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MICROCHIPS: TECHNOLOGY THAT CAN CHANGE MEDICAL SERVICES

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ABSTRACT

Healthcare costs have increased greatly over the last few years. The result is a tremendous burden for businesses and private individuals. Experts say there is no end in sight to this increase. This situation has forced the federal government, state governments, and private industry, to investigate methods to slow down and reduce this constant increase in healthcare costs. Microchip technologies have been presented as a means to ensure better patient care while also reducing costs and errors resulting from the current system of healthcare. This paper presents an overview of microchip technology programs, issues with implementation, and future considerations for evolving programs.

Keywords: Healthcare, Insurance, Encrypted Transaction, RFID, Microchip Technology, Smart Card

1. INTRODUCTION

With the implementation of the *U.S. Affordability Care Act of 2010*, the focus of the federal government and all entities that are bound by their policies is on holistic patient-care with an emphasis of providing preventive treatments that reduce aggregate healthcare costs (Tabaesh, 2015). The holistic approach has, actually, resulted in increases in the time spent on administration and has caused rising high healthcare costs (Woolhandler & Himmerlstein, 2014). Physicians spend approximately sixteen percent of their time (i.e. less than nine hours weekly) on administrative tasks. While administration tasks can be reassigned to non-physicians and staff, efforts to reduce time spent on these tasks is important.

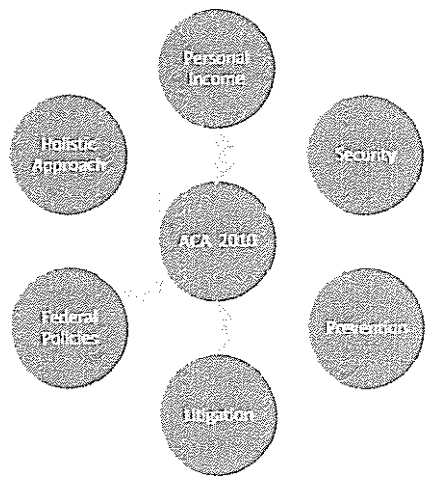

FIGURE 1 – U. S. Affordable Healthcare Act Influences

In considering reductions in healthcare expenditures, general discussions (cf. Or et al., 2011; Tabaesh, 2015) note RFID, smart card, and microchip technology are tools that can help avoid costs associated with the delivery of unnecessary healthcare tests and procedures. These technologies can manage patient records, schedule appointments, and facilitate payment transactions (Firouzabad & Mohammadi, 2016).

With these patients' data, technology must comply with the Health Insurance Portability and Accountability Act of 1996 ("HIPAA") provisions to ensure the security of records and confidentiality of patient information (Ting et al., 2011). Therefore, the successful integration of microchip related technology programs for patient identification and facilitating medical claims must consider how patient information can reduce healthcare expenditures while not reducing patient care.

2. CHIPS – RFID, Smart Card, and Microchip Technologies

Firouzabadi and Mohammadi (2016) offer that Radio Frequency Identifier (RFID) and Near Field Communication (NFC) could be used to expedite patient registrations and payments through mobile applications or embedded smart cards. These technologies hinge on patients' actions and acceptance of technology use. Patients would enter registration and medical information prior to seeing medical providers. In essence, the responsibility of data entry and billing is shifted from medical providers to patients with this technology. In turn, it is generalized that patient wait times will be reduced, billing errors minimized, and patient care increased.

With microchip technology, it may be embedded within a patient or in a plastic card (Katz & Rice, 2009). Embedding technology into patients to track medical histories and to provide ease of billing is not desirable. Not only are there issues associated with civil liberties and religious beliefs but also medical complications associated with medical implants and obsolescence of those implants (Katz & Rice, 2009; Pagnattaro, 2008). Hence, technology (e.g. plastic cards or mobile applications on mobile phones) that is external to patients is preferred. Being external to the patient would make this technology easier to replace, upgrade, and use. Consequently, this technology is not widely accepted by medical providers.

However, there are examples of microchip technologies being accepted on a larger scale in non-healthcare settings. Park et al. (2015) note that some mobile phones are equipped with microchips for facilitating electronic payments. Employees may be granted access to secure locations with smart cards and their movements can be monitored (Pagnattaro, 2008). In health care settings, inventory can be tracked and patients can be located. Consequently, encryption concerns exists.

TABLE 1 - RFID, Smart Card, and Microchips

Pros	Cons
Avoid costs for unnecessary tests and procedures	Must follow HIPPA 1996 - ensure security and confidentiality of records
Manage patient records and schedule appointments	Patients must accept and use technology
Facilitate payment transactions	Patient care increased
Expedite patient registrations and payments	Billing errors minimized
Use of mobile applications or smart cards	Encryption concerns
Patient is given responsibility of data entry and billing	Subject to attack by hackers
Mobile phones already use the technology for electronic payments and tracking employees	Need for a standardized national U. S. framework for encrypted security protocol to protect users using multiple platforms and networks
In health care settings mobile phones can be used to track inventory and locate patients	Need to develop secure systems to reconcile multiple billings from various medical providers and provide an analysis of medical treatments

Information must be encrypted on the microchips and on the networks facilitating data transfer as security is a primary concern to prevent information misuse and data theft (Blobel et al., 2001; Chuang & Chen, 2014), as well as, preventing public relations nightmares, which could result if medical records were obtained through something such as a "hacking" incident.

Hence the authentication of microchips is a critical defense in protecting patient information and network integrity (Jiang et al., 2013; Lee, 2015). Although authentication helps protect information, the users are also gatekeepers and are subject to attack by hackers seeking passwords and ways to infiltrate networks (Lee, 2015).

Security becomes an ever increasing issue when users must routinely present various access cards across multiple platforms and networks (Amin & Biswas, 2015). Therefore, a standardized national U.S. framework for **an** encrypted security protocol microchip card program would strengthen the desirability of the development of such **a** program. In developing such program, key issues should be addressed. The next section addresses such issues.

3. ISSUES

A primary contributing factor in limited technology acceptance may be attributed to patients' approval of such programs (Or et al., 2011). Patient trust in medical technology is very important to **a** program's success (Ziefle & Holzinger, 2011).

In addition to trust, and the program being cost effective, other factors influencing program outcomes must be considered, including social influences, usability, patients' knowledge, and consistent successful functionality of programs (Or et al., 2011). In fact, Katz and Rice (2009) state that use of technology can be driven by nontechnical factors including gender, ethnicity, and socioeconomic variables.

Factors to Consider When Developing Chip Based Systems:

- Social influences
- Usability
- Patients' knowledge
- Consistent successful functionality of programs
- Gender
- Ethnicity
- Socioeconomic variables

For example, Aboutorabi et al. (2016) found that patients in developing countries engaged in the practice of making informal payments (i.e. non-required out-of-pocket cash payments) to non-physicians to ensure better healthcare services.

These informal payments are failures in the healthcare system because they ensure that those with financial means to make informal payments acquire better services. It is suggested that educating medical staff and patients and increasing non-physician compensation, may positively affect the culture of expectation of medical treatments.

Paul (2016) notes that federal public policy demands that resources for medical indigence programs be appropriately applied towards providing basic levels of care for the population as a whole. Conversely, some portions of the population are left venerable with differences being attributed to State managed programs.

Furthermore, physicians have been pushed to practice *defensive medicine* to comply with third-party directives and to avoid patient retaliation, i.e., law suits (Studdert et al., 2005). In fact, emergency

physicians, practice defensive medicine more than other physicians by generally ordering more tests and seeking second opinions.

Moreover, patients deemed high-risk are often actively avoided by physicians due to perceptions of defending medical decisions in litigation. Thus, the practice of defensive medicine increases overall healthcare costs which may be reduced with the introduction of a national program using microchip technology which can be used to collect data that can be used to analyze behaviors of patients and providers of medical care.

Studying the, possibly, overcautious methods of physicians, especially emergency physicians, and the service they provide, could result in changes that protect health care providers from litigation and still allow physicians to provide reasonable health care services.

4. CONCLUSION

Microchip technologies have been presented in this paper as a means to ensure better patient care while also reducing costs and errors resulting from the current system of healthcare. Medical providers still need to build trust and relationships with patients as technology is not a substitute for communications (Rosner, 2016; Ziefle & Holzinger, 2011).

Furthermore, a national framework consisting of minimum standards concerning microchip programs is necessary. Technology platforms should have a preference for external biometric microchips. Similar to credit card and store value cards, regulations and technology could provide a platform for insurance providers to move forward in adapting external smart card types of technology for billing practices.

Part of this process is creating an encrypted identity program that can reconcile multiple billings from various medical providers and provide an analysis of medical treatments. If credit card companies can conduct fraud analysis, then third-party healthcare providers can conduct similar analysis. Therefore, more research in data analytics as applied to medical situations is necessary.

For future research, it is recommended that research in decision processes for funding medical drugs and treatments be conducted in large programs such as Medicaid and State run health insurance programs. Moreover, special focus on decisions to change covered drugs and treatments should provide justifications for such changes.

It is anticipated that some justifications would note best interest of patients while others will note cost constraints. In either event, microchip technologies can be used to collect data, even on a limited population, and the results of this analysis can be used to enhance and improve medical programs.

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