Proposing an Intelligent Cloud-Based Electronic Health Record System

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ABSTRACT

With the aging United States population, healthcare costs have considerably increased and are expected to keep rising in the foreseeable future. In this paper, the authors propose an intelligent cloud-based electronic health record (ICEHR) system that has the potential to reduce medical errors and improve patients’ quality of life, in addition to reducing costs and increasing the productivity of healthcare organizations. They developed a set of best practices that encompass end-user policies and regulations, identity and access management, network resilience and service level agreements, advanced computational power, “Big Data” mining abilities, and other operational/managerial controls that are meant to improve the privacy and security of the ICEHR, and make it inherently compliant to healthcare regulations. These best practices serve as a framework that offers a single interconnection agreement between the cloud host and healthcare entities, and streamlines access to private patient information based on a unified set of access principles.

Keywords: Clinical Decision Support System, Cloud Computing, Electronic Health Record System, Health Insurance Portability and Accountability Act of 1996 (HIPAA), Privacy, Security

INTRODUCTION

Healthcare expenditures in the United States (U.S.) reached 17.9% of the country’s gross domestic product (GDP) in 2011, and healthcare spending is projected to grow at a rate of 6.2% annually through 2021 (Centers for Medicare & Medicaid Services, 2010). According to the health division of the Organization for Economic Co-operation and Development (OECD Health Division, 2011), the United States spent over $8,000 per capita on healthcare in 2010, two-and-a-half times higher than the corresponding average per capita health expenditures of all other developed nations. As people live
longer, and the U.S. population gets older, this trend is expected to continue with no easy fix.

With its ability to reduce medical errors and improve patient safety and quality of living, Health Information Technology (HIT) is viewed by many as an enabler of a revamped U.S. healthcare system (Institute of Medicine, 2001). HIT’s benefits are expected to further materialize into increased productivity and reduced costs through faster and more reliable information sharing and integration across healthcare professionals and healthcare institutions (Blumenthal, 2011). A 2006 study conducted at the University of Minnesota analyzed the costs and benefits of one such technology, telehealth that consists of remotely monitoring the well-being of patients using HIT. The study was conducted by creating three separate groups of patients. The first control group received traditional skilled nursing care at home. The second group received traditional skilled nursing care at home and virtual visits using videoconferencing technology. The third and last group received traditional skilled nursing care at home, virtual visits using videoconferencing technology, and physiologic monitoring for their underlying chronic condition. Within 6 months of study, no differences in mortality or morbidity were found between the groups. The average visit costs were $48.27 for face-to-face home visits, $22.11 for average virtual visits, and $32.06 and $38.62 for average monitoring group visits for congestive heart failure and chronic obstructive pulmonary disease subjects, respectively. The results of the study showed that virtual visits and monitoring by skilled healthcare practitioners of chronically ill patients can provide positive patient outcomes at a lower cost compared to traditional face-to-face meetings (Finkelstein et al., 2006).

Despite all of its potential, HIT has historically faced many barriers to acceptance and adoption by healthcare practitioners because of its high implementation and maintenance costs, difficulties of integration with legacy health infrastructures, the lack of standards that ensure interoperability between various HIT components, and the time and effort required for learning and training. In addition, patients have thus far shown meager interest in adopting pricey HIT products and services, and have expressed concerns about sharing their private information online. For example, the free Google Health service shutdown after only a few years of operation because of lack of adoption by patients (Google, 2011).

Organizations in the US that furnish, bill, or receive payment for healthcare, and transmit or perform transactions involving an individual’s protected health information (PHI) are required to comply with the Health Insurance Portability and Accountability Act of 1996 (HIPAA). Title I of HIPAA is aimed at ensuring that no patient is denied insurance coverage based on health conditions, and at limiting coverage exclusions based on preexisting health conditions (U.S. Department of Labor, 2004). Title II of HIPAA has promoted the standardization of healthcare through using HIT in an effort to ensure that patients’ private information is protected and transferred securely (Centers for Medicare & Medicaid Services, 2012). The fundamental issues of privacy loss and excessive costs that permeate HIT were addressed in the American Recovery and Reinvestment Act (ARRA) that was signed into law by President Obama on February 17, 2009. ARRA allocated $300 million for improving health information exchanges, $20 million to the National Institute of Standards and Technology (NIST) to develop standards and enhance system interoperability, and $1.5 billion for health IT system upgrades in public health centers (Hoyt, 2009). Most importantly, ARRA included a provision stipulating over $19 billion in funding to establish a national electronic health record (EHR) system that enforces stringent security measures to protect patients’ private information (Khansa et al., 2012). This provision, called the Health Information Technology for Economic and Clinical Health (HITECH) act, was meant to “promote the adoption and meaningful use of health information technology” (U.S. Department of Health and Human Services, 2009a, p. 56124). Further, Title XIII of HITECH specifically encouraged healthcare institutions to adopt EHR systems.
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