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Hospital Technology Integration in South US States

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ABSTRACT

The paper chronicles exploratory research in the domain of hospital electronic health records (EHR) adoption with a view to establishing a foundation for additional research. After reviewing the literature on technology integration within hospitals and health information exchange, the paper includes a review of the adoption and use of EHR by hospitals in southern US states to determine if anomalies exist by state or by year. The first major finding is that no differences existed between states. Next, it was discovered that there were statistically significant differences in hospital ERH adoption between four consecutive year pairs (2010/11, 2011/12, 2012/13 and 2013/14). This finding was mirrored in small hospital adoption; however, the finding was slightly different in rural hospitals where the difference was only significant in 2011/12 and 2012/13. These findings should be the catalyst for future research to explore the cause of these differences.

Keywords

Health IT, electronic health record, technology integration

INTRODUCTION

The use of electronic health records (EHR) by hospitals is USA has increased from 13% in 2008 to 83% in 2014. This nearly six-fold increase offers tremendous opportunities as well as many challenges. The aim of the paper is to review the adoption and use of EHR by hospitals in southern US states to determine if anomalies exist by state or by year. This foundational research will provide a platform to launch additional future research.

TECHNOLOGY INTEGRATION WITHIN HOSPITALS

The Health Insurance Portability and Accountability Act, more commonly known as HIPPA, was signed into law in 1996. The goal of the act was to simplify administration controlling rising costs through computer standardization. However, HIPPA is behind with regard to information security measures due to the advances in technology (Conn, 2011). The American Recovery and Reinvestment Act of 2009 provided incentives for physicians to adopt medical records. Due to these and other legislative requirements, medical record adoption numbers are escalating (Keynes, 2011). Consumers faced with a not so obvious trade-off between better products and services and the potential privacy risks as result of more detailed information online are uncomfortable with the required changes. When dealing with digitizing health care records the product result can be better portable information and lower costs with the added danger of adding additional stakeholders. Stakeholders or players to whom records are disseminated increase the likelihood of an information leak also increases and HIPPA as does not address the added entities (Laric & Pitta, 2009; Conn, 2011).

At the heart of the use of EHR is the Privacy Paradox. The definition of health information privacy is an individual's right to control the acquisition, uses or disclosures of his or her identifiable heath data (Conn, 2010). The privacy paradox is a term used to describe the relationship between and individuals' intention to disclose personal information and actual disclosure behaviors (Carter-Langford, 2010). Therefore, individuals disclose personal information and yet maintain a high expectation of privacy. Further, privacy as it relates to patient data has been described as giving the patient the ability to disclose particular pieces of their healthcare records on a need-to-know basis (Conn, 2010; Rothstein, 2010).

Tweets or other leaks forms of social media are of a higher consideration among celebrities with regard to their medical information, but average people still have dangers associated with information leaks. The danger of identity theft can increase because of added federated searches to connect disparate systems. Patients are typically the first to detect a security breach suggesting that patient data has been exposed unbeknownst to privacy and security officers (New Study: Healthcare long way

to protect, 2011). Literature also suggests the length of exposure could be mitigated by Privacy Impact Assessments (Mudiwa, 2011).

Proponents of digitizing medical information have been politicians and Information Systems (IS) professionals not familiar with the marketing knowledge necessary to gain consumer confidence. Some marketing literature has suggested that marketers need to take a lead role in the information process associated with digitizing health care to gain trust, support, and cooperation from consumers (Laric & Pitta, 2009). Privacy concerns could undermine effectiveness of the system. Although most would go along with digital records those that would most need an integrated approach to their health care, female and older populations, have shown to be more conscious of the importance of health care information security (Laric & Pitta, 2009). Conn (2010) cited a (2009) study by The Agency for Heathcare Research and Quality (AHRQ) that conducted 20 focus groups across the country and found that there was the almost universal sediment that participants had a desire to "own" their data. The concern for ownership seems to arise as a matter of principal to the participants (Conn, 2010). To the contrary, Keynes (2011) found that patients who have experienced electronic medical records do not desire more control over them than those who have traditional medical records. Therefore, a more extensive literature review could determine that opinions on electronic or digitized medical records are changing as time marches on. Patients are likely to have become increasing familiarity to health care legislation regarding privacy. However, the most likely cause of changing opinions is the sharing information on the internet; people value their information but tend to let their guard down when sharing information on social networking sites (McDowell, 2009). The technology and focus of the sites may differ but, the general purpose remains the same; they allow information dissemination and communication through various electronic mediums.

Often privacy risks have been cited as reasons for delaying implementation; we must find ways to adapt the communication realities of today while still protecting confidential patient information (Carter-Langford, 2010). Biometric patient identity is one of the advanced options for efficiency, satisfaction and quality patient care while lowering costs and keeping patient security in mind. Telemedicine Law Weekly (2011) cited a palm scanner example that is 100 times more accurate than fingerprints and can even tell identical twins apart. Their example highlighted errors that could be made based on the 44 different languages spoken by the patient population served by the medical center (Medical Records, 2011). Suggestions include additional requirements for breach notification as well as software that would tell a patient if someone were looking as their information for all of the wrong reasons.

Health Information Exchange

As EHR and health information exchange (HIE) are adopted under the federal government's effort, health IT shows prominent impacts on patients' health and providers' performance (Buntin, Burke, Hoaglin, & Blumenthal, 2011; Rudin, Motala, Goldzweig, & Shekelle, 2014). Jones et al. reviewed investigations on the impact of health information technology in clinical decision support (CDS) (Jones, Rudin, Perry, & Shekelle, 2014). Their review shows more than 50% studies of health information technology are related to commercial health IT systems. A study investigated the impact of adopting EHR in New York City dialysis centers (Pollak & Lorch, 2007). It reported that the mortality rate of patients was reduced up to 49.5% in year 5-9 than year 1-2 in dialysis units, while the average mortality rate of United States Renal Data System (USRDS) had no significant change. It also reported that the number of patient care staffs per 100 patients at all three dialysis units was 25.1% lower than the average level of USRDS. Miskulin et al. also explored the impact of implementing CDS in 143 dialysis units, 18 of which used CDS (Miskulin et al., 2009). They found that the time nursing staffs spent on anemia management decreased nearly 50% with the help of CDS. Amarasingham et al. examined the impact of health IT at 41 urban hospitals in Texas (Amarasingham, Plantinga, Diener-West, Gaskin, & Powe, 2009). They reported hospitals equipped with advanced clinical information technology archived 15% less mortality rate, 16% less complication rate, and lower costs. Himmelstein et al. studied the impact of health IT on about 4000 hospitals according to the data from Medicare Cost Reports, the 2008 Dartmouth Health Atlas, and a Healthcare Information and Management System Society (HIMSS) analytics annual survey (Himmelstein, Wright, & Woolhandler, 2010). They concluded that utilizing health IT in hospitals might contribute to the better qualities of treating heart failure and pneumonia, but could increase administrative costs. Lee et al. investigated the hospital productivity change due to the adoption of health IT (Lee, Mccullough, & Town, 2013). Their results imply implementing health IT can improve productivity.

Rudin et al. concluded that the use of HIE probably contributes to lowering the usage of emergency department and related costs (Rudin et al., 2014). In a nationwide survey with 1000 participants, 79% respondents believed the adoption of HIE would improve service quality of health providers (Ancker, Silver, Miller, & Kaushal, 2013). Shank conducted a 2010 survey totally comprised of behavioral health providers in an Midwestern state (Shank, 2012). Her results indicated 67% providers believed they might benefit from the use of HIE while many providers also expressed concerns such as cost increase and heavier time burdens. Dimitropoulos et al. conducted a survey on English speaking adults in US (Dimitropoulos, Patel, Scheffler, & Posnack, 2011). This survey showed 70% respondents worried about privacy risk of using HIE. The privacy and security issues were

also recognized by AHIMA/HIMSS HIE Privacy and Security Joint Work Group (*The Privacy and Security Gaps in Health Information Exchange.*, 2011).

Although most results of health information technology implementation on the part on practitioners are positive, there are still some negative results reported in literature. Trivedi investigated the impact of using CDS for depression in routine public mental health care in Texas (Trivedi et al., 2009). They observed that implementing CDS was not always successful due to some barriers. The first barrier is computer literacy. Clinicians could be frustrated with technical errors and frequent switchs between different software systems. The second barrier is the high requirement of on-site IT support. Local IT staffs need to optimize network traffic and balance server load for peak demand during busy time. Thirdly, site-specific issues need to be solved. Each clinic may have its specific issues when switching to CDS. The new system has to leave space for workarounds to meet these particular requirements. Fourthly, implementing CDS needs the support from local administrators. The fifth barrier is the requirement of clinician autonomy and flexibility. Many patients are stable with their old treatments, so the new system should allow clinicians to keep these treatments. Finally, a successful implementation of CDS needs to consider patients' feeling. Mchugh et al. explored the effect of adopting electronic laboratory reporting on Lyme disease in New Jersey (LA McHugh, Semple, Sorhage, Tan, & Langer, 2008). They found that the annual number of Lyme disease reports increased by 386.1%, while the increase on that of confirmed reports was only 17.7%. It indicated that the adoption of new systems might cause overreporting. Zickmund et al. studied the impact of using computer programs to help the patients and their health care teams securely contact each other (Zickmund et al., 2008).

Methodology

All of the data used in the project is from the *Health IT Dashboard* which is a US Government *Open Government* initiative developed and maintained by the U.S. Department of Health and Human Services (HHS)'s Office of the National Coordinator for Health IT (ONC). This study focused specifically on the South of the USA; one of the four geographic segments specified by ONC. The South includes the following states: Alabama (AL), Arkansas (AR), Florida (FL), Georgia (GA), Kentucky (KY), Louisiana (LA), Mississippi (MS), North Carolina (NC), Oklahoma (OK), South Carolina (SC), Tennessee (TN), Texas (TX), Virginia (VA) and West Virginia (WV).

This project is focused on three key variables from the American Hospital Association (AHA) Annual Survey/Health IT Supplement. Specifically, the research is focused on the percentage of of all non-federal acute care hospitals that have adopted a basic electronic health record (EHR). For the purpose of this project, a hospital meets the criteria when the main site of the hospital includes a computerized system with capabilities in the following areas: patient demographics, patient problem lists, electronic lists of medications taken by patients, discharge summaries, advanced directives, orders for medications, viewing laboratory results, and viewing radiology results.

This project focusses on the adoption of EHR without clinical notes primarily because the data has been collected since 2008. Starting in 2011 an additional variable was added to the data collection that considers the adoption of EHR with clinical notes. Although this is an important capability there may be insufficient data at this point to create any meaningful findings. The data under analysis is segmented into three categories (overall hospital adoption, rural hospital adoption, and small hospital adoption). Each category is analyzed to determine if there are differences between states or between convective years, resulting in six hypotheses:

H1: Hospitals in some Southern states report a significantly lower level of EHR adoption than others.

H2: In some years, hospitals in Southern states report a significantly lower increase of EHR adoption than others.

H3: Rural hospitals in some Southern states report a significantly lower level of EHR adoption than others.

H4: In some years, rural hospitals in Southern states report a significantly lower increase of EHR adoption than others.

H5: Small hospitals in some Southern states report a significantly lower level of EHR adoption than others.

H6: In some years, small hospitals in Southern states report a significantly lower increase of EHR adoption than others.

The same procedure was followed for each of the six hypotheses. First the data for the states under review was extracted from OHC' Non-federal Acute Care Hospital EHR Adoption and Use dataset. Next, the data was converted to a chart to conduct a visually review of the individual states by year. Once the visual review was complete a one-way ANOVA was used to test for differences among 14 states and for the seven years under review (2008 – 2014). If a difference was identified, then post-hoc comparison using the Tukey HSD test was conducted to determine which consecutive years or states showed the difference.

Analysis

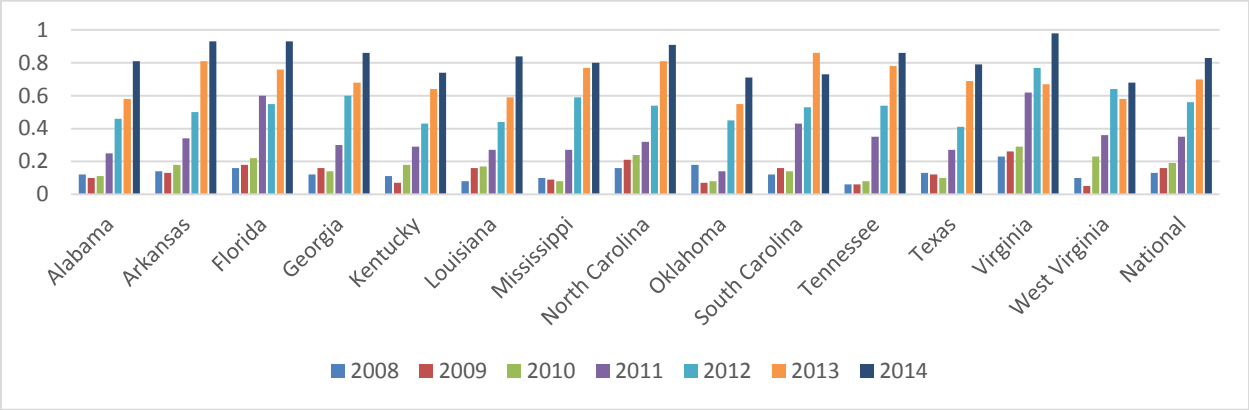

Figure 1 - Hospital EHR Record Adoption by State

H1: Hospital EHR Adoption by State. A one-way ANOVA was used to test for hospital adoption percentages among the 14 states. Hospital adoption percentages did not differ significantly at the p<.05 level across the 14 states, F (13, 84) = 0.31, p = 0.989.

H2: Hospital EHR Adoption by Year. A one-way ANOVA was used to test for hospital adoption percentages over the seven-year period (2008 – 2014). Hospital adoption percentages did differ significantly at the p<.05 level for the seven years, F (6, 91) = 146.08, p = 0.000. Post-hoc comparison using the Tukey HSD test indicated that the significant differences between means existed for the following consecutive years:

- 2010 (M = 0.16, SD = 0.067) and 2011 (M = 0.34, SD = 0.131).
- 2011 (M = 0.34, SD = 0.131) and 2012 (M = 0.53, SD = 0.097).
- 2012 (M = 0.53, SD = 0.097) and 2013 (M = 0.70, SD = 0.101).
- 2013 (M = 0.70, SD = 0.101) and 2014 (M = 0.83, SD = 0.091).

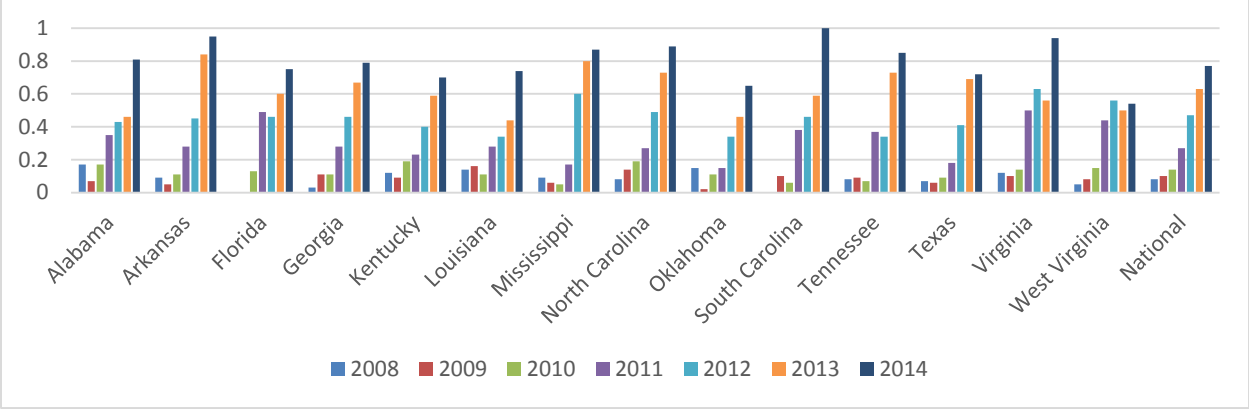

Figure 2 0 Rural Hospital EHR Adoption by State

H3: Rural Hospital EHR Adoption by State. A one-way ANOVA was used to test for rural hospital adoption percentages among the 14 states. Rural hospital adoption percentages did not differ significantly at the p<.05 level across the 14 states, F (13, 81) = 0.23, p = 0.997.

H4: Rural Hospital EHR Adoption by Year. A one-way ANOVA was used to test for rural hospital adoption percentages over the seven-year period (2013 – 2015). Rural hospital percentages did differ significantly at the p<.05 level for the seven years, F (6, 88) = 122.46, p = 0.000. Post-hoc comparison using the Tukey HSD test indicated that the significant differences between means existed for the following consecutive years:

- 2010 (M = 0.12, SD = 0.045) and 2011 (M = 0.31, SD = 0.114).

- 2011 (M = 0.31, SD = 0.114) and 2012 (M = 0.46, SD = 0.092).
- 2012 (M = 0.46, SD = 0.092) and 2013 (M = 0.62, SD = 0.129).
- 2013 (M = 0.62, SD = 0.129) and 2014 (M = 0.80, SD = 0.127).

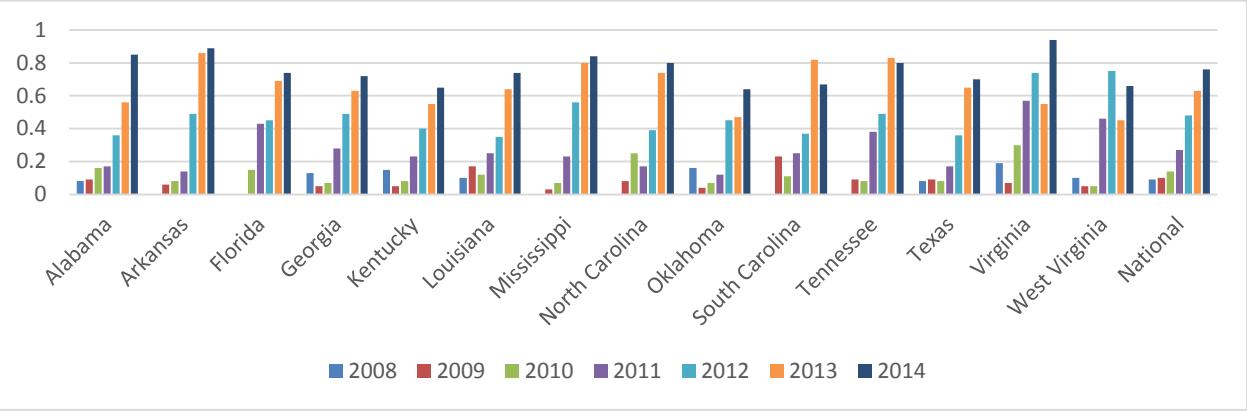

Figure 3 - Small Hospital EHR Adoption by State

H5: Small Hospital EHR Adoption by State. A one-way ANOVA was used to test for small hospital adoption percentages among the 14 states. Small hospital adoption percentages did not differ significantly at the p<.05 level for the states, F (13, 77) = 0.35, p = 0.980.

H6: Small Hospital EHR Adoption by State. A one-way ANOVA was used to test for small hospital adoption percentages over the seven-year period (2008 – 2014). Small hospital adoption percentages did differ significantly at the p<.05 level for the three years, F (6, 84) = 90.20, p = 0.00. Post-hoc comparison using the Tukey HSD test indicated that the significant differences between means existed for the following consecutive years:

- 2011 (M = 0.28, SD = 0.135) and 2012 (M = 0.48, SD = 0.130).
- 2012 (M = 0.48, SD = 0.130) and 2013 (M = 0.66, SD = 0.135).

Conclusions

The paper chronicles exploratory research in the domain of hospital EHR adoption with a view to establishing a foundation for additional research. After reviewing the literature on technology integration within hospitals and HIE, the paper reviewed the adoption and use of EHR by hospitals in southern US states to determine if anomalies exist by state or by year. The first major finding is that no differences existed between states. Next, it was discovered that there were statistically significant differences in hospital ERH adoption between four consecutive year pairs (2010/11, 2011/12, 2012/13 and 2013/14). This finding was mirrored in small hospital adoption; however, the finding was slightly different in rural hospitals where the difference was only significant in 2011/12 and 2012/13. These findings should be the catalyst for future research to explore the cause of these differences.

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