care Hospitals

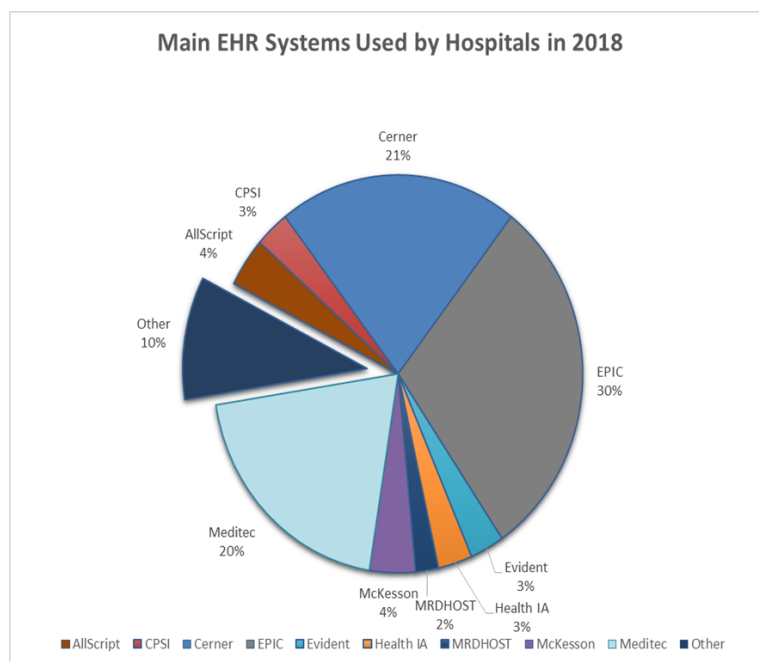


Figure 2. Main EHR Systems Used by Hospitals in 2018

Chi-square analysis was conducted in order to address this second research question:

4.2.1.2 Research Question 2: Are there differences in this change by hospital characteristics (bed size and ownership)?

As depicted in Figure 3 through 6, the increase in EHR systems with the capacity to fully implement advanced directive (DNR) orders for 2009 and 2018 was associated with smaller bed size. In 2009, implementation increased for <50 bed went from 27% to 80%, for 50-99 from 35% to 84% 100-249, 50% to 85% for 250-449, increased from 56% to 89% and >450 from 49% to 92%. These results were statistically significant as indicated by a significant Chi-square test, $\chi^2(4) = 174.3791, p < .0001$. The association was moderately strong (Cohen, 1988), Cramer's $V = .245$. In 2018, implementation increased to 80% for < 50, 84% for 50-99, 85% for 100-249, 85% for 250-449, and 89% for >450 to 92%. These results were statistically significant as indicated by a significant Chi-square test, $\chi^2(4) = 33.2297, p < .0001$. The association was small (Cohen, 1988), Cramer's $V = .109$ Tables 3 and 4 depicts this information below. Chi-square analysis was conducted in order to address this second research question.

Figure 3 shows the smaller hospital having a much larger (and statistically significant) improvement in DNR availability by 2018 that that seen in larger hospitals $p < .0001$, and < 50 went from 38% to 80%. Figure 4 exhibits the government and for-profit hospitals having a greater improvement in DNR implementation than Non-profit hospitals ($p < .0001$). Figure 5 shows the hospital with EHR systems in 2009 classified outside the major systems were more likely to improve their status by 2018, probably because those with the big systems already had the capacity of DNR in 2009. Figure 6 presents no significant effect of stated intent to apply to CMS for Promoting Interoperability (Meaningful Use) payment on DNR capacity in 2018.

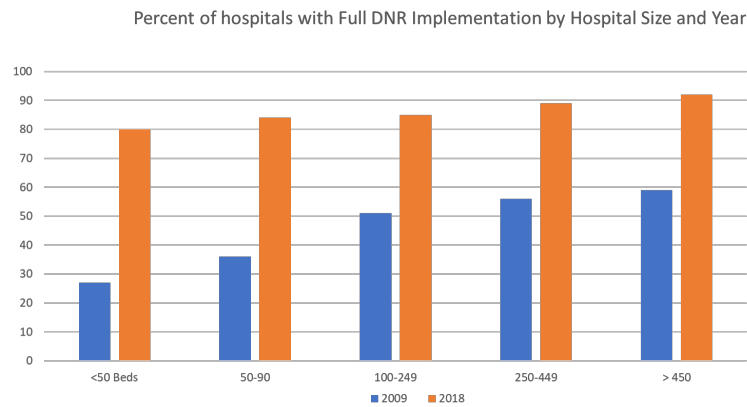


Figure 3. Percent of Hospitals with Full DNR Implementation by Hospital Size & Year

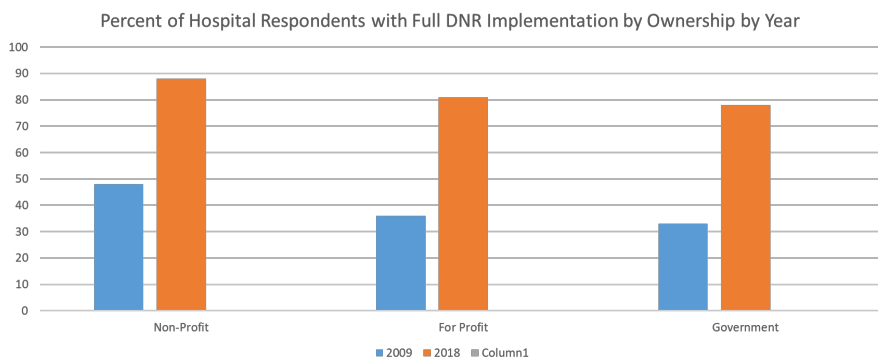


Figure 4. Improvement in Full Implementation of DNR

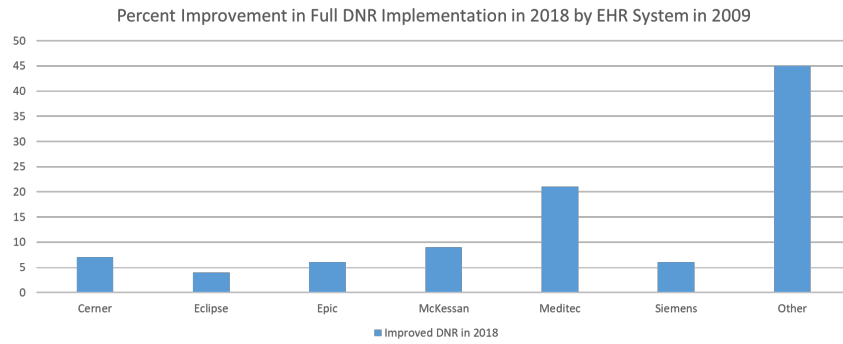


Figure 5. Percent of Improvement in Full DNR Implementation (2018) by EHR System (2009)

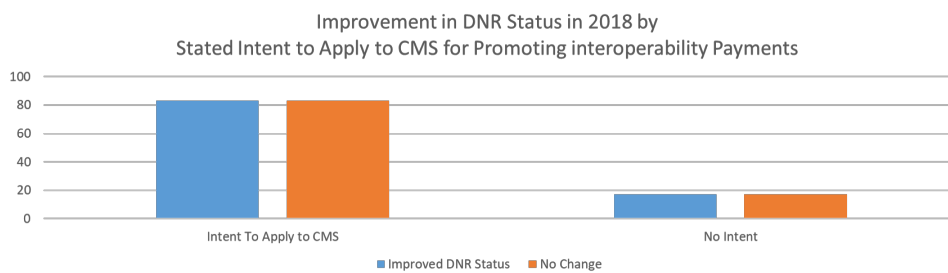


Figure 6. Improvement in DNR Status (2018) by Stated Intent to Apply to CMS for Promoting Interoperability Payments

Chi-square analysis was performed in order to detect any significant association between EHR and ownership for 2009 and 2018. Tables 4 through 10 provide the results of the analysis. Table 7 indicates that full implementation of EHR to fully document advanced directive in 2009, most were nonprofits (48.53%). Additionally, for non-full implementation, most were government owned (66.67%). These results were statistically significant as indicated by a significant Chi-square test, $\chi^2(2) = 55.7063, p < .001$ (Table 8). The association was small to medium (Cohen, 1988), Cramer's $V = .134$. In 2018, of those hospitals that had full implementation of EHR systems most were nonprofits (87.83%), as depicted in Table 7.

Table 4

Table of DNR by Size (2018 Survey)

	DNR		Size			
	<50	50-99	100-249	250-449	>450	<50
Frequency						
Percent						
Row Pct						
Col Pct						
0	162	69	114	52	22	419
	5.82	2.48	4.10	1.87	0.79	15.06
	38.66	16.47	27.21	12.41	5.25	
	19.73	16.31	14.67	11.04	7.59	
1	659	354	663	419	268	2363
	23.69	12.72	23.83	15.06	9.63	84.94
	27.89	14.98	28.06	17.73	11.34	
	80.27	83.69	85.33	88.96	92.41	
Total	821	423	777	471	290	2782
	29.51	15.20	27.93	16.93	10.42	100.00

Table 5

Chi-Square Results for Bed Size (2009 Survey)

Statistic	DF	Value	p
Chi-Square	4	174.3791	<.0001
Likelihood Ratio Chi-Square	4	177.9539	<.0001
Mantel-Haenszel Chi-Square	1	163.3302	<.0001
Phi Coefficient		0.2451	
Contingency Coefficient		0.2380	
Cramer's V		0.2451	

Table 6

Chi-Square Results for Bed Size (2018 Survey)

Statistic	DF	Value	<i>p</i>
Chi-Square	4	33.2297	<.0001
Likelihood Ratio Chi-Square	4	35.0662	<.0001
Mantel-Haenszel Chi-Square	1	32.7399	<.0001
Phi Coefficient		0.1093	
Contingency Coefficient		0.1086	
Cramer's V		0.1093	

Table 7

Table of DNR by Ownership (2009)

Ownership			
Government	NonProfit	Profit	Total
484	951	212	1647
16.67	32.76	7.30	56.73
29.39	57.74	12.87	
66.67	51.57	63.66	
242	893	121	1256
8.34	30.76	4.17	43.27
19.27	71.10	9.63	
33.33	48.43	36.34	
726	1844	333	2903
25.01	63.52	11.47	100.00

Table 8

Chi-Square Results for Ownership (2009 Survey)

Statistic	DF	Value	<i>p</i>
Chi-Square	2	55.7063	<.0001
Likelihood Ratio Chi-Square	2	56.4192	<.0001
Mantel-Haenszel Chi-Square	1	9.7351	0.0018
Phi Coefficient		0.1385	

Contingency Coefficient	0.1372
Cramer's V	0.1385

Table 9

Table of DNR by Ownership (2019)

	Ownership			
	Government	NonProfit	Profit	Total
	133	223	63	419
	4.78	8.02	2.26	15.06
	31.74	53.22	15.04	
	21.66	12.17	18.75	
	481	1609	273	2363
	17.29	57.84	9.81	84.94
	20.36	68.09	11.55	
	78.34	87.83	81.25	
	614	1832	336	2782
	22.07	65.85	12.08	100.00

Table 10

Chi-Square Results for Ownership (2018 Survey)

Statistic	DF	Value	<i>p</i>
Chi-Square	2	36.4313	<.0001
Likelihood Ratio Chi-Square	2	34.8602	<.0001
Mantel-Haenszel Chi-Square	1	6.7049	0.0096
Phi Coefficient		0.1144	
Contingency Coefficient		0.1137	
Cramer's V		0.1144	

Chi-square analysis was conducted in order to address this third research question:

4.2.1.3 Research Question 3: Are there differences in this change by primary inpatient EHR/EMR system in place in 2010?

Table 11 below depicts a cross tabulation of EHR by bed size for 2009. For bed size < 50, the most utilized EHR was in the “other” category 68.66%. For 50-99, “other” was the

most utilized (47.99%). Meditech was the most utilized in the 100-249 category (33.21%). Additionally, Meditech was the most utilized EHR in the 250-449 category (24.21%). Epic was the most used EHR in the >450 category (19.12%). These differences were statistically significant, $\chi^2(24) = 807.1972, p < .001$. The association was medium (Cohen, 1988), Cramer's $V = .264$ (Table 12).

Table 11

Table of EHR by Size (2009)

EHR	Size					Total
	<50	50-99	100-249	250-449	>450	
Frequency						
Percent						
Row Pct						
Col Pct						
Cerner	41	28	91	83	45	288
	1.41	0.96	3.13	2.86	1.55	9.92
	14.24	9.72	31.60	28.82	15.63	
	4.90	5.62	10.79	17.47	17.93	
Eclips	6	2	27	31	36	102
	0.21	0.07	0.93	1.07	1.24	3.51
	5.88	1.96	26.47	30.39	35.29	
	0.72	0.40	3.20	6.53	14.34	
Epic	29	18	41	41	48	177
	1.00	0.62	1.41	1.41	1.65	6.10
	16.38	10.17	23.16	23.16	27.12	
	3.47	3.61	4.86	8.63	19.12	
McKess	31	48	103	89	26	297
	1.07	1.65	3.55	3.07	0.90	10.23
	10.44	16.16	34.68	29.97	8.75	
	3.71	9.64	12.22	18.74	10.36	

Meditec	128	140	280	115	18	681
	4.41	4.82	9.65	3.96	0.62	23.46
	18.80	20.56	41.12	16.89	2.64	
	15.31	28.11	33.21	24.21	7.17	
Siemens	27	23	64	43	33	190
	0.93	0.79	2.20	1.48	1.14	6.54
	14.21	12.11	33.68	22.63	17.37	
	3.23	4.62	7.59	9.05	13.15	
xOther	574	239	237	73	45	1168
	19.77	8.23	8.16	2.51	1.55	40.23
	49.14	20.46	20.29	6.25	3.85	
	68.66	47.99	28.11	15.37	17.93	
Total	836	498	843	475	251	2903
	28.80	17.15	29.04	16.36	8.65	100.00

Table 12

Chi-Square Results for EHR by Size (2009 Survey)

Statistic	DF	Value	<i>p</i>
Chi-Square	24	807.1972	<.0001
Likelihood Ratio Chi-Square	24	778.5929	<.0001
Mantel-Haenszel Chi-Square	1	450.9196	<.0001
Phi Coefficient		0.5273	
Contingency Coefficient		0.4664	
Cramer's		0.2637	

Table 13 below depicts a cross tabulation of EHR by bed size for 2018. For all bed sizes, Epic was the most utilized EHR: 25.09% for < 50, 25.77% for 50-99, 28.06% for 100-249, 33.55% for 250-449, and 51.72% for >450. These differences were statistically significant, $\chi^2(36) = 507.5487, p < .001$. The association was medium (Cohen, 1988), Cramer's $V = .214$.

Table 13
EHR by Size (2018)

EHR	Size					Total
	aL5	bL100	cL250	dL450	eG450	
Frequency						
Percent	0					
Row Pct						
Col Pct						
Allsc/Ec	18	11	32	20	21	102
	0.65	0.40	1.15	0.72	0.75	3.67
	17.6	10.78	31.37	19.61	20.59	
	5	2.60	4.12	4.25	7.24	
	2.19					
CPSI	64	20	8	1	0	93
	2.30	0.72	0.29	0.04	0.00	3.34
	68.8	21.51	8.60	1.08	0.00	
	2	4.73	1.03	0.21	0.00	
	7.80					
Cerner	138	65	170	140	75	588
	4.96	2.34	6.11	5.03	2.70	21.14
	23.4	11.05	28.91	23.81	12.76	
	7	15.37	21.88	29.72	25.86	
	16.8					
	1					
Epic	206	109	218	158	150	841
	7.40	3.92	7.84	5.68	5.39	30.23
	24.4	12.96	25.92	18.79	17.84	
	9	25.77	28.06	33.55	51.72	
	25.0					
	9					
Evident	64	21	11	1	0	97
	2.30	0.75	0.40	0.04	0.00	3.49
	65.9	21.65	11.34	1.03	0.00	
	8	4.96	1.42	0.21	0.00	
	7.80					

Healthl4	55	13	2	0	0	70
	1.98	0.47	0.07	0.00	0.00	2.52
	78.5	18.57	2.86	0.00	0.00	
	7	3.07	0.26	0.00	0.00	
	6.70					
MRDHOST	32	19	16	2	0	69
	1.15	0.68	0.58	0.07	0.00	2.48
	46.3	27.54	23.19	2.90	0.00	
	8	4.49	2.06	0.42	0.00	
	3.90					
McKess	17	21	37	20	5	100
	0.61	0.75	1.33	0.72	0.18	3.59
	17.0	21.00	37.00	20.00	5.00	
	0	4.96	4.76	4.25	1.72	
	2.07					
Meditec	110	101	213	102	21	547
	3.95	3.63	7.66	3.67	0.75	19.66
	20.1	18.46	38.94	18.65	3.84	
	1	23.88	27.41	21.66	7.24	
	13.4					
	0					
xOther	117	43	70	27	18	275
	4.21	1.55	2.52	0.97	0.65	9.88
	42.5	15.64	25.45	9.82	6.55	
	5	10.17	9.01	5.73	6.21	
	14.2					
	5					
Total	821	423	777	471	290	2782
	29.5	15.20	27.93	16.93	10.42	100.00
	1					

Table 14

Chi-Square Results for EHR by Size (2018 Survey)

Statistic	DF	Value	p
Chi-Square	36	507.5487	<.0001
Likelihood Ratio Chi-Square	36	549.0866	<.0001
Mantel-Haenszel Chi-Square	1	30.6268	<.0001
Phi Coefficient		0.4271	
Contingency Coefficient		0.3928	
Cramer's V		0.2136	

Table 15 below depicts cross tabulations of EHR type by ownership for 2009. In all types of ownership, some other EHR category had the most utilization: 56.47% for government owned, 31.51% for non-profit, and 53.15% for profit. These differences were statistically significant, $\chi^2(12) = 236.6915, p < .001$. The association was small to medium (Cohen, 1988), Cramer's $V = .202$ (Table 16).

Table 15

EHR by Ownership (2009 Survey)

EHR	Ownership			Total
	Government	NonProfit	Profit	
Frequency				
Percent				
Row Pct				
Col Pct				
Cerner	53	224	11	288
	1.83	7.72	0.38	9.92
	18.40	77.78	3.82	
	7.30	12.15	3.30	
Eclips	16	85	1	102
	0.55	2.93	0.03	3.51
	15.69	83.33	0.98	
	2.20	4.61	0.30	

Epic	14	162	1	177
	0.48	5.58	0.03	6.10
	7.91	91.53	0.56	
	1.93	8.79	0.30	
McKess	54	202	41	297
	1.86	6.96	1.41	10.23
	18.18	68.01	13.80	
	7.44	10.95	12.31	
Meditec	138	449	94	681
	4.75	15.47	3.24	23.46
	20.26	65.93	13.80	
	19.01	24.35	28.23	
Siemens	41	141	8	190
	1.41	4.86	0.28	6.54
	21.58	74.21	4.21	
	5.65	7.65	2.40	
xOther	410	581	177	1168
	14.12	20.01	6.10	40.23
	35.10	49.74	15.15	
	56.47	31.51	53.15	
Total	726	1844	333	2903
	25.01	63.52	11.47	100.00

Table 16

Chi-Square Results for EHR by Ownership (2009 Survey)

Statistic	DF	Value	p
Chi-Square	12	236.6915	<.0001
Likelihood Ratio Chi-Square	12	267.2169	<.0001
Mantel-Haenszel Chi-Square	1	9.2437	0.0024
Phi Coefficient		0.2855	
Contingency Coefficient		0.2746	
Cramer's V		0.2019	

Table 17 below depicts cross tabulations of EHR type by ownership for 2018. Epic was the most utilized for government (18.24%) and non-profit (39.41%). Cerner was the most utilized for profit ownership type. These differences were statistically significant, $\chi^2(18) = 681.2118$, $p < .001$. The association was large (Cohen, 1988), Cramer's $V = .495$ (Table 18).

Table 17

EHR by Ownership (2018 Survey)

EHR	Ownership			
	Government	NonProfit	Profit	Total
Frequency				
Percent				
Row Pct				
Col Pct				
Allsc/Ec	15	85	2	102
	0.54	3.06	0.07	3.67
	14.71	83.33	1.96	
	2.44	4.64	0.60	
CPSI	50	37	6	93
	1.80	1.33	0.22	3.34
	53.76	39.78	6.45	
	8.14	2.02	1.79	
Cerner	99	434	55	588
	3.56	15.60	1.98	21.14
	16.84	73.81	9.35	
	16.12	23.69	16.37	
Epic	112	722	7	841
	4.03	25.95	0.25	30.23
	13.32	85.85	0.83	
	18.24	39.41	2.08	
Evident	50	40	7	97
	1.80	1.44	0.25	3.49
	51.55	41.24	7.22	
	8.14	2.18	2.08	

Healthla	46	21	3	70
	1.65	0.75	0.11	2.52
	65.71	30.00	4.29	
	7.49	1.15	0.89	
MRDHOST	22	16	31	69
	0.79	0.58	1.11	2.48
	31.88	23.19	44.93	
	3.58	0.87	9.23	
McKesson	23	62	15	100
	0.83	2.23	0.54	3.59
	23.00	62.00	15.00	
	3.75	3.38	4.46	
Meditec	97	284	166	547
	3.49	10.21	5.97	19.66
	17.73	51.92	30.35	
	15.80	15.50	49.40	
xOther	100	131	44	275
	3.59	4.71	1.58	9.88
	36.36	47.64	16.00	
	16.29	7.15	13.10	
Total	614	1832	336	2782
	22.07	65.85	12.08	100.00

Table 18

Chi-Square Results for EHR by Ownership (2018 Survey)

Statistic	DF	Value	p
Chi-Square	18	681.2118	<.0001
Likelihood Ratio Chi-Square	18	649.1104	<.0001
Mantel-Haenszel Chi-Square	1	29.2619	<.0001
Phi Coefficient		0.4948	
Contingency Coefficient		0.4435	
Cramer's V		0.3499	

Lastly, this fourth research question was addressed:

4.2.1.4 Research Question 4: Did this change differ by a hospital's stated intent in 2010 to apply for Medicare or Medicaid incentive payments for meaningful use of health IT?

In 2009, the number of respondents that intended to apply for Medicare and Medicaid meaningful use of health IT was 2416 (83%). There was no information available regarding this intent from the 2018 survey.

4.3 Summary

This study examined the change in availability of advanced directive from the time of implementation of the HITECH Act in 2009 compared to reported rates in 2018 for US acute care hospitals. The following four research questions were addressed:

1. What are the reported FI rates for AD in 2009 and 2018?
2. Are there differences in this change by hospital characteristics (bed size and ownership)?
3. Are there differences in this change by primary inpatient EHR/EMR system in place in 2010?
4. Did this change differ by a hospital's stated intent in 2010 to apply for Medicare or Medicaid incentive payments for meaningful use of health IT?

Regarding the first research question, in 2009, 1256 (43%) of the hospitals were fully implemented EHR systems with the capability to include advanced directive (DNR) across all units. In 2018, 2363 (85%) were fully implemented. This was an increase in EHR implementation by 42%. The second research question assessed the associations between DNR % and hospital characteristics of bed size and ownership type. Fully implemented EHR systems with the ability to incorporate advanced directive (DNR) for 2009 and 2018 were associated with smaller bed size. Regarding ownership type, for full implementation of

advanced directive (DNR) in 2009 and 2018, most were for profit and government. There were significant differences in EHR type by hospital characteristics. For bed size < 50, the most utilized EHR was in the “other” category. For 50-99, “other” was the most utilized. Meditech was the most utilized in the 100-249 category. Additionally, Meditech was the most utilized EHR in the 250-449 category. Epic was the most used EHR in the >450 category. Regarding ownership type, some other EHR category had the most utilization in all three ownership types of government owned, for non-profit, and profit.

Next, Chapter 5 will provide a discussion of the study’s findings and how the findings relate to similar studies detailed in the literature review. A discussion of the study’s limitations and recommendations for further research is also provided. The chapter concludes with a summary of the study and the contribution to the literature.

CHAPTER V DISCUSSION

5.1 Discussion of Results

HITECH is a novel government policy that was initiated in 2009 to promote and expand the use of technology, reduce data breach notifications, and protection of patients' information in the hospitals within the US. In so doing, the policy offers financial incentives to speed up the adoption and use of EHR in hospitals. In view of this, the purpose of this study was to investigate the improvement in the rate of full implementation of hospitals that have the capacity to deplore DNR in acute care hospitals after the introduction of HITECH Act in 2009, which was informed by the need to increase information flow between patients and physicians. Based on the analysis performed in this study, it was established that there was an improvement in the rate of EHR systems with the capacity to handle full directive orders from 2009-2018. The study findings show that in 2009, at least 1256 representing 45% of hospitals responding to the survey had the EHR capacity.

Similarly, in 2018, the analysis shows that 2363 (85%) of hospitals had the EHR systems capable of handling advance directives. This was a 42% increase from the previous years since the introduction of the HITECH Act in 2009. One of the possible factors that could have contributed to the rise in the number of full implementation rates for EHR from 2009 to 2018 can be attributed to the HITECH Act which motivates health care facilities to integrate electronic records in handling patient information and promote privacy, security and accessibility to vital information required by physicians to make medical decisions relating to patients. As such, many hospital institutions are able to promote and share critical information between patients and physicians. In particular, informed by the study findings, the adoption of EHRs tends to enhance and improve information flow between patients and doctors to promote disease diagnosis, error reduction, patient safety, and warrant better patient outcomes. As a result, it was found that the increase rate in the number of EHR

systems capable of handling advance directives from 2009 to 2018 could be linked to the bettered patient-doctor communication regarding end-of-life plans or directive orders, which can easily be accessed through EHRs without family consultation due to the urgency of such decisions.

The above study findings collaborate the results presented by Bhatia et al. (2015) who also note that the use of technology in hospitals, foundationally in the context of HITECH Act, increased access to patients' data making it possible for doctors to use it to execute urgent medical decisions relating to patients without consultation with families or close friends. The most important thing to accentuate from the research conducted by Bhatia et al. (2015), which parallels with the present research findings is that EHR increases communication between patients and doctors, a situation that facilitates the implementation of advanced directives or end-of life plans without consultations. This presumption is well supported by the result presented by the present study, which shows that access to such information through the increase in EHR systems that can manage advance directives.

The present results supports that the HITECH Act plays a significant role in promoting the adoption of EHR in hospitals as the results shows the increased number of EHR systems implemented with the capability to improve quality of life in patients with terminal illnesses, specifically by complying with the end-of-life information stored in the EHR systems for future references. Another significance that can be derived from the above study findings is the implementation of computerized systems that can handle the documentation of advanced directives for different patients electronically, significantly contributed to the increase number of hospital with EHR that were implemented from 2009 to 2018. In this case, the underlying explanation is that electronic records offer flexibility in clinical communication and ease the documentation of advanced directives for patients.

The study findings also show that there has been an increase in the use of EHR from 2009 to 2018. Based on the analysis performed, there was an increase of 27% in the use of inpatient management through EHR from 2009 to 2018. One explanation for these changes could be the use of HITECH programs that seek to provide financial incentives to hospitals implementing technology in handling patient information. The findings show that hospitals are using different types of EHR systems since the introduction of the HITECH Act in 2009. According to the results, incentives to hospital encourages the leadership to consider using different kinds of EHRs as the Federal government subsidizes the implementation costs.

Finally, it is established that the changes in the implementation of EHR rates from 2009 and 2018 could be linked to the unique hospital characteristics such as ownership and size. In particular, the study established that the implementation of EHR systems from 2009 and 2018 was higher in for profit and government hospitals. The increase could be attributed to the ownership structure in the for-profit hospital and government where stakeholders from different backgrounds commit their resources for premium services by digitalizing medical data. One reason for this increase can be linked to the fact that additional financial incentives by the government through HITECH gives for-profit and government hospitals an added advantage to focus more on the digitalization of the medical records compared to non-profit health facilities. Equally, Halpern (2019) and Lakin et al. (2016) collaborate the above findings by reporting that hospitals characteristics such as ownerships and regions significantly influence the use of Medicaid and Medicare services, even though both schemes are funded through HITECH programs. In addition, the Lakin et al. (2016) note that hospital characteristics determine the technological background that is required for HITECH programs to be functional and successful. In this regard, it can be deduced that for-profits and government hospitals have a better opportunity to implement EHRs compared to the non-profit hospitals where the existing information technology is already developed.

The study findings have practical implications for future policy that seeks to enhance the adoption of technology by healthcare facilities. First, the present findings suggest that economic incentives that are linked to the adoption of technology are presumed to improve and support the use of technology in hospitals. In particular, the study result shows that the introduction of HITECH Act in 2009 has significantly encouraged hospitals to implement technology and digitalized vital processes that have reduced data breaches, warranted confidentiality and privacy, enhanced management of patients, and increased bed capacity. In turn, this may be a different picture when other policies have failed to influence hospitals to implement the technology.

One of the possible explanations for the success of HITECH in promoting the use of technology in the hospital could be that health facilities respond to financial incentives programs, including promoting interoperability of incentives which are not applicable in ambulatory practices. Therefore, the present findings raise vital concerns relating to the effect that use of incentives, as advocated by the HITECH programs, has on the adoption of technology by hospitals. In this case, the results imply that incentives tend to reduce technology adoption costs for most of the hospitals, which in turn encourages the hospitals' leadership to consider the use of new technologies in their health facilities. The adoption of technology, as supported by the present findings, may lead to reduced data breaches, reduced hospital congestion, and results in positive impacts on the hospitals' abilities to deplore advance directives within the EHR systems across the hospital units.

More specifically, the current findings raise concerns as to why HITECH has been successful in promoting technology adoption in healthcare facilities when other policies have failed to change hospitals' and ambulatory providers' behaviour. This is a crucial implication that policymakers can capitalize on for future policy formulation if the primary goals are to promote technology adoption by hospitals. While there have previously been mixed findings

on the effectiveness of a pay-for-performance program that is designed to improve quality of care in hospitals through the use of EHR, the present findings imply that the main reason for this delay is the sense of inevitability. In this case, EHR has always been a long-term plan, but the use of HITECH programs has reduced the associated costs and hence its adoption by many hospitals.

Another implication that can be drawn from the present findings relates to the increase in EHR systems due to the HITECH programs. Based on the study findings, the use of HITECH has increased hospitals' capability to include advance directives in the EHR between 2009 and 2018. By integrating patients' information through the use of EHRs, physicians have adequate knowledge of what to do in case the patient's heart stops functioning. As such, the free flow of information that has been proposed through the implementation of technology in hospitals has resulted in the advanced directive orders being executed.

Moreover, another implication that can be drawn from the study findings is that the use of EHR is influenced by hospital characteristics, such as the size and many more. In this case, policymakers must understand that while HITECH has been effective in promoting the use of technology in the health sectors, its usage is primarily influenced by hospital characteristics. Larger and well-established hospitals are likely to implement EHR to aid in the management of the increased patient number compared to hospitals with few beds, among other factors. Furthermore, the study findings imply that the largest type of IT system to be used by hospitals is the EHR compared to EMR. In addition, because hospital characteristics influence the adoption of HITECH and the resulting implementation of EHR systems, policymakers need to consider factors such as region and attributes for different health facilities in allocating the financial aid to spur the use of technology in managing and

documenting patient information, including the documentation of patients' end-of-life directive orders.

5.2 Limitations

While the present findings are invaluable for policy formulation as far as the integrating and adoption of technology through HITECH programs in health facilities, there are few limitations that must be contextualized when examining the study findings. Most notably, the American Hospital Association (AHA) Annual Survey analysis may be incomplete by providing self-reported data on many variables. In this case, the present analysis may be limited by the fact that the survey concentrated on investigating acute care hospitals, and not critical access hospitals, long term care hospitals and skilled nursing facilities. Thus, not able to capture the accurate picture of how HITECH has impacted the usage of EHRs in non-acute hospitals. Therefore, the failure of the American Hospital Association (AHA) Annual Survey to capture such information could, to some extent, limit the broader interpretation of the present findings.

Second, the study could be limited by the over-reliance on the use of secondary data, whereby primary data that can be used to provide current information on a phenomenon being investigated was not used in this study. In this study, the data used data was stored in AHA databases from 2009 to 2018. Practically, this is an extended period and some changes in regard to how HITECH is used in hospitals might have changed over the years. However, by using such timeframes, critical changes are ignored, and the findings might not be reflective of the present situation. Third, while the overall response rates from the AHA supplement are considered to be high for the national institutional survey, there is a possibility that non-responders could have differed from responders, which was not addressed in the survey data. Although the research applied statistical techniques to mitigate its impacts and potential bias, these adjustments were unfortunately not perfect.

A foundational limitation that must be recognized is that the AHA survey may be less representative of all hospitals in the US. Subsequently, this analysis could be limited by the available data. It could be more specific if more healthcare facilities provided extra data relating to the impact that HITECH has in healthcare facilities. Lastly, the survey results were unable to unravel the effects of the several individual components of HITECH on the adoption and implementation of EHR. Even though promoting interoperability programs were the far-reaching motivation of HITECH programs, complementary programs such as the Regional Extension Centre program, as well as the EHR certification programs, could have influenced the EHR adoption.

5.3 Future Research

Based on the study findings, which support the need benefits of using technology in hospitals, there is a need for policymakers to support the adoption of technology in hospitals. Appropriate policies must be put in place to support the adoption of technology. This is an area that needs to be considered by researchers in the future as collaboration between the government and other stakeholders is critical to the adoption of technology in hospitals, as suggested by HITECH programs. Second, while HITECH programs have offered financial incentives to digitalize medical records and operations, there is a need to examine internal factors in hospitals that influence the adoption of technology. Such studies will provide underlying aspects about non-financial incentives that influence the implementation of technology in hospitals, which currently are not addressed by the HITECH programs.

Moreover, owing to the fact that the use of secondary data limited the study, other areas for study would suggest that researcher should use qualitative methods that combine the use of qualitative and mixed methods to investigate the topic further. The suggestion is based on the fact that sometimes secondary data are characterized by longitudinal effects where data over a long period may be less reflective of the current situation. Therefore, the use of

qualitative and mixed methods will allow researchers to collect both quantitative and qualitative data that can be used to overcome the weaknesses of each technique and promote clarity, while at the same time enriching the study findings.

In like manner, the study could be limited by basing the analysis on data only retrieved from AHA databases. To overcome this limitation, it is suggested that researchers should, in the future, include multiple databases to provide a comprehensive picture of the responses for the informed analysis. Because the study was geographically limited as the focus was on the use of information collocated from the US hospitals, the researchers should overcome this in the future by expanding the geographical scope to include other regions for generalizability and transferability of the results to a large population.

In summary, an extended recommendation for future research should be the need to focus on overcoming usability challenges that are associated with the use of IT in hospitals. As a result, researchers should examine the extent to which collaboration between stakeholders can promote the effective utilization of IT in hospitals and realize the vision for implementing HITECH programs. Whereas policymakers may need to initiate many of the policies that support the implementation of technology in organizations, its success is contingent on the true engagement from related parties, especially vendors of the systems, researchers, policymakers, healthcare institutions, clinicians, as well as patients.

5.3 Conclusion

The purpose of this study was to investigate changes in the availability of advance directive in EHR systems in response to the introduction of the HITECH Act 2009 in patients with acute illnesses in the US hospitals. Subsequently, secondary data from the American Hospital Association (AHA) Annual Survey and Information Technology Survey responses from 2009 and 2018 were used. The objective of the study was to assess whether there had been a change in the number of advanced directives from 2009-2018 in response to the use of

HITECH programs that support documentation of end-of-life plans for patients and stored electronically for medical decisions. The study also examined factors that influence the adoption of technology and the changes in the use of EHR and EMR over the years owing to the increased need to use technology to manage inpatients data. The study findings show that the use of HITECH programs to provide financial incentives to the hospital to use EHR in documenting patients' end-of-life plans within the EHR systems. In addition, it was found that hospital characteristics, such as bed number, location, state, and ownership, significantly influence the type of EHR programs used.

Moreover, the study established that there had been an increase in the number of EHR systems from 2009-2009, which can be attributed to the surge in technology adoption by hospitals across the states. From the results of the study it is reasonable to conclude that the HITECH Act influenced acute care hospitals' ability to fully implement the usage of EHR systems in their facilities and, in turn, increase their ability to adhere to DNR directives from their patients. The results above show that HITECH programs have increased the number of EHR systems with the capacity to document advanced directives. Patient information is documented and electrically stored for future references in case urgent medical decisions have to be made for patients with acute illnesses. The findings above can be used to encourage stakeholders in the health facilities to embrace technology in documenting patients' data for critical decisions such as the execution of advanced directives. In addition, because hospital characteristics influence the adoption of technology, the present results can be used by policymakers to redesign HITECH incentives by integrating aspects such as non-acute hospitals when providing financial incentives to spur the use of technology in hospitals.

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