



Connecting Healthcare Whitepaper

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Executive Summary

A recent study published in the journal *Health Affairs* showed that the United States is now dead last among 19 developed countries in their ability to provide timely and effective healthcare¹. The researchers concluded that over 100,000 preventable deaths per year were attributable to this shortcoming in the United States. Most informed observers would point to a lack of coordinated care from adequate health information exchange as the main reason for this current problem.

As the various, often piecemeal solutions for electronically handling health information have begun to pile up, a situation has been created that now presents a complicated and unwieldy solution to a complicated and unwieldy problem.

The critical missing piece to this situation is a cooperative effort guided by input from all of the various users of the system. When the stakeholders have a say in how the system works, they're much more likely to use it. When everyone uses it, the level of care goes up, and the costs go down. We believe that this is the secret ingredient and the guiding philosophy of a successful health information exchange.

Reaching critical mass in the adoption process is one of the greatest challenges in setting up a health information exchange, and is precisely what is currently lacking in many of the communities seeking to implement such a system. A key component to reaching the tipping point is a system designed around the community's needs, and which is affordable from the beginning, even to the smaller physicians' offices.

"Doctors want one login to get the right information on the right patient at the right time."

-Lonnie Draper, MD

By employing an affordable, integrated system such as the Avocare Regional Health Information Network (RHIN), health care providers have a single entry point with a single password in an environment that gives them access to all the information needed to make an informed and timely decision for care. The RHIN can be defined as a community based hardware and software system that brings medical information together letting health care providers share patient information and communicate securely.

This whitepaper will outline the current state of affairs in Health Information Exchange (HIE), identify several problem areas in the solutions that have been offered to date, present the basis for an economically sustainable model, address privacy and security issues, and detail Avocare's RHIN solution. The Avocare model offers a proven RHIN solution that is both cost effective and, by producing billable services, can help bring a sustainable business model to HIE efforts.

¹ Nolte, E., & McKee, M., (2008). Measuring the Health of Nations: Updating an Earlier Analysis. *Health Affairs*, 1, 58-71. doi: 10.1377/hlthaff.27.1.58

The Need for Health Information Exchange

There have been numerous papers and publications on the need for Health Information Exchange (HIE) in the United States however, in our opinion, few have studied, understood and explained HIE as well as the eHealth Initiative (eHI)². The bulk of the information in this section is pulled directly from the publicly available [eHealth Initiative Blueprint: Building Consensus for Common Action](#).

A Problem in Healthcare

Concerns about quality, safety, and rising costs in healthcare have driven the federal government and national and local leaders alike to look for solutions to the challenges of our nation's healthcare system.

U.S. adults receive about half of recommended healthcare services. Despite documented benefits of timely preventive care, a Commonwealth Fund-sponsored U.S. Scorecard on Health System Performance indicates that not quite half of adults (49 percent) receive preventive and screening tests according to guidelines.

A major problem facing U.S. healthcare today is a lack of coordinated care causing medical errors, duplicate testing & therapies, and an increase in overall cost.

Poor quality translates into higher costs. According to the same Commonwealth Fund report, the current gap between national average rates of diabetes and blood pressure control and rates achieved by the top ten percent of health plans translates into an estimated 20,000 to 40,000 preventable deaths and \$1 to \$2 billion in avoidable medical costs.

In addition, chronic disease is a growing problem in the United States. More than 125 million Americans had at least one chronic care condition in 2000, and this number is expected to grow to 157 million by the year 2020. As baby boomers continue to age, the number of individuals living with chronic conditions will continue to grow. Seventy-six percent of all hospital admissions are attributable to people with chronic conditions. And people with chronic conditions account for 88 percent of all prescriptions filled and 72 percent of all physician visits. People with chronic conditions drive a majority of healthcare spending in the U.S., accounting for 78 percent of all health care spending in 1998. *These patients see an average of 4.6 physicians each year making a collaborative model imperative.*

Because of the highly fragmented nature of the U.S. healthcare system, information about the patient is stored in a variety of locations largely in paper-based forms and therefore cannot

² <http://www.ehealthinitiative.org/> The eHealth Initiative and the Foundation for eHealth Initiative are independent, non-profit affiliated organizations whose missions are the same: to drive improvement in the quality, safety, and efficiency of healthcare through information and information technology.

Both organizations are focused on engaging multiple and diverse stakeholders--including hospitals and other healthcare organizations, clinician groups, consumer and patient groups, employers and purchasers, health plans, healthcare information technology organizations, manufacturers, public health agencies, academic and research institutions, and public sector stakeholders--to define and then implement specific actions that will address the quality, safety and efficiency challenges of our healthcare system through the use of interoperable information technology.

easily be accessed. As a result, clinicians often do not have comprehensive information about the patient when and where it is needed most—at the point of care, and those responsible for managing and improving the health of populations do not have all the information they need to measure progress and facilitate response and improvement. Those responsible for public health often don't have timely access to information that supports monitoring, detection, and response to hazards and threats. Finally, and most importantly, consumers don't have access to information that is needed to manage their own health and navigate an increasingly complex healthcare system.

What is HIE, RHIO, & RHIN?

Health information exchange (HIE) is defined as the mobilization of healthcare information electronically across organizations within a region or community.

HIE provides the capability to electronically move clinical information between disparate healthcare information systems while maintaining the meaning of the information being exchanged. The goal of HIE is to facilitate access to and retrieval of clinical data to provide safer, more timely, efficient, effective, equitable, patient-centered care.

Formal organizations are now emerging to provide both form and function for health information exchange efforts. These organizations (often called Regional Health Information Organizations, or RHIO) are ordinarily geographically-defined entities which develop and manage a set of contractual conventions and terms, arrange for the means of electronic exchange of information, and develop and maintain HIE standards.

Although HIE initiatives differ in many ways, eHI survey results and experiences with states, regions and communities indicate that those who are experiencing the most success share the following characteristics. They are:

- Governed by a diverse and broad set of community stakeholders;
- Develop and assure adherence to a common set of principles and standards for the technical and policy aspects of information sharing, addressing the needs of every stakeholder;
- Develop and implement a technical infrastructure based on national standards to facilitate interoperability;
- Develop and maintain a model for sustainability that aligns the costs with the benefits related to HIE; and
- Use metrics to measure performance from the perspective of: patient care, public health, provider value, and economic value.

With RHIOs being defined as the governing body and political structure for HIE, the Regional Health Information Network or RHIN is the system or technology that physically moves the electronic data. In general terms a RHIN is a community based hardware and software system that brings medical information together letting healthcare providers share patient records and communicate securely.

The Call for a National Health Information Network

Over the last several years, recognition of the importance of health IT and health information exchange to improve our nation's health and healthcare have grown significantly, bringing a number of policy changes—both at the federal and state levels.

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In 2004, a new office was created within the Department of Health and Human Services (DHHS) — the Office of the National Coordinator for Health Information Technology (ONC) — to provide federal leadership and coordinate efforts within the federal government around health IT. Since that time, ONC has initiated several activities designed to provide support for the adoption of health IT, including contracts that support standards harmonization, certification of health IT products, and the assessment of business rules and policies related to privacy and confidentiality across states.

On August 2006, President George W. Bush issued an executive order calling for healthcare programs administered or sponsored by the federal government to utilize health IT systems and products that meet recognized interoperability standards. In addition, several grant programs and technical assistance activities designed to support health IT adoption have been initiated by several federal agencies including the Agency for Healthcare Research and Quality, the Centers for Disease Control and Prevention, the Centers for Medicare & Medicaid Services, and the Health Resources and Services Administration.

A number of states are also moving forward in parallel with federal efforts to develop and implement policies and plans that promote health IT and health information exchange. While there was virtually no legislation at the state level related to health IT prior to 2005, 121 bills were introduced in 38 states in 2005 and 2006, 36 of which were passed in the legislature and signed into law in 24 states. There has been a considerable increase in state legislative activity in 2007. As of this writing, more than 200 bills focused on health IT have been introduced in 41 states since January 1, 2007, sixteen of which have been signed into law by the governors in 11 states. U.S. governors are also playing a critical role in moving forward health IT policy change. To date, 20 executive orders have been issued by governors in 15 states, which are designed to drive improvements in health and healthcare through the use of IT—eight in 2007 alone.

Health Information Exchange as a True Solution

There is now general consensus that HIE is the solution to the fragmentation of healthcare delivery in the United States. However since it is still a new and complex field, there is no “one size fits all” model that can be deployed in every community to solve all the healthcare information problems. This section explores what a HIE should and *should not* bring to a community.

Benefits of a Connected Healthcare Community

Although no two HIE solutions are the same, successful ones will share these basic characteristics:

- Solve the issue of fragmented healthcare by bring coordination to the healthcare community.
- Save the provider time and money.
- A *single logon* for the provider which will give them access to all the information needed for treatment of a patient.
- Integrate into the providers’ current workflow and current Electronic Medical Record (EMR) systems.

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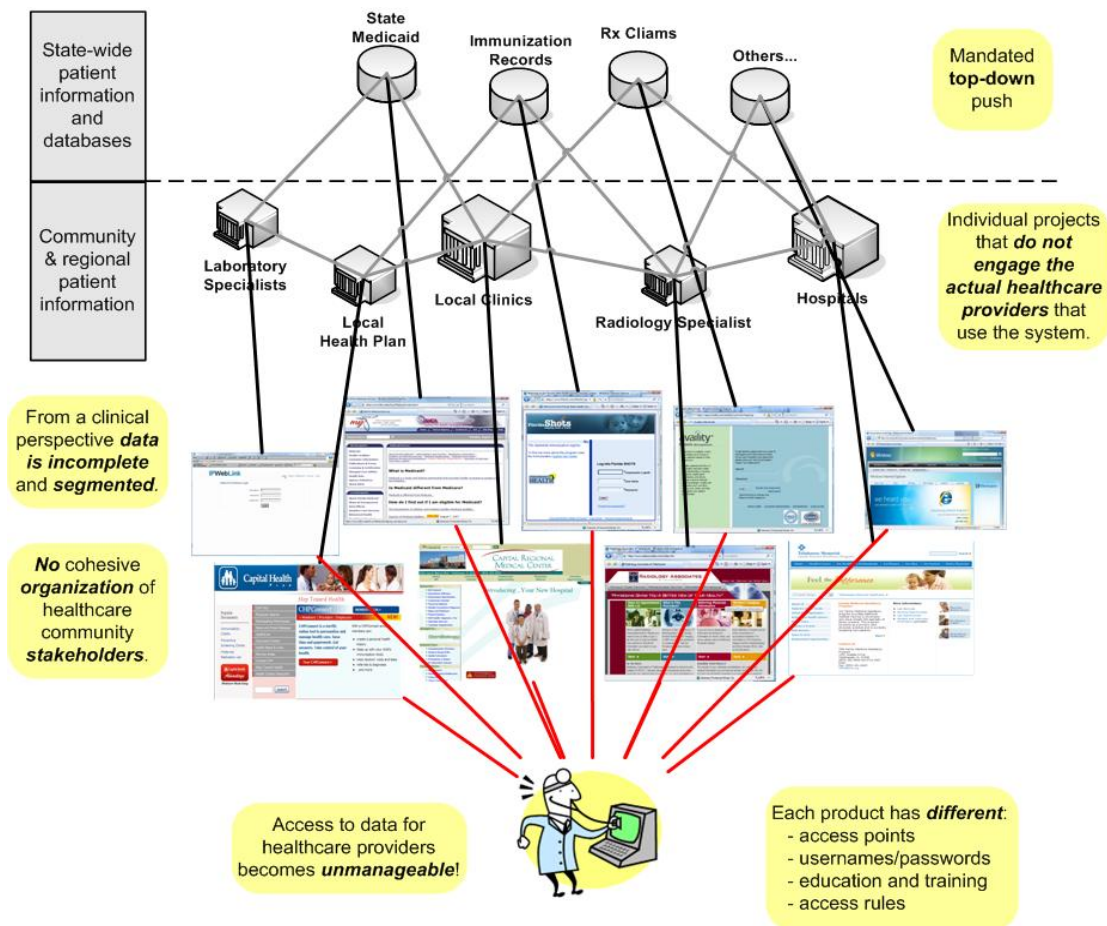
- Combine information from multiple sources into a single view, thereby reducing the effort to interpret the data.
- Based on real-time clinical data, not aged claims data.
- Convenience for the patient.
- Increase the quality of care and saves lives!

The Wrong Implementation

With such positive benefits there is much excitement surrounding HIE and RHIOs these days and healthcare stakeholders are faced with an ever increasing selection of health IT solutions from which to choose. Many solutions can bring electronic efficiencies and some unification however they fail to engage the entire healthcare community and fall short of an operationally suitable HIE. Common causes for failure are:

- Overly complex technology that is expensive to implement and maintain yet does not offer everyday business solutions for healthcare providers.
- Mandated top-down push that does not receive buy-in from local users of the system.
- Inability of technology solution to cooperate with and connect all healthcare stakeholders and available medical databases.

The following diagram depicts a health IT implementation scenario to avoid.

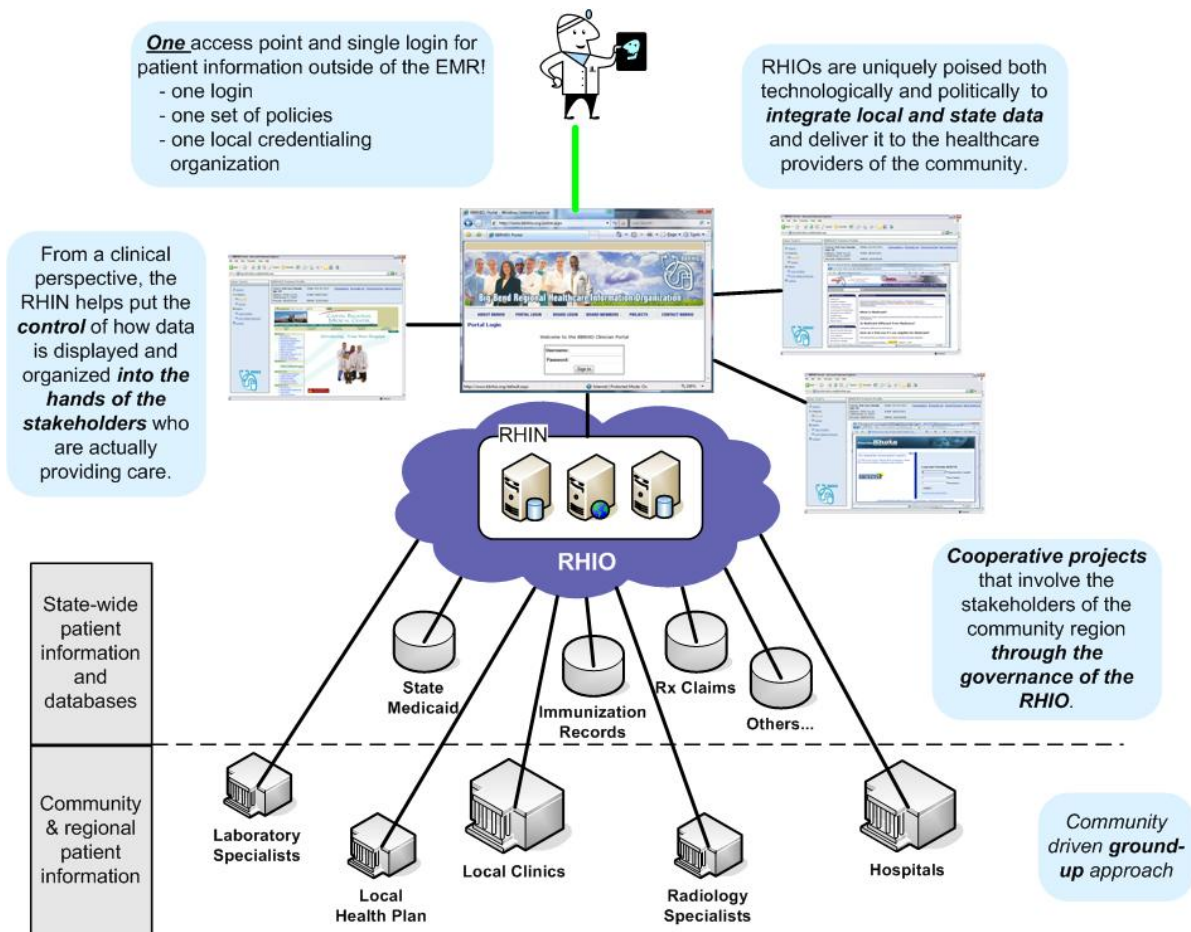


The Right Implementation

The good news for healthcare stakeholders is that solid best practices are emerging in the HIE environment. By studying and implementing these best practices the probability of successfully deploying an operationally sustainable HIE is greatly improved. Known success factors include:

- Provide simple to use affordable technology that solves a specific business need.
- Community driven ground up approach that engages the local users of the system.
- Cooperative projects that can connect all healthcare stakeholders in the community.

The following diagram depicts a best practice model for HIE.



The Elusive Business Model

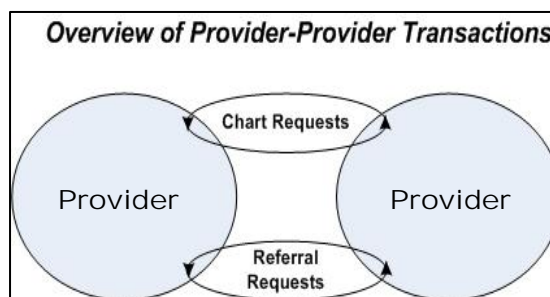
At the core of every profitable business model is the ability to generate revenue. The key to a sustainable business model is being able to produce enough revenue to recover startup costs and cover daily operational costs. Therefore the focus and objective of HIE should be to garner acceptance and consensus plus identify and combine the elements that will create the most improvement in efficiency and return on investment for stakeholders. Stakeholder return on

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investment either in time savings, reduced cost, reduced liability or improved patient satisfaction is ultimately the bedrock from which sustainability will emerge.

The following analysis begins to quantify the monetary value of HIE through the review of the annual administrative cost savings produced by electronically sharing patient chart requests and referral requests between a range of healthcare providers at four (4) levels of HIE³.

Level	Attributes
1	Charts and referrals carried by patient or mail
2	Faxed charts and referrals
3	Free-text electronic charts and referrals
4	Encoded, standardized electronic charts and referrals



Savings		Level 1	Level 2	Level 3	Level 4
Provider Group	Size				
Small Group	5 clinicians	\$0	\$46,700	\$133,000	\$215,000
Medium Group	10 clinicians	\$0	\$93,500	\$266,000	\$429,000
Large Group	25 clinicians	\$0	\$215,000	\$599,000	\$979,000
Small Hospital	≤ 49 beds	\$0	\$47,800	\$138,000	\$222,000
Medium Hospital	50-199 beds	\$0	\$123,000	\$350,000	\$571,000
Large Hospital	200-399 beds	\$0	\$314,000	\$875,000	\$1,430,000
Jumbo Hospital	400+ beds	\$0	\$693,000	\$1,930,000	\$3,150,000
National		\$0	\$2,920,000,000	\$8,110,000,000	\$13,200,000,000

With the understanding that cost savings are available through HIE, it is important for the HIE to offer solutions that target the specific needs of their stakeholders. The following list may act as a guideline to help identify solutions that meet these needs. An effective HIE should:

- Reduce the resources needed to communicate and exchange data within the healthcare community.
- Offer a more efficient electronic replacement to paper & phone communications currently used by the healthcare community.
- Transition existing community workflow processes that are manually difficult or time consuming to a more efficient process that creates a mechanism for accountability and auditing.
- Be custom built and operated for a number of clients ranging from private healthcare entities to the county or the state.
- Be thought of as a billable service by connected healthcare providers (e.g. annual membership fee, monthly access fee, transaction fee, or a combined hybrid pricing model).

³ "The Value of Health Care Information Exchange and Interoperability"
<http://content.healthaffairs.org/cgi/content/full/hlthaff.w5.10/DC1>, January 2005.

Privacy and Security

HIE cannot be discussed without mentioning privacy and security. Following is a list of the basic concerns surrounding privacy and security and HIE:

- HIPAA requirements
- Patient consent, privacy and control
- Policy and procedures
- System security and reliability
- Access to patient records

The simple fact is we face these same concerns in the paper world, and the sharing of electronic medical records is safer and more compliant than doing so with paper. This section provides thoughts on a few technology solutions that can help to resolve specific concerns of HIE from both the healthcare provider's perspective and the patient's perspective.

From the Healthcare Provider Perspective

Important privacy and security requirements for technology from a provider's perspective include:

- Data control - providers want a "bank and safety-deposit box" solution for their data; the RHIO can provide overarching security similar to a brick and mortar bank however each data provider also wants their own safety deposit box (i.e. database) for their data where they hold the key.
- Detailed audit reports of record access.
- HIPAA compliant policy and procedures.

From the Patient Perspective

Important privacy and security requirements for technology from a patient's perspective include:

- Ability to opt-out.
- Require providers to submit a Declaration of Entitlement to view patient records.
- Break-the-glass functionality for emergency healthcare providers in life and death situations.
- Detailed audit reports on provider access of patient records.

Avocare Solution

Avocare's Regional Health Information Network (RHIN) is a community based hardware and software system that brings medical information together letting healthcare providers share patient records and communicate securely. The powerful combination of our Core RHIN Platform and customizable RHIN Applications offer a comprehensive electronic replacement to paper and phone communications currently used by the healthcare community.

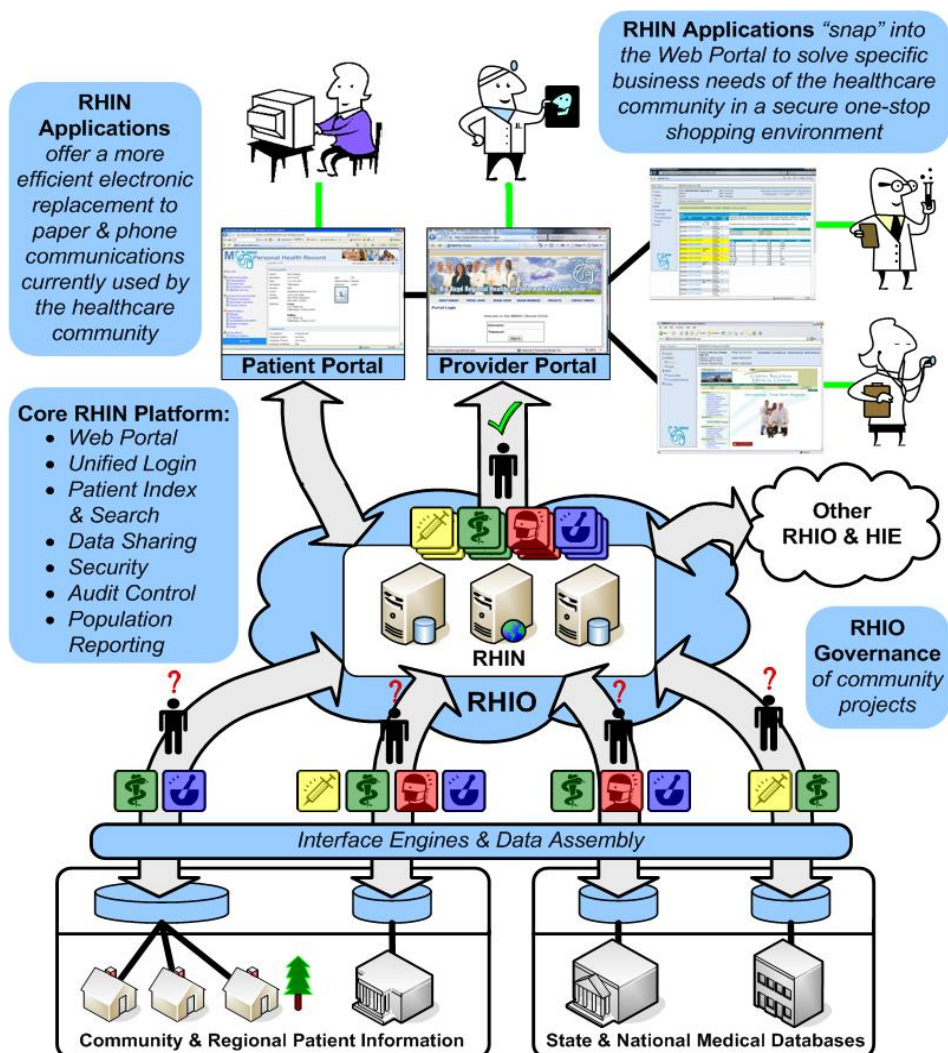
The remainder of this section describes Avocare's RHIN solution from a more technical perspective providing an overview of system architecture and details on key features of system components.

Overview

Our RHIN platform is a thoughtful solution that embraces a “hybrid” (centralized *and* federated) system architecture. The system has a RHIN Web Portal that provides secure access to available patients and their associated electronic medical records through the Core RHIN Platform. Additional business functions and services are available through the use of RHIN Applications. RHIN Applications “snap” into the Web Portal to solve specific business needs of the healthcare community in a secure one-stop shopping environment. From an architectural systems perspective, think of our solution is as a data warehouse and decision support system model. Each connected healthcare provider becomes an available database for the data warehouse through the connecting power of the Core RHIN Platform. Then associated RHIN Applications become various decision support systems available through the RHIN Web Portal.

System Architecture

The diagram below graphically depicts the Avocare RHIN solution.



Starting with the bottom of the diagram, the following process flow describes how health information is collected and displayed in the RHIN System:

1. Data is created at each of the connected participating organizations (community and regional patient information & various state and national medical databases).
2. The data is automatically captured through interface engines and a data assembly procedure where it is “staged” or cleansed and assembled into community defined patient datasets.
3. Part of the staging process includes notifying the Regional Master Patient Index (RMPI) and Record Locator Service (RLS) within the Core RHIN Platform that a patient has medical information available at the corresponding participating organization.
4. The RMPI stores limited patient demographics along with other meta data on the patient provided by the participating organization and, using a conservative algorithm, automatically links the associated record to the records of the other connected participating organizations for the same patient.
5. Once in the RMPI, patient information may be securely transmitted either to the RHIN Web Portal or other defined locations from the Core RHIN Platform thus providing a *combined unified* view of patient information from *all* participating organizations.
6. In addition to being a viewer for combined patient information, The RHIN Web Portal allows a user to interact with a patient record through already bundled or other third party web based “RHIN Applications”. These services may include ePrescribing, document imaging, electronic referrals, or other custom RHIN Applications that serve a specific business need in your community.

We understand the RHIO environment & offer a proven RHIN solution that is both cost effective and, by producing billable services, can help bring a sustainable business model to your HIE efforts.

Core RHIN Platform

The Core RHIN Platform is the heart of the system and consists of a series of components that act as an information broker to accurately associate and retrieve patient records. Features of the Core RHIN Platform include:

Interface Engines – HL7 (Health Level 7) messaging is a common cost-effective method for data transfer and aggregation within the medical industry. If HL7 is not the answer for your community then we can support CCR and XML or build custom interfaces.

Patient Index & Search – The patient index & search is comprised of a Regional Master Patient Index (RMPI) and Record Locator Service (RLS). The RMPI is an algorithm that assigns a unique number to every patient within the system. The algorithm automatically links (and unlinks) new and updated patient records from healthcare providers connected to the Core RHIN Platform. The algorithm is based on a combination of gender, last name, social security number, date of birth and other available patient demographics to maximize fast access to a true patient match while minimizing the possibility of false positives. The RLS interacts with the RMPI to search

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for and return patient records based on a Patient Accuracy Indicator (PAI). The PAI number indicates how closely a patient matches information entered in a search.

Data Sharing – We believe that for a RHIN to be successful it must share the data your community feels is important. To accomplish this goal we have developed data assembly routines that build interchangeable “patient datasets”. Pick from our existing selection (patient demographics, allergies, diagnosis, radiology reports, laboratory reports, problem lists, medication history, provider lists, vital statistics, et cetera) or have us build a new patient dataset that is just right for your community.

Security & Audit Control – Record access audit is an important required function of any medical data system. Our platform creates a detailed audit log specific to each connected healthcare provider and across the entire system.

Maintenance Component – Part of our system includes a methodology for manual patient record conflict resolution and correction. We believe it is vital to not underestimate the importance of a data correction system for the RMPI.

Population Reporting - The Core RHIN Platform has the ability to provide de-identified community health informatics for research and planning purposes.

Disaster Recovery – The Core RHIN Platform can be configured to store a copy of the “Patient Datasets” supplied by the healthcare providers to act as a community backup of basic medical records and can be incorporated into a disaster recovery and business continuity plan.

RHIN Web Portals

The RHIN Web Portals are a secure SSL-enabled website for credentialed users. The RHIN Web Portals provide single username/password access to view patient medical information available through the Core RHIN Platform and launch various RHIN Applications to interact with the patient data. These portals allow for integrated “one stop shopping” of all system functionality from the end user perspective.

Key features of the **Provider Portal** include:

Encounter List – Navigational tool that is the user’s guide to available data through the Core RHIN Platform. The Encounter List improves the usability of the Provider Portal by summarizing the data stored in each of the connected healthcare providers. This saves users time by directing them to their desired information as opposed to having to click and “fish” to see if a source has information they need.

Clinical Summary – A web based, community-wide, electronic “patient chart”. The clinical summary page provides a unified display of clinical data available from the connected healthcare providers.

Detailed Data Displays – From the unified patient chart a user may drill into the specific sections of the chart to quickly access detailed records.

Key features of the **Patient Portal** include:

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Personal Health Record (PHR) – An easy to use PHR where patients can securely store all their medical information including: demographics, emergency contacts, insurance and care providers, medical history, and family history.

Patient Opt-out – The Patient Portal allows a patient to opt-out of participation in the RHIN system.

New Patient Registration Automation – Once a patient has entered their information into the Patient Portal it becomes available to connected healthcare providers to print or download as part of the new patient registration process saving both the patient and provider time.

RHIN Applications

With the core RHIN platform in a community we can provide applications and services that will reduce the resources needed to communicate and exchange data within the healthcare community. RHIN Applications “snap” into the Web Portal to solve specific business needs of the healthcare community in a secure one-stop shopping environment. Existing RHIN Applications may be bundled with the Core RHIN Platform or new applications may be custom built for the specific needs of your healthcare community. Examples of existing RHIN Applications include:

Referral Management - Allows users to efficiently manage in-coming and out-going referrals within their office. Electronic forms are simple and easy to fill out as patient information is pre-populated from the RHIN system.

Document Upload - Electronic document imaging with simple-to-use document upload and management capabilities. Allows user to upload scanned paper charts and documents for a patient into the RHIN system.

Patient Demographic Download – Download and print patient information or import directly into your Electronic Medical Records (EMR). Patient information is available from any connected provider as well as the Patient Portal and includes demographics, insurance, emergency contacts, next of kin and more.

Provider Messaging – Secure communication for connected health care providers. Think email that is HIPAA compliant.

Other examples of RHIN applications are:

- Lab Messaging
- Physician Directory & On-call List
- Electronic Home Healthcare Orders
- Patient Education Solution
- Medication Reconciliation
- Many Others

Appendix

References & Sources

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