The Use of Smart Card Technology in Health Care

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INTRODUCTION

This article describes a health information technology (IT) system for patient-centered access to health information through smart cards as an enhancement to Electronic Health Records (EHR) systems currently becoming implemented in the United States (U.S.) and around the world. Smart card technology provides patients with a virtual assistant accessed through data readers. This system allows patients and health care providers to enter patient information such as demographics, health history, health insurance, or symptoms onto the smart card. Patients and providers can access the patient's EHR through a cloud-based Internet platform, or with a smart card through data readers embedded in kiosks at provider locations. Patients could easily access their own health records with easy-to-understand explanations about their health condition and treatment. While smart card technology is widely used outside the U.S., the U.S. health care system may significantly benefit from this type of health IT to better coordinate patient care and control costs. This article explains the benefits of smart card technology, the use of self-service kiosks, comparisons to cloud-based Internet access for patient health care data, and privacy and security issues for this technology.

BACKGROUND

At present, the lack of a wholly integrated health information system leads to redundancy for the patient and a struggle for providers to coordinate care and control costs. Patients become frustrated to repeat complex sets of information and health history to multiple providers, such as emergency personnel, hospital admission staff, and primary care doctors, often within one episode of care. Patients and providers may lose faith in the medical system. Information that patients convey may not be properly captured. Providers should document the data correctly once and share among providers to assist in patient compliance with prescribed care, while better managing costs of care. Several agencies advocate for health IT to help health care workers communicate more effectively in care coordination for patient safety,

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better efficiency, and cost reduction in the U.S. and the world (National Quality Forum, 2011; IOM, 2011).

Health IT also extends geographic access to low- and middle-income countries around the world where there are critical shortages of health care providers (Lewis et al., 2012). To control costs while maintaining quality, healthcare has adapted systems improvement initiatives, such as PDCA (Plan, Do, Check, Act) cycles, TQM (Total Quality Management) methods, and Six Sigma and Lean Systems. Breakthrough technological advances such as Electronic Health Records (EHR) and Electronic Medical Records (EMR) are increasingly used to boost the capacity and assure sustainability of healthcare systems particularly with regards to the vast amount of patient data needed to manage care and control costs.

In the U.S., the increase in EHR adoptions arose from pressure exerted by the Obama Administration who offered $2.5 billion in incentives to increase the use of these systems (U.S. Department of Health & Human Services, 2010). As a result, the number of office-based physicians applying for EHR certification through the Office of the National Coordinator (ONC) for Health Information Technology grew to over 100,000 nationwide (ONC, 2012). A National Ambulatory Medical Care Survey (NAMCS) of physicians found that 57% nationally use some type of EHR/EMR system (Hsiao et al., 2011). Hence, the expanding use of EHR and EMR systems may still not completely satisfy patient and provider needs.

While EHR is supposedly capable of interoperability between organizations, EMR does not communicate with other EHRs or EMRs (Garrett & Seidman, 2011). In 2012, EHR and EMR adoptions markedly increase redundant manual data entry needs. The inability to consistently share accurate data remains a substantial barrier to realization of return on investment for EMR and EHR adopters. Some systems may deliver unmodified content to the patient, who may not understand the terminology. Instead, smart card technology, cloud-based Internet access, self-service kiosks and data readers would provide the patient a human-factors approach to explaining technical information in layman's terms. Patient-identified 'inaccuracies' can be systematically shared with providers to correct real or perceived gaps in data and improve patient compliance with effective therapies, providing a natural bridge to shared decision making (Heisler et al., 2009; Stacey et al., 2011).

Outside of health care, the public routinely uses computers and smart phones to securely access information and perform tasks for banking, home management, travel reservations, and more. Patients seek similar ease in accessing health information, although health care has been slow to develop patient information tools of comparable functionality (Krist & Woolf, 2011). The addition of smart card technology to EHR systems may overcome limitations of those systems while retaining patient control with convenient, familiar technology similar to that already used for other functions.

SMART CARD TECHNOLOGY

Issues, Controversies, Problems

Smart Cards

As a mature technology, smart cards offer independence and reliability at low cost, and they are widely used by healthcare, finance, government, mass transit, and other sectors in developing and developed countries (Frost & Sullivan, 2012). The smart card is called an "integrated circuit card" by the International Standards Organization (ISO) (Smart Card Tutorial, 1992). A smart card is defined as a "card incorporating one or more integrated [electronic] circuits within its thickness" (Xiao & Yu, 2009). The integrated circuit is mainly a memory unit but could also include a microprocessor (Smart Card Tutorial, 1992). Xiao and Yu (2009) explain that the smart card has tamper-proof microcontrollers that encrypt all information. The smart card is read by a card reader, connects to a computer, or is accessed wirelessly.

Cards that have physical contact with a reader are called contact cards. A typical contact smart card operates under the ISO/IEC 7816 standard, a plastic card body, a chip embedded in the body, and an often gold-plated contact point. When a contact card is inserted into a smart card reader, commands, data, and card status are transmitted over the physical contact points (Smart Card Alliance, 2012). A contactless smart card is powered by its own antenna through magnetic field induction initiated by the antenna in a card reader no more than 4 inches away for a passive card or less than 2 feet for an active card that requires a battery to enhance the card's power. Data on contactless cards