Abstract

In recent times the issue of national healthcare has entered the center stage in political and social circles. It has become a main point in political platforms and caused many debates both within the United States and around the world. Mainly, these debates are an extremely political and touchy subject. The biggest concern with healthcare is not who should get it, but how and what should people receive. However the answer to the question, “should citizens receive healthcare?” is generally accepted to be “yes” and furthermore viewed as a human right.

To this day, many different national health plans have been proposed; most of the newer ones including electronic information systems. In this proposal, Smeirc, working with Mountain Valley Medical Care Center, creates an electronic information solution that plans to be helpful for all.

Background

Smeirc, to the best of the corporation’s ability, tries to keep government and political involvement in its solution to this RFP to a minimum. Due to the fact that a final health care plan has not been approved, Smeirc’s solution must address a number of possible scenarios. However, a primary goal in the majority of health care proposals involves implementing electronic filing systems. Although electronic filing is not necessary, a system that enhances the efficacy, feasibility, and (preferably) safeguards of a national health care plan is, and Smeirc feels that an electronic record keeping system is the most direct manner in which the objectives of this RFP can be reached. Electronic record keeping itself falls under the category of Health Information Technology (HIT), which is considered capable of making the health care industry more productive. HIT could decrease spending, due to increased productivity, by $500 billion a year in
the year 2016 (Hillestad et al., Can Electronic Medical Record Systems Transform Healthcare?). Many of the estimates on savings come from the economy’s experience with the adoption of I.T. in other business sectors, such as telecommunications and retail, where productivity was increased from 1.5% to 8%. With the government looking to push forward with the implementation and use of electronic solutions quickly, physicians and their patients can receive $44,000 or more in government stimulus, if or when they transfer to an electronic medical system (Lack of Standards Delay Electronic Medical Records).

Considering the amount of information on a patient that has to be entered and then moved around through an office, Smeirc and its employees’ hopes are to streamline the process. This will make the error rate lower along with the time a patient needs to spend in a particular office. Additionally, this will speed up the time it takes a doctor to get a patient’s data when an emergency occurs; saving precious seconds for a physician trying save a life. With a national health care plan under consideration, these cost savings are being considered more thoroughly than ever before. Also, the increased accessibility of electronic health records is in itself an already appealing benefit, as physicians across the country could access a patient’s full medical history (saving time and money by removing the need for redundant tests). Indeed, some systems have already been created to address the rising demand for electronic record keeping: Google Health, Microsoft Healthvault, and WebMD Personal Health Record, to name a few. However, many say that simply throwing money at physicians will not ensure increases in productivity (Lohr, Steve, Electronic Health Records: How to Spend the Money Wisely). Although there is considerable impetus behind HIT initiatives, several issues must be addressed before they can be successfully implemented. Smeirc has a plan to continue to bring down these costs to the medical system. In conclusion, with all the cost savings, Smeirc hopes to help the patient by making data available immediately, allowing physicians to save lives and not get caught up in paperwork or bureaucracy.
Problem Definition

There are a myriad of issues which need to be addressed with this solution. Privacy must be ensured, so that a person’s constitutional and legal rights are protected under an electronic record keeping system. The system must have security policies to ensure informational integrity, and a system to verify who a person is. In order for efficiency to truly be achieved, the system must be widely adopted and utilized. A system to store information must be created and maintained. Monetary expenditures on the project must go towards achieving efficiency, not adding technology to the system for the sake of adding technology. Also, the I.T. Futures Foundation requests, specifically, that any proposed solution include security systems to reduce fraud or misuse, a monitoring and accountability system to prevent predatory pricing by the government (in a system involving a national healthcare option), and a system to reduce the costs of free-market healthcare. This system plans to reduce unnecessary medical interventions through the delivery of reliable information to consumers about the efficacy of various treatments. The last two requests present special problems, as they involve the collection of data. Specifically, the data would be most easily collected through the proposed electronic record keeping system, however concerns about privacy and the reliability of information within the system may prevent the collection of data in that manner. The request of a security system may also present privacy concerns. In particular, such a security system would require some manner of identification: a system to authenticate the identity and a system to authorize any action used under the identity. Ideological reservations aside, the high start-up costs of any genuine attempt at a HIT system acts as a roadblock (a speed bump at least) to implementation. A system which improves the speed of check-in and reduces miscellaneous administrative overhead would also be desirable – it is estimated that Americans age 15 years and older collectively spent 847 million hours waiting for medical services to be provided in 2007 (Krueger, Alan. A Hidden Cost of Health Care: Patient Time). Ideally, such a system would increase customer satisfaction and efficiency by removing the need to fill out multiple
copies of forms with redundant information (i.e. if a customer could swipe a card through a card reader and have their height, weight, and name added to paperwork automatically, they would not need to add that information every time they visit a doctor). The proposed solution must show that increases in productivity will yield a return on investment and sustain savings in the long term, while still acting as a superior solution compared to alternative proposals. Although this task may be difficult, a strategy of effective implementation and best practices will most likely yield desirable results.

Proposed Solution

We at Smeirc propose a Health Center Kiosk check in. This system would first be implemented in Family Practice and other Urgent Medical Centers that are not Emergency rooms. The emergency room implementation will take further research to develop a solution that will appropriately fit to the importance and severity of the visit. This system will have the patient check in through a kiosk that will ask them all the basic questions regarding the purpose of their visit, gathering all required health and insurance information, and to fill out the necessary forms. This process will alleviate the frustration of the patients resulting from filling out the same form more than once; they will only have to sign the final copy and turn it in. The system will require at the start of the business day that the management logs in which medical professionals are working and which examination rooms will be used during the day. The system will be connected with the appointment system to help with management.

Smeirc has looked at different solutions for implementing kiosks in an office setting, and has found that implementing a thin-client solution would help secure the patients’ data more than other solutions. For example, in a standard setup with a computer and keyboard, a patient could possibly install malicious software or track the data on the machine. The computer could also allow him or her through any number of uncontrollable security flaws to get outside the setup environment and collect very important data – clients’ health records. With our thin-client solution we will use a machine that doesn't do anything but connect to a server and display a program from the server. In a touch screen kiosk
configuration, the user cannot get outside our setup environment and all data is encrypted and sent to a controlled server. If the user manages to get outside the environment we put them in, the thin-client cannot be modified, thus stopping them from installing any sort of tool. Since these thin-clients are just connecting to a server which we control in a secure facility. We can upgrade the server at anytime and these thin-clients can last for years to come, whereas if we wanted to upgrade a standard setup, we would have to upgrade each unit, making the expenses greater. Finally the thin-clients are designed for different industries, have no moving parts, and won’t break down like a standard computer would. The user will swipe a self identifying card or enter a self identifying pin, then choose whether they are a walk-in or have a scheduled appointment and continue to fill out the information of the purpose of the visit. This will reduce human interaction and minimize the initial questions once inside the Examination Room.

As the patient checks in, they will be put into a queue for the rooms and professionals available. This will also allow the patients to have an understanding of actual wait times. This process will maximize the services and allow time for service monitoring for efficiency of treatment. The management will be able to review the records over the months and average wait times and treatment times to better understand how to further manage resources while maximizing service to the patients. The kiosk will minimize errors in paperwork and ensure that all paperwork is properly filled out. The system with the queuing software will be able to send the medical records of the patient to the next open exam room for the doctor. This will also minimize the unnecessary viewing of the patient’s records. When the patient is checked out of the room, the room will be opened up in the system and the next patient’s information will be sent to that room. With the direction of health care records going electronic, having the patient input their information digitally will start the transition to the new way of healthcare records. The patient will no longer have to fill out five of the same forms. The system will fill out all forms with the information that was input by the patient. The patient prints out the finished form, signs, and turns it in to the receptionist. This type of system is being used in many service related industries.
Implementation Plan

For the test-execution of this solution, Smeirc partnered closely with Mountain Valley Medical Care Center, a mid-sized multiple-physician office located outside Denver, Colorado that provides healthcare services to a wide variety of patients local to that area. The center, wishing to improve their service to the community it has been involved with for the last fifteen years, graciously provided Smeirc with a live setting in which to study the effectiveness of the programs described above and detailed below.

Phase I: Initial Planning & Design

At Smeirc, we understand that every organization faces its own unique problems, each of which may demand a highly customized solution. With this in mind, the first part of this phase directly involved Mountain Valley’s staff—its doctors, nurses, receptionists, and other professionals. Sit-down interviews, meeting sessions, and our own independent observations were conducted for one week prior to the official launch of the project. In this time, we were charged to identify where the greatest leaps could be made in improving the center’s interaction with its patients.

Actually watching how the center’s medical professionals interacted (or did not interact) with IT systems paired with the initial talks allowed us to meet the faces behind the facility and to understand what it was they needed from us. The center utilized a primary records system in paper format, though newer entries were also documented digitally in a system internal to the facility. Patients checking-in for their appointments would have their records handed to an orderly who would then find an unoccupied examination room to which the doctor’s services could be queued.
Redesigning this process to eliminate headaches and improve upon existing efficiencies, with an implementation that took advantage of current IT resources, was our primary goal. It was determined that a move to a managed electronic medical record system (EMS) would allow this procedure to occur more fluidly, since it would not only improve the speed and productivity of the working environment, but also the quality of care provided to the community, benefiting the interests of all involved.

Phase II: Identification of Target & Needs

Smeirc understands that the reason health centers like Mountain Valley exist is to serve patients who require medical care. To gain some metric on the public opinion of the center’s service, satisfaction surveys were distributed prior to checkout and collected before patients left the clinic. Most feedback included some desire to increase speed, either relating to reducing wait-time or time consumed while performing administrative work.

Again, Smeirc viewed this problem as solvable through an efficient electronic medical records system. But, it also showed that the center needed to get people in the door, seen, and on their way faster. By means of an automated check-in/out system, we believed the center could increase its speed of service and, therefore, better serve its community’s interests. Thus work began on crafting an optimized method in pursuit of fulfilling Mountain Valley’s new primary concern: an EMS-integrated kiosk that was both quick and simple for patients to understand and easy for the center’s staff to pick up and use.

Phase III: Technical Setup

Mountain Valley needed a solution that not only fulfilled today’s design criteria, but set the center apart and made it a standard for healthcare providers in the future. Smeirc understood from its initial research with medical professionals at the center that concepts such as evidence-based medicine are tools that enable doctors to make better diagnosis and further the quality of treatment. The best time to plan for future advances in technology is at the inception of a system itself; in other words, as soon as possible.
Thus, special care was taken to make the center’s EMS program extendible. The first stage of setup involved organization of medical records on the backend. We worked closely with the center’s personnel to design a digital format for their records that satisfied both their professional needs and their patients’ medical interests. We were quick to follow this up with an overhaul of Mountain Valley’s technical systems, to enable full digital storage of patients’ records, leaving paper copies as fallback.

![Medical Records Card](image.jpg)

**Figure 1.1a: Front View**

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<th>Name</th>
<th>Tor Eivind Hagemann</th>
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<td>Issued</td>
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<tr>
<td>Signature</td>
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</table>

**Figure 1.1b: Back View**

Now an infrastructure for records existed, but interface was still limited to employees in the office. To speed the process of check-in, Smeirc provided patients with a means to announce their presence instantly: a card specifically designed to access their electronic medical record at Mountain Valley. (see the figure above for example) This card, when used at kiosks available to patients.
entering the office, automatically: 1) accessed the repository of records held at the center; 2) cross-referenced a table of appointments to alert the staff of patient’s check-in; and 3) allocated an exam room to which the patient could be directed with a prompt, and where that patient’s record was made easily available to doctors and nurses. This solution eliminated the headache of logistics management from the hospital staff while keeping patient check-in uncomplicated. The kiosks were, therefore, able to fulfill their proposed functionality.

Phase IV: Trial Evaluation

The success of Smeirc’s kiosk card system at Mountain Valley establishes a precedent for the system’s strength and usability. Because patients were shielded from the internal complexity of the EMS database, the robustness of the system was not wasted. This single case ensures the story of success at Mountain Valley will provide encouragement for other clinics that see the value of such a system. In the future, offices might even use be able to use portions of this system to aid in the processing of health insurance alongside patients’ medical information, but always to the benefit of the patient, the care center, and the community they both represent.
Technical Description

Strictly speaking, the EMR system uses records an XML format that can be validated by a DTD for “well-formedness.” This allows modularization and limitless extension of the record itself. Also, all internal records are housed and maintained by a GIT-repository, which provides “complete history and full revision tracking capabilities, not dependent on network access or a central server.” However, the entire record itself is secured with RSA encryption, to which only patients and their doctors share secret keys. This allows for safe transmission of records throughout any network, since deciphering is done at only endpoints and only public keys are exchanged as plain-text. These secret keys are housed on the card provided to a patient, and are themselves revocable, so that loss of a card does not compromise the record as a whole. Permission and trust can be managed dynamically without an unreasonable level of technical knowledge through the “fingerprints” printed on the backside of the cards. Repositories themselves can share anonymous patient metrics (small, statistical data to be used in comparative diagnostics by other medical professionals at other offices) without the inherent risk of opening the entirety of a patient’s record. This control also allows offices to conform to laws regulating the sharing of medical information, giving the system its proper versatility, but also built-in safeguards.
Resource Request

Research - $10,000
   Includes:
   • Finding appropriate sites for test cases
   • Transportation
   • On site data collection

Development - $25,000
   • $10,000- office kiosk setup (includes multiple kiosks)
      o $2,000 - kiosk per office
      o $500- kiosk setup, connecting to Internet and server
   • $15,000 – setup main server

Personnel-$10,000
   Includes:
   • Initial setup
   • Service and maintenance
   • Training

Total cost for test case- $45,000

Individual Contributions

David Molik -
Brainstorming session, outline, project direction

Troy Derouin-
Brainstorming session, main researcher into background and problem definition

David Blevins-
Brainstorming session, research and writing into background and problem

Dan Bekowitz-
Brainstorming session, writing into problem solution

Tor Hagemann-
Brainstorming session, graphics, implementation

Evan Slaughter-
Writing into abstract, editing, compiling and formatting final draft
Works Cited


