Electronic Health Records

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The needed innovation in health care in the U.S., areas of change, adoption drivers and its implications.

Burag Cetinkaya

The United States population is one of the largest in the world with 300 million people and increasing at rate of 1%.[1] A growing population of this size, however, also comes with its set of problems. One of the problems, maybe the most important, is health care and how it is provided and consumed in such a large country. One particular aspect of health care that makes it a special topic is its universality. No matter how healthy or sick, every single person in the population is part of this system either by receiving or providing health care, although the frequency and the amount of care will vary among different demographic groups. Unfortunately the cost of health care has been increasing over years and health cost per capita in the U.S. is highest in the world[4]. A direct result of high cost of health care is reflected in the decreased number of people getting the necessary medical treatment. According to a National Institute of Health (NIH) study, almost 8% of people who are in need of medical help cannot get it due to economic hardship[2]. When high cost medical insurance and health care is combined with inaccessibility of patient records, unavailability of specialized medical personnel and equipment in remote areas, and unavailability of information on diseases and available treatments, one can see the dire state health care is in the U.S. today. Michael Porter portrays the current situation of health care in the U.S. as follows:

> "The U.S. Health Care System has registered unsatisfactory performance in both costs and quality over many years. While this might be expected in a state-controlled sector, it is nearly unimaginable in a competitive market- and in the United States, health care is largely private and subject to more competition than virtually anyplace else in the world." (Porter, 2004).

As a response to growing concern and discontent among people on the topic, healthcare was included in the important checklist of topics on the speech lists during the 2008 presidential election campaign. Both candidates recognized the fact that the U.S. ranks relatively low (37 out of 191) compared to other health care systems in terms of overall health system performance[3] despite being one of the most expensive countries in terms of cost of health care per capita[4]. Throughout his campaign, president-elect Barrack Obama promised a new era in health care by stretching health care coverage to as many people

[1] https://www.cia.gov/library/publications/the-world-factbook/print/us.html
[2] See Exhibit - 2
[3] http://www.who.int/whr/2000/en/whr00_en.pdf retrieved on 11/24/2008.
[4] Poisal, J.A., et al, Health Spending Projections Through 2016: Modest Changes Obscure Part D's Impact. Health Affairs (21 February 2007): W242-253.

as possible, lowering the overall cost of health care and removing the inefficiencies in the system[5]. These reforms however cannot be accomplished unless the competition shifts from pricing among health plans and networks to prevention of diagnosis and treatment of specific diseases. It is at this level that true value is created (Porter, 2004). This shift is only possible by utilizing health information technology which is a combination of many technologies available today to bring health care to the digital age. A combination of these new technologies can be used in a variety of areas such as patient record sharing among physicians, patient-centric web portals, remote health care administration, computer assisted remote surgeries, virtual patient visits and patient education in health problems and treatments. As different as these applications of technology might sound, one thing they all have in common is the fact that they build on the same underlying basic principle of electronic health record (EHR).

Throughout history the healthcare industry has been known for its quick adoption of technological innovations in medicine or medical procedures. Unfortunately, the same cannot be said for technology innovation in patient information sharing or storage of patient records (Amor, 2008). One of the biggest challenges faced today in health care is the availability of patients' medical records. Traditionally, most of the patient history, which consists of records on operations that patients undergo, medications, allergies, hereditary conditions they take are recorded on paper and archived after a couple of months. As of today, most patients typically don't get a copy of this information and the fate of these documents is in the hands of care providers. When needed, the patient is asked to reconstruct her medical history, which is seldom complete or accurate. Since physicians cannot rely on the accuracy of this information, most of the time identical procedures, tests are performed to verify a patient's conditions. To prevent this, HIPAA (Health Insurance Portability and Accountability Act) regulations, a government initiative that regulates the operations of health care related entities in the U.S., mandate that patient records must be kept for 5 years[6]. This forces care providers to hold on to a copy of the record for years, yet it does not guarantee the availability of this data when physicians actually need it. While it might not be obvious at first, this creates an enormous amount of redundancy in medical procedures and slows down medical treatment. According to a study conducted by Massachusetts Medical Society absence incompleteness of health information alone frustrates 18% of physicians[7]. Subsequently, more physicians are reluctant to use this incomplete set of information for diagnostic

[5] http://www.change.gov
[6] http://edocket.access.gpo.gov/cfr_2005/octqtr/42cfr482.24.htm
[7] See Exhibit 3

purposes. To address this problem, many government agencies and large health insurance providers started to promote the concept of Electronic Health Records for the past couple of decades. Electronic Health Records, or EHRs, represent a patient's complete medical history in electronic form. This small change from paper to digital has tremendous impact on health services delivered. According to RelayHealth, one of the most prominent EHR system providers in the health care industry, EHRs reduce costs related to physical storage of health records, make the transfer of health records almost instantaneous, provides very efficient ways of searching for specific information, and paves the way for a set of innovative health care approaches[8]. To just name a few of these health information systems, Decision Support Systems that help physicians with diagnosis of complex diseases, Disease Management systems that are used to facilitate the handling of patients with certain diseases such as diabetes, cancer, AIDS etc. These systems can greatly increase health provider efficiency and quality of health care that a patient receives two inversely proportional concepts in the industry.

Although the use of EHRs is revolutionary and paves the way for many other innovations, the technology behind the EHR is hardly new. Use of EHRs is made possible by advancements in the software, networking and health care industries. Since its inception, the internet has evolved from a small network of computers between a handful of universities to an integral part of life where business, entertainment, education is conducted on a daily basis. During the dot-com bubble of late 1990s companies started investing in infrastructure by laying out thousands of miles of fiber-optic cables that increased the available capacity of computer networks. After the dot-com bubble burst, all of these networks were still intact, waiting to be fully utilized. Realizing this opportunity, companies started developing software that requires constant, high-bandwith internet connectivity. The nature of the data people operated on rapidly changed from lines of text to voice, high resolution images and video. This trend increased the amount of data that people work with. To meet the demand, hardware manufacturers concentrated on increasing electronic data storage capacity while decreasing the costs. Consequently, the price per megabyte has fallen to $0.001 in 2005 from $10 in 1990[9]. When combined together these two advancements alone make electronic data storage very appealing from a cost-efficiency and data-transfer points of view. Realizing the increased capacity in hardware, software world started pushing the envelope even further. Most software developers realized that the era of desktop software has been coming to an end for the most part and the computing power has been shifting to the Web. Most

[8] http://www.relayhealth.com/specific/hco/default.aspx
[9] http://www.hitachigst.com/hdd/technolo/overview/chart03.html

companies concentrated on working with large amounts of data. One can see the fruits of this labor by looking at breakthroughs in search, data mining. At the same time invention of new languages such as Java and C# have made it very easy to develop and integrate applications over the internet. This trend has been gaining momentum in the past couple of years and a new term, “cloud computing”, has been coined to go along with it. Cloud computing, makes it possible to create services that live on the internet and are accessible by a variety of clients such as mobile clients, desktops, laptops and even small single purpose devices (Kane, 2008). These advancements create the perfect set of conditions for health care industry. Health care industry has always been keen on categorizing and organizing health data to make it more accessible and searchable by creating coding standards such as International Classification of Diseases (ICD) by World Health Organization in as early as 1893[10]. ICD databases, for example, enable physicians to look up disease information for diagnosis and when communicating with other physicians. So when these supporting technologies were mature enough to prove reliable, perfect conditions were set for a recombinant innovation (Hargadon, 2003) by harnessing the advancements in these diverse fields to revolutionize and modernize the health care industry as a whole. Already aware of the problems in the health industry, major players started to realize that centralized EHRs could finally be set up and used as a basis for other innovations to create the needed edge in the ever increasing competition in the non-price dimensions.

Health care industry in the U.S. can be split into four major categories by function. There are the patients, care providers (such as doctors, nurses, hospitals and laboratories), health insurance companies, and finally the government. Out of these groups, health insurance companies and health providers have been subject to increasing competition. To cope with the competitive pressure health plans and providers, until recently, have tried reducing the costs and shifting them onto each other. Cost shifting, however, does not create the competitive edge that they are looking for anymore. Thus they are the first ones drawn to technical innovations such as EHRs to differentiate themselves in the market place. At the same time health insurance firms in the U.S. have a special place in health care industry. According to Centers for Disease Control and Prevention’s (CDC) National Health Information Survey (NHIS) 85% of people who have been treated in the U.S. had some sort of medical insurance in 2007[11]. This suggests that the U.S. health care system is mostly powered by health insurance companies. On the other hand health insurance companies have a lot of exposure since they face both customers and care

[10] http://www.who.int/classifications/icd/en/
[11] Please see exhibit 1

providers simultaneously. Due to their special position, they have the biggest influence in technology adoption. Aware of the changing playground to stay competitive, health insurance companies are looking towards providing more value to their members while minimizing the patient care needed at the same time by targeting pro-active wellness programs towards patients to keep the health costs down. Each physician visit, lab test or procedure paid for by health insurance companies trims the profit margin per member. One solution that they have come up with, that combines both cost-savings with increased value proposition for the members, is Personal Health Record (PHR) portals that build on top of the EHR concept. PHRs, typically supplied by health insurance companies, provide a central place for members to check their health status, latest claim activity, follow up on doctor appointments, fill prescriptions, get alerts and notifications based on their lab results etc[12]. By involving members in their health management more, health insurance companies are trying to reduce the number of doctor visits that result from not following directions or simply lack of information. According to a recent physician survey 17.89% of medical mistakes occur due to patient noncompliance with prescribed treatment[7]. Health insurance companies are hoping to increase patient compliance via PHRs. They are offering services that send electronic alerts to patients reminding them to stay on course with the prescribed treatments. This could, in turn, reduce the number of medical visits and procedures which directly translate into higher profit margins for health insurance companies. On top of pro-active member participation through PHRs, health insurance companies are also embracing the concept of e-visits. Some physicians are offering medical consults to patients via e-mail and web portals. Patients who already have an EHR set up with the physician could skip an in-person office visit for simple questions to their doctors such as medication refills, non-urgent symptoms or simple information questions. Up until recently such e-visits did not qualify for payments by the health insurance companies and consequently not too many physicians offered them. In January, some of the leading health insurance companies such as Aetna, CIGNA and Blue Cross/Blue Shield have decided to pay doctors and cover members for “virtual” or e-visits (Gearon, 2008). The process works by members filling out a short clinical survey upon initiating a web visit. A single, centrally managed database holds all of the patient information that can be accessed by all providers in the health network who treat the same patient. Latest data suggests that patients are also liking the idea. Since its inception in January through March 93,000 Aetna members have used the service and reported a high level of satisfaction (Gearon, 2008). But one might ask what’s in it for the health plans? Virtual visits are cheaper compared to physical in-office visit. This reduces the amount that

[12] http://www.aetna.com/showcase/phr/

the insurance companies need to pay the doctors. Doctors are also embracing the virtual visits. It gives them the ability to prioritize the e-visits based on their schedule and urgency, which in turn helps them increase their efficiency and serve more patients. This solution alone creates tremendous value for all players in the health care industry. Seeing the increased quality and higher profit margins on EHR based solutions, some insurance companies are taking the concept of EHRs one step further and giving the control of health records to their members. Aetna, for example, recently launched a way of enabling its 17,000,000 members to export their entire Electronic Health Record to the cloud via a Microsoft powered service called the HealthVault[13]. Using this service, members get the ability to share their health records with their personal care-givers, families, and more importantly make their health information available to software applications that run on a variety of devices such as blood glucose meters, weight tracking applications on the PC, or blood pressure trackers that work over the telephone. By offering this service Aetna wants to offer a better value proposition than its competitors and gain market share not through just competitive pricing but also through improved customer engagement. This is a positive sign that health insurance companies are realizing the importance of generating value to their members rather than just being the most cost-effective when it comes to competitions. This falls in line with what Michael Porter emphasizes as the negative impact of price based profitability as follows:

> "Rivalry is especially destructive to profitability if it gravitates solely to price because price competition transfers profits directly from an industry to its customers." (Porter, The Five Competitive Forces that Shape Strategy, 2008)

In parallel to these efforts by health insurance companies, care providers are also embracing EHRs to stay ahead of the competition, provide better quality service, reduce costs and to build patient loyalty. Care providers have mostly ignored information technology for years. They were mainly concerned with delivering services in person and protecting privacy (Amor, 2008). Despite the little attention new technology usually receives in the industry, EHRs are becoming central in so many health organizations that it is hard to ignore them anymore if an organization wants to stay competitive. According to Dr. Gupta

[13] http://www.microsoft.com/presspass/press/2008/oct08/10-21AetnaHVPR.mspx

> "…health-care organizations that don't join in the coming changes will incur higher costs and less integration. This will make them less competitive in the global health-care marketplace, just as is happening with companies that have resisted outsourcing and system integration in other sectors" (Amor, 2008).

To stay competitive in the market most hospitals want to reduce their costs and provide value to patients. Recent events show that care providers think integrating various health systems with EHRs could be a step forward in this direction. Typically, patients move from one department to another within the hospital and their records follow. This presents a set of problems. To begin with, since the records are paper based there's a series of problems ranging from illegible handwriting to sheets of paper being misplaced. Additionally, this increases the administrative overhead associated with keeping copies of these records up to date, transferring them between physicians and finally storing them in the archives. An alternative approach is installing software and hardware systems that feed patient data into a central database from all departments and devices. With such a solution, a patient's status can be monitored almost real time from all departments and outside the hospital. More accurate information supplied by this solution increases quality of care while overhead and costs associated with paper based systems is significantly reduced. Saint Luke's Health System, an 11 hospital health system in Kansas City decided to invest in an innovation program that upgraded the entire health network's hardware and software to use an EHR. The new system would virtually eliminate paper, and feed data from medical devices and other departments directly into a single repository. By doing so the health network was able to see a 3 to 1 return on its EHR purchase within the same year in terms of increased efficiency (Baldwin, 2008). By switching to digital records and installing appropriate systems in place, many organizations can achieve similar results like St. Luke's Health System, which in the long run will get reflected onto patients in terms of more efficient and higher quality health care services.

While EHRs enable hospitals to cut costs for existing services they also enable health service providers to offer services in remote locations areas via tele-medication. As the population keeps increasing and housing keeps moving farther away from central city locations, it is becoming harder to serve patients from a handful of central locations in large cities. To cope with the increasing demand, health networks are setting up so called satellite clinics and smaller hospitals to reach out to the population in remote areas. But one question that still lingers is the one about resource allocation. Due to low utilization, it is not economically feasible for health networks to set up clinics/hospitals that have a large number of specialists in different areas. On the other hand, not keeping a minimum number of full-time specialists

defeats the purpose of having a satellite clinic/hospital. In the absence of a minimum number of specialists most of the time patients would need to be transferred to the central locations. This is a common problem for health networks that want to bring medical care services to remote areas. Up until recently there was no silver bullet for this problem. Latest advancements, however, cleared the way to delivering specialist services from remote locations via the internet. With the help of specially developed software running over high bandwith networks, hospitals can start offering expert medical consult to remote satellite clinics/hospitals from the central locations without incurring extra costs and sacrificing quality of care. Although general physician visits don't require such systems, certain conditions require expert opinion in a timely manner. One such case is stroke. In 1996 the FDA approved a drug that treats acute strokes, with one caveat; the drug needs to be delivered within three hours of onset of stroke. According to industry average, however, only 2 to 4 percent of stroke patients actually get this drug, mostly because the crucial 3 hour window has expired by the time the patient finally reaches a qualified neurologist (Hess, 2008). In an attempt to address the issue, Medical College of Georgia started an initiative where they took the idea of EHR and combined it with instant feedback to help physicians in remote areas assess the need to administer the aforementioned drug. Prior to this project, there have been some attempts to conduct this assessment over the phone. However, the inability to see the CT scans or analyze the visual feedback of the patient has made the assessment very difficult and the program had no success. The new program that is in place today, establishes a high speed link between a set of highly specialized neurologists and satellite clinics. When stroke patients are brought into one of the satellite clinics, a physician uses a rolling computer to establish a high-resolution video feed between the patient and an expert neurologist at a remote site. Simultaneously, the CT scan and the patient's electronic health record are transferred to the neurologist's laptop. The expert neurologist then consults with the physician who is next to the patient, assesses the situation and makes the call on whether or not the patient should receive the tPA drug (Hess, 2008). Applications of EHR such as this enable providers to reach out to patients who are hundreds or thousands of miles away and provide a a way for health networks to offer very specific medical care to smaller hospitals that might not have in-house experts in highly specialized areas. Solutions such as this one also provide the ability to work around the clock by utilizing time differences, thus increase the efficiency of medical specialists. Combined together these abilities make medical service outsourcing a very real possibility. Especially with the last wave of globalization, people are becoming more and more comfortable with the idea of outsourcing specific tasks to the experts in their relative fields and getting the best service available. Being able to apply the same concept to health care will pave the way towards specialization just like in

the case of Medical College of Georgia where hospitals or clinics specialize in just one type of medical care and others tap into this expertise as needed. Michael Porter refers to this process as a positive sum value creation for the patient when he says:

> "Providers should compete to be the best at addressing a particular set of problems"(Porter, 2004).

If this trend continues, patients will be able to receive top quality care from experts while health provider networks will reduce their costs. So it will be a win-win situation for both patients and care givers. At the same time, this sort of specialized competition will push health care providers that want to stay ahead of the competition to constantly innovate in order to provide the added value to the patients. Although these incremental innovations might range from different ways of using EHRs to using new medical technology to more efficient patient scheduling software, patients will surely benefit from them.

While care providers and health insurance companies are providing innovative services that build on the concept of EHRs, consumers are also realizing the benefits of using EHR based solutions and are driving up the demand for such services. According to a survey conducted in 2007 two thirds of patients are considering EHRs when selecting a physician[14]. Health care customers are aware of the change that EHR systems bring to their physician's office. In the information age that we are in, more and more people want to be educated in all aspects of their lives from shopping and entertainment to health care and want to make informed decisions. Although there are various information sources where consumers can look up information on automobiles, housing etc, there is no such comparable solution for healthcare. Seeing this gap between health care and other industries, consumers are drawn to health insurances and physicians that are more transparent, informative, patient centric and accessible online. Michael Porter points out the need for more information availability for a positive-sum health care when he prescribes making information about providers' experience in treating particular diseases, treatments and alternatives public (Porter, 2004). This sort of criticism combined with consumer appetite for more information is fueling the change that industry is going through. An increasing number of PHRs are offering members ways to sign up for disease and wellness programs where they receive health tips via emails, also a number of PHRs are enabling patient provider

[14] Consumers consider EHR when choosing physicians. (2007, April). *Healthcare Strategic Management*, Retrieved November 4, 2008, from Business Source Elite database.

communication via their web platforms (Greene, 2008). In an interview Kaiser Permanente's, a national health insurance company, practice leader of its Internet Services Group says,

> "Instead of traditional hierarchical system, where physicians have all the information and deign to share it with the patient, members have a right to understand their care and their medical issues" (Greene, 2008).

This shows a clear commitment to patient empowerment on health insurers' part. At the same time physicians are also being pushed hard by consumer demand to adopt virtual visits, answer simple questions via email and most importantly be patient centric. Looking at the adoption rate of EHRs by hospitals and physicians and combining it with latest PHR offerings by health insurance companies one can see that the consumer demand is slowly shaping the industry.

The government, the fourth big force in health care is also impacting the way health care is evolving today. While consumer demand is driving most of the innovation in the field, government is one of the biggest consumers of health care through its Medicare/Medicaid programs. Increasing efficiency, reducing the dollars per visit and possibly reducing the number of patient visits will have an incredibly large impact on government spending on Medicare. Naturally, government is a big supporter of EHRs and subsequent innovations that build upon the concept of the EHRs that offer cost-savings. It tries to promote such solutions in many different ways. One of the earliest attempts in promoting EHRs by the federal government was the creation of Regional Health Information Organizations (RHIO) under the initiatives of David Brailer, first national coordinator of IT, initiatives (Havenstein, 2007). These regional organizations, fueled by government grants, would set up data repositories where hospitals and providers in a geographic region could exchange patient data. However, since participation was rather voluntary at the time, it turned out to be very low. Seeing that the RHIO model did not attract too much voluntary participation, in early 2004, President Bush introduced his health information initiative mandating that all healthcare providers implement an EHR system within one decade (Selenke, 2007). This created a sense of urgency among hospitals and providers. Big players that were already considering RHIO adoption sped up the process after this announcement. On the other hand provider and small clinic adoption of EHRs did not improve much during this timeframe. When asked, most providers cite the cost of entry for hardware, software and training to be too high (Weinstock, 2008). Government officials were also aware of the slow adoption of EHRs by smaller practices. During in an

interview in 2007, David Brailer, the former national health information technology (IT) coordinator, explains

> "…there are barriers hidden behind this favorable trajectory. We are now in the period of adoption by the willing—large hospitals or large physician groups—organizations that have been planning this for some time or that have the native capacity to take on such a complicated project. Small doctors' offices, one- or two-person practices, safety-net clinics, and rural and underserved areas are not there yet. One-third of providers will not be able to adopt EHRs without policy intervention." (Milstein, 2007).

Realizing the slow EHR adoption rate by providers was mostly due to lack of monetary incentives, the federal government has started offering more incentives to physicians to use EHRs. In such an effort in late 2007, the federal government announced that it will pay higher Medicare reimbursements to up to 1,200 medical practices that deploy EHR systems (Havenstein, 2007). By offering higher reimbursements the government wants to win over the smaller clinics that serve millions of patients every day. In the coming months there might be similar initiatives by president elect Barrack Obama according to his proposed health care changes that propose lower cost of medical care and reach the underserved areas of the nation. Despite lowering costs for Medicare/Medicaid programs, one huge possibility for the government in the future is the extraction of statistical data. Currently, hospitals or the government cannot use data on the living patients. However, two years after the death of a patient that data can be stripped of personal information and can be used for statistics. Having one, or a handful, of national EHR databases will enable the government to run analysis on certain drug treatments, procedures and help extract best-practice patterns that have a high success rate. This sort of best practice patterns published by the government would set a clear benchmark for health care providers such that their performance can be measured against a reliable average. This would greatly increase the standards in the long run by catalyzing the competition among health care providers.

One group that is more often than not neglected when health care related issues are discussed is employers. In a health insurance fueled health care industry, employers have the biggest bargaining power when it comes to choosing health plans for their employees. Businesses are the ultimate buyers of health insurance. Unfortunately, up until recently, health plan choices were made solely on cost. Companies looked for the cheapest possible health care solution they could buy for their employees. In the absence of clear metrics and expectations from buyers, health care costs started to rise exponentially over the years. Health care costs per employee have reached $6,200 in 2003 and this number is expected to grow at double digit rates in the future (Porter, Redefining Competition in Health

Care, 2004). It was not until recently that health care expenditures have become an important part of financial planning for large corporations. Previously, health plan choice has been delegated to parties whose incentives did not align with the well being of the employees. It is true for most services that quality service comes with a premium. It would be foolish to ignore this when it comes to a complex industry like health care. Just picking the cheapest health plan does not guarantee good service for a company's employees. Instead companies should be focused on picking the best care for their employees. If they make the switch and decide to get the most effective health plan instead of most cost-efficient they could have a big impact on services offered. In order to pick health plans that offer the most value and maximize the well being of their employees, companies could exert a lot of pressure on health plans to offer services that focus on members rather than just cost savings. Employers can require more transparent processes by providers, adherence to certain best-practices in the industry and insist that employees be treated by experienced providers. However, all of this will come at the cost of giving up volume discounts offered to larger corporations (Porter, Redefining Competition in Health Care, 2004). Once smaller are forgone for long term benefits, companies will help shape the health care revolution that is underway. One might ask; why would any company spend so much time and effort trying to get better health care for its employees? A recent study at Unilever shows a direct relationship between employee well being and business performance (Brockett, 2007). According to the study, the one year pilot program rolled out in U.K. offices resulted in £4 return for every £1 invested. The program was such a big success that the company decided to roll it out internationally. So in essence, by ensuring its employees' well-being companies get better performance from them which in turn directly translate into higher profits.

Despite all the demand from consumers and efforts to supply this demand by health insurance companies, providers and government, there are still certain issues that need to be resolved for a widespread adoption of EHRs in health care. One of the biggest challenges is disparate standards in data and file formats. Differences in file formats make inter-EHR communication difficult. Consequently physicians are driven away from adopting EHRs due to the high cost associated with converting existing in-house systems with more compatible ones (Murray, 2008). A number of initiatives by the government to standardize the electronic health data formats are underway. Recently, creation of a new data format called Continuity of Care Document (CCD) takes a shot at standardizing the health care industry by providing a single government sponsored standard. Another problem is the recurring cost of hardware maintenance that is required when local EHR systems are installed in physician offices. One possible solution for this is to have services that run in the cloud and need only a thin client to connect to it.

Google Health and Microsoft HealthVault already started offering these services and more players might come on board in the near future. While technological problems might be solved with greater regulation and standardization, EHR adoption is largely dependent on physicians' willingness to use computer systems at clinics. Doctors in the U.S. are inferior in terms of computer use when compared to their U.K. brethren (Huston, 2006). One can only hope that government incentives and increasing consumer pressure might change this trend over the course of the next decade.

Private companies that realize the importance of EHR in the marketplace have been developing software based integration systems for a while now. There are established players in the market such as McKesson and RelayHealth that provide custom built, EHR based solutions to health care providers as a bundle of hardware of software systems. These software systems use proprietary ways of storing the patient data on local database servers that are owned and maintained by health care providers. Using their early entrant advantage into this sector, these two companies were able to successfully connect multiple health provider systems using their proprietary software and data standards. At the same time, due to lack of competition, not too many buyers questioned the feasibility of closed, locally managed EHR offerings. Although always compliant to HIPAA regulations and standards, these closed data formats and the way the data storage choices of these systems did not promote interoperability. The barrier of entry into this market became so high that many smaller companies did not even try to compete in this arena, allowing McKesson and RelayHealth to serve a very large part of the industry with virtually no competition.

Starting in late 2007, however, software giants like Google and Microsoft became aware of the big potential in the EHR space and quickly entered the market with their offerings of Google Health and Microsoft HealthVault respectively. These latecomers picked a completely different strategy. The key difference was that they wanted to offer a platform[15] instead of implementing custom solutions to health providers themselves unlike McKesson and RelayHealth. This is a completely different strategy that focuses on owning the core services, providing a robust and scalable infrastructure while letting other software and health care companies develop specific health care solutions that run on this platform. Such health information platforms enable smaller firms to concentrate on niche segments of the EHR space such as diabetic, cancer patient care while bypassing the initial investment needed in the

[15] http://healthvault.com/Industry/index.html

infrastructure, HIPAA compliance[16], implementing CCD standards, etc. Standardized platforms create a very competitive and level playground on which companies strive to offer increased value to their relative user bases instead of competing on better infrastructure or compliance. Both Microsoft and Google health platforms run as services in the cloud, making use of their enormous data centers around the nation. These companies are also turning their relative lack of expertise in the health field into an advantage. Microsoft and Google have formed new health information technology teams that are run by relatively young managers[17] with medical backgrounds. These managers, in return, have a more positive attitude towards revolutionary changes in health care technology that are underway. Such an open attitude towards change enables both companies to embrace the government backed Continuity of Care Document data standard, instead of coming up with proprietary data representation formats. This move, while relatively straight forward for both Microsoft and Google, would be considered a bold move for established companies. The flexibility that these software companies have in their DNAs are putting them one step ahead in terms of providing incremental innovations when compared to established players in the market. Additionally, both companies have an enormous execution power due to their size, marketing ability and lobbying power. Combining these abilities with such strategic moves, two software giants might shape the health industry over the next decade.

The current state of health care in the U.S. is calling for a major overhaul. For years, cost-shifting cycle from health insurers to providers and subsequently to patients has come to an end. Increasing health care costs per capita, sub-par quality of health system throughout the nation and growing concern among people for access to inexpensive care are pushing big players in the industry to concentrate on a value based competition rather than cost based competition. To offer the competitive value proposition, health insurers, providers and government is turning to innovations that will help shape this new competitive arena for health care. One such key innovation is Electronic Health Record (EHR). EHRs enable care providers to digitize all aspects of a patient's health record. Making the interchange of patient records instantaneous and storage of the files very cost efficient. This technology also paves the way for virtual visits, remote consultations and collaboration among doctors from geographically separate locations on the same patient. While all of this is happening at the care provider side, consumers are beginning to like the idea of being in charge of their own health. Patients want to get educated on their health problems, understand their conditions, treatment options and

[16] http://www.google.com/intl/en-US/health/hipaa.html
[17] http://www.google.com/intl/en-US/health/about/ghac.html

consequences. To stay informed, they are increasingly relying on the use of technology such as e-mail, PHRs, virtual visits. Government is also supporting this restructuring effort in the industry to reduce its Medicare expenses in the long run by offering monetary incentives in the form of tax breaks and increased Medicare payments, imposing regulations to increase adoption and offering standardization effort. While the existing behaviors of established companies are encouraged to change, new entrants into the market are slowly changing the playground. By offering health platforms that take the administrative and infrastructure related burden off the shoulders of small companies, Microsoft and Google are fostering competition in the EHR based software solutions arena. Such changes are promoting government standards while driving the costs down. As these efforts intensify, health care will go through a very positive digital transformation in the coming years.

Exhibits

Exhibit 1 – Hard Drive Prices over time

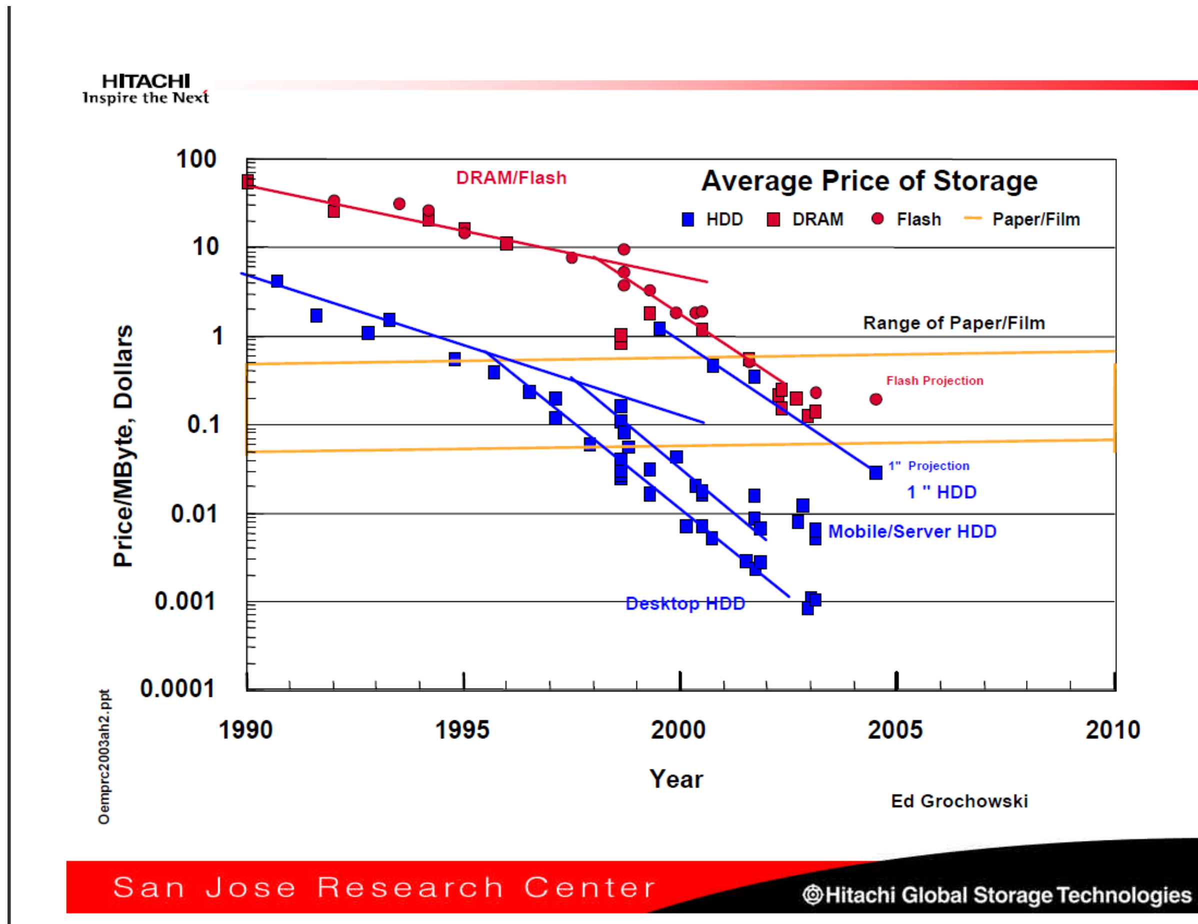
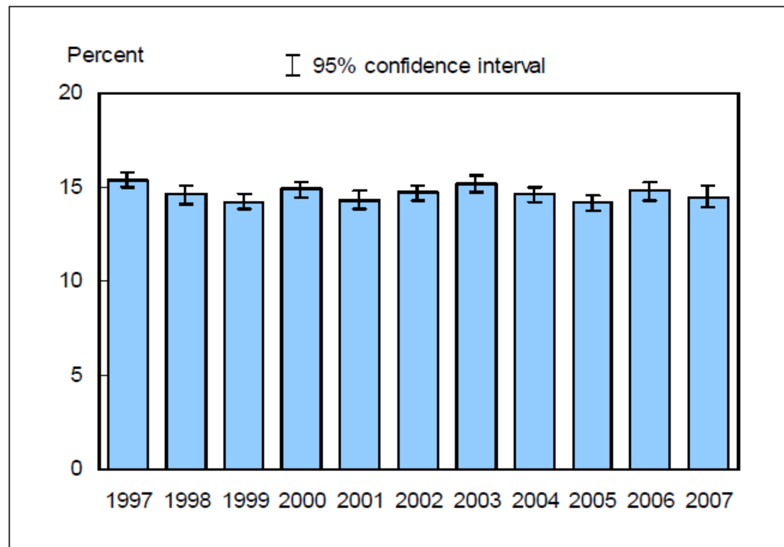


Figure 1 - Hard Drive Prices over time

Source: http://www.hitachigst.com/hdd/hddpdf/tech/chart03.pdf, retrieved on 12/01/2008.

Exhibit 2

Figure 1.1. Percentage of persons of all ages without health insurance coverage at the time of interview: United States, 1997–2007

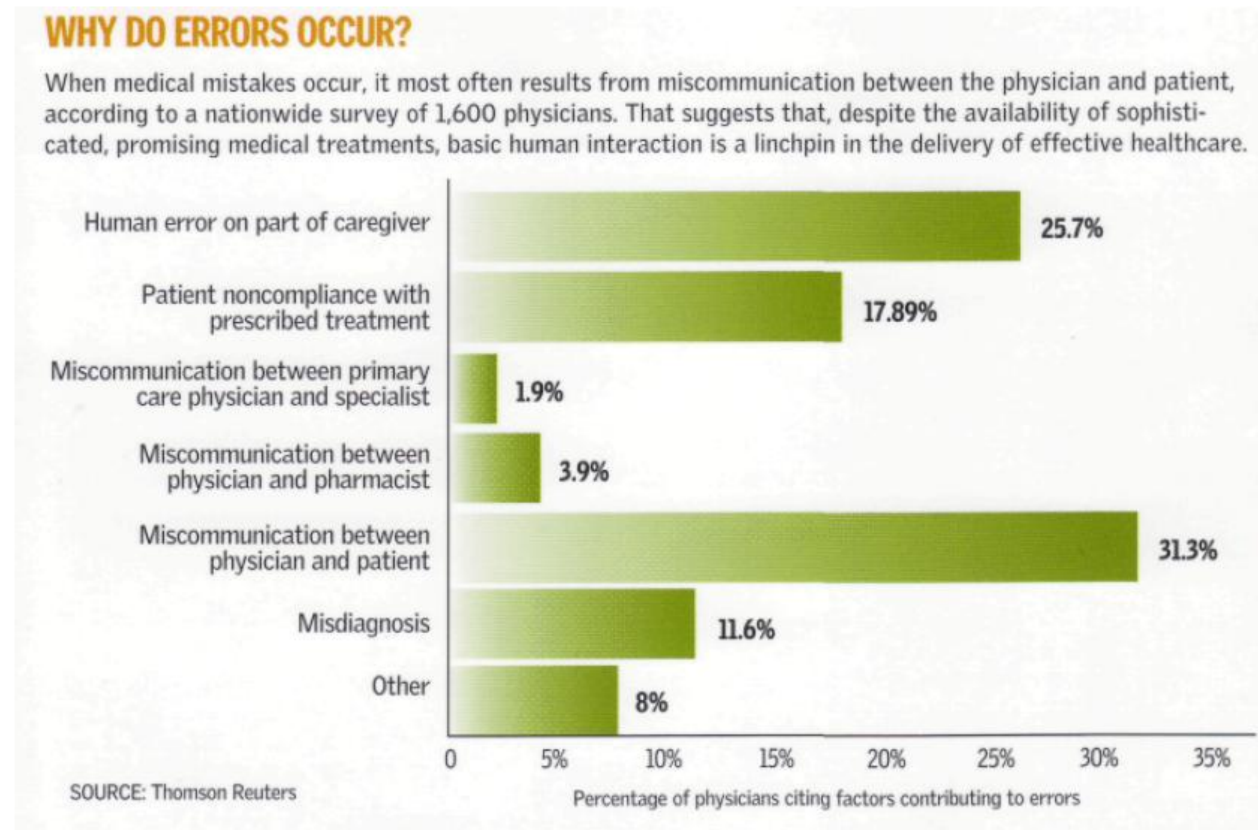


NOTES: A person was defined as uninsured if he or she did not have any private health insurance, Medicare, Medicaid, State Children's Health Insurance Program (SCHIP), state-sponsored or other government-sponsored health plan, or military plan at the time of the interview. A person was also defined as uninsured if he or she had only Indian Health Service coverage or had only a private plan that paid for one type of service such as accidents or dental care. The analyses excluded persons with unknown health insurance status (about 1% of respondents each year). The data on health insurance status were edited using an automated system based on logic checks and keyword searches. For comparability, the estimates for all years were created using these same procedures. The resulting estimates of persons without health insurance coverage are generally 0.1–0.3 percentage points lower than those based on the editing procedures used for the final data files. Occasionally, due to decisions made for the final data editing and weighting, estimates based on preliminary editing procedures may differ by more than 0.3 percentage points. Beginning with the 2003 data, the National Health Interview Survey (NHIS) transitioned to weights derived from the 2000 census. In this Early Release, estimates for 2000–2002 were recalculated using weights derived from the 2000 census. See "About This Early Release" for more details.

Figure 2 - Percentage of people without health insurance

Source: http://www.cdc.gov/nchs/data/nhis/earlyrelease/200806_01.pdf, retrieved on 11/27/08

Exhibit 3 – Why Medical Errors Occur



Source: Thomson Reuters

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