

REAL-TIME PUBLIC HEALTH SECURITY

A Case for an Emergency Department
Patient Vigilance Network, Today



Executive Summary

A secure, nationwide network is urgently needed to provide real-time awareness for a range of public health threats, from multidrug-resistant diseases to bioterrorism. This network can be deployed based on the computer network architecture presented in this paper. The architecture provides a broad range of surveillance functionality and can deliver improved healthcare safety and patient outcomes sooner than the National Health Information Network (NHIN), scheduled to be operational by 2014.

The National Institutes of Health and the National Institute of Neurological Disease and Stroke are already funding the deployment of this architecture in emergency departments (EDs) through a Neurological Emergency Treatment Trial network (NETT) to expedite the study of neurological emergencies. Studies have shown that the ED is the ideal point to capture surveillance information because it represents the first contact with the healthcare system for most people with reportable conditions.

This technology can be extended to deliver a real-time patient vigilance network for public health threats. It has designed-in protections for patient confidentiality, data security, information sharing, and virtual networking that meet the requirements of HIPAA (Health Insurance Portability and Accountability Act) and other federal and state protections.

Once in place this technology can be leveraged throughout the hospital for additional surveillance applications. Providing a surveillance capability in the hospital also creates opportunities for several new sources of revenue, leading to a self-sustaining business model for the hospital and other participating healthcare providers.

Introduction

Improving the quality and the safety of healthcare delivery in the United States using information technology (IT) is a major priority of the Department of Health and Human Services (HHS). David Brailer, the first national coordinator for health information technology (HIT), has indicated that he expects it to be a prime force for meaningful healthcare innovation that improves patient safety and outcomes.

Several problems have been identified on the way to a safer but more HIT-intensive healthcare system. These include the cost and the complexity of the technology, who pays for it versus who benefits from it, how to connect disparate existing systems, and how to provide universal access to patient medical records while preserving patient confidentiality.

This paper describes a distributed, self-organizing network capable of providing worldwide healthcare surveillance while simultaneously enabling appropriate access to patient healthcare information and remaining in full compliance with local and national privacy laws. A network with these capabilities can begin operations and the production of useful public health surveillance information in less than a year and can be expanded to broader coverage and new applications as opportunities permit.

The widespread deployment of a self-organizing network that is voluntarily accepted by its users will build the infrastructure needed by a national network and stimulate the adoption of HIT throughout the healthcare industry.

In August 2006 the president issued an executive order committing federal departments and agencies that purchase and deliver healthcare to require the use of healthcare IT that is based on interoperability standards recognized by the secretary of HHS as new upgrades or systems are implemented within the federal system.

Presidential Executive Order
13410, August 22, 2006



Background and Trends

Role of the Department of Health and Human Services

In response to George W. Bush's presidential executive order dated April 27, 2004, HHS has become the lead agency in an effort to achieve the 10-year goal of having a nationwide capability for implementing substantial advances in healthcare quality and efficiency. HHS is approaching this mission through a planned deployment of a universal electronic medical record system by 2014.

HHS has studied and continues to explore a variety of network approaches to satisfy the goals of the executive order and has been working with a public/private partnership, the American Health Information Community, to develop the computer systems and related standards necessary to accelerate the adoption of a National Health Information Network (the "National Network").

Essential Surveillance Missions

Surveillance activities today are passive and depend on the voluntary cooperation and notification of reportable events by doctors and healthcare institutions. There is a clear need to broaden the coverage base with automated reporting systems that include as many patients and healthcare providers as possible, make event reporting automatic rather than voluntary, and ensure real-time availability of information.

Centers for Disease Control

The National Network is required to perform healthcare surveillance activities for the Centers for Disease Control and Prevention (CDC) and to monitor a variety of diseases and conditions.

The CDC intends to award as many as 15 five-year demonstration contracts that will be coordinated with the National Network's development contracts in a parallel effort to scan electronic medical records for biosurveillance purposes.

Food and Drug Administration

In January 2007 the Food and Drug Administration (FDA) initiated a national dialogue regarding actions that can be taken to assemble the Sentinel Network, which will be, in the words of the commissioner, Dr. Andrew von Eschenbach, "a virtual, electronic, integrated medical products safety system [that]

can be one of the most profound contributions to the new era in healthcare in this nation, and ultimately in the world."¹

Department of Homeland Security

In 2004 President Bush directed the Department of Homeland Security (DHS) to consolidate federal agency biosurveillance data into a single system. In response DHS began efforts to develop the National Bio-Surveillance Integration Systems Program, the nation's first system capable of providing comprehensive and integrated biosurveillance and situational awareness.

Diverse Problems, Common Solution

Each agency, whether in Homeland Security or a part of Health and Human Services, has a history of approaching health surveillance in isolation. Healthcare workers are already overloaded with dozens of surveillance requirements that generate ever more paperwork and demands on their time. An obvious solution to this situation is a single system that can perform all required surveillance missions.

Lack of Information Technology

Few hospitals and even fewer points of healthcare delivery beyond hospitals have been able to take advantage of today's low-cost computing hardware and the IT architectures that are commonplace in other industries. Thus they have had few opportunities to automate their surveillance responsibilities.

According to studies, IT is used in fewer than one in five hospitals in the United States, and fewer than one in 20 U.S. physicians has access to electronic systems that successfully use IT to improve healthcare.² Therefore improving the quality and the efficiency of healthcare through the application of IT has become a major priority of the entire healthcare industry as well as of the federal government. Despite these obvious needs, legislation for healthcare IT funding failed to pass Congress in 2006, and the Wired for Health Care Quality Act of 2007, currently before Congress, does not include the funding needed to change the status quo.

Hospitals are reluctant to make these investments on their own because of a persistent cost/benefits imbalance and a doubtful return on investment. There is also great concern that required participation in the National Network will become another unfunded government mandate.



A self-funded national surveillance network will jump-start the use of the latest information technology in the small and medium-sized hospitals and clinics and lead to a rapid modern-ization of health information technology.

Shortcomings in Surveillance

In July 2007 the Department of Homeland Security's Office of the Inspector General released a report on the federal effort to coordinate and consolidate the various means of detecting a biological event, be it naturally occurring or manmade. The gist of the report is, given the money spent, we're worse off than we were the first time the president made this a priority.



According to the report, since 2001 an estimated \$32 billion has been spent on federal biosurveillance and biodefense IT programs (e.g., CDC's BioSense, DHS's BioWatch, FDA's CARVER + Shock, among others). To date there is no coordinated effort to coalesce the data gathered into anything resembling actionable intelligence.³

A self-funded National Surveillance network deployed primarily in emergency departments creates the foundation for the collection of vast quantities of public health information that can be integrated into the National Bio-Surveillance Integration System when it is ready.

Globalization Threatens Public Health

Surveillance for public health risks, whether pandemic influenza or terrorism related, cannot be effective if confined to the United States. Early detection means that detection capabilities must exist close to potential sources.

The growth of air travel will increase airline passengers and the risk of disease transmission by 50 percent every 10 years. International surveillance of biothreats is essential to the earliest possible detection and the longest lead time to develop countermeasures.

Public health agencies must take advantage of the leverage provided by worldwide healthcare community to keep up with new threats posed by globalization

The World Health Organization Director-General Dr. Margaret Chan said, "New diseases are emerging at the historically unprecedented rate of one per year. Airlines now carry more than 2 billion passengers annually, vastly increasing opportunities for the

rapid international spread of infectious agents and their vectors."⁵

One of the significant advantages of the network approach being discussed in this paper is that it is easily extended across borders without compromising the identity of patient data.

The History of Health Data Sharing

It seems unlikely that the process of building the federal National Network will provide timely support to any of the nation's needs for surveillance. It is entirely possible that a sustainable, self-funded national surveillance network, however, will facilitate the investment in foundational technology for the National Network.

The current National Network approach to meeting the goals of the executive order has grown out of grassroots efforts designed to meet local shared-access needs that are widely seen as the logical pathways to improved patient safety and care. A few local healthcare information exchanges were originally funded by the federal government, foundations, and community groups. The intent has been that these local efforts would gradually aggregate into state-level organizations with the hope that all of the state networks would be combined into a National Network by 2014.

Since the 2001 publication of the Institute of Medicine's report *Crossing the Quality Chasm: A New Health System for the 21st Century*, seed funding from the Agency for Healthcare Research and Quality and private foundations has resulted in the creation of more than 150 of these local health information exchanges.

On June 5, 2007, HHS released a request for proposal for Phase II of the National Network trial implementations, consisting of 10 demonstration projects based on the concept of a network of networks. The implementation and the evaluation of these Phase II tests is scheduled to occur over a one- to three-year time frame beginning with the acceptance of bids on September 30, 2007. The test results will lead to recommended methods for the National Network to link hospitals and providers.

Much has been published concerning the success and the failures of the health information exchanges, but the most common criticism is the lack of a viable business model. The following sections describe one solution to this problem.

"Globalization in the twenty-first century is breaking down economic, political, cultural, social, demographic, and symbolic barriers across the world at a pace hitherto unseen in the history of civilization."⁴

Ichir Kawachi and Sarah Wamala, *Globalization and Health*



The Solution: Distributed, Self-organizing Networks

A useful and economical surveillance solution needs to function across all borders within a healthcare system, including administrative borders within a clinic or hospital, across ownership and organizational borders such as distinct hospitals and federal agencies, and across political borders such as cities, states, and, ultimately, countries.

The optimal solution would be a fully distributed federation of individual systems that maintains consistent architecture regardless of scale. A federated system permits a nearly unlimited number of members to collaborate directly in any combination without preconfigured accounts and connections.

Examples of systems that benefit from federated solutions include:

- An individual hospital's information system interacting with the information systems of associated organizations such as clinics and doctors' offices
- Two or more hospital information systems sharing information about a patient who is transferred across international borders
- Multiple clinics and hospital information systems sharing information in a collaborative clinical trial with the researchers and data analysis centers
- A national information system monitoring treatment outcomes across the entire healthcare system nationally or globally

Using a federated network, each local system would operate according to local institution rules while at the same time ensuring that relevant information is made available throughout the entire network, including monitoring agencies, in a manner that doesn't violate privacy laws. The operation of a federated system is discussed below.

The building block of the entire network would be a small computer system configured to be installed and connected directly into each local software environment. This approach provides a low-cost, nonintrusive presence in each healthcare location.

Once the local computer creates an electronic patient registration, key identifying information is formatted, encrypted, and sent via the Internet to a regional network resource called a record locator index. It is important to note that no identifiable patient information is transmitted over the Internet.

The record locator index is a resource that identifies all locations where a given patient has healthcare information stored-without disclosing protected health information. This approach keeps locally generated information stored locally and ensures that access to that information is controlled by the local healthcare provider.

Under the federated network approach, the network could start small, with minimal investment, while providing near-term payoff in terms of functionality and return on investment. More important, with even a few operational network nodes, the network can provide useful and timely information beyond what is currently available. Further, the network can grow incrementally over time until it supports the most ambitious healthcare initiatives.

Federated Features

In a federated environment of locally controlled systems, individual patients may exercise complete control over their medical records, first by preauthorizing that their records be shared with physicians in the case of future treatment and then by authorizing the attending physician to access earlier records located remotely from the current treatment site. In the past, a complex web of data-sharing agreements would have been required to accomplish a similar result. When using a federated network, such a complicated web of paper-based interactions becomes unnecessary.

The decentralized and self-organizing principles of the network provide the following unique benefits to the worldwide healthcare community:

- 1. High-volume screening.** Upon admission, all patient conditions can be matched to surveillance and research protocols.
- 2. Massively parallel statistical analysis.** Local computers analyze local data, and the network aggregates the results until critical thresholds of significance trigger appropriate alerts and provide statistical reports to various users, including the CDC and the DHS.
- 3. Flexible Response.** The network control center can instantly distribute new automatic surveillance protocols to participating facilities, changes to threshold criteria and reporting requirements for immediate response to the changing threat environment.
- 4. Communication and coordination.** National security alerts as well as epidemic and disaster coordination messages can be instantly disseminated through the network control centers with guaranteed authenticity.
- 5. Patient-centric controls.** Patients and their healthcare providers maintain full control over the storage and the use their medical information.
- 6. Rapid point-to-point connections.** Connections between institutions that request patient information or that respond to such requests are made via the Internet without the use of designated network appliances or preconfigured point-to-point protocols that require each server to have a unique account for each of the other servers.
- 7. Secure communications.** When required authentication protocols are satisfied, a patient's de-identified medical history is encrypted and delivered to the requesting institution. The network technology guarantees data integrity, security, and non-repudiation in all transactions.
- 8. Protection from hackers.** For transmitted patient information, the requestor is the only party who can re-identify the data. This approach renders the entire federation of networks nearly immune to all forms of Internet hacking, especially "spoofing."
- 9. Lower software burden.** The operational costs at each healthcare facility are reduced as automated remote software installation, monitoring, bug repair, and update services are provided from a network control center.
- 10. Self-sustaining business model.** Complete protection of patient confidentiality creates revenue opportunities from clinical trials and data mining that can offset the cost of the technology, which can make participation in the network financially beneficial to each institution.
- 11. Clinical research and clinical trials.** Participating institutions will be able to receive study forms via the network, and anonymized results will be delivered to data coordinating centers for analysis. Digital signatures and authentication provide fully electronic audit trails.
- 12. Multicenter Clinical Trials.** Investigators can create a virtual presence in multiple locations to increase patient flow and improve study results, thus overcoming the main source of failures in clinical trials. According to the Pharmaceutical Research Association, most clinical trials fail due to inadequate patient recruitment.

Who Will Benefit?

Many federal agencies are currently exploring the use of the National Health Information Network as a means to meet their missions to promote public health, product safety, and disease control. The capabilities of the distributed and self-organizing national surveillance network will enable many of these projects to begin operations years before the National Network reaches its deployment phase.

Surveillance projects in development that can be immediate beneficiaries of a self-organizing national surveillance network include:

- The Department of Homeland Security's National Bio-Surveillance Integration Systems Program
- The Centers for Disease Control and Prevention's BioSense program, a real-time surveillance system currently under development for detecting and managing potential pandemic outbreaks
- The Food and Drug Administration's Sentinel Network for post-approval monitoring of drug and medical device safety
- The Department of Defense's Comprehensive Health Surveillance directive
- Healthcare providers who will no longer be required to remember what form to file with what agency for which reportable conditions
- Those interested in the geographic distribution of diseases and health problems, from individuals planning a trip to local or regional public health agencies who can use the network to create unique reports comparing health conditions with demographic and geographic information

The national surveillance system as described can easily be used for additional activities and initiatives under way that are beyond surveillance, such as clinical research, clinical trials, hospital information systems, health information exchanges, and more. KDH Systems has developed and is currently deploying technology components that provide surveillance and some of these other functions.

KDH Systems

KDH Systems is a privately owned company that specializes in developing software for improved operations in emergency departments and for research in emergency medicine, where there is little tolerance for any distraction from patient care. Real-time identification of potential research subjects, the elimination of false positives, and studying rare conditions have guided the development of this technology since 2003.

The distributed and self-organized national surveillance network concepts and federated systems discussed in this paper have been developed by KDH for healthcare providers and have the common thread of streamlining and integrating technology to improve workflow.

Overview of a Global Health Network as Envisioned by KDH Systems

KDH has developed a vision of the effective delivery of improved healthcare results and enhanced clinical research capabilities coupled with 100 percent coverage surveillance through the use of a Global Health Network (GHN) that will serve as a national health information system for participating healthcare providers. A key feature of the GHN is its ability to serve a variety of surveillance needs. This network, based on the KDH distributed and self-organized network architecture, will have the following capabilities:

- The collection, analysis, and summarization of medical surveillance information in real time for the benefit of government agencies
- Continued operation in the event of system-wide or regional Internet outages, with as much regional connectivity as the network conditions permit
- Easy expansion from a national to an international scale, retaining all capabilities while adhering to privacy laws and protocols
- The exchange of healthcare information in a secure manner without violation of an individual's privacy rights
- Rapid identification and recruiting of potential participants for clinical trials

“Implementing health information technology nationwide will require changing, quite dramatically, the work of millions of health professionals and tens of thousands of institutions throughout our \$2 trillion healthcare system.”⁶

David Blumenthal and John P. Glaser, *New England Journal of Medicine*

- Collecting data for longitudinal studies and longer-term efficacy for clinical trials, including collecting and integrating data regarding contraindications for patients taking multiple medications
- The operation as a backbone infrastructure to monitor ongoing clinical trial results in real time

A Real-world Example

A model of GHN architecture is currently demonstrated by KDH Systems in TotalCR™ an application designed to lower the cost and reduce the time required for patient recruitment for clinical research. It has similar benefits for surveillance, where speed, accuracy, and reduction of false positives are important attributes.

TotalCR is currently being deployed for the Neurological Emergencies Treatment Trials Network (NETT) funded by the National Institutes of Health and the National Institute of Neurological Disorders and Stroke. The primary use of the NETT is to identify potential candidates for drug and medical equipment clinical trials and to serve as a conduit for collecting and distributing information for those trials. See Appendix A for a more complete description of the NETT.

Benefits on the Path to Full Deployment

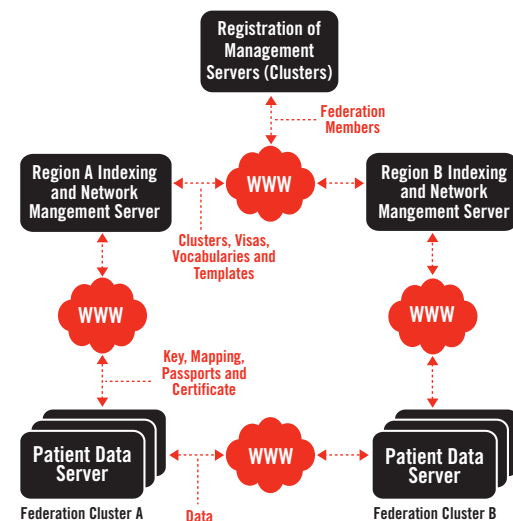
Healthcare providers, patients, public health agencies, and the Department of Homeland Security can participate in and gain advantages from the GHN long before all or even most hospitals and physician offices have adequate, functioning electronic medical records. Developing and implementing a GHN-based network now will advance the date that surveillance networks become operational and available to generate useful results.

As the GHN is deployed in the United States, the number of cases will ramp up from the current few hundred per day to more than 300,000 per day from emergency departments alone. The GHN’s scalable architecture allows the review of all cases, extracting information in real time, and reporting statistical anomalies and signature events for all ED patients as they are discovered. When combined with other healthcare locations, the strength of the database is significantly enhanced well before 100 percent build-out occurs.

Using GHN as the backbone infrastructure to deliver interoperability for many other applications developed for the National Network is a feature of the KDH component technology. In fact, the open architecture as proposed for the GHN offers a broad and accessible market that will attract many more developers.

The GHN and Its Value Propositions

By replicating the NETT on a regional basis, the structure of the GHN expands like LEGO bricks.⁷ This structure is shown in the following diagram. The NETT is a network of 102 widely dispersed emergency departments and functions like a small-scale version of the GHN.



The primary mechanism implemented by the GHN provides every participating healthcare provider with the ability to locate and access healthcare information, whether paper or electronic, for any individual in a timely manner regardless of where the information is stored. Information requested can be as detailed as a complete medical chart or as simple as the most recent lab results.

It is widely expected that this capability will result in improved patient care, particularly in the areas of safety and improved outcomes.

Surveillance

The GHN makes surveillance an autonomous function as opposed to the voluntary, paper-based reporting structure that currently exists.

Automated surveillance and communications can mean the difference between effective response and after-the-fact identification of the presence of contagious diseases and disease clusters, pandemics, and the emergence of potential bioterrorism threats.

Surveillance information collected, analyzed, and made available by the GHN can be trended so that when thresholds are exceeded, the GHN can notify monitoring agencies at the local, regional, and national level in real time. Likewise the monitoring agency such as the CDC can react to information and change the detection and reporting parameters and even the target of the surveillance.

Once a risk has been identified and confirmed, automated processes within the GHN can send messages to each relevant healthcare provider that will activate local protocols for emergency situations and coordinate the response to regional and national emergencies through a multiplicity of communications channels: text messaging, screen alerts, e-mails, automated telephony with text-to-speech capability, and so on. Such built-in proactivity means that the GHN will keep trying until the appropriate responses are received or escalation points are reached.

Evidence-based Medicine

Several benefits emerge from the broad nature of the GHN, especially in the area of evidence-based medicine. The GHN allows the creation of an inclusive statistical base of anonymous patient histories that will enable researchers to determine which medical interventions are best, for whom, and under what circumstances. The GHN can combine statistical results for large numbers of cases to find exemplar cases that closely match difficult-to-treat patients.

Such capabilities will make treating difficult cases easier, more accurate, and much more cost-effective. This is a new initiative to meet the objectives expressed by the Institute of Medicine's Roundtable on Evidence-Based Medicine:⁸

"Evidence-based medicine describes a diverse array of healthcare initiatives that seek to ensure that medical care received by patients is grounded in the best scientific knowledge and is appropriate for a given individual. Central to the ability to deliver safe, effective, and patient-centered care is a need for better and timelier evidence on which to base clinical decisions about which medical interventions are best, for whom, and under what circumstances."

Research

By utilizing the GHN, clinical trials can be initiated more rapidly and can provide a broader base of representative participants for faster completion of Phase III clinical trials. Further, the GHN makes available a real-time mechanism for capturing long-term results for previously approved drugs. This reduces the cost to manufacturers to perform Phase IV clinical trials and increases the probability that such trials will be completed. Such information is of extreme importance to consumer safety agencies such as the FDA, and the GHN can provide continuous monitoring for the life of a medication.

As in the case of evidence-based medicine, the capabilities of the GHN to call upon a vast body of de-identified case history information and the statistical data that the network can provide open a new pathway to medical researchers to work with current data in a cost-effective manner.

Conclusion

Now is the right time to extend the NETT, as enabled by KDH technology, to become a national surveillance network for public health. Such an extension would form the basis for a viable healthcare network for surveillance needs and for patients, healthcare providers, and clinical researchers to deliver on the promise of improved healthcare for our society.

KDH Systems has developed and has currently deployed many of the technologies that are required to enable and implement the GHN; additional portions of the GHN will be in place as the NETT is deployed to its 102 locations. The NETT deployments are steps on the way to a fully functional GHN.

A fully expanded GHN in the United States will see more than 120 million patients annually who can be surveilled at the initial point of patient contact with the healthcare system: the hospital emergency department.

By emphasizing emergency patients as an inherent part of surveillance, monitoring agencies such as the DHS, CDC, and FDA and even local and regional public health agencies can obtain real-time early visibility of disease clusters, the emergence of epidemics, and the overall presence of specific diseases.

An important thing to remember is that by using the GHN, such surveillance activities are done automatically on 100 percent of the patients who are admitted by GHN participants. No longer will agencies be forced to rely on voluntary compliance and less than 100 percent coverage for their surveillance activities. The future of surveillance will be based on massive amounts of prescreened and de-identified information available in real time.

The operational costs of a surveillance network based on KDH technologies will be minimal due to the real time monitoring, remote installation, and remote update capabilities that relieve the workload of the local IT staff, plus the fact that it can provide a flexible, affordable, robust electronic medical record as needed. Membership in the GHN provides a unique ability for HIT users to align costs and benefits and earn a positive return on investment.

The easy and rapid expansion of the Global Health Network to international healthcare sites while retaining local control over privacy laws and other legal requirements will aid the international efforts in better identifying the potentially rapid spread of infectious diseases.

For more information about the operation and the revenue potential of the GHN, register at www.kdhsystems.com.

Endnotes

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APPENDIX A



The NIH has created a Neurological Emergencies Treatment Trials (NETT) Network to conduct large simple trials to reduce the burden of very acute injuries and illnesses affecting the brain, spinal cord, and peripheral nervous system. The network recognizes and seeks to explore the special narrow window of opportunity that seems to exist in treating neurologic damage from a variety of pathologies ranging from stroke and traumatic brain injury to seizures and meningitis. The study of very rapid interventions will have to be implemented by paramedics in the field, or by physicians in the Emergency Department. This network provides the basis for conducting efficient studies in these environments.

Background

Every 28 seconds, a patient in the US becomes a victim to one of the eight most common devastating neurological emergencies. These include stroke (ischemic, intracranial hemorrhage or subarachnoid hemorrhage), traumatic brain injury, status epilepticus, anoxic encephalopathy, spinal cord injury, or bacterial meningitis. Every 2 minutes, a patient in the US dies from one of these conditions, and these conditions alone are responsible for more than \$115 billion per year in US health care spending (7% of total spending). Other less common neurological emergencies cause additional morbidity and cost.

A Burden of Disease and a Challenge to Clinical Research

Neurological emergencies represent a huge burden of disease and therefore represent a significant opportunity to reduce morbidity and mortality through high quality clinical research. These eight conditions affect 1.1 million patients per year, and are responsible for 250,000 deaths annually in the US. Therapeutic options, however, are often limited or non-existent, in part because of the difficulties of performing clinical trials on neurological emergencies.

Although large numbers of patients are affected, they are distributed among about 4500 emergency departments in the US, making it difficult to accrue the large sample sizes often required for effective clinical studies. This barrier is amplified when the treatment interventions need to be administered in the first few hours after the onset of symptoms. Studying the acute phase of neurological emergencies and their treatments will require a large number of institutions working together in a coordinated fashion to generate adequate sample sizes to yield clinically useful results and reduce the length of such studies.

As an example, in a recent study by the Greater Cincinnati/Northern Kentucky Stroke Team, analysis was done to determine the potential eligibility of patients with non-traumatic intracranial hemorrhage (ICH) to be enrolled in a therapeutic trial within 3 hours of onset, such as a trial of activated Factor VII. In an exhaustive look at presentations to all 16 hospitals in the 5-county region of Greater Cincinnati (a population of 1.3 million) there were only 133 patients who had no exclusions and presented within the prescribed time over a 4 year period of study. Thus, even with a very optimistic enrollment rate of 50% it would take 60 years to complete a 1,000 patient 1:1 randomized trial in this well-coordinated 16 hospital network. An established, multi-center, hub and spoke model with 10-20 hubs each with 2-10 spokes, however, could complete such a trial in a much shorter time.

Source: <http://nett.umich.edu/>



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About KDH Systems

KDH Systems is a privately held healthcare information technology (IT) company located in Berkeley, California. The company has spent several years developing IT solutions for the hospital emergency department environment. Its products are being used daily at Stanford Hospital and the University of California at San Francisco Medical Center. KDH has extended its emergency department solutions to apply across multiple disparate entities to foster collaborative research project; and it is the named software vendor for the Neurological Emergencies Treatment Trials Network (NETT), funded by the National Institutes of Health.

About the Authors

Krzysztof Durski, PhD

Dr. Durski has authored 23 research publications in nuclear medicine and cardiology. He has organized and managed the computer laboratory at the Medical Academy of Lodz in Poland and has been a lecturer in computer imaging techniques for residents of radiology and nuclear medicine at Johns Hopkins University in Baltimore, Maryland. Dr. Durski founded and managed the independent Nuclear Medicine Engineering Department and then the Advanced Technologies Departments for Toshiba America MRI, Inc., in South San Francisco, California. He also co-managed several joint product development projects with Siemens Medical Systems and has developed and released many successful software products for medical imaging and the data interchange market.

Dr. Durski holds an MS degree in electronic engineering and computer sciences from the Technical and Agricultural Academy in Bydgoszcz, Poland, and a PhD in natural sciences from the Medical Academy in Lodz, Poland; he completed a post-doctoral fellowship at Johns Hopkins University.

David Haddick

Mr. Haddick is a 30-year veteran of the medical imaging industry, holding various senior management positions. He also holds numerous patents in the fields of diagnostic-quality visualization of clinical images in nuclear medicine, ultrasound, computerized axial tomography (CT), and magnetic resonance imaging (MRI). As an engineering design and marketing consultant, he led several companies through the transition to digital imaging and installed the first digital imaging network for Kodak Japan at the Nagoya Rehabilitation Hospital.

Before co-founding KDH Systems with Dr. Durski, Mr. Haddick led the development of diagnostic imaging software in cardiology and neurology, including automated diagnostic reporting, for an Internet healthcare firm with an application service provider (ASP) business model, and he managed alliances with leading healthcare provider institutions around the world.

Mr. Haddick holds a BS degree in electrical engineering from the University of California, at Berkeley.