Accepting the Inevitable: Trends, Expected Outcomes, and What to Look for as Electronic Health Record Implementation Goes Forward

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I. Introduction

Earlier predictions that information technology will play a critical role in curing the crisis that is the nation's fragmented healthcare delivery system[1] are quickly becoming validated.[2] Implemented correctly, the modernization of the healthcare industry through the current national health information technology (NHIT) initiative has the potential to have a profoundly positive impact on the cost, access, and quality of healthcare in the U.S.[3] Ramped up efforts to fine-tune existing and develop new electronic health record (EHR) technologies, coupled with demonstrated cost-saving efficiencies and significant quality improvements,[4] are now resulting in rising pressures upon the healthcare industry to move toward a higher standard of care.[5]

As technology for EHR becomes more readily available, patients will begin to demand and expect it. Personal testimonials of how the implementation of EHR has the potential to improve upon the state of healthcare in the U.S. can be found on the website endingthedocumentgame.gov.[6] As improvements in patient safety and reduction in medical errors become increasingly well-documented, the availability of EHR technology will result in an environment where the errors of yesterday are no longer tolerated. Implementation of information technology on a nationwide level will essentially redefine the medical standard of care as we know it today. Healthcare professionals will find themselves unable to meet this higher standard of care, absent moving forward with EHR implementation. As a consequence, doubt with regard to expectations on return on investment (ROI) may no longer be looked to as a basis for not going forward with adoption of EHR.

The difficulty is that while it is quickly becoming apparent that the transition to a NHIT framework is inevitable, there remain many uncertainties in adoption of EHR, which account in large part for the continued resistance of many healthcare professionals in moving forward with implementation. Fortunately, many big name technology companies have recognized the need to assist healthcare professionals in this endeavor and are working to develop the capabilities to be able to roll this out for healthcare professionals. This leaves us at a critical juncture where healthcare professionals need to carefully establish equal footing with such technological vendors to set an equitable stage for future dealings.

Information technology alone cannot cure all the ills of the nation's healthcare system, but it will go far in filling in existing gaps. The concerns that come associated with EHR are also very real, but can be surmounted with careful planning. "If not done properly, computerizing medical care can frustrate doctors and threaten the confidentiality of patients' records. But in health-care systems that have adopted the technology, these are occasional problems, while improved safety, quality and efficiency are a daily reality."[7]

II. Understanding the Full Extent of the Crisis

The National Academy of Sciences released a report entitled *To Err is Human: Building a Safer Health System* in 1999, and another report entitled *Crossing the Quality Chasm: A New Health System for the 21st Century* in 2001, in which the Institute of Medicine makes some telling observations regarding the crisis condition of the nation's healthcare delivery system at that time, and recommends innovation and technology as a means to improving upon that system. The reports put forth eye-opening numbers on how many people die in hospitals each year as a consequence of medical errors that could have been prevented, and identify the nation's healthcare system as being decentralized to the point of being a "non-system."[8] Although we appear to be on the verge of improvements with NHIT and pay-for-performance initiatives, many of the concerns identified in these reports remain unaddressed in the nation's current healthcare delivery system.[9] The nation's healthcare system remains highly fragmented and difficult to access as a consequence of continued record storage in a variety of locations, and in paper-based forms. Providers are still hampered by a lack of comprehensive information about the patient at the point of care.[10]

Reading the reports of the National Academy of Sciences in full, or at least the summary report briefs (which are available on-line), is highly recommended. The quality chasm identified by the Institute of Medicine can be linked to the convergence of two key factors:

1. The scope of scientific knowledge has expanded exponentially in the past half-century; and
2. Healthcare has become increasingly complex. This is a consequence of patients living longer, suffering from combinations of conditions, and seeking more care, in concert with the availability of more procedures, equipment, technologies, and medications to prevent and treat the many more conditions about which we now know.

The move from paper-based to electronic recordkeeping systems will help to alleviate this crisis by allowing for the implementation of information technologies that can be utilized to translate the existing knowledge base into practice, thereby making healthcare more scientific (evidence-based), more effective, and less costly. The current system is poorly organized, overly complex, and not coordinated with healthcare organizations, hospitals, and physician groups typically operating independently of each other, where no one has the full pic-

ture of a patient's medial condition and history.[11] Information technology needs to be implemented to provide effective access to information so that evidence-based evaluation methods can be developed, extracting best practices from the expanse of scientific knowledge, and widely disseminated to benefit both providers and consumers.

It is ironic that when our lives and the lives of our loved ones are at stake, the nation continues to rely on an antiquated healthcare delivery system, where the memory of the provider and the risks of human error remain at the core of the quality of our care. This is in stark contrast to matters where finances are at stake. In that arena, the nation has at its fingertips, and expects financial professionals to have at their fingertips, sophisticated systems of coordinated data funneling up-to-the-minute investment advice and research tools into user-friendly sites, as well as real-time tracking of the status of our financial investments (e.g., stock tickers).

Compare the financial tools available electronically to those available in the healthcare arena. "Google takes about 0.12 seconds to return 184 million pages on diabetes . . . one hundredth of second longer to offer 163 million results for heart disease . . . Like a parched traveler offered a drink from a fire hose, consumers face a flood of healthcare information that has morphed into 'mess information,' in the past five years. Payors and physicians are among the groups that have started winnowing that information down for consumer use, driven by the advent of consumer-driven healthcare."[12]

Patients no longer show up at the doctor's office looking to the physician to explain the ABC's of a particular diagnosis. Rather, many patients come armed with a plethora of information from the internet and his/her own theories and explanations for whatever symptoms he/she is experiencing. Patients sometimes challenge the decisions of medical professionals based on conflicting information on the internet, which may or may not be based on sound science. The information is out there, but none of the players in this industry, neither the consumers, nor the providers, nor the payors, know how to navigate it. The healthcare industry needs to catch-up with implementation of available technologies into the healthcare delivery system, thereby enabling the nation to utilize "mess-information" to come up with the most effective approaches for treating illnesses and preventing medical errors, and deaths.

III. Key Definitions

Although the terms Electronic Health Record (EHR) and Electronic Medical Record (EMR) are often used interchangeably, there is an important distinction between the two terms. While the use of EMR has experienced increases over the last five years,[13] adoption of EHR is not as widespread. Implementation of the NHIT initiative requires adoption of both EMR and EHR and careful coordination between the two.

A. Electronic Medical Record

An EMR (electronic medical record) is generally defined as the set of databases (or repositories) that contains the health information for patients within a given institution or organization. Thus, an EMR contains the aggregated datasets gathered from a variety of clinical service delivery processes, including laboratory data, pharmacy data, patient registration data, radiology data, surgical procedures, clinic and inpatient notes, preventive care delivery, emergency department visits, billing information, etc.

Furthermore, an EMR contains clinical applications that can act on the data contained within this repository—for example, a clinical decision support system (CDSS), a computerized provider order entry system (CPOE), a controlled medical vocabulary, a results-reporting system, etc. In general terms, EMRs are clinician-focused in that they enhance or augment the workflow of clinicians or administrators. EMRs are said to be interoperable if they are able to exchange (transmit and receive) data using standardized data transmission (coding and messaging) formats.[14]

B. Electronic Health Record

An EHR (electronic health record) extends the notion of an EMR to include the concept of cross-institutional data sharing. Thus an EHR contains data from a subset of each institution's EMR (that is agreed upon by the institution). An EHR may also reside "entirely within one institution" and link the various affiliated practice sites together. The EHR is generally patient-focused and spans episodes of care rather than a single encounter. An EHR can only be present if the participating sites all have an EMR in place that is interoperable.[15]

IV. Trends and Expected Outcomes

A. AMC Study

In April 2006, the National Institutes of Health (NIH), National Center for Research Resources (NCRR), in conjunction with the MITRE Corporation, issued a report summarizing the features and functions of major commercial EHRs and reviewing the use of these EHRs in the academic medical center (AMC) setting (AMC Study).[16] The report found that many modern-day EHRs are based on the pioneering work done in AMCs and for government clinical care organizations,[17] but that those systems have serious shortcomings, i.e. non-standard vocabularies and system interfaces. The focus of the AMC Study is that commercial off-the-shelf (COTS) systems may be an attractive and cost-effective solution for AMCs, based on the following findings [portions excerpted]:

[1.] The ability of clinical systems to interoperate through the use of standard clinical vocabularies and structured data organization enhances the use of EHR data for purposes of clinical trials management and scientific discovery.[18]

[2.] COTS systems introduce new capabilities which were non-existent with paper-based systems, e.g., interactive alerts to clinicians, interactive flow sheets, and tailored order sets.[19]

[3.] An AMC is actually multiple organizations within one. Many AMCs have multiple healthcare facilities, such as affiliated hos-

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pitals and clinics, numerous specialty diagnostic and treatment centers, laboratories associated with training and research, and complex business operations to manage all of these components. Because AMCs are providing tertiary medical care and are doing research, they often have more complex and more niche information systems to support new diagnostic and treatment modalities than a community hospital would have.[20]

[4.] The major value of integrated clinical systems is that they enable the capture of clinical data as a part of the overall workflow. An EHR enables the administrator to obtain data for billing, the physician to see trends in the effectiveness of treatments, a nurse to report an adverse reaction, and a researcher to analyze the efficacy of medications in patients with co-morbidities. If each of these professionals works from a data silo, each will have an incomplete picture of the patient's condition. An EHR integrates data to serve different needs. The goal is to collect data once, then use it multiple times.[21]

[5.] Most commercial EHRs are designed to combine data from the large ancillary services, such as pharmacy, laboratory, and radiology, with various clinical care components (such as nursing plans, medication administration records [MAR], and physician orders). The number of integrated components and features involved in any given AMC is dependent upon the data structures and systems implemented by the technical teams.[22]

The AMC Study highlights the immediate rewards, intervening pain, and successes AMCs can expect to go through in engaging a COTS vendor, as was reported by the Medical Records Institute [excerpted]:

[1.] Rewards: Virtually any current EHR application can support more efficient and accurate collection, storage, analysis, and distribution of data than current manual operations. Eliminating the need for managing paper files provides immediate efficiency benefits.[23]

[2.] Pain: At present, available EHR applications rarely allow a seamless flow of data to a common database where multiple users—physicians, researchers, administrators, patients, and nursing stations—can convert data to information using a shared set of tools. As more EHR systems are implemented, chief information officers' departments will be forced to find ways to interface existing ancillary systems (such as pharmacy) to respond to pressing needs for integrated data views and analyses. Some have investigated buying all components of their clinical automation tools from one vendor, but have discovered that these vendors have recently bought series of smaller vendors and have not yet had a chance to integrate disparate applications themselves. Also, specialty physicians often resist using the solution provided by a "mega-vendor," preferring to use a more specialized vendor that they consider "best of breed."[24]

[3.] Success: Discussion of EHRs at the national level begins to impose expectations that any new technology must be compatible with a data-driven medical enterprise. New data, communication, and visual technologies (e.g., "endo-cams," digital camera views of the intestine uploaded to a hip-mounted data collection device), for example, will need to be integrated into the automated clinical records systems. More systems will be designed to allow data collection to become a by-product of the process—administration of a medication to a patient could be integrated with billing, inventory, and MAR systems. This improvement will come as the systems mature and as the clinical users become more involved in the design of systems and associated process changes.[25]

Overall, the AMC Study came to the following conclusions regarding EHR Implementation [excerpted].[26]

[1.] Pros: Clinicians in environments with EHRs spend less time updating static data, such as demographic and prior health history, because these data are populated throughout the record and generally remain constant. Clinicians also have much greater access to other automated information (regarding diseases, etc.), improved organization tools, and alert screens. Alerts are a significant capacity of EHRs because they identify medication allergies and other needed reminders. For clinical researchers, alerts can be established to assist with recruitment efforts by identifying eligible research participants.[27]

[2.] Cons: Challenges that EHRs may present to workflow processes include: increased documentation time (slow system response, system crashes, multiple screens, etc.), decreased interdisciplinary communication, and impaired critical thinking through the overuse of checkboxes and other automated documentation. System crashes are particularly problematic because clinicians, particularly at in-patient facilities, will not know what treatments are needed or if medications are due.[28]

B. Governmental Activity

1. Initiatives at the Federal Level

In April 2004, President George W. Bush called for widespread adoption of interoperable electronic health records within 10 years and issued an executive order that established the position of the National Coordinator for Health Information Technology. A National Coordinator within the Department of Health and Human Services (DHHS) was appointed in May 2004 who released a framework for strategic action two months later.

In late 2005, to help define the future direction of a national strategy, DHHS awarded several health IT contracts and formed the American Health Information Community, a federal advisory committee made up of healthcare stakeholders from both the public and private sectors. Through the work of these contracts and the professional community, DHHS and its Office of the

National Coordinator for Health IT (ONC) have made progress in five major areas associated with the President's goal of nationwide implementation of health IT.

The five major areas are:

a. Advancing use of electronic health records;

b. Establishing interoperability standards for a health information exchange;

c. Developing prototypes of a nationwide health information network;

d. Addressing privacy and security issues associated with the nationwide exchange of health information; and

e. Integrating public health systems into a national network.[29]

On August 22, 2006, President George W. Bush issued an Executive Order that directs federal agencies to share with beneficiaries information on the quality of services provided by doctors, hospitals, and other healthcare providers as well as on prices paid to healthcare providers for procedures.[30]

On September 1, 2006, the Government Accountability Office (GAO) released a report summarizing DHHS' progress so far, but also expressing concern in the lack of detailed plans, milestones, and performance measures for meeting the President's goals.[31]

On September 20, 2006, Robert M. Kolodner, MD, joined DHHS as the Interim National Coordinator for Health Information Technology.

2. Initiatives at the State Level

The recently published findings of the Third Annual Survey of the eHealth Initiative reflect significant increases in policy activity and leadership at the state level. Thirty-six bills were passed in 24 states during 2005 and 2006, calling for the use of health information technology to improve health and healthcare, and ten state governors have passed executive orders related to the same.[32]

The objectives of improving quality and safety, and eliminating or reducing inefficiencies in the nation's healthcare system, were identified as driving forces behind state activities. Ninety-two percent of respondents cited "improving quality" as a significant driver of their Health Information Exchange efforts, while 82% cited "improving safety." Additionally, 70% cited "inefficiencies experienced by providers who need information to support patient care" as a significant driver, while 56% cited "rising healthcare costs".[33]

DHHS has contracted with the National Governors Association's (NGA's) Center for Best Practices to establish the State Alliance for e-Health. The State Alliance creates a vehicle through which states may come together to evaluate and possibly resolve:

a. State-level privacy and security issues;

b. State-law practice of medicine barriers; and

c. State-level health information organization issues in governance, sustainable financial models, and the role of payors and integration of public health and benefit programs.[34]

C. Technology Vendors

The AMC Study makes an interesting observation on consolidation as a "standard phase in the life cycle of software in a cash-rich industry." The phases identified are [excerpted]:

[1.] Initiation: Small, entrepreneurial ventures, responding to recognized "pain" within an industry, focus on a specific niche (e.g., patient records, billing, etc.) and serve it with proprietary software. They attempt to respond to unique language, structure, and processes associated with an industry. As awareness of their products and their credibility grows, they leverage the knowledge they have gained serving their installed base of customers and apply increasing revenues to further the development of their "flagship" product and attempt to expand into other arenas of the industry.[35]

[2.] Acquisition: As their sales begin to validate the presence of a real need, entrepreneurs attract acquirers–larger companies that seek to exploit an emerging market and build upon their own capabilities and products (such as "compatible" software, data collection devices such as barcode readers, etc.). Acquirers' difficulty comes when they try to integrate disparate software that was created using different terminology, operating systems, and hardware platforms. It can take several years to establish a stable suite of products.[36]

[3.] Consolidation: The final stage is consolidation, in which larger companies make decisions about remaining in the market or departing it, and in which a few surviving companies become "standards" for the industry.[37]

The AMC Study comes to the conclusion that EHR vendors are in the acquisition phase, but are quickly moving towards consolidation, with companies like GE, Siemens, and McKesson buying smaller vendors and bundling them with their own products. There also are companies such as IBM, Intel, Microsoft, and Accenture that lack established clinical record product lines and are investing in the development of EHR-related technology.[38]

V. What to Look for as EHR Implementation Goes Forward

Until recently, the EMR and EHR vendor community has created proprietary database systems that make it difficult for them to send and receive data from other (potentially competing) products. Fortunately the need for interoperability is now well-recognized and the medical informatics community has created standards for data coding and communication. The ONC has also announced several major initiatives to harmonize standards and create a certification process for information technology vendors so that different products can interoperate better and be easily and objectively compared.[39]

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Due to the excessive costs of adopting traditional information technology options (that is hosted within the practice) many providers are evaluating *ASP* (application service provider) models. "These are 'subscription-based' models for information technology, whereby the application runs on the computer system (server) of an *ASP provider* (a company that hosts the EMR and/or EHR). This approach substantially reduces the cost for the practice. In addition, the risks associated with security and privacy protection are undertaken by the host company and not the practice. Some practitioners dislike this approach because their data then reside with the host company."[40]

The limitations of the final EHR fraud and abuse rules, published by the Centers for Medicare and Medicaid Services (CMS), effective October 10, 2006, (providing that donations of EHR technology will not violate the physician self-referral law (Stark) or the Anti-Kickback Statute) also support implementation through the ASP approach. While the final EHR rules do not permit the donation of hardware, including modems, wireless routers, and storage devices, donations of certain software information technology and training services, such as connectivity, maintenance services, and help desk support, are protected under the EHR rules.

As providers select vendors to assist in the EHR implementations, they are likely to receive contracts crafted by the vendor's sophisticated legal resources (whether in-house or outside counsel) to maximize the vendor's profits and minimize vendor risk. The end result is that the brunt of the costs and risk will fall on providers, unless equitable terms are carefully negotiated. Providers need to be proactive in ensuring a standard is not established early on in the transition period that unduly burdens providers with technological responsibilities that could consume and cripple their ability to focus on patient care.

The following is a brief overview of some key issues to address in contract discussions with information technology vendors.

A. Ancillary legal considerations: "Implementation of an EHR raises many legal issues related to cross-institutional data sharing, security and privacy of shared records over potentially insecure network lines, and patient access to and augmenting their own data in electronic format (using the web, for example)."[41] Even for some big name vendors, this NHIT initiative is their first foray into working with the provider community within the healthcare industry.

1. Do not assume the vendor knows or understands the myriad of federal and state laws, regulations, and requirements applicable to healthcare.
2. Require key vendor representatives who will have frequent contact with the provider to undergo the same training as provider's workforce, including compliance, privacy, and security.
3. Have key vendor representatives sign off on the same confidentiality statements required of provider's workforce.
4. Consider entering into a Business Associate Agreement that addresses in detail the regulatory requirements, especially setting forth timeframes for response, rather than merely citing to the statute that the vendor may never take the time to fully understand.

B. Quality improvement and reporting functionalities: Verify that the vendor has expanded capabilities to be able to support quality improvement and reporting activities. "It is estimated that only about 20% of current health information exchange efforts have incorporated functionalities such as providing disease or chronic care management services and 10% quality performance reporting capabilities."[42]

C. Customization and Pricing: Each provider's unique needs will drive pricing from the vendor. Each practice has distinct requirements, and systems often need to be custom tailored. Many EHR systems are based on templates that are initially general in scope, with the intention of customization in cooperation with the vendor to fit specified needs of a particular provider. There are EHR systems available that do not use templates.[43]

Under the ASP framework two common pricing frameworks are often presented for "usage" charges: (1) based upon the number of patients or providers using the system, or (2) based upon the amount of storage and bandwidth used by the system. The latter may prove the better approach where new technologies are likely to cause some data/exchanges to occupy less storage space/bandwidth, thereby creating a cost-saving which is built into the contract terms. Separate fees may also be assessed for deployment, subscription, and implementation and support services.

D. Governing Law: Many vendors are national companies providing these services for clients in states across the United States. While it is likely these vendors have designed their services and processes to comply with federal laws, providers must confirm that vendors are aware of the nuances in the law that are specific to each state. At a minimum, providers must seek to have a clause subjecting the contract to governance by the state laws under which the provider client is licensed. A more proactive approach is to add a rider to the vendor's boilerplate, providing citations to key state requirements, and expanding upon any areas where the state laws present unique challenges.

E. Record Retention: Make sure the vendor's policy to retain medical records matches up with the provider's policies and state law requirements.

F. Mobility: The provider will need to invest a considerable amount of time and energy in moving paper records to electronic form. Clearly address in the contract what happens if the provider decides to terminate and choose another vendor to ensure the vendor is required to return the provider's records in a compatible electronic form if another vendor is chosen.

G. Hook & Bait: Vendors are aware of the investment providers will need to make on the front end and may offer lucrative deals in the initial years with plans to ramp up rates once the provider is hooked. To avoid the risks of later price gouging, cap the amount all fees can increase for any renewal term.

H. Miscellaneous Vendor Responsibilities: Responsibility and assumption of risk for the following obligations belong with the vendor, as the entity with the technological expertise, control, and ownership of the process:

1. Service Level Guarantee: The responsibility to guarantee and warrant the system will be up and running 98% of the time or more must fall on the vendor. The provider needs to be careful to specify in the contract when scheduled maintenance can occur without disrupting the provider's practice of medicine. Ensure the vendor has an incentive to minimize down-time by including a pro-rata deduction of fees for any down-time, including the right to terminate, and recoup all fees paid if down-time exceeds agreed to limits.
2. Successful installation, implementation, support, and maintenance services must also fall on the vendor, including training, workflow analysis, configuration support, account management, monthly utilization reporting, upgrades, and educational materials for patients, providers, and other stakeholders.
3. The vendor shall perform and assume all costs for set-up, training, maintenance, and updates to the system.
4. The vendor must provide a grant of license.
5. System configuration and accessibility must fall on the vendor.
6. Responsibility for back-ups and restoration of user data lies entirely with vendor.
7. The vendor must guarantee against software defects.
8. The vendor must guarantee current and continued compatibility.
9. The vendor must provide technical desktop and system support. Make sure there is a local or 1-800 help-line providers can call if they have difficulty. Require resolution in one business day or less.
10. If EHR is hosted on vendor's server, the vendor should be responsible for safeguarding confidentiality and integrity of data and communications, daily data back-up, and restoration of service.
11. The vendor must protect confidential information and not just PHI. The vendor will also have provider's identification information and other sensitive data.
12. For purposes of registration, the vendor is responsible for setting forth pre-load data requirements, and assisting provider in collecting and transferring this information into electronic form compatible with vendor's functionalities.
13. Responsibility for authentication of users should also fall on the vendor.
14. Provider will need to be responsible for notifying vendor when a user (either provider or patient) should not longer have access, but responsibility for de-activation of rights must fall on the vendor. Deactivation should be immediate, upon notice from the provider.

I. Vendor Logos: Many vendors will insist their logo appear on the site with the practice name. Include a strong, clearly visible statement on the site clearly indicating who is the licensed provider of care and who is not.

J. Testing periods: EHR systems generally are not fully functional or adequately customized to the providers' needs in the first-run implementation. Include in the contract terms the right for the provider client to inspect, review, test, and validate data and report functionalities during a testing period.

K. Termination: Providers will be in a serious bind if the vendor is able to terminate without sufficient notice for the provider to transition to another vendor. Qualify the vendor's right to terminate upon the provider having had the opportunity to either make this transition or cure the breach that may be the basis for the vendor's desire to terminate. The provider should have an unrestricted right to terminate with a reasonable number of days prior notice to the vendor.

In any contract negotiation, compromises will need to be made. By focusing on redirecting certain areas of risk and responsibility which are inextricably tied to the vendors' technological expertise, a more equitable share of the stresses that come with this transition will be placed on the vendor, instead of falling upon the already overwhelmed provider community.

VI. Conclusion

Where the biggest value lies in NHIT is not in the reduction of paper, but in electronic data that can be readily shared, searched, measured, and analyzed to determine what the most effective approaches to healthcare are, and at what cost. The mobilization of clinical information electronically supports interoperability and facilitates access to and retrieval of clinical data, privately and securely, among different entities involved in the healthcare delivery system, to provide safer, more timely, efficient, effective, equitable, and patient-centered care."[44]

In moving forward with EHR implementation, and in anticipating the many headaches that are likely to come with that transition, one should keep in mind lessons of Hurricane Katrina and the difference an established EHR system could have made in the lives and well-being of so many in that disaster. Thousands of people in those disaster-ravaged areas no longer had access to their healthcare providers and their paper medical records were lost. Having such a system well established and running would also make an

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immeasurable difference in the unthinkable event this country should ever be subject to bioterrorism.[45]

** The statements expressed herein are those of the writer and do not necessarily reflect the policies, practices, or opinions of her employer, its management, trustees, or affiliates.*

Endnotes

[1] National Academy of Sciences (2001) *Crossing the Quality Chasm: A New Health System for the 21st Century, available at* www.nap.edu/openbook/0309072808/html/ and http://newton.nap.edu/html/quality_chasm/reportbrief.pdf (last visited Oct. 22, 2006). *See also* Kohn, L. T., Corrigan, J. M. and Donaldson, M. S., Committee on Quality of Healthcare in America, Institute of Medicine (2000) *To Err is Human: Building a Safer Health System*, *available at* www.nap.edu/catalog/9728.html and http://newton.nap.edu/html/to_err_is_human/reportbrief.pdf (last visited Oct. 22, 2006).

[2] Dr. Tim Johnson, ABC News (Oct. 18, 2006), *Technology to Cure the System*, *available at* http://abcnews.go.com/Health/print?id=2578981 (last visited Oct. 22, 2006). *See also* Steve Lohr, The New York Times, nytimes.com (Aug. 20, 2006), *Smart Care Via a Mouse, but What Will it Cost?*, *available at* www.nytimes.com/2006/08/20/business/yourmoney/20info.html?ex=1313726400&en=4e90d17594a9f01c&ei=5088&partner=rssnyt&emc=rss (last visited Oct. 22, 2006).

[3] *See* Government Accountability Office (GAO), *Healthcare: National Strategy Needed to Accelerate the Implementation of Information Technology,* GAO-04-947T (Washington, D.C., July 14, 2004).

[4] *See* GAO, *Information Technology: Benefits Realized for Selected Healthcare Functions,* GAO-04-224 (Washington, D.C., Oct. 31, 2003) (stating "a 1,951-bed teaching hospital reported that it realized about $8.6 million in annual savings by replacing outpatient paper medical charts with electronic medical records. This hospital also reported saving more than $2.8 million annually by replacing its manual process for managing medical records with an electronic process to provide access to laboratory results and reports. Healthcare organizations also reported that IT contributed other benefits, such as shorter hospital stays, faster communication of test results, improved management of chronic diseases, and improved accuracy in capturing charges associated with diagnostic and procedure codes.")

[5] *See* GAO, *Health Information Technology: HHS Is Continuing Efforts to Define Its National Strategy,* GAO-06-1071T (Washington D.C., Sept. 1, 2006), p. 2. (stating "Studies published by the Institute of Medicine and others have indicated that fragmented, disorganized, and inaccessible clinical information adversely affects the quality of healthcare and compromises patient safety. In addition, long-standing problems with medical errors and inefficiencies increase costs for healthcare delivery in the United States.") *See generally* Gandhi TK, Kachalia A, Thomas EJ, Puopolo AL, Yoon C, Brennan TA, et al. *Missed and delayed diagnoses in the ambulatory setting: a study of closed malpractice claims.* Ann Intern Med. Oct. 3, 2006; Vol. 145 Is. 7:488-96. *See also* The Boston Globe, *Basic Errors Hurt Patients.* October 3, 2006, *available at* www.boston.com/news/nation/articles/2006/10/03/basic_errors_hurt_patients/ (last visited Oct. 5, 2006).

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[7] Bates, David W., M.D. and Komaroff, Anthony L., MSNBC.COM Newsweek (Oct. 16, 2006), *Next: Paperless Medicine, available at* www.msnbc.msn.com/id/15173075/site/newsweek/print/1/displaymode/1098/ (last visited Oct. 22, 2006) (stating "Computerizing medical care will be expensive, but there should be a huge return on investment. An authoritative study from the Center for IT Leadership estimates savings at a staggering $78 billion a year just from better information exchange. If not done properly, computerizing medical care can frustrate doctors and threaten the confidentiality of patient records. But in health-care systems that have adopted the technology, these are occasional problems, while improved safety, quality and efficiency are a daily reality.")

[8] *See* National Academy of Sciences (2001), *supra* note 1. *See also* Kohn, Corrigan, and Donaldson, Committee on Quality of Healthcare in America, Institute of Medicine (2000), *supra* note 1.

[9] *See* Jim Molpus, HealthLeaders Magazine, (Aug. 2006) *5 Intersections, From pay for performance to the rise of the uninsured, healthcare is eyeing a convergence that could transform the industry, available at*, http://www.healthleadersmedia.com/magazine/view_magazine_feature.cfm?content_id=81594 (last visited Oct. 22, 2006).

[10] eHealth Initiative, (September 25, 2006) *Improving the Quality of Healthcare Through Health Information Exchange, Selected Findings from eHealth Initiative's Third Annual Survey of Health Information Exchange Activities at the State, Regional and Local Levels*, p.5-6, *available at* http://toolkits.ehealthinitiative.org/assets/Documents/eHI2006HIESurveyReportFinal09.25.06.pdf (last visited Oct. 22, 2006).

[11] *See generally* National Academy of Sciences (2001), *supra* note 1.

[12] Molpus, *supra* note 9.

[13] Catharine W. Burt, Ed.D; Esther Hing, M.P.H.; and David Woodwell, B.A., Division of Healthcare Statistics, CDC/NCHS Health E-Stats, *Electronic Medical Record Use by Office-Based Physicians: United States 2005*, *available at* www.cdc.gov/nchs/products/pubs/pubd/hestats/electronic/electronic.htm (stating "In 2005, approximately 23.9 % of physicians (95% confidence interval: 21.1-27.0) reported using full (11.2 %) or partial (12.7 %) EMRs in their office-based practice. This represents a 32% increase since 2001. EMR use did not vary by physician age, gender, or specialty type.")

[14] U.S. Department of Health and Human Services, Agency for Healthcare Research and Quality (AHRQ) National Resource Center for Health Information Technology, *Knowledge Library, Key topic: Electronic Medical/Health Records*, *available at* http://healthit.ahrq.gov/portal/server.pt?open=

514&objID=5554&mode=2&holderDisplayURL=http://prodportallb.ahrq.gov:7087/publishedcontent/publish/communities/k_o/knowledge_library/key_topics/health_briefing_01232006114616/electronic_medical_health_records.html (last visited Oct. 22, 2006).

15 *Id.*

16 NIH, NCRR, and The, MITRE Corporation, Center for Enterprise Modernization, (April 2006) *Electronic Health Records Overview*, *available at* www.ncrr.nih.gov/CRinformatics/EHR.pdf (last visited Sept. 23, 2006).

17 *Id.* at p. 2, stating

> Notable early projects include:
>
> COSTAR (the Computer Stored Ambulatory Record), Barnett, et al., developed Harvard, placed in the public domain in 1975 and implemented in hundreds of sites worldwide.
>
> HELP (Health Evaluation through Logical Processing), Warner, et al., developed at Latter-Day Saints Hospital at the University of Utah (brought to market by the 3M Corporation). HELP is notable for its pioneering decision support features.
>
> TMR (The Medical Record), Stead and Hammond, Duke University Medical Center.
>
> THERESA, Walker, at Grady Memorial Hospital, Emory University, notable for its success in encouraging direct physician data entry.4
>
> CHCS (Composite Healthcare System), the Department of Defense's (DoD) clinical care patient record system used worldwide.
>
> DHCP (De-Centralized Hospital Computer Program), developed by the Veteran's Administration and used nationwide.
>
> TDS, developed by Lockheed in the 1960s and 1970s.

18 *Id.* at p.9.

19 *Id.* at p.1.

20 *Id.* at p.2.

21 *Id.* at p.3.

22 *Id.* at p.6.

23 *Id.* at p.12.

24 *Id.*

25 *Id.* citing to *Medical Record Institute's Seventh Annual Survey of Electronic Health Record Trends and Usage for 2005, available at* www.medrecinst.com/files/ehrsurvey05.pdf.

26 *Id.* at p.13.

27 *Id.* at p. 13

28 *Id.* at p.13

29 *See* GAO, *supra* note 5, at p. 2.

30 eHealth Initiative, *supra* note 10, at p. 5.

31 GAO, *supra* note 5.

32 eHealth Initiative, *supra* note 10, at p. *2.*

33 *Id.*

34 DHHS Press Release, (Oct. 19, 2006) Office of the National Coordinator for Health Information Technology (ONC) Press Office, Nancy Szemraj, *available at* www.hhs.gov/healthit/20061019.html (last visited Oct. 22, 2006).

35 NIH, NCRR, and The, MITRE Corporation, Center for Enterprise Modernization, *supra* note 16, at p. 17.

36 *Id.*

37 *Id.*

38 *Id. See also* Lohr, *supra* note 2 (stating "Major Technology corporations like I.B.M., General Electric, and Microsoft, as well as a crowd of specialist companies including Cerner, Epic Systems, and Eclipsys, are all chasing what they see as a fast-growing multibillion-dollar opportunity to sell health information technology to hospitals.")

39 U.S. Department of Health and Human Services, Agency for Healthcare Research and Quality (AHRQ) National Resource Center for Health Information Technology, *supra* note 14.

40 *Id.*

41 eHealth Initiative, *supra* note 10, at p.2.

42 *Id.*

43 *See* NIH, NCRR and The, MITRE Corporation, Center for Enterprise Modernization, *supra* note 16, at p.18-19. (Summarizing the tradeoffs between completely customized systems as opposed to COTS).

44 eHealth Initiative, *supra* note 10, at p. 5-6.

45 *See* GAO, *Bioterrorism: Information Technology Strategy Could Strengthen Federal Agencies Abilities to Respond to Public Health Emergencies,* GAO-03-139 (Washington, D.C. May 30, 2003).