

WHITE PAPER

MOBILE HEALTH INFORMATION EXCHANGE

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INTRODUCTION

In August 2005, as Hurricane Katrina buffeted the Gulf Coast, the ability to connect the right people with the right information could have saved lives. Since then, hundreds of millions in federal stimulus dollars have been funneled into local governments throughout the U.S. to develop statewide health information technology (HIT) programs. At the same time, states are rapidly developing *Health Information Exchanges* (HIEs) to streamline information sharing and the continuity of patient care.

One other irresistible force could have a major impact on the adoption of HIEs by clinical users, from emergency responders to ED physicians to case managers: mobility.

Mobile technologies have the ability to impact the industry's future like no other. In the U.S. today, recent studies claim that more than 70 percent of physicians use smartphones, both for their clinical needs and in their personal lives. According to an article published by the American Medical Association on August 23, 2010, "The reason for smartphones' professional popularity, compared with desktop-based health technology, is fairly simple: smartphones allow mobility, and desktops don't. This is critical for health professionals who don't spend their days sitting in one place."¹

For these two trends to succeed together, however, a new solution is evolving that will be unique in form and function — mobile health information exchange (mHIE). mHIE is similar to HIE in that its goal is to deliver relevant information to clinicians. However, mHIE is completely distinctive in its focus to deliver the right information at the point of care, even if that moment takes place outside the normal clinical workflow, enabling clinicians to make better decisions and improve outcomes.

mHIE will bring major changes to the practice of medicine. Unlike other technologies that disrupt the practice of medicine, mHIE can provide health professionals with the information they need via a technology they already embrace wholeheartedly.

CONVERGING FORCES DRIVING THE NEED FOR MOBILE HIE

The need for mHIE is being driven by the healthcare industry's continued emphasis on mobility, the exchange of data, and the standards to facilitate interoperability. While these converging forces are creating the need for this new offering, it is important to understand each particular force individually.

STAGGERING INCREASES IN THE USE OF MOBILITY

Handheld devices and other mobile technologies have followed a significantly steep adoption curve over the last 10 years.

In 2002, a Harris Interactive poll suggested that approximately 18 percent of the nation's physicians reported a personal digital assistant (PDA) was integral to performing their professional duties. Today, according to a report published by Manhattan Research, use of smartphones by physicians in the U.S. more than doubled between 2001 and 2009, to 64 percent. That figure is expected to increase to 81 percent by 2012, according to the same research report. Similar studies suggest those numbers could climb into the 90th percentile by 2012. This growth is driven in large part by the availability of handheld software solutions that stimulate adoption through valuable application functions.

Mobile healthcare offerings today include electronic prescribing, referential drug content, inpatient data delivery systems, clinical documentation, and more. End-user demand for mobile time-saving solutions will inevitably affect the demand and adoption of mHIEs in the same way HIEs became a priority of hospital executives 10 years ago.

THE GROWTH OF HIE

On February 12, 2010, Health and Human Services (HHS) Secretary Kathleen Sebelius and U.S. Secretary of Labor Hilda Solis announced nearly \$400 million in American Recovery and Reinvestment Act (ARRA) Health Information Technology for Economic and Clinical Health (HITECH) awards. These federal stimulus dollars are being funneled into local governments to develop statewide HIT programs, and states are rapidly developing HIEs to streamline information sharing and facilitate the continuity of patient care.

Over the next two years, as funding for HIE investments is presented through incentive payments for healthcare IT under ARRA, the HIE landscape will change significantly. To show meaningful use of electronic health records (EHR) and qualify for incentives under the ARRA, healthcare organizations clearly understand the need to invest in HIE technologies. In addition, those failing to demonstrate meaningful use by 2015 will face penalties in the form of reduced Medicare and Medicaid payments.

For these reasons, the growth of HIEs across the U.S. has been staggering. In fact, a recent report from eHealth Initiative, entitled "The State of the Health Information Exchange in 2010," states that more than 230 active HIEs currently operate in the U.S. While questions of how to sustain HIEs remain largely unanswered, the growth of these new entities will clearly continue into the future.

DEVELOPMENT OF THE NATIONWIDE HEALTH INFORMATION EXCHANGE NETWORK

Despite widespread support for HIEs as a means of sharing electronic patient information across providers, few state governments agree on the best approach to implementing them. To tie together HIEs, integrated delivery networks, health systems, and other stakeholders, the U.S. Office of the National Coordinator for Health Information Technology (ONC) is developing an initiative for the exchange of healthcare information called the Nationwide Health Information Network (NHIN). Today, the ONC's main focus is on spreading the "set of conventions that provide the foundation for the secure exchange of health information that supports meaningful use."² This includes "technical, policy, data use, and service level agreements, as well as other requirements that enable data exchange, whether between two different organizations across the street or across the country."²

The explosive growth in demand for mobile healthcare solutions is matched only by a similar progression of HIEs across the U.S. As NHIN interoperability standards evolve, three forces — mobility, exchange of data, and interoperability — will continue to converge, creating new demand for a mobile health information exchange.

HOW CAN MOBILE HIE MAKE A DIFFERENCE? A PRACTICAL EXAMPLE ...

The following collection of scenarios describes how mobile access to an HIE can help provide continuity of care by giving the right information to the right person at the right time.

Scenario 1: mHIE for First Responders

Accessing patient information from the HIE on a mobile device

Fifteen hours into a natural disaster, a middle-aged individual is semi-conscious, dehydrated, and unable to provide first responders any meaningful clinical information. While the response team cuts through the roof to extract the patient from the flood waters, the EMT logs into an mHIE solution on his mobile device and brings up the patient's medical history from the mHIE by entering the patient's name and address, retrieved from the patient's identification. The EHR information is available to view on his mobile device via the mHIE, which is on a back-up database, unaffected by the storm lightning and flooding.

Mobile HIE info impacts medication administration

The information obtained from using the mHIE includes medication information as well as current and legacy medical history in the form of a common Problem List. This information tells the EMT that the patient has a history of cardiac disease (including heart failure secondary to valve disease), was recently treated, and is taking warfarin. It appears to the EMT as though there might be an electrolytic imbalance secondary to the dehydration that's causing an arrhythmia, appearing as second-degree heart block and manifestations of heart failure, all of which might prompt the use of amiodarone to initiate treatment in the field.

Based on the information received from the mHIE at the flooded house, along with an initial examination of the patient, the team sees that the patient is taking warfarin; therefore they opt not to administer amiodarone (due to increased risk of bleeding) and to monitor the patient closely. The paramedic starts an IV, but from the mHIE information they know it is imperative that they don't overload the patient with fluids, which could potentiate the heart failure risk.

Alerting the Emergency Department to the patient's condition

The patient is flown by MedEvac to a hospital Emergency Department beyond the impact of the storm. Realizing that the PCI gold standard of door-to-balloon time is 90 minutes,³ the EMT selects the ED to which they are heading and alerts staff by sending a message with a link to the patient's mHIE information and a brief description of what has transpired.

The ED receives from the EMT the message describing the patient's current condition of trauma, dehydration and known cardiac history. Based on this information, the triage nurse (charge nurse) holds and prepares a high-caliber bed and bay. The physician assigned to the ED is informed that the patient is incoming and clicks a link to review the nurse's notes and mHIE patient history and alerts the catheterization lab.

Scenario 2: mHIE for ED Team & Specialists

On-call cardiologist consults via iPhone

The dehydrated storm survivor patient arrives in the ED. During the workup, aggregated EHR information from the mHIE shows that a mechanical mitral valve replacement had been performed on this patient at a different hospital that's attached to the mHIE. The ED physician suspects that changes in the EKG are now indicative of heart failure and not dehydration, and the patient might be having or has had a myocardial infarction. Cardiac enzyme labs are immediately drawn and the on-call cardiologist, who is having dinner, is called for a consult.

The on-call cardiologist consults with the ED physician while reviewing the patient's info from the mHIE using his mobile device. He sees what he needs from the valve procedure, changes the focus to ensure heart failure is ruled out ASAP, and orders a STAT 2-D echocardiogram and additional cardiac lab tests.

As the cardiologist finishes dinner, he checks in on the patient's status from the mHIE application on his mobile device and reviews results from the 2-D echocardiogram and BNP tests. He then contacts the ED physician, who informs him that the patient's status is not improving, in spite of appropriate rehydration, and that more than 60 minutes have elapsed since the patient was admitted.

Based on the accumulation of the bedside 2-D echo report, the second consultative discussion with the ED physician on lab results, and the new STEMI indications from the ED work-up that the patient could be at risk for worsening congestive heart failure, the clinical team determines the need for an emergency heart catheterization. The cardiologist activates the on-call catheterization team for a potential angiography and heads to the hospital to perform the procedure well within the PCI 90-minute milestone of door-to-balloon time.

Scenario 3: Primary Care Physician Stays Current from Patient Status Alerts

After stabilization, the patient is transferred from the hospital to a long-term acute-care facility (LTAC) for three weeks. The primary care physician is then alerted via her iPhone when her patient is discharged from LTAC. The physician, who is working from their home office, uses the link in the mobile alert to open the patient's HIE information to review what's occurred. She looks at the most recent hospital visit and has a question for the attending cardiologist. She clicks the provider's name and is given the option to call or message him from her device.

She schedules a follow-up appointment with the patient a few days after discharge from the LTAC.

KEY CONSIDERATIONS WHEN REFLECTING ON MOBILE HIE

When choosing the right vendor for an mHIE offering, the following key areas require significant consideration. Solutions that can deliver around these critical areas are the ones that will achieve the highest levels of user adoption.

- **The right data at the right time:** Any successful mHIE solution needs to provide access to care-dependent data. Getting the *right* information to the *right* person at the *right* time are key to ensuring user adoption, while the quality of the mHIE solution is only as good as the information it provides.

mHIE differs from HIE in that the objective of the HIE network is to provide physicians with as many different types of information from as many different sources as possible. A typical HIE will provide access to historical datasets from local hospitals, reference labs, pharmacies, and other organizations. Trying to view a HIE on a mobile device is akin to reading the *New York Times* through a keyhole: The necessary data is in there, but clinicians may be hard-pressed to find what they are looking for when they need it. Because a tremendous amount of information must be skimmed in order to find what is relevant to the current case, the patient's safety can be put at risk.

mHIE is different because it scales back the necessary information and provides the right information at the right time. mHIE takes the most useful, high-yield, high-impact information and makes it easy to use on mobile devices.

- **Simple user interface:** The right mHIE solution will provide patient information in a familiar, easy-to-view format. Navigating through the solution must be simple and intuitive, and provide the patient information in logical groupings that make it easy to access. mHIE users are not looking to cast a broad net to see if useful information is available from the HIE; they need the interface to do the legwork and present it to them instantaneously.
- **Ability to integrate disparate sources of data:** HIEs involve many stakeholders, including pharmacies, community health centers, local lab systems, and more. In order to flourish, HIEs clearly need to be able to effectively accept data from a variety of different data sources.

Similarly, a successful mHIE provides a solution that is designed to integrate with a variety of clinical systems. In essence, the mHIE needs to act as a universal adapter, requiring no modification to the existing HIE; it must also be capable of integrating data from any source involved in the exchange.

- **Designed for performance (scalability):** Scalability encompasses speed, reliability, and, most importantly, user capacity. Given that information is present on the handheld device, an mHIE must quickly and reliably update information.

Additionally, being that handheld devices vary in their bandwidth and connectivity options, an mHIE should provide high performance for commonly used devices, regardless of whether the device uses a cellular network or Wi-Fi to connect to the network. The system should be designed as an enterprise-level solution — scalable enough to reliably accommodate thousands of users with substantial data needs. And, while speed may predictably decline with a significant number of users, any decline in speed must not affect the usability of the system.

Regardless of the number of users, the mHIE must accomplish its goal of delivering the right information to the right user with no impact on existing systems.

- **Connectivity options:** Key to adoption is ease of access, so connection to the mHIE should be seamless and available through any carrier or any wireless access point. Essentially, any properly equipped, Internet-enabled, touch-screen phone or pad device should be able to be easily set up to receive and send highly secure, industry-compliant, encrypted data and messages as easily as text messages, stock quotes, weather, and email or status updates are exchanged today.
- **Authentication:** The sensitive nature of patient medical data requires extension of the underlying HIE's role-based data access and authentication into the mobile infrastructure. Mobile access should be provisioned and granted at a per-user level to add a layer of access control that the HIE can easily grant and revoke as needed. Mobile authentication for data access should exist as an additional hash-based authentication per each device. Once granted, the mobile user will have the same role-based data permissions that the underlying HIE supports. This extension and support of the HIE's data access and restriction rules is vital to providing consistent data privileges for mobile users.
- **Security/Privacy:** HIEs are required to comply with Federal and State laws to keep personal health information private and secure. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) helps protect medical records. The HITECH Act of 2009 provides additional rules about EHR information.

mHIE adds to these challenges as the access to the information often occurs outside of a hospital or physician's office setting. To ensure security and privacy, consider implementing an mHIE solution that:

- Persists patient information only in device memory and doesn't write them to storage (i.e., doesn't store the data at rest).
- Requires a password each and every time they are accessed.
- Supports remote mHIE applications and data wipes.
- Provides a robust audit trail for each mobile access, including who accessed what patient information by date, time, and access route.

SUMMARY

The evolution of mobile technology has, by default, created a demand for connectivity and information at a rate that is no less than immediate. In no other sector is this immediacy as valuable as in healthcare. Mobilizing Health Information Exchange is not only a logical progression in the development of this technology; it is also the key to timely, well-informed healthcare by multiple caregivers from multiple sources. It is this accuracy that will help emergency response teams meet the PCI gold standard of door-to-balloon time in 90 minutes, as well as benefitting many other areas.

As the healthcare industry continues to adopt new mobile technologies and HIEs proliferate, mHIE will make an immediate and significant impact on healthcare workflow in the coming years. When clinicians — from early responders to specialists to primary care physicians — have access to patient information when and where they need it, hospitals will realize the cost-savings and higher-quality care only possible with high adoption of such systems.

KEYWORDS:

- American Recovery and Reinvestment Act (ARRA)
- Community Health Information Network (CHIN)
- Electronic Health Record (EHR)
- Emergency Department (ED)
- Handheld
- Health and Human Services (HHS)
- Health Information Exchange (HIE)
- Health Information Technology for Economic and Clinical Health Act (HITECH)
- Meaningful Use
- Mobile Health Information Exchange (mHIE)
- Mobility
- Nationwide Health Information Network (NHIN)
- U.S. Office of the National Coordinator for Health Information Technology (ONC)

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