Next Generation Healthcare Information Networks (HINs)

Healthcare IT Market Commentary

November 2010

Afsaneh Naimollah – Partner (Afsaneh@MarlinLLC.com)

Next Generation Healthcare Information Networks

About Marlin & Associates

Marlin & Associates Holding LLC (M&A)[1] is an independent boutique investment banking and advisory firm focused on advising owners and managers of U.S. and international companies that provide technology, digital information, and healthcare-related products and services. The firm is based in New York City, with offices in Washington, DC and Toronto, Canada and has been the recipient of numerous awards including being named as the "Middle-Market Investment Bank of the Year."[2]

M&A's senior members have come together from some of largest and most prestigious global companies. Our professionals include executives with operating backgrounds as well as investment bankers with extensive transactional experience. Together, we have advised on over 200 successfully completed transactions worldwide.

We believe that our unique blend of industry focus, financial and operational experience and international execution capabilities put M&A in a formidable position to advise our clients. We have a strong track record of success in executing challenging transactions in our select industries.

We believe that every CEO and Board of Directors has a vision. Our job is to help them realize that vision, achieve their objectives and build enduring value in the process.

Next Generation Healthcare Information Networks

Table of Contents

Next Generation Healthcare Information Networks

Table of Contents

M&A
MARLIN & ASSOCIATES

BACK TO THE FUTURE

HEALTHCARE REBOOTED

Some of us remember the famous quote from the movie Back to the Future when Doc says to Marty McFly: "You are just not thinking fourth dimensionally." And Marty answers: "Right, right. I have a real problem with that."

Understanding the intricacies of the present U.S. healthcare system may not require fourth dimensional thinking, but it is certainly a topic of profound complexity; and some people have a real problem with that. In the past 15-20 years, we have had notable triumphs in improving the quality of our healthcare, extending our life expectancy, and discovering new treatments. However, despite the phenomenal growth in advanced medicine, the cost of delivery is increasing at breakneck speed and threatening the very core of our healthcare system.

Today, as the cost of healthcare nears 18% of GDP[3] and the nation ages rapidly, many believe that we are approaching a new dawn in the evolution of an affordable high-quality healthcare system. We echo the same sentiments for four reasons:

1. The *social and economic imperatives* for a better healthcare system have never been so pronounced. We believe that solving the cost problem from the fringes has never worked and now finally others agree.

2. The *healthcare IT (HIT) mandates* in the federal healthcare reform bill, coupled with a stream of superior technologies, puts us in a position to have a measurable impact on the costs and the quality of care delivery.

Despite the phenomenal growth in advanced medicine, the cost of delivery is increasing at breakneck speed and threatening the very core of our healthcare system

3. The *confluence of technologies* is at a pivot point to enable radical changes at relatively reasonable costs. In addition to continuing advancement in the field of medicine; major breakthroughs in telecommunication, data management, infrastructure, and analytics technologies have laid the foundation for more innovative solutions for the industry.

4. The *availability of capital, coupled with drive towards industry-specific solutions*. In every industry, there are pioneers and "early settlers". Despite multiple failures in the past to improve

Executive Summary

HIT systems (such as investors' substantial losses in funding pioneering Electronic Medical Record companies in mid-1980s), the brave souls in the venture capital community continue to finance next generation healthcare IT companies. Many of these companies are building industry-specific HIT solutions by leveraging advanced battle-tested horizontal technologies from BI (Business Intelligence), analytics, and ERP, to transaction processing, SaaS and social networking. Thankfully, there are now many success stories where these companies are fetching prices at record levels – including some at valuations close to 10x revenue.

OUR OBJECTIVE:

When we set out to write this industry overview, we wanted provide market commentary that was overarching, educational, and thought provoking. We interviewed 50 companies in the healthcare IT industry and talked to many thought leaders, as well as studied white papers and government documents. We have tried not to fall into a messianic fervor in predicting the future of healthcare, but rather attempted to give our readers a sense of the possible for the direction of the healthcare IT industry, distilled from our own experience and the collective thoughts and efforts of industry visionaries and leaders who are forging the new paradigm in healthcare IT.

We see the new healthcare IT paradigm as a "network of networks" which we call Healthcare Information Networks (HINs). In this report, we embark on a deep dive into the major components of HINs; including Infrastructure, Revenue Cycle Management (RCM), Administration, Clinical Data, and Analytics (Figure 1). For every building block, we will describe the role that each can play in bringing about the promised transformation to this industry. We also touch on some key factors for HIT vendor differentiation.

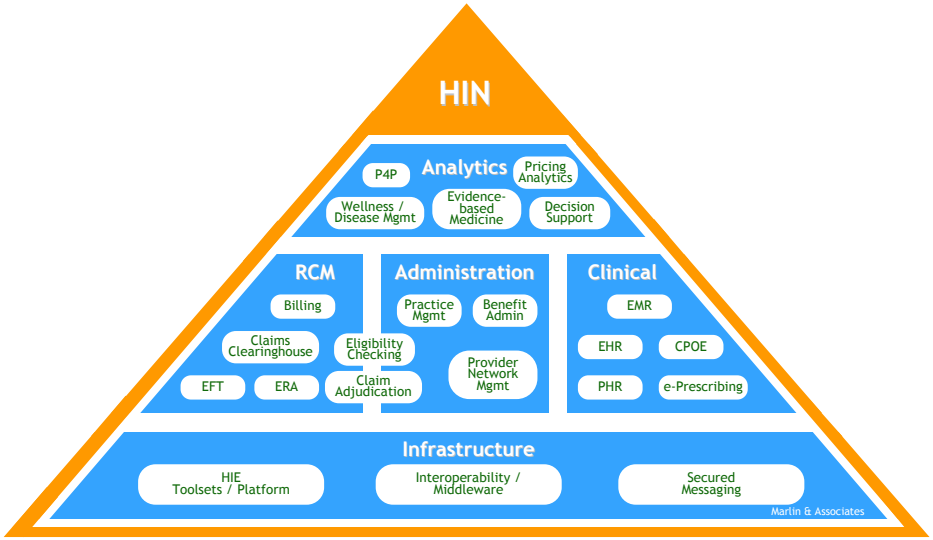

Figure 1

We See the New Healthcare IT Paradigm as a "Network of Networks" Which We Call Healthcare Information Networks (HINs)

Source: Marlin and Associates, 2010

BACKGROUND:

The cost of healthcare administration in the U.S. was approximately $404 billion in 2009 (or 16% of total U.S. healthcare expenditures).[4] Of these costs, about $150 billion was spent by payers and providers on billing and insurance administration-related activities.[5] It is clear that healthcare administration is where the IT expenditures are the largest and where we believe employing advanced technologies can make significant contributions.

Below, we briefly describe the role of each constituency; namely *payers* (insurance companies), *providers* (hospitals and physicians) and *patients* in addressing the healthcare administration issue.

We have identified more than 350 *payers* in the U.S. with combined revenues of $500 billion. These payers spend $13 billion annually on IT.[6] The leadership at the top of these organizations has faced major operational challenges in responding to the rapidly changing IT environment and the public pressure for a more active participation in "fixing the system".

In addition to payers' own internal IT efforts, third party companies such as ikaSystems, NASCO, and TriZetto have also emerged and grown to further reinforce the payers' objective for lowering the administrative burden so entrenched in the system. Collectively, much of the payers' initiatives to date have revolved around business process optimization as well as coordination of benefits and care for consumers.

Healthcare administration is where the IT expenditures are the largest and where we believe employing advanced technologies can make significant contributions

Similarly, *providers* have also been hampered by administrative inefficiencies. In the early 2000s, a number of companies emerged with a focus on trying to solve the providers' administrative challenges. Many of these firms offer products to facilitate effective claim processing and more timely reimbursements; the latter being a top priority for providers. Companies such as Availity, Instamed, and NaviNet are a few of the companies in this category. It is worth noting that a number of large payers participated in funding these ventures, thereby aligning the economic interests of payers and providers. Many start-ups were also funded to help physicians leverage their internal and external clinical data to assist them in making better informed medical decisions. These new provider-centric

technologies bring efficiencies both to the physicians' workstations as well as to their administrative staff.

And finally, *patient*-centric companies, which until recently were practically non-existent, have been pushed to the forefront as a driving force in the healthcare revolution. Given the ample availability of wellness websites, home diagnostic tests, and PHR (Personal Health Records) solutions, patients today are empowered, more informed, and are taking a more active role in engaging in their own process of care. For example, many patients are able to organize much of their treatment plans on disease-specific websites, thus reducing the need for frequent doctor visits. Furthermore, as high deductible health plans become increasingly popular, patients are finding themselves to be dealing directly with payers. As a result, patients are paying a lot more attention to their lifestyle which speaks directly to the issue of patient accountability; a key driver for reducing the average cost of care per person.

Clearly, the forces between payers, providers, and patients are complex and often conflicting. In a world where payers are in danger of becoming commoditized (some are even opening sales offices with store fronts in shopping malls), we believe that the payers will continue to shoulder much of the initial costs of the U.S. healthcare system's overhaul. For example, payers have devised products to reward or punish providers depending on medical outcomes, they have now built pricing mechanisms that can reduce or increase individual premiums of patients depending on their behavior, etc. Many of these innovative products are designed in close collaboration with third party solution vendors which continue to play an important role in helping the payers launch unique offerings. Payers are well aware that the cornerstones of their strategy moving forward need to be the individualization of healthcare plans, stronger provider relationships, and automation/streamlining of their administrative tasks.

We believe that the payers will continue to shoulder much of the initial costs of the U.S. healthcare system's overhaul

AN INTRODUCTION TO HINS

In order to articulate our concept of a HIN, let us discuss some appropriate analogies:

1. *Telecommunication Networks:* Imagine if you were a Verizon subscriber and you were not able to speak to your friend because s/he was on the Sprint network. This is precisely

the dilemma of non-interoperability in the current care environment. Today, there are a number of companies that are developing software systems and middleware in an effort to glue these disparate healthcare "networks" together.

2. *Technology Standard-bearers*: The technology industry made major strides when Microsoft and Intel (followed by Apple, Google, and Facebook as newer players), managed to get a broad community of users to accept "standards" that they created. We believe that the healthcare industry is now in a similar position where the current cacophony needs to be replaced by a new breed of standard-setting companies. Clearly, the role of the government in introducing certain industry standards is a good jump start. However, we believe the private sector will be the one that will ultimately set the working standards in the industry. Whether leaders such as Ingenix, who has been an active acquirer, could play an important part in setting industry standards is yet uncertain. A new entrant from outside the industry such as a telecommunication company, a large diversified technology company, or the next well-funded venture-backed company could also have a viable shot at becoming the standard bearer(s) of the industry.

3. *Financial Information Networks*: And lastly, there are distinct parallels between HINs and the development of financial information networks such as Bloomberg and Thomson Reuters. In our opinion, in the end there will be only a handful of HINs (just as we have only a few large financial information networks in the U.S.) that will emerge as nationwide networks that connect different regional Health Information Exchanges (HIEs) and transaction platforms. These HINs will aggregate and analyze vast amounts of data, as well as provide tools so that their clients can execute, facilitate or intermediate a variety of transactions. In addition to serving payers, providers, and patients, the HINs will provide data and sophisticated analytics to governmental, educational, and pharmaceutical organizations. We predict that the revenue model for a HIN will most likely be in the form of a "toll fee" for transactions, an "access fee" for data, or subscription-based pricing.

We predict that the revenue model for a HIN will most likely be in the form of a "toll fee" for transactions, an "access fee" for data, or subscription-based pricing

As we look at the different building blocks of HINs, we note that, with some exceptions, the industry has not yet fully

coalesced around these networks. Instead, the industry is populated with single function firms each within separate building blocks. We believe that those enterprises that successfully assemble the largest integrated presence among the most building blocks stand the best chance to become the Bloomberg, Google, or Thomson Reuters of the HIT Industry.

Referring to our earlier idea of Network of Networks, at the present time, we have identified over 200 HIE and Regional Health Information Organization (RHIO) initiatives in the U.S. at various stages of development.[7] We expect this number to rise sharply as the benefits of connectivity become more apparent and as the government continues to provide funding for local and regional HIEs. It is clear that the technology for connecting these exchanges at the network level exists today; the challenge is connecting the networks at the higher stacks where transactions can be performed and data can be aggregated, extracted and manipulated. For example, in the early days of Bloomberg, the company was focused on being a provider and aggregator of financial information. Over time, Bloomberg expanded its mission to include a wide range of analytic tools, as well as a comprehensive trading platform, which now form a substantial part of the company's offerings. Similarly, we have begun to see analytic tools, execution capabilities, and other creative approaches that take advantage of the wealth of available data, as well as some innovative technologies forming around deeper access to the information embedded in HINs. These advances will enable the execution of transactions across a broad set of applications.

The challenge is connecting the networks at the higher stacks where transactions can be performed and data can be aggregated, extracted and manipulated

KEY PREDICTIONS

We may not be fourth dimensional thinkers, but we have great conviction that the following predictions will eventually crystallize:

1. Companies in the Administration and RCM building blocks will lead the industry consolidation. Some of these firms are already expanding product lines and acquiring new payer/provider customer bases and offering new products/services. The purchase of RealMed by Availity in September 2010 is demonstrative of this trend.

2. As the convergence of Administration/RCM building

blocks evolves, and as clinical data businesses join this convergence, new business models will emerge. These models can range from subscription-based, pay-as-you-go, and access fee to toll fee and settlement fee.

3. We envision that companies providing payment services, as well as those firms providing traditional solutions in billing and practice management (PM), will forge close partnerships with clearinghouses and eventually merge with them.

HINs will become major engines of transformation

4. We will witness a new data outsourcing trend (Healthcare BPO) for both government-owned as well as privately-owned HIEs, whereby the owners of the HIE will contract out the management of the data (including image data) flowing within their own networks. Whether the winners will be the traditional outsourcing companies such as Accenture, HP, IBM, etc (capitalizing on their managed services outsourcing experience), or builders of HIEs such as Axolotl or Medicity (capitalizing on their deep knowledge of healthcare infrastructure software), or new entrants is yet uncertain. But, we believe parties closest to building these exchanges will be best suited for becoming the major data outsourcing companies of tomorrow.

5. Payers will embark on offering innovative products to avoid commoditization. Behavioral-based premiums and pay-for-performance programs are some early examples of how payers will try to differentiate themselves. Payers are well aware that once the restrictions for purchasing health insurance across state lines are lifted, the pace of commoditization in the industry will accelerate, increasing the pressure to drive down costs as well as to differentiate through creative products.

Payers will embark on offering innovative products to avoid commoditization

In examining the pace of healthcare IT development, we are convinced that HINs will become major engines of transformation. Perhaps this time around the stars and the moon are aligned; there is substantial funding, advanced technologies, valuable lessons from transformation of other industries, and above all, the human capital and the social will to reboot the system. The healthcare industry holds great promise

for change. The question is which firm possesses the means, the vision, and the leadership to build the first comprehensive HIN and seize this opportunity.

"If you want to build a ship, don't drum up people together to collect wood and don't assign them tasks and work, but rather teach them to long for the endless immensity of the sea."

- Antoine de Saint-Exupery, French pilot and author of "The Little Prince" 1900-1944

Next Generation Healthcare Information Networks

Table of Contents

Next Generation Healthcare Information Networks

Background

Healthcare spending in the United States, already the highest among the world's industrialized nations, continues to grow. In 2010, the U.S. is projected to spend $2.6 trillion, or 17.5% of the GDP, on financing healthcare services ($8,389 per person).[8] Given current spending trends, U.S. healthcare costs are projected to exceed $4.6 trillion by 2019 (19.6% of GDP or $13,653 per person).[9]

Despite having the most costly health system in the world, the U.S. ranks last on indicators of patient safety, efficiency, and equity of treatment when compared to similarly industrialized countries.[10] The prevalence of chronic diseases and the growing population of elderly Americans is only exacerbating the systemic problems by increasing the demand for costly healthcare services. To give an idea of the cost of the chronic disease epidemic: cardiovascular disease and diabetes together will cost the U.S. an estimated $750 billion in national income annually.[11]

The adoption of advanced healthcare technologies correlates with improved health outcomes and some recent trends, such as the adoption of EMR/EHR (Electronic Medical Records / Electronic Health Records), correlate with reduced healthcare spending.[12] Not surprisingly, early adopters of HIT in the U.S. such as Kaiser Permanente, Intermountain Health Systems, the Veterans Health Administration, and the New England Healthcare Exchange Network have been successful in improving quality of care while also reining in healthcare costs.

Through the better use of HIT, these organizations have enabled more comprehensive sharing of patient information among their various constituencies. Consequently, there is an opportunity for greater efficiency in the delivery of healthcare services in these organizations, which can result in lower administrative costs and, in some cases, improved quality of care for patients.

However, advanced HIT adoption in the U.S. remains low. For example, while 44% of office-based physicians use EMR/EHR, only 6% use a fully functional system (Figure 2).

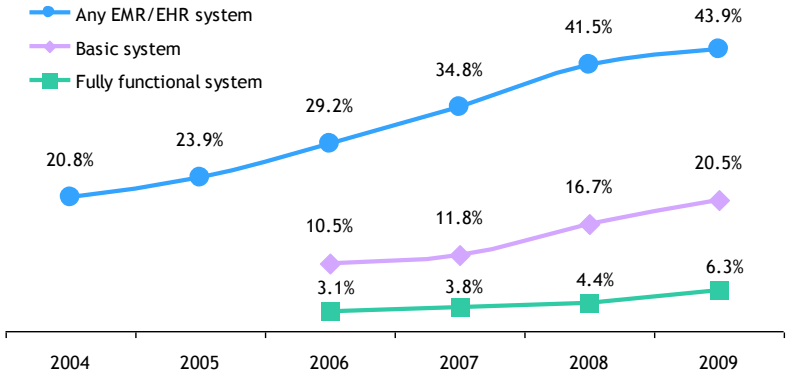

Figure 2

Electronic Record System Adoption is Increasing Among Office-based Physicians, But Advanced Adoption Remains Low

Source: CDC / National Center for Health Statistics, 2009

Next Generation Healthcare Information Networks

Background

In the U.S., historical barriers to HIT adoption include the cost of HIT purchase and ownership, lack of technical expertise to deploy and maintain HIT systems, and lack of interoperability among various HIT applications. However, innovation in the HIT industry, increased empowerment and responsibility of healthcare consumers, and government funding such as stimulus money for EMR adoption in the American Recovery and Reinvestment Act of 2009 (ARRA) are beginning to erode these historical barriers. These trends are driving the evolution of next generation HIT applications that will usher in a new era of efficiency and greater integration in U.S. healthcare.

Improving efficiency in U.S. healthcare requires integrating clinical and administrative workflows, ensuring continuity in patient care, adopting evidence-based medicine, leveraging value-based benefits, and linking insurance premiums to patient behavior. Integrating currently disparate healthcare constituencies requires real-time access to clinical and administrative data. The widespread use of paper records in the current U.S. healthcare system, however, prevents immediate access to relevant information that can be leveraged in improving patient care. Furthermore, the few patient records that have become electronic in recent years are stored in proprietary formats. As a result, critical information remains in silos and require extensive standardization ("data scrubbing") to yield meaningful information. In our view, next-generation HIT applications need to leverage interoperability standards and enable real-time healthcare data exchange.

In our view, next-generation HIT applications need to leverage interoperability standards and enable real-time healthcare data exchange

Table of Contents

Next Generation Healthcare Information Networks

Introduction to HINs

The fragmented nature of U.S. healthcare gave rise to the emergence of multiple players in the payer and provider markets. In the past three decades, the payer sector experienced the most rapid growth due to the emergence of Health Maintenance Organizations (HMOs), availability of commercial health insurance, and the rise in government healthcare spending. More recently, the rise in consumer directed health plans (CDHPs) is increasing the complexity of the market by increasing involvement of patients in the payer/provider ecosystem.

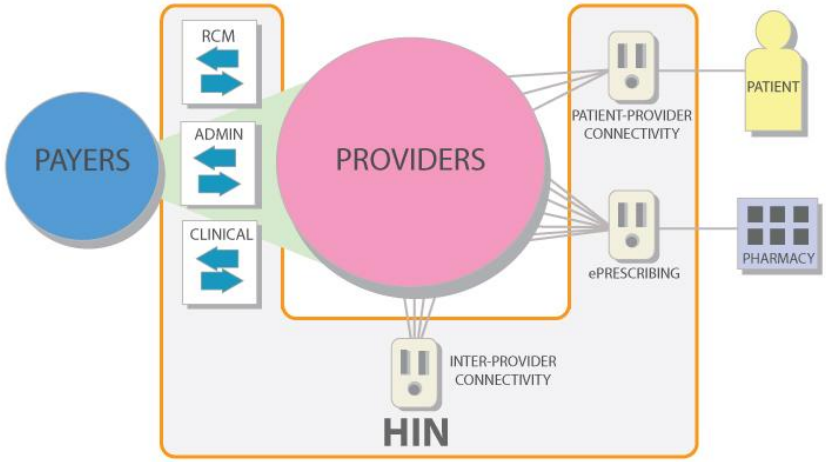

Figure 3
HINs are Platforms for Exchanging Information and Performing a Wide Variety of Transactions
Source: Marlin & Associates, 2010

The need for seamlessly exchanging healthcare data among healthcare constituencies (payers, providers, and patients) is driving the HIT industry towards the evolution of next generation Healthcare Information Networks. As seen in Figure 3, we believe HINs will function as platforms for exchanging information and performing a wide array of healthcare transactions. Due to the complexity of assembling a HIN and the criticality of mass necessary to create a compelling business model, we believe that no more than a handful of HINs of meaningful size will emerge, as seen in Figure 4.

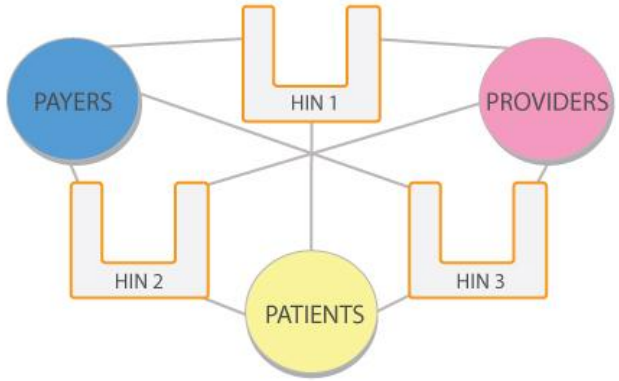

Figure 4
A Handful of HINs Will Emerge
Source: Marlin & Associates, 2010

The need for seamlessly exchanging healthcare data among healthcare constituencies is driving the HIT industry towards the evolution of next generation HINs

Next Generation Healthcare Information Networks

Introduction to HINs

Marlin & Associates has developed a new paradigm – a way to understand the broader health information technology industry. We refer to this as the HIN pyramid. As you can see, we organize the HIT industry into three layers, each of which we sub-divide into fundamental building blocks (Figure 5).

The Infrastructure layer serves as the foundation on which HINs are built. Layered above the Infrastructure layer is an "applications layer" which is sub-divided into Revenue Cycle Management (RCM), Administration, and Clinical Data platforms that enable real-time access to healthcare data and streamline healthcare delivery workflows. Above the applications layer is an "analytics layer" where much of the data from the application layer is sliced and diced for a variety of purposes.

Today, many HIT companies have solutions that cover more than one building block. We believe that the companies that will ultimately succeed will have competencies resident across multiple building blocks.

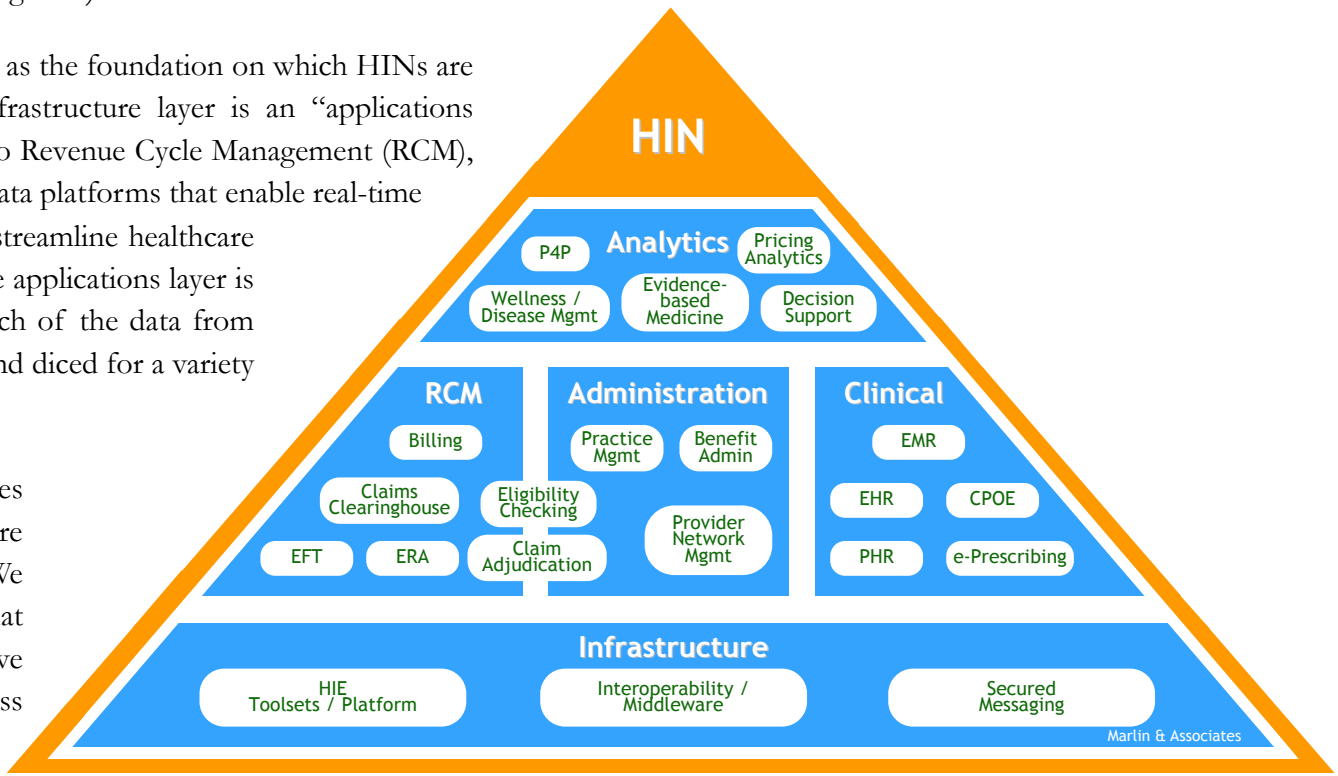

Figure 5
We Organize the HIT Industry into Building Blocks
Source: Marlin & Associates, 2010

Table of Contents

The foundation layer of Marlin & Associates' HIN pyramid is the Infrastructure layer (Figure 6). This layer consists of HIE Toolsets / Platforms, Interoperability & Middleware applications, and Secured Messaging platforms that facilitate the secure and seamless exchange of data among providers, payers, and patients.

Using an analogy from the computing world, we think of the Infrastructure layer as the operating system of the HIN (similarly, it could be thought of as "the cloud"), while the higher building blocks serve as the application layers.

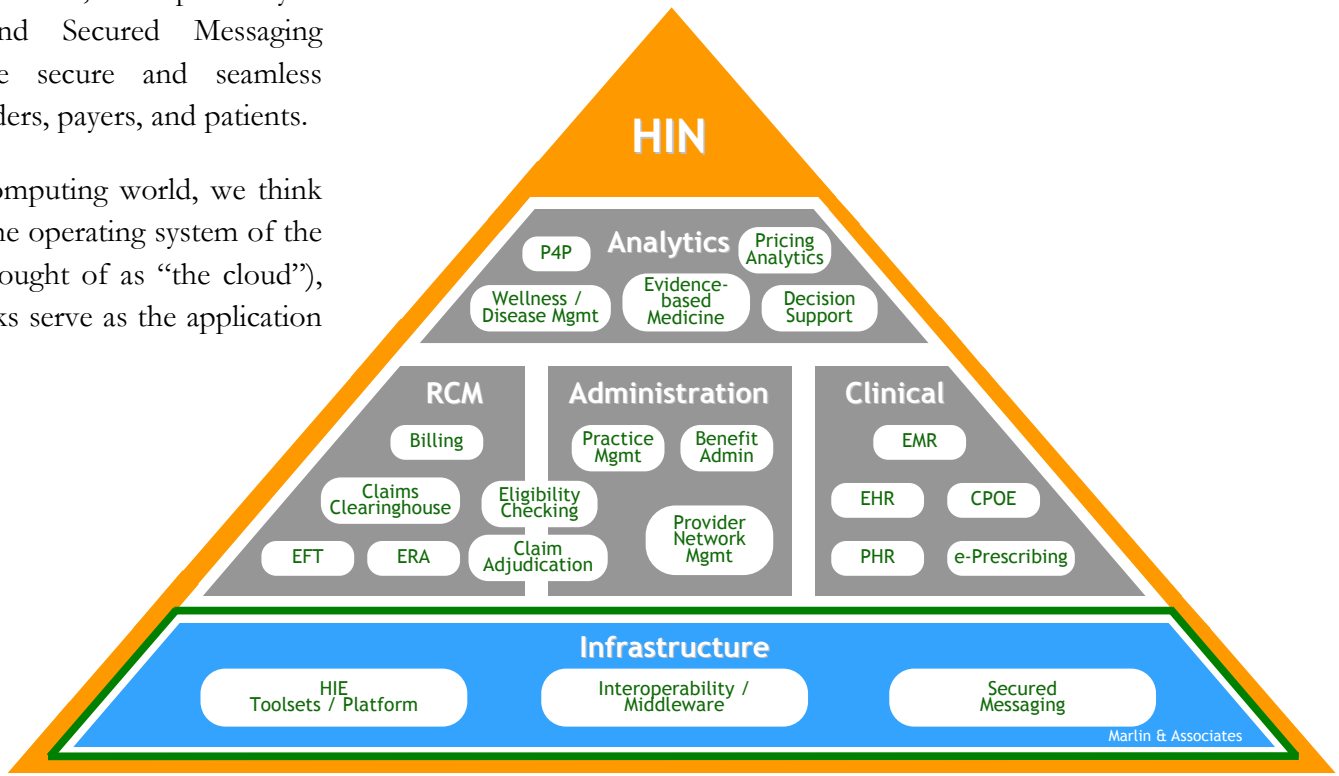

Figure 6

The Infrastructure Layer Forms the Foundation of a HIN

Source: Marlin & Associates, 2010

Next Generation Healthcare Information Networks

Healthcare data in the U.S. is largely held within disparate information silos, which are scattered amongst the three principal constituencies; namely providers, payers, and patients. There is a great need to connect these silos in order to integrate and leverage this wealth of data. This connectivity is made possible by using components of the Infrastructure layer categorized into Health Information Exchange (HIE) toolsets and platforms; Middleware and Interoperability applications; and Secure Messaging platforms.

HIE toolsets and platforms facilitate healthcare data exchange by connecting information systems deployed in large healthcare organizations. Middleware and interoperability applications convert healthcare data into standard forms that are meaningful to each healthcare constituency. Lastly, secure messaging platforms facilitate interactive communication among providers, payers, and patients that comply with healthcare regulation.

Unlike the financial services sector, the U.S. healthcare industry still lacks common transaction and information standards, with each payer, technology vendor, etc having their own proprietary standard. Therefore, integrating workflows and exchanging information is challenging or, in some cases, nearly impossible. As a result, there is an ongoing need for translation layers, middleware applications, and scrubbing software to transform healthcare data into forms that are readily interpretable by the party receiving the information.

In the 1980s, integrated health delivery systems, local managed care organizations, and large hospital groups envisioned electronically exchanging healthcare data through Community Health Information Networks (CHINs, a technologically inferior precursor to HIEs/RHIOs).

The U.S. healthcare industry still lacks common transaction and information standards, with each payer, technology vendor, etc having their own proprietary standard

Without common transaction and information standards, however, healthcare data collected at the point of service lacked interoperability. As a result, data could not be easily exchanged among a CHIN's provider members. Further, exchanging information within CHINs relied on the point-to-point transfer of unstructured data between computers. As the cost of purchasing hardware and networking was prohibitively high, small healthcare organizations with limited IT budgets were effectively excluded from participating in initiatives for exchanging data. In addition, historically available HIT applications had limited capabilities in capturing clinically

valuable data. Not surprisingly, healthcare providers during the 1980s displayed little enthusiasm in adopting expensive HIT applications that generated little to no clinical value.

In the late 1990s, several healthcare systems once again attempted to connect and share information, this time using RHIOs. Given available government funding, larger HIT budgets among some healthcare organizations, and a growing interest in sharing information to identify best care practices, a number of RHIOs successfully deployed networks for exchanging clinical data. Without a sustainable business model, however, most RHIOs eventually faltered.

During the RHIO movement, the HIT-enabled exchange of healthcare data amongst providers experienced limited success. Healthcare payers, however, persisted in making significant HIT investments to enable electronic billing and payments. During this period, exchanging administrative and financial data became commonplace.

Currently, there are over 200 HIEs and RHIOs in the U.S. at various stages of development.[13] Healthcare data exchange for present-day HIEs/RHIOs in the provider sector is enabled by Infrastructure applications focused on applying the lessons learned from the implementations of payer-centric HIT solutions. Vendors of Infrastructure platforms envision moving up the stack into the higher application-level blocks of the pyramid. We have witnessed similar trends in the financial technology industry when vendors that initially offered only platform software eventually entered the application business.

Companies providing Infrastructure applications include Axolotl (acquired by Ingenix), CareEvolution, Covisint (acquired by Compuware), dbMotion, Half Penny Technologies, Kryptiq, Medicity, Mirth, and Orion Health (based in New Zealand).

Vendors of Infrastructure platforms envision moving up the stack into the higher application-level blocks of the pyramid

Next Generation Healthcare Information Networks

Components of HINs > Infrastructure > ***Health Information Exchange (HIE) Toolsets and Platforms***

The Infrastructure layer in the M&A HIN pyramid includes a building block that we call HIE Toolsets and Platforms. These toolsets and platforms form the backbone of HINs by enabling secure data exchange between multiple destinations within a defined network (whether it be local or regional, private or government-owned, etc). Figure 7 lists a number of healthcare entities that can be networked using HIE-building technologies resident within a HIN.

Federal initiatives to build the National Health Information Network (NHIN) leverage HIE Toolsets and Platforms to connect community- and state-level HINs to the internet, thereby facilitating the exchange of structured clinical, administrative, and financial data on a national level.

HIE solutions in the current HIT marketplace tend to focus on facilitating clinical data exchange among healthcare organizations within a defined geography; connectivity at the state-level and nationwide HINs is still in its infancy. As the market matures, however, we believe that applications and services that connect state and national exchanges (e.g. Verizon's HIE Solutions) will eventually become commonplace.

In addition to building and managing HINs, major HIE Toolset and Platform vendors have ambitions to move up the pyramid and provide value-added services such as clinical documentation, billing, decision support, and quality reporting. This BPO model is similar to the transformation of data center providers into off-site client application managers (e.g., EDS and Perot).

Figure 7

HIE Toolsets and Platforms Enable the Connectivity of All Healthcare Entities

Source: Marlin & Associates, 2010

Middleware and Interoperability Applications enable diverse HIT platforms within HINs to interface and exchange data with each other. Specifically, they receive structured or unstructured data, filter/sort the data, and translate/match/convert data from constituent-specific formats into standardized data structures that are understandable to recipients (Figure 8). These data conversion processes occur on both the sending and receiving ends of the transactions flowing through the HIN.

One function of these Middleware and Interoperability Applications is to map and update legacy transaction codes (e.g., LOINC, ICD, and CPT). As advanced HIT applications become more widespread and the lexicon of transaction codes expands and evolves, we believe that customers will insist that newly-installed applications have backward compatibility to legacy systems. This layer also automatically converts transaction codes into standardized forms in order to ensure the unambiguous communication of healthcare data to better manage transitions of care.

Currently, Middleware and Interoperability Applications are primarily stand-alone solutions that are installed as "add-on" patches to legacy systems. As legacy systems are phased out and standards begin to coalesce, we envision tighter integration with HIT applications.

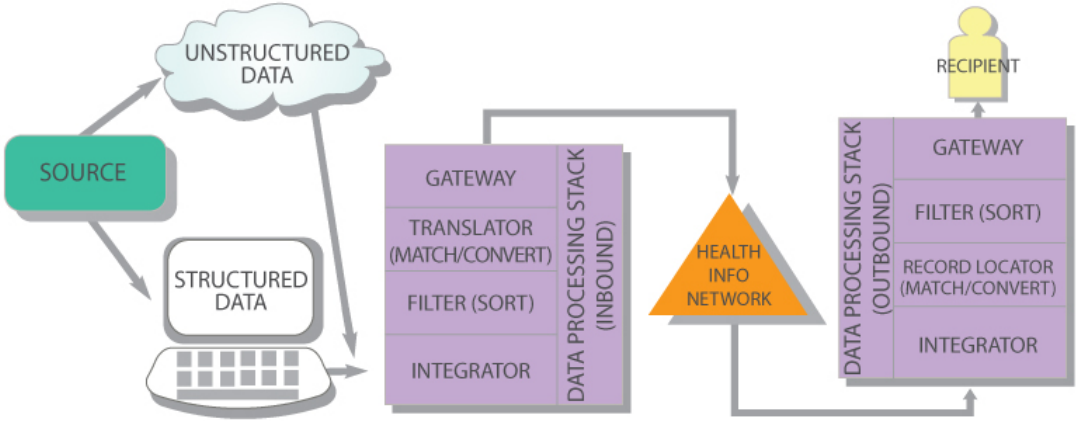

Figure 8

Middleware and Interoperability Applications Enable Diverse HIT platforms within HINs to Interface and Exchange Data

Source: Marlin & Associates, 2010

Next Generation Healthcare Information Networks

Components of HINs > Infrastructure > ***Secure Messaging***

The third component of the Infrastructure is the building block that we call secure messaging platforms. These platforms facilitate direct communication between any two constituents within a HIN.

Secure messaging platforms enable direct provider-to-provider exchange of clinical data that can be leveraged in improving patient care. This communication is particularly critical during "transitions of care" when a provider is handing-off the care of a patient to another provider. Secure messaging platforms also facilitate interactive, two-way patient-provider communications, thereby permitting the tighter integration of patient-centered medical home initiatives, telehealth, and e-care practices in healthcare delivery workflows. Additionally, secure messaging platforms can be leveraged to replace inefficient and costly paper-based communication from payers to patients or from payers to providers such as Explanation of Benefits.

As healthcare transactions become increasingly routed through next generation HINs, we envision the greater need for augmenting automated machine-to-machine transactions with interactive person-to-person secure messaging capabilities. In our view, the most important secure messaging capabilities in the future include embedding data into workflows, as well as context-driven communication among providers to streamline referrals, and patient-provider communication to schedule appointments and renew prescriptions. Vendors of secure messaging platforms include Kryptiq and Medfusion (acquired by Intuit in May 2010).

In our view, the most important secure messaging capabilities in the future include embedding data into workflows

Next Generation Healthcare Information Networks

Table of Contents

MARLIN & ASSOCIATES

Next Generation Healthcare Information Networks

One layer above the Infrastructure layer is a software layer we call Revenue Cycle Management (RCM). These applications facilitate the "electronification" of healthcare payment-related transactions (Figure 9). Core RCM capabilities include electronic funds transfer and remittance advice, real-time eligibility checking and insurance verification, paperless billing, and claims processing.

Effective RCM platforms can help providers and payers improve cash flow by accelerating the revenue cycle and lowering costs through streamlining claims and payments processes.

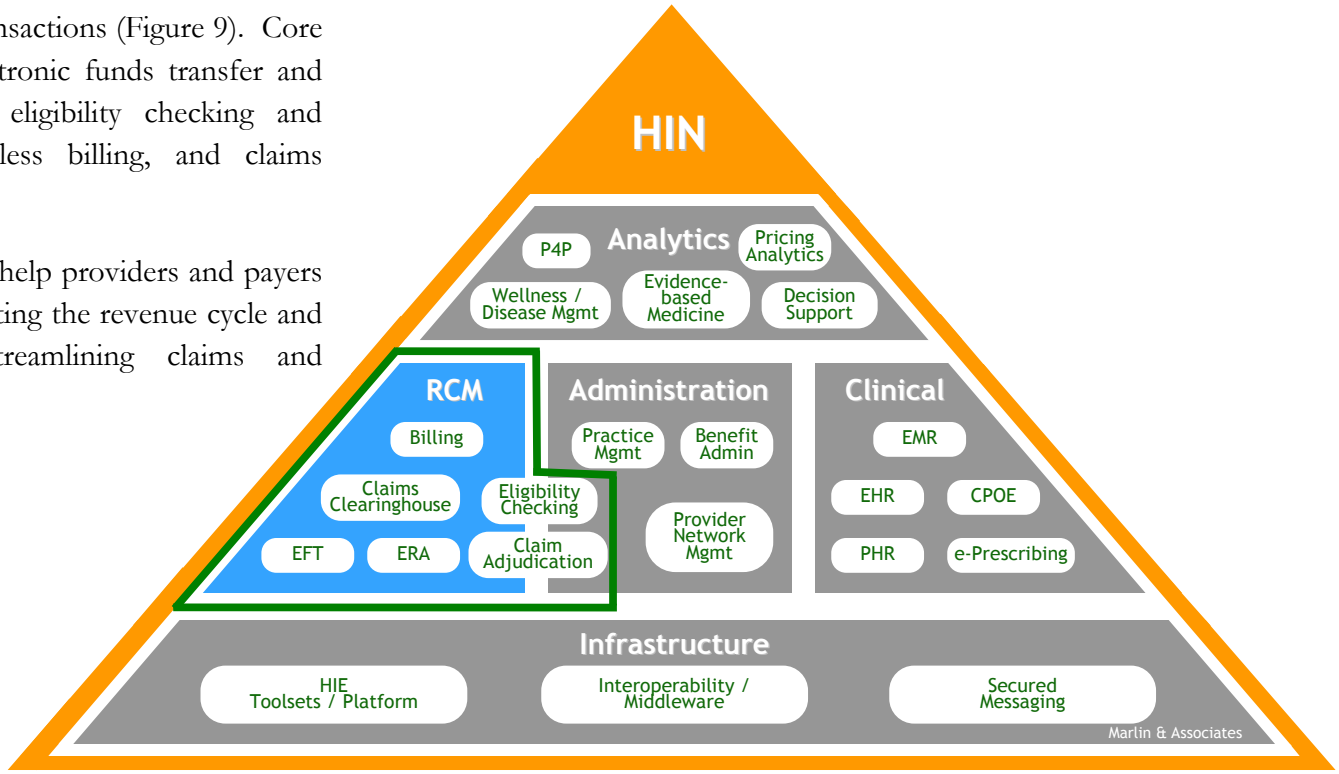

Figure 9

RCM Applications Facilitate the "Electronification" of Healthcare Payment Transactions

Source: Marlin & Associates, 2010

RCM is one of the more dynamic subsectors of the healthcare industry where advanced financial technology is being deployed. Companies in this sector include Abeo Medical, Accretive Health, AHS, AthenaHealth, Emdeon, Gateway EDI, HERAE, Instamed, MMP (subsidiary of Cbiz), Orion Healthcorp, and Zirmed.

Healthcare RCM is undergoing rapid changes, many of which are a result of a healthcare system that is shifting from nearly exclusive payer-centric RCM workflows to RCM workflows that increasingly feature patient payment processes. The driving force behind all of this technology innovation is to automate and streamline as many revenue cycle-related processes as possible. Much like STP (straight-through processing) in financial services, a goal of RCM is to allow transactions to be automatically completed without manual intervention. For a brief history of the evolution of RCM processes, see Figure 10.

Traditional Clearinghouse Solutions

Today, many of the key steps in the traditional clearinghouse solution are largely the same in the next generation solution, such as eligibility checking, claim adjudication, etc. (see discussion of these processes on following pages). However, there are some key capabilities in which the traditional clearinghouse solutions fall short of the next generation RCM solution, such as:

- traditional clearinghouses use manual and rudimentary patient-centric payment workflows due to lack of connectivity to the payment networks (such as credit card networks)
- the EFT and ERA are de-coupled in the traditional clearinghouse model, making the payment posting and remittance processes more difficult for the provider

Next Generation RCM Solutions

In the following pages, we have outlined the step-by-step transaction workflow (see Figure 11 on following page) for the next generation RCM solution.

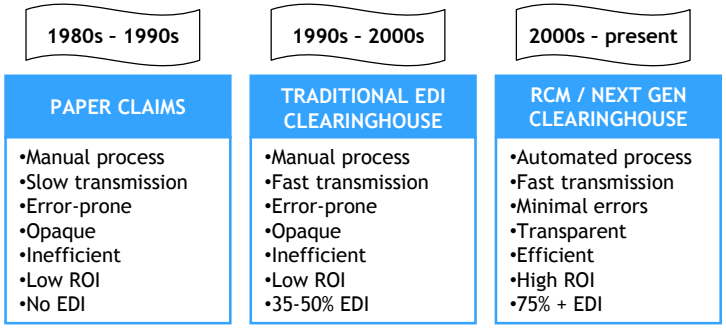

Figure 10

Next Gen RCM Solutions Focus on Electronification and Automation

Source: Navicure, 2010

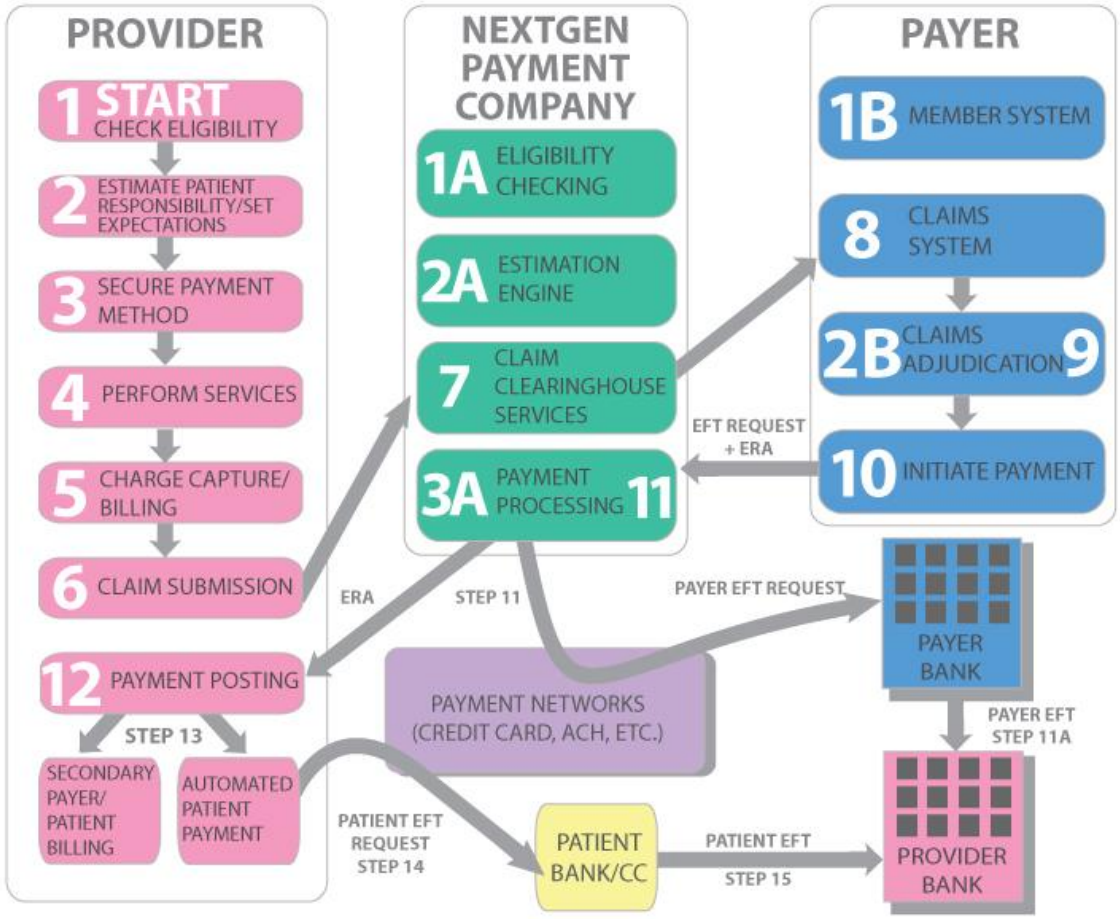

Figure 11

The Use of Next Gen RCM Solutions Moves the Healthcare Industry Closer to "Straight-Through Processing" of Payments

Source: Marlin & Associates, 2010

Step 1/1a/1b – Eligibility Checking

The process of checking eligibility determines whether a health plan will pay for the services that the patient is about to receive (in other words, if the condition to be treated is a "covered condition"). Checking eligibility is also necessary for procedures that require pre-authorization and referrals. Historically, this is a manual process conducted over the phone, through the mail, or via single-payer web portals. Next generation payment companies provide real-time eligibility checking services to provider clients via multi-payer desktop systems that connect to the payer's member system.

Step 2/2a/2b – Patient Payment Estimation

As previously mentioned, next generation RCM solutions have increased focus on patient payment processes. The first step in which this manifests itself is in the patient payment estimation phase. With next generation technologies, the provider can provide the patient with detailed cost estimates as well as options for payment. The estimation can either be calculated by a proprietary estimation engine within the next gen company or calculated by the payer's claim adjudication system (however, not all payers have this ability). This estimation step is becoming increasingly important as patients adopt consumer-directed and high deductable health plans.

Step 3/3a – Secure Payment Method

Once the patient payment responsibility has been estimated, the next generation payment company then utilizes its connectivity to the payment networks (such as Visa, Mastercard, etc.) to "secure" the payment at the point of service. This pre-authorization of payment allows for automated, and thus more timely and reliable, patient payment processes later in the RCM cycle. This is analogous to giving your credit card to the front desk of a hotel when checking in: you pre-authorize any charges made for room service, pay-per-view movies, etc. but your card will not actually be charged until you check out.

Next generation RCM solutions have increased focus on patient payment processes

Step 4/5 – Perform Services & Charge Capture / Billing

After the patient payment method has been secured, the provider performs the medical procedures and captures the details of them accordingly for billing purposes.

Despite HIPAA's standardization of transaction codes for healthcare payments, billing workflows among providers and payment requirements among payers remain highly varied. As claims processes become more complex, increasing numbers of providers are outsourcing their billing functions to third party billing specialists.

Marlin & Associates Deep Dive: Billing Service Providers

While there are many companies that provide outsourced billing services across all specialties, we believe some of the most compelling billing service providers today are those that focus on one (or a few) specialized verticals, especially those practices with highly nuanced and complicated billing, such anesthesiology or emergency medicine. On the other hand, some billing service providers (such as those in radiology) are being challenged in the current environment due to the relative ease of billing for that specialty (and thus face pricing pressure from competition) and/or because procedure volumes are positively correlated with the economy. We believe the mid- to long-term prospects are brighter for multi-practice billing firms who are diversified enough to withstand market pressures that may negatively affect a single specialty. As a result, we anticipate merger & acquisition activity in the sector to pick up considerably in the coming years.

Step 6 – Claim Submission to Next Gen Company via Electronic Data Interchange (EDI)

Once the charges have been captured, coded, and the claim assembled, the provider electronically submits the claim to the next gen payment company electronically via HIPAA-compliant secure EDI networks which leverage standardized code sets to communicate uniform information on payment requests, authorization, and notification between payers and providers.

Step 7 – Claim Clearinghouse Services

In order to reduce errors, increase office staff efficiency, and speed revenue cycle times, many providers (including billing service providers) choose to submit their electronic claims to payers via claim clearinghouses rather than submitting claims to payers directly. Next generation payment companies provide similar services to those provided by traditional claim clearinghouses. These claim clearinghouse services include: 1) scrubbing the claim for errors, 2) translate the claims to adhere payer-specific specifications, 3) aggregating claims for batch submission to payer, and 4) securely transmitting the file to the payer using its established connection to the payer.

Marlin & Associates Deep Dive: Claim Clearinghouses

Firms that provide only claim clearinghouse services, while performing a necessary function in the RCM workflow, are facing some challenges as the HIN continues to evolve. One is that the price charged per transaction is being pushed down, similar to how commissions on stock trades have been squeezed over the years. Another threat is that the next generation payment-centric players are beginning to provide clearinghouse services as a part of their end-to-end RCM services, thereby cutting out the "middle-man". Both of these competitive pressures will force clearinghouses to leverage their existing provider install bases by providing additional products and value-added services (such as analytics or revenue-related decision support) in addition to their traditional clearinghouse services.

Step 8 – Claim Submission to Payer

Once the claim has been processed by the next gen payment company or clearinghouse, the prepared claim is transmitted to the payer's claims system via secure EDI connection that the clearinghouse maintains with the payer. Connectivity to and strong relationships with the payers are huge value-adds for clearinghouses and not easily replicable on a large scale.

Step 9 – Claim Adjudication

After receipt, the claim enters the payer's claim adjudication system. During the claim adjudication process, the payer determines its financial responsibility by examining the procedures performed against the member's benefits.

Step 10 – Payment Initiation

Payment consists of two parts: 1) EFT and 2) ERA. The EFT (Electronic Funds Transfer) is the actual money payment. The ERA (Electronic Remittance Advice) is a set of accompanying documents which explain the payment, and is simply the electronic version of the paper-based EOB (Explanation of Benefits). After adjudication, the payer sends the EFT request and accompanying ERA to the next gen payment company. Keeping these two transmissions coupled eases the remittance processes on the provider side and allows for simplified audit/tracking capabilities for the payment and paperwork.

Step 11/11a – ERA and Payer EFT

Assuming end-to-end integration, the ERA is sent into the provider's practice management / billing system while the EFT from the payer is sent to the payment networks and ultimately arrives in the provider's account.

Step 12 – Payment Posting

Once the ERA is recorded into the provider's practice management / billing system, the provider goes through a payment posting process in which it analyzes the payment and documentation received from the payer. The provider is then able to determine the patient's payment responsibility (this is similar to the adjudication process that payers go through earlier in the workflow). The importance of running an effective and efficient payment posting processes is being magnified as consumer-directed health plans and high-deductable plans are forcing patients to pay larger out-of-pocket bills (via a variety of means, including credit card) than the nominal co-pays of traditional health plans.

Step 13 – Secondary Payer/Patient Billing OR Automated Patient Payment

After determining patient responsibility, the provider bills the patient for the portion of the healthcare expense not paid for by the payer. Alternatively, if there is a secondary payer (such as Medicare), they will then be billed at this stage. If the Secure Payment Method (step 3) process was successful, the remaining patient-related payments are largely automated.

Step 14/15 – Patient EFT

Because the payment method had already been secured prior to services being performed, the provider is able to initiate a EFT from the patient through the payment networks without further involvement from the patient. This automated patient billing and payment is extremely useful in limiting bad debts and minimizing clerical work for providers.

The importance of running an effective and efficient payment posting processes is being magnified as consumer-directed health plans and high-deductable plans are forcing patients to pay larger out-of-pocket bills

Table of Contents

The second building block above the Infrastructure layer is a software layer we call Administration. Administrative applications integrate front-office healthcare tasks on both the payer and provider side such as provider network management, practice management, and benefits administration (Figure 12). These functionalities largely focus on lowering costs and streamlining business processes through reduced paperwork.

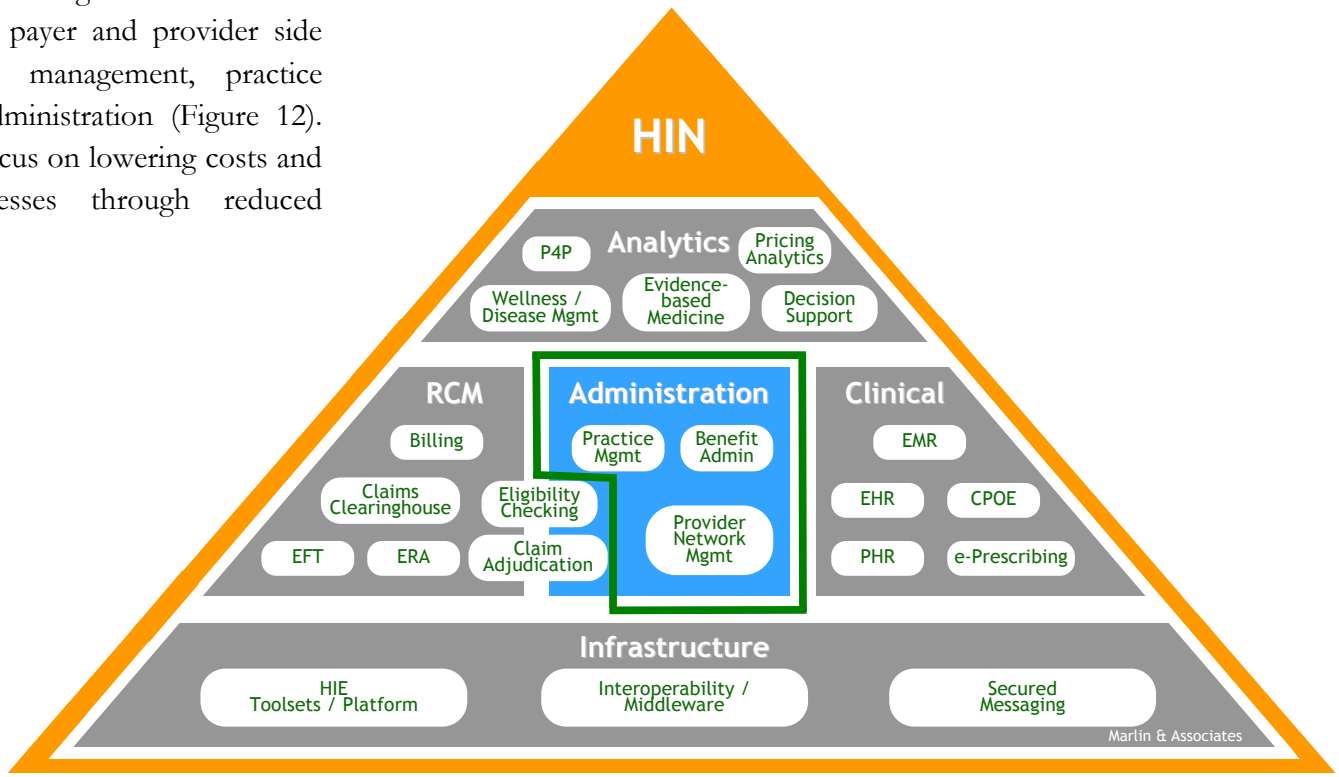

Figure 12

Administration Applications Focus on Lowering Costs and Streamlining Business Processes

Source: Marlin & Associates, 2010

The healthcare industry is one of the most people intensive sectors of our economy. The U.S. healthcare sector now employs four times as many administrative and office support staff as physicians and surgeons.[14]

Billing and insurance administration-related activities, in part due to the persistence of manual administrative transactions and widespread use of easily-lost paper records, cost the U.S. healthcare industry about $150 billion.[15] In the recently legislated Patient Protection and Affordable Care Act, there is significant focus on recovering and channeling healthcare dollars currently lost as administrative costs into financing healthcare services. As seen in Figure 13, non-care related healthcare costs were $404 billion in 2009 and are projected to nearly double by 2019.

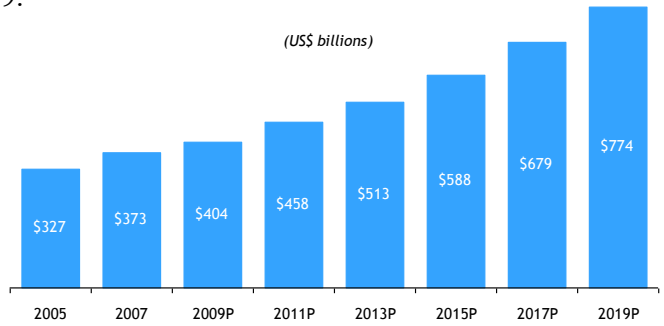

Figure 13

Non-Care Related Healthcare Costs are Projected to Nearly Double In the Next Decade

Source: Centers for Medicaid and Medicare Services, 2010

Despite being costly and labor-intensive, manual and paper-based administrative transactions persist in the current U.S. healthcare system. The few administrative transactions that have become electronic continue to operate in silos and require better integration. In the near future, we envision the consolidation of disparate administrative transactions in benefits administration, practice management, and provider network management (Figure 14) onto a handful of common administration platforms.

Given the increasing adoption of interoperability standards, we also envision the real-time exchange of electronic administrative information via next generation HINs. Companies that provide administration platforms include Emdeon, ikaSystems, NASCO, Portico Systems, TriZetto, and Vistar Technologies.

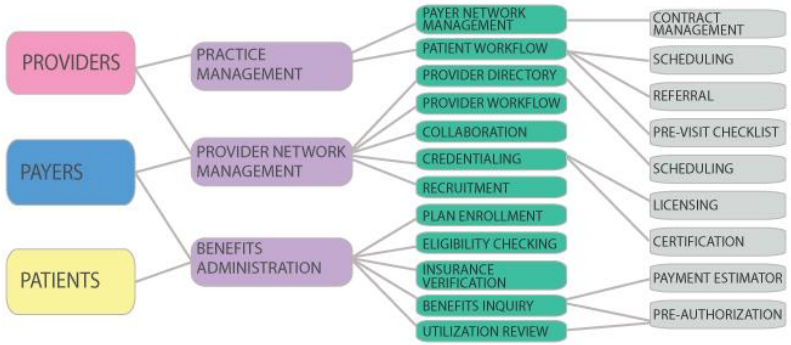

Figure 14

Key Administrative Functionalities in the HIN

Source: Marlin & Associates, 2010

Practice management, a subset of the Administration layer, broadly encompasses day-to-day administrative tasks in a provider's office. It involves managing payer network affiliations (documenting and adhering to managed care contracts, payer-specific practice guidelines, and requirements for claims submission) and simplifying patient-centric workflows (scheduling appointments and coordinating referrals). Many RCM-related tasks such as electronic claims and billing, eligibility verification, and payment remittance (discussed in previous section) are also part of practice management.

In addition to simplifying patient-centric workflows, PM platforms provide the "glue" between administrative and RCM transactions. In fact, many HIT vendors and billing service providers offer bundled PM and RCM services. Companies such as Availity and NaviNet enable patients to schedule appointments and submit insurance information via the internet. This enables providers to verify insurance status and check eligibility of patients prior to a scheduled appointment. More importantly, this streamlines the initial stages of the claims and billing process, making the revenue cycle more efficient.

Additionally, PM platforms integrated with clinical solutions are now being offered to assist providers in simplifying the patient intake process. For instance, Availity's PM functionality allows patients to submit symptoms prior to their appointment with providers. This generates a checklist that providers can use to guide the patient consultation process. As a result, there is significant reduction in paperwork during patient intake and providers can focus on caring for patients.

U.S. healthcare providers contract with multiple payers. Payer contracts specify practice guidelines, fee structures, payment schedules, and claims submission procedures. Since third-party payers account for approximately 86% of total healthcare payments (consumers directly pay for less than 14 percent of healthcare costs),[16] providers face increasing pressure to meet payer-specific requirements to receive reimbursements for services. To help providers cope with the complexities of interfacing with multiple payers, PM platforms enable the consolidation of multi-payer contracts into a rules-based central repository. Providers can then leverage rules-based contract clauses stored in these centralized repositories as decision support rules for claims submission. Thus, providers are able to identify which payer and how much to charge during claims submission.

Next Generation Healthcare Information Networks

Benefits administration applications are another subset of the Administration layer. They involve identifying services and conditions that will be paid for by a health plan and identifying appropriate reimbursement rates and payment structures for covered services.

Using benefits administration platforms with data aggregation capabilities, payers can analyze information on services that are highly utilized among health plan subscribers and update covered services accordingly. The applications can help the user identify cost-effective interventions for patients and determine which patients are likely to benefit the most from certain procedures. By analyzing data collected from pre-visit patient forms and claims submissions data from providers, healthcare payers can increase the transparency of deciding fee structures and updating the list of covered conditions. Lastly, benefits administration involves providing health plan subscribers with the means to understand insurance policies, fee schedules, allowable charges, and covered services.

Administration platforms that connect payers and patients not only permit real-time utilization reviews but also facilitates monitoring of patient initiatives to improve health. By collecting information on individual member behavior, benefits administration platforms enable payers to leverage value-based insurance. For instance, TriZetto recently launched their Value-Based Benefits Solution to assist healthcare payers to automatically adjust co-pays and coinsurance rates during the plan year based on qualifying events.

We predict that, with a value-based benefits solution, it will eventually become possible for payers to adjust co-payments and coinsurance rates for patients who take proactive steps in improving their health. Consequently, benefits can be personalized and administered at the individual member level.

It will eventually become possible for payers to adjust co-payments and coinsurance rates for patients who take proactive steps in improving their health

Next Generation Healthcare Information Networks

Provider network management (PNM) applications are the third building block within the Administration layer. PNM refers to the recruitment of providers into managed care networks and the maintenance of those networks for the purpose of meeting the healthcare needs of health plan subscribers. We consider Portico Systems a leader in providing PNM solutions.

Payer networks use PNM applications to effectively manage the recruitment and credentialing of providers. As payers expand their member networks, a comprehensive directory of contracted providers is necessary to provide health plan subscribers with information on healthcare providers who are part of a payer's network. PNM solutions are also employed to manage contractual agreements on reimbursements between providers and payers. The same solutions can also be leveraged to collect information about individual provider performance for compliance reporting and performance metrics, the latter of which will enable performance-based compensation for providers.

Given the increasing competition for low-risk patients, health reform provisions mandating minimum coverage guidelines, and the establishment of health insurance exchanges, we believe that commoditization of traditional health insurance plans is inevitable. Health Maintenance Organizations and insurance companies are beginning to see the need to find new differentiating factors, other than low premiums, to recruit and maintain members within their network. In recent years, provider network management and value-based premium pricing have emerged as key competitive differentiators for payers. Payers who effectively manage their networks by collecting information on provider credentials and performance are likely to be preferred by potential health plan subscribers.

We are aware of several potential regulations on the horizon that could amplify the need for PNM platforms among payers. For instance, if payers were allowed to sell insurance plans across state lines, the number of available providers to any payer would skyrocket. This would increase competition between payers and force them to better manage their provider supply chain as well as create more innovative products and services in order to remain competitive.

In recent years, provider network management and value-based premium pricing have emerged as key competitive differentiators for payers

Next Generation Healthcare Information Networks

Table of Contents

Next Generation Healthcare Information Networks

Clinical Data platforms are the third major sector above the Infrastructure layer. These applications permit the accessibility of patient health information at all stages in healthcare delivery (Figure 15). In addition, they provide access to valuable information across care settings.

Clinical data platforms are designed to enable providers to improve the quality of patient care. The coupling of patient data held in EMR / EHR applications with population-level clinical data sets is but one of many key developments in this field.

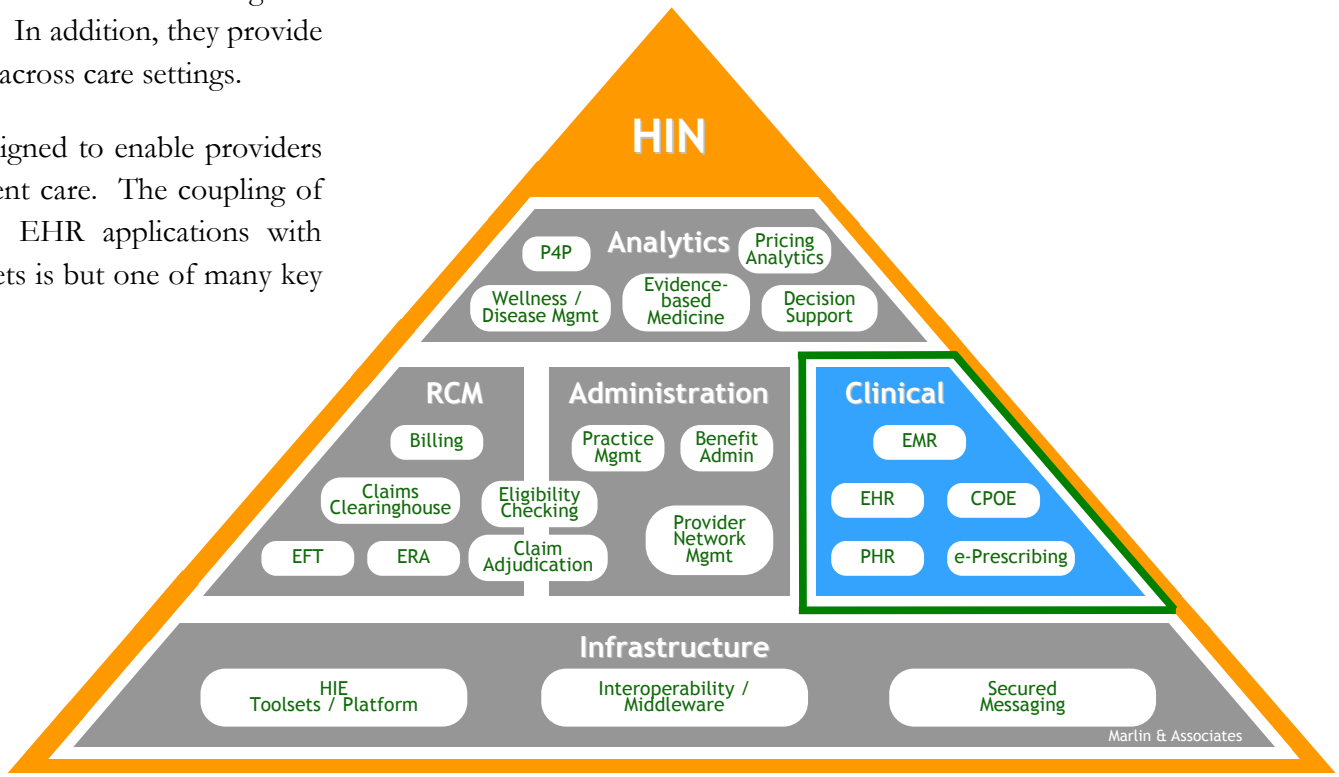

Figure 15

Clinical Data Platforms Enable Real-time Access to Patient Health Information

Source: Marlin & Associates, 2010

Clinical Data (CD) platforms enable providers to gain real-time access to patient health information. Traditionally, patient health data generated at the point of care is recorded on paper. Healthcare delivery processes that rely on immediate access to patient health information are often crippled by these paper-based records. As a result, relevant data that can be leveraged in ensuring continuity of care is often missed or underutilized. The first step towards seismic change in the industry is moving clinical records to an electronic format that is easily accessible.

Specific functionalities that are enabled by the seamless exchange of electronic information include clinical documentation, computerized provider order entry (CPOE), and prescription management.

Among the different HIN building blocks, CD platforms are a top priority for immediate implementation

Presently, electronic health records are often kept siloed (for example, the ER records don't talk to the OR records, which don't talk to the primary care records, and so on) and providers lack access to integrated and comprehensive health records that could be used to improve treatment outcomes. As a result, diagnostic tests are often unnecessarily repeated, leading to delays in the delivery of urgent medical care and additional fees that contribute to rising healthcare expenses. Without health record integration, prescription histories also remain inaccessible, contributing to the over 1.5 million annual cases of preventable adverse drug events, roughly 10% of which result in fatalities.[17]

The absence of real-time access to comprehensive patient records prevents real-time utilization reviews, which can lead to payers incurring significant losses from overpaid charges due to fraudulent claims

Among the different HIN building blocks, CD platforms are a top priority for immediate implementation. With tens of billions in federal stimulus funds available to aid in the adoption and implementation of HIT platforms (including as much as $27 billion in incentive payments to providers for adoption of electronic records),[18] there is a renewed interest in electronic medical records. In addition, the possibility of financial penalties for failure to deploy EMRs is applying further pressure on providers to "electronify". The temporary relaxation of Stark Laws in 2006 (which allowed hospitals to distribute EMR to their affiliated doctors) provided independent physician practices

with access to clinical IT capabilities of large provider networks and integrated health delivery systems. Further, there is finally mutual interest between providers and payers to reduce healthcare spending through the adoption of value-based care. This is made possible by analyzing national health outcomes data to identify cost-effective interventions.

The five building blocks of the Clinical layer are EMR, EHR, PHR, CPOE, and eRx.

Electronic Medical Records (EMR)

At the heart of HIT-enabled connectivity are EMR platforms that serve as the bedrock of electronic clinical data exchange (Figure 16). EMRs facilitate the electronic documentation of structured patient health information at the point of care.

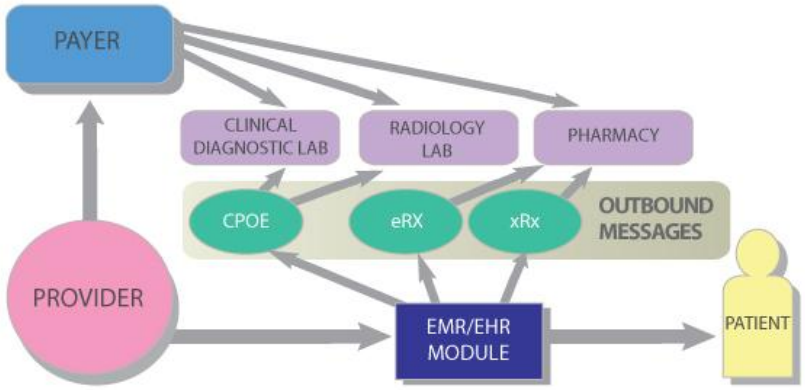

Figure 16
The EMR is at the Heart of Clinical Data Exchange
Source: Marlin and Associates, 2010

With over 400 vendors, EMR is a crowded segment in the HIT market. In the next few years, we expect the number of EMR vendors to rapidly decline due to attrition and merger & acquisition consolidation. Additionally, the final rule on Meaningful Use Requirements (see Figure 21 in Appendix, Page 58) that set minimum guidelines to qualify EMR platforms for federal reimbursements is further contributing to the industry commoditization; vendors are now being "forced" to offer multi-functional EMR platforms with integrated capabilities that include e-prescribing, medication reconciliation, CPOE, and decision support. Consequently, pure-play EMR platforms are now being displaced by multi-functional applications that have overlapping RCM and administrative capabilities.

Healthcare providers will begin to utilize EMR capabilities in electronically transmitting patient referrals. This includes generating an electronic health record that summarizes patient heath information in a structured format, thus facilitating the seamless transition of patients from primary to specialized care. Lastly, providers will begin to leverage EMR capabilities in transferring patient-specific health information to personal

health records (PHR). Patients can then employ PHRs to securely gather, store, manage, and share personal and family health information.

Electronic Health Records (EHR)

An Electronic Health Record represents a comprehensive summary of a patient's health information generated by the EMRs of each provider involved in the patient's care. This snapshot of a patient's continuous health record uses XML interoperability standards and can be sent to other providers, local or regional HINs, or to the patient's PHR. EHR, in essence, is the longitudinal record of the patient within the healthcare and wellness system.

Personal Health Records (PHR)

PHRs are one mechanism by which consumers (i.e. patients) can keep control of their personal health information. We can envision a world where providers are expected to transfer patient-specific health information from EMRs to personal health records and vice versa. Although traditionally viewed as platforms with little or no clinical value, PHRs are now beginning to gain legitimacy in complementing EMRs as sources of patient health information. Also, the growing emphasis on patient empowerment has created a role for PHRs, as acknowledged by NHIN standards which now incorporate PHRs.

CPOE (Computerized Physician Order Entry)

CPOE or POE (Physician Order Entry) is an order entry application specifically designed to assist physicians in creating and managing medical orders for patient services or medications. This application has special electronic signature, workflow, and rules engine functions that reduce or eliminate medical errors associated with physician ordering processes. Similar to e-Prescribing, basic CPOE ensures standardized, legible, and complete orders by only accepting typed orders in a standard and complete format. This prevents medication errors (estimated at 1.5 million per year)[19], reduces repeat tests, and reduces average length of stays.

Almost all CPOE systems include or interface with a CDSS (Clinical Decision Support System) of varying sophistication. Basic CDSSs can include suggestions or default values for drug doses, routes, and frequencies based on predetermined guidelines. More sophisticated CDSSs can perform drug allergy reminders and corollary orders (e.g., prompting the user to order glucose checks after ordering insulin) or drug guidelines to the physician at the time of drug ordering.

e-Prescribing

e-prescribing refers to the electronic routing of prescription orders from a provider's office to the pharmacy. Sending or receiving electronic prescriptions using standardized and structured formats prevents medication errors resulting from illegible handwriting. Further, it facilitates the documentation of a patient's medication history, which is necessary in reconciling and updating patient drug information. To date, many integrated health delivery systems and large managed care networks have been successful in deploying e-prescribing platforms. These firms account for much of the growth in Active e-Prescribers in Figure 17. However, e-Prescribing adoption rates remain relatively lower among small physician practices as well as community and rural health centers.

e-Prescribing can either be deployed as a stand-alone system or as a component of a comprehensive EMR application, as seen in Figure 18. Some currently available stand-alone e-Prescribing platforms lack capabilities mandated by meaningful use requirements such as medication reconciliation as well as prescription dose and formulary support. As a result, adoption of EMR platforms with these integrated functionalities designed to close gaps in care are expected to continue outpacing the adoption of stand-alone e-Prescribing solutions.

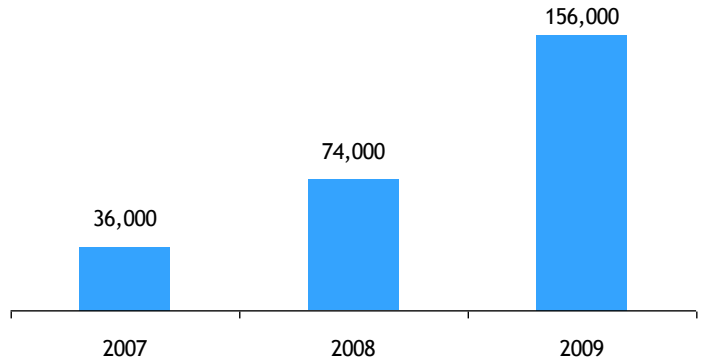

Figure 17

The Number of Active U.S. e-Prescribers has Doubled Each of the Last Two Years

Source: Surescripts 2009 Progress Report on e-Prescribing

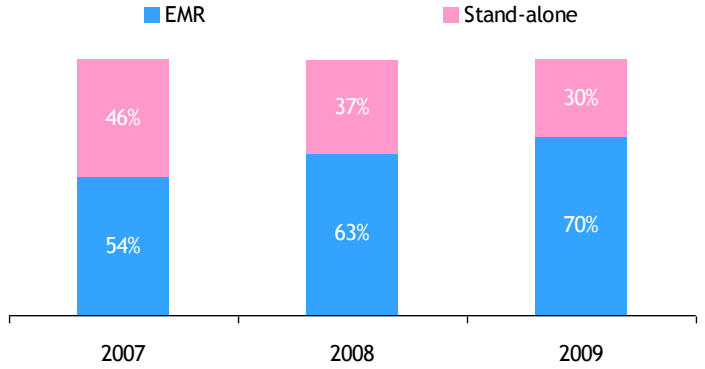

Figure 18

70% of Active U.S. e-Prescribers Use Integrated EMR Systems vs. Stand-alone E-Prescribing Software

Source: Surescripts 2009 Progress Report on e-Prescribing

Next Generation Healthcare Information Networks

Table of Contents

Next Generation Healthcare Information Networks

The Analytics layer of our HIN pyramid uses mathematics, statistics, and advanced modeling, as well as the data collected from the lower layers of the HIN, in order to provide insight on how to improve quality of care and decrease healthcare costs. This layer is still evolving, but there are a few exciting and promising companies building multi-purpose analytics engines that could become the core or "Intel Inside" of healthcare analytics in the future.

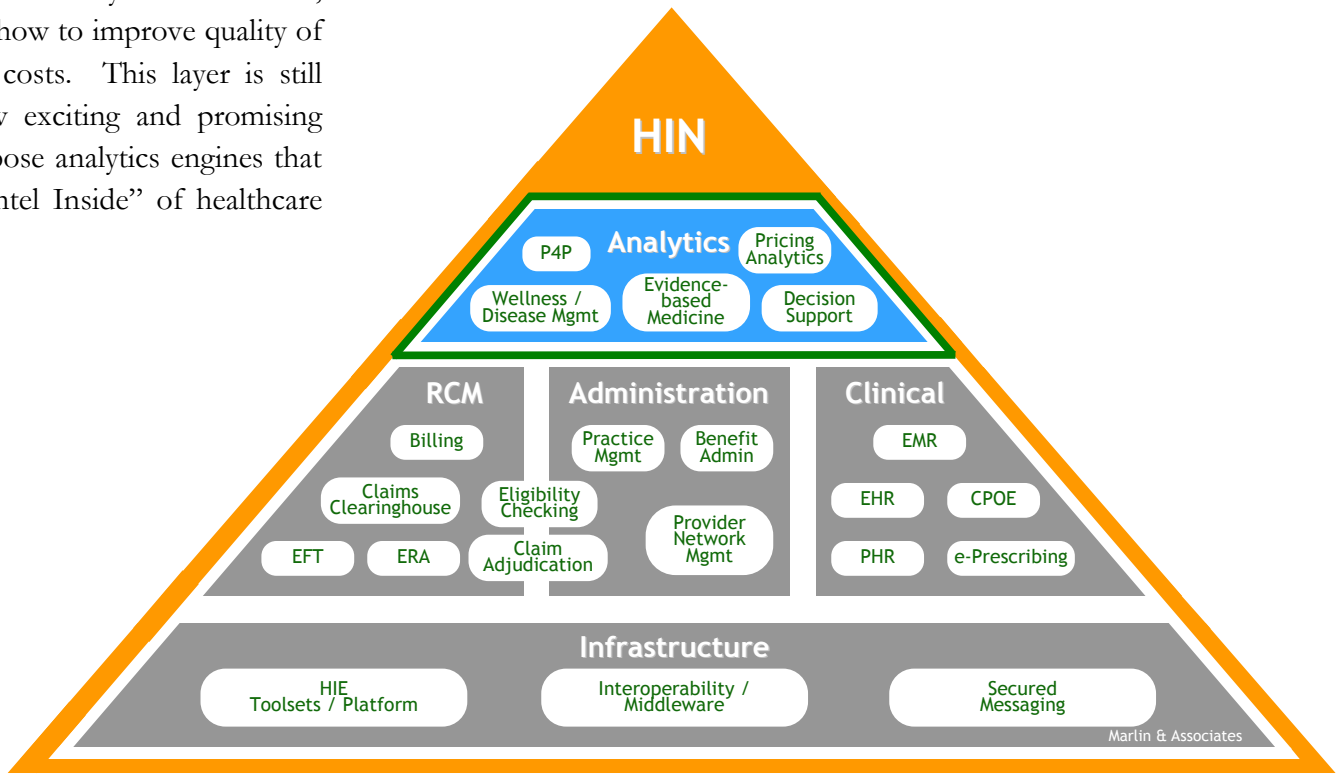

Figure 19
Analytics Component of the HIN
Source: Marlin & Associates, 2010

Next Generation Healthcare Information Networks

Health information collected through HINs – either through point-of-care encounters, medical claims, pharmacy claims, lab results, genetic testing, EMR/EHR/PHRs, and other sources – can be analyzed to identify best care practices and provide real-time clinical decision support. Analytics applications can also provide consumers with wellness and disease support tools while providing payers with pricing analytics capabilities to customize premium pricing for health plan subscribers and determine pay-for-performance (P4P) incentives for providers. Hospitals can also use analytical tools to improve quality of care and improve their overall efficiency.

The development of advanced analytics in the healthcare sector is still in its early stages. Clinical analytics capabilities are currently hampered by the lack of comprehensive national health outcomes data. In addition, currently available health outcomes data is documented in diverse formats, thereby impeding the use of clinical analytics platforms. Consequently, best practices in care that can be used to populate pay-for-performance incentive structures are currently lacking.

We are, however, encouraged by the great strides that many companies, including Anvita Health, Health Dialog, Thomson Reuters Health, and Verisk Analytics, are taking to overcome these obstacles. As more data is stored digitally and as the fields of data management, statistical modeling, and mathematical modeling advance with better inference engines, we predict that the industry will witness exciting developments in this field. In our opinion, the promise of personalized medicine can only be achieved through advanced analytics where providers can have an integrated view of a broad set of data as it pertains to each patient.

In our opinion, the promise of personalized medicine can only be achieved through advanced analytics where providers can have an integrated view of a broad set of data as it pertains to each patient

In the following pages, we will briefly discuss the five building blocks of the Analytics layer, namely: DSS, P4P, Wellness / Disease Management, Evidence-based Medicine, and Pricing Analytics.

As payers fight against the forces of commoditization, they will be forced to offer new and innovative programs to their provider networks

Decision Support Systems (DSS)

Patient health information documented in structured, interoperable format can be analyzed to identify best care practices and provide real-time clinical decision support.

Broadly, clinical analytics platforms can be leveraged in providing decision support for healthcare payers, provider, and patients. Given the rising costs of financing healthcare, payers are becoming increasingly focused on only reimbursing procedures with demonstrable benefits; and analytics platforms can be employed in analyzing clinical outcomes data to identify cost-effective interventions and make decisions regarding procedure coverage.

Providers are also great beneficiaries of DSS analytics. As active "knowledge" systems, DSS' can generate valuable and intelligent care-specific advice which will help increase the quality of the care they are able to provide.

Pay for Performance (P4P)

Payers can employ analytics platforms to build incentive structures for providers in their network. Specifically, payers can employ analytics applications to identify and reward providers who consistently achieve positive health outcomes and reduce healthcare delivery costs under a data-driven pay-for-performance incentive structure. As payers fight against the forces of commoditization, they will be forced to offer new and innovative programs to their provider networks. P4P is clearly at the forefront of payer's product development initiatives.

Wellness / Disease Management

Wellness and Disease Management programs are patient-centric applications in which analytics capabilities are overlaid on individual health information in order to ensure that patients are provided with customized decision support tools to better manage their illness, diet, exercise regimen, and general everyday health. Payers are also developing wellness and disease management programs tied to incentive plans for patients in their member network.

Next Generation Healthcare Information Networks

Components of HINs > Analytics > ***Evidence-based Medicine, Pricing Analytics***

Evidence-based Medicine

For providers, analytics platforms can be used to identify best practices in care. Using national health outcomes data, providers can benefit from evidence-based medicine by having access to information on effective interventions when deciding on a course of treatment for a patient.

Given the emphasis on value-based care and evidence-based medicine, we believe that analytics platforms that are capable of identifying cost-effective interventions using population health outcomes data will gain increasing importance for both payers and providers.

Pricing Analytics

Payers can employ analytics platforms to identify individual patients in their member networks who are taking steps to improve their own health. Once the payers have identified these members, they can then reward such members with discounted co-pays or reduced premiums using a pricing analytics framework. Naturally, these pricing analytics will be tied into participation in payer-sponsored wellness and disease management programs. An analogy to these pricing analytics initiatives is in the car insurance industry, where drivers are often awarded discounts on their insurance premiums for being "good drivers".

We believe that analytics platforms that are capable of identifying cost-effective interventions using population health outcomes data will gain increasing importance for both payers and providers

Next Generation Healthcare Information Networks

Table of Contents

Vendor Differentiation

There is a large, growing, and ever-changing list of functionalities that many HIT vendors need to offer in order be competitive in this dynamic sector. Below are a few that we see as particularly important for the next generation HIN market.

Bi-directionally communicate and receive data.

For electronic medical records, Meaningful Use Requirements emphasize the collection of computable data that can be shared across the different constituencies of healthcare. HIT applications play a very important role in achieving this goal by ensuring that data generated by multiple applications and platforms are interoperable.

A big challenge in healthcare is the proliferation of legacy information systems that largely comprise the IT infrastructure of most providers and managed care networks. Further, there is widespread use of paper charts - 83% of doctors and 90% of hospitals in U.S. still rely on paper-based records.[20] Consequently, HIT software applications need to facilitate the electronic conversion of data regardless of migration path (paper to electronic format or legacy to current formatting standards). We believe that HIT applications that are able to exchange data with other HIT applications sitting in the billing office, laboratories, pharmacy, and computers in providers' offices are likely to be key players in the future.

Ability to receive, interpret, process, and transfer data in multiple formats.

The current healthcare delivery system involves multi-stage workflows, protocols, and constituents speaking different languages. For example, to be competitive, EMR products must be able to receive, interpret, process, and transfer both unstructured and structured data from multiple sources. As a platform for receiving and compiling patient information at the point of care, EMRs should have vocabulary and content exchange capabilities including SNOMED-CT, ICD10-CM, ICD10-PCS, HIPAA v5.0, and NCPDP v10.0.

Flexible architecture and customizability

Healthcare providers often have unique practice needs that require customizable platforms which can adapt to the specific requirements of their practices. Successful next generation HIT companies need to demonstrate applications with architectural flexibility that can easily be adapted and modified. This is particularly true in the analytical field where self-tailored rules can be added to the inference engine resulting in accurate and targeted results.

Next Generation Healthcare Information Networks

Vendor Differentiation

Vendor support

A traditional barrier to HIT adoption has been the lack of in-house IT expertise in small and medium provider practices to oversee deployment and provide IT support. Therefore, SaaS and SOA-based applications with robust vendor support for network deployment and troubleshooting are key differentiators.

Backward compatibility

It is a widely-held opinion that healthcare is 10-20 years behind other sectors in truly embracing enabling technologies. As a result, there is wide variation in both hardware and software installed in provider and payer offices. The lack of consistency in deployed technology platforms requires HIT applications to run on basic hardware and be compatible with earlier software versions.

Data privacy and security

Privacy of patient information is protected by HIPAA regulations. Therefore, healthcare IT applications must meet HIPAA privacy standards. Privacy laws relating to patient health information are routinely updated. Healthcare IT applications should have the capacity to be updated seamlessly to be compliant with privacy and other regulating requirements.

Provide real-time capabilities

For many applications, key game changers in the HIT market will include products that are able to offer real-time functionality. In a recent HIMSS and Anvita Health study, likely end-users of analytics software indicate the need to obtain real-time support in making patient-specific decisions at the point of care. Similarly, on the RCM side, any processes that can be done in real-time, such as eligibility checking, adjudication, coding, claims processing, etc. will serve to bring the revenue cycles closer to a point of "straight-through processing" – again providing a key differentiator.

Automation platforms

As we discussed earlier, healthcare is one of the most people-intensive industries. Software companies that can automate people-intensive tasks, such as practice management and billing, or analytics on the fly, etc will show superior returns.

Short time to deployment

Since healthcare IT applications handle information generated in provider settings that are necessary for the delivery of care, it is important that IT applications present the least downtime and disruption in workflow during installation and integration.

Next Generation Healthcare Information Networks

Table of Contents

Using IT applications as benchmarks, we've divided IT-enabled connectivity in U.S. healthcare into three periods: pre-1980s (the Big-Iron Age), 1980-2004 (the Computer Age), and 2005-present.(the Internet Age).

The Big-Iron Age: Pre-1980s

The Big-Iron Age is characterized by the use of big, mainframe-based computers. Limited use of IT applications in recording, storing, and sharing clinical and administrative data characterize the pre-1980s. Since their inception in the late 1960s, IT systems were primarily implemented in well-financed hospital networks and integrated health delivery systems that could afford the purchase of costly mainframe-based computer equipment (Big Iron). In addition, large healthcare delivery institutions greatly valued the portability of electronic patient information in managing transitions of care. Clinical IT systems, however, were not widely used in small provider practices. Consequently, recording patient health information on paper became standard practice during this period.

The Computer Age: 1980 – 2004

Personal computers first appeared on the market in the late 1970s. With the introduction of smaller computers that were affordable for consumers, the software industry was also born at this time. Over the next few decades, the fact that computers became smaller, cheaper, and more powerful allowed hospitals and integrated health delivery systems to shift IT investment priorities from hardware to software purchase.

As computer networking and the Internet developed, the vision of healthcare data interchange seemed to be more attainable. However, this era was riddled with failures in creating networks or exchanges for the sharing of patient care information amongst providers.

While the PC revolutionized the computing world, the healthcare financing and delivery model was going through similarly radical changes. Given rapidly growing healthcare costs in the 1980s, payers mandated utilization reviews and gate-keeping as cost-cutting measures. As a result, managed care emerged as the predominant model of healthcare delivery. Under this model, patients subscribe to a health plan managed by a HMO.

By 2001, approximately 91% of physicians were contracted with managed care.[21] In addition, health plans and government-subsidized health insurance were beginning to insulate patients from shouldering the actual cost of purchasing healthcare

services. More importantly, patients were electing their primary care providers through health plan administrators. As a result, third party payers (especially HMOs) gained an increasingly important role in healthcare financing and delivery. All of these forces lead to the fragmentation of U.S. healthcare into distinct payer, provider, and patient constituencies during this period.

The Internet Age: 2005 - Present

From 2005 to present, increasing technological innovation facilitated the emergence of key trends with significant implications for healthcare IT connectivity. With lower telecommunication costs, development of Software-as-a-Service (SaaS) applications, use of internet as a business platform, and increasing sophistication of software applications for data aggregation and business intelligence solutions, the healthcare sector is well-positioned to finally leverage information technology in creating a more integrated and efficient delivery system.

However, significant roadblocks preventing the full deployment of IT-enabled connectivity remain. Specifically, content exchange standards and protocols for exchanging financial and clinical information are still sparsely implemented. Despite the standardization of clinical transaction codes with the passage of the Health Insurance Portability and Accountability Act in 1996, different payers continue to implement their own billing workflows and payment requirements. In response, multi-payer portals began to emerge in the late 1990s to consolidate varying payment workflows into a unified and easily accessible interface.

Over time, piecemeal efforts to better integrate the different U.S. healthcare constituencies resulted in a connectivity framework where payers are better connected to providers. However, patient connectivity to both providers and payers remains poor. Therefore, connecting the three different constituencies has become a top priority in recent healthcare IT deployment efforts.

Next Generation Healthcare Information Networks

Table of Contents

MARLIN & ASSOCIATES

Healthcare Reform Driving HIT Adoption

The current U.S. healthcare system broadly resulted from two past reform efforts, the Medicare and Medicaid Act of 1965 and the Health Insurance Portability and Affordability Act of 1996. A seismic shift in U.S. healthcare, however, is expected to come from the recently-legislated Patient Protection and Affordable Care Act of 2010 (PPACA). By establishing touch points with all constituencies in the sector, PPACA is the most comprehensive attempt to reduce waste, increase efficiency, and improve patient care in U.S. healthcare, a sector notorious for its sluggishness in adopting innovation. Central to the extensive mandates in PPACA is adopting standards for healthcare transactions. For providers, guidelines have been established to standardize administrative workflows. Together with ARRA 2009, PPACA identified a compliance timeline to incentivize the adoption of clinical IT applications until 2015 and levy financial penalties for noncompliance thereafter (Figure 20). In addition, ARRA 2009 provides grants and loans to state governments and regional non-profit entities to leverage current IT capabilities in building local Health Information Exchanges.

For consumers, PPACA makes the purchase of health insurance mandatory. In addition, ARRA 2009 reinforces the 2004 goals outlined by the Office of the National Coordination for Health Information (ONCHIT) to provide electronic health records for all Americans by 2014. For payers, PPACA mandates healthcare payers to receive certification for their insurance policies as compliant with minimum coverage guidelines.

2009	2010	2011	2012
•Creation of operating rules to adopt updated v. 5010 of HIPAA transaction standards •Recognition controls and variability exist in use of EDI standards •Major banks support NACHA to help operationalize EFT adoption	•Healthcare payment EFT's become a HIPAA transaction •HITECH Privacy and Security guidelines become effective	•Creation of operating rules for eligibility for a health plan and health claim status transactions by July •Operating rules to include the usage of machine readable identification cards	•Effective date for all covered entities to be fully 5010 compliant •Health plan identifiers by October •Creation of operating rules for EFT's and health care payment and remittance advice transactions by July
2013	**2014**	**2015**	**2016**
•Health plans required to file certification for eligibility verification, claims status, claims remittance and EFT by end of year •Effective date for eligibility and claim status rule implementation	•Compliance with NCVHS consensus standards by April of face a penalty •Effective date for Medicare A and B payments to be paid by EFT •Effective date for EFT's and health care payment and remittance advice transactions rule implementation	•Health plans required to file certification for health claims, enrollment and disenrollment in plans, health plan premium payments, and referral certification and authorization by end of year	•Effective date for implementation of operating rules for health claims, enrollment and disenrollment in plans, health plan premium payments, and referral certification (rules adopted by July 2014)

Figure 20

2009 Stimulus Bill and Reform Will Phase in Over the Next Five Years

Source: J.P. Morgan, 2010

Meaningful Use Requirements

In order to qualify for federal reimbursements, healthcare providers must meet mandated requirements for "meaningful use". These requirements will help ensure that providers actually utilize available HIT solutions that could improve quality of care (just installing an EMR system is not enough, the provider must use it in a meaningful way). In Figure 21, we outline some of the meaningful use requirements as well as specific benchmarks providers must meet in order to maximize their reimbursements.

Objective Core Set	Measure
Record patient demographics (sex, race, ethnicity, date of birth, preferred language, and in the case of hospitals, date and preliminary cause of death in the event of mortality)	More than 50% of patients' demographic data recorded as structured data
Record vital signs and chart changes (height, weight, blood pressure, body-mass index, growth charts for children)	More than 50% of patients 2 years of age or older have height, weight, and blood pressure recorded as structured data
Maintain up-to-date problem list of current and active diagnoses	More than 80% of patients have at least one entry recorded as structured data
Maintain active medication list	More than 80% of patients have at least one entry recorded as structured data
Maintain active medication allergy list	More than 80% of patients have at least one entry recorded as structured data
Record smoking status for patients 13 years of age or older	More the 50% of patients 13 years of age or older have smoking status recorded as structured data
For individual professionals, provide patients with clinical summaries for each office visit; for hospitals, provide an electronic copy of hospital discharge instructions on request	Clinical summaries provided to patients for more than 50% of all office visits within 3 business days; more than 50% of all patients who are discharged from the inpatient department or emergency department of an eligible hospital or critical access hospital and who request an electronic copy of their discharge instructions are provided with it
On request, provide patients with an electronic copy of their health information (including diagnostic test results, problem list, medication lists, medication allergies, and for hospitals, discharge summary and procedures)	More than 50% of requesting patients receive electronic copy within 3 business days
Generate and transmit permissible prescriptions electronically (does not apply to hospitals)	More than 40% are transmitted electronically using certified EHR technology
Computer provider order entry (CPOE) for medication orders	More than 30% of patients with at least one medication in their medication list have at least one medication ordered through CPOE
Implement drug-drug and drug-allergy interaction checks	Functionality is enabled for these checks for the entire reporting period
Implement capability to electronically exchange key clinical information among providers and patient-authorized entities	Perform at least one test of EHR's capacity to electronically exchange information
Implement one clinical decision support rule and ability to track compliance with the rule	One clinical decision support rule implemented
Implement systems to protect privacy and secuirty of patient data in the EHR	Conduct or review a security risk analysis, implement security updates as necessary, and correct identified security deficiencies
Report clinical quality measures to CMS or states	For 2011, provide aggregate numerator and denominator through attestation; for 2012, electronically submit measures

Figure 21

Meaningful Use Requirements Drive Provider Reimbursements

Source: Office of National Coordinator for Health IT, 2010

Next Generation Healthcare Information Networks

Table of Contents

MARLIN & ASSOCIATES

ACH (*Automated Clearinghouse*) - Electronic banking network used for direct deposit and electronic bill payment, often facilitating the electronic interbank transfer of funds.

ARRA (*American Recovery and Reinvestment Act of 2009*) - Also known as the Stimulus or Recovery Act. The package provisions $147.7B funding for healthcare including $19B for HIT.

Benefits Administration - Identifying services that will be covered by a health plan and identifying appropriate reimbursement rates and payment structures for covered services.

BPO (*Business Processing Outsourcing*) - Contracting of the operations and responsibilities of specific business functions (or processes) to a third-party service provider.

CDHP (*Consumer Directed Health Plan*) - CDHPs typically have lower premiums but higher deductibles and out-of-pocket costs for some medical procedures than other insurance plans. They usually include a health reimbursement account or health savings account that employers contribute to.

CDI (*Clinical Data Interchange*) - CDI platforms permit the accessibility of patient health information at all stages in healthcare delivery. They provide real-time access to clinical information for the different stakeholders involved in patient care.

CDSS (*Clinical Decision Support System*) - Interactive computer programs that link health observations with health knowledge to influence health choices and assist clinicians with decision making in order to provide better health care.

Charge Capture - Process in which medical diagnosis and procedure codes are used to generate claims for reimbursements from payers resulting from provider-patient encounters.

CHIN (*Community Health Information Network*) - Prevalent in the early 1990s, these were precursors to the RHIOs and HIEs of today.

Claim Adjudication - the determination of a payer's financial responsibility by comparing examining the procedures performed to the member's benefits.

Claims Clearinghouse - Third party "middle man" for claims processing between payers and providers whose services include: scrubbing claims for errors, translating claims into payer-specified formats, aggregating claims for batch submission, and secure transmission of claims between providers and payers.

CPOE (*Computerized Physician Order Entry*) - Electronic entry of medical instructions entered by the physician for the treatment of patients.

CPT (*Current Procedural Terminology*) - Code set maintained by the American Medical Association to describe medical, surgical, and diagnostic services.

Decision Support - Computer-based information systems including knowledge-based systems that support decision-making abilities. These systems are used in many different areas including: assisting physicians to provide better service at the point of care, customizing tools to help individuals manage diet and exercise, analyzing data to reimburse only procedures with demonstrable benefits, etc.

Disease Management - A system of coordinated health care interventions and communications for populations with conditions in which patient self-care efforts are significant.

EDI (*Electronic Data Interchange*) - Structured transmission of data between organizations by electronic means. It is used to transfer electronic documents or business data from one computer system to another computer system. In healthcare payment workflows, EDI networks leverage standardized code sets to communicate uniform information on payment requests, authorization, and notification between payers and providers.

EFT (*Electronic Funds Transfer*) - Electronic exchange or transfer of money from one account to another, either within the same financial institution or across multiple institutions.

EHR (*Electronic Health Record*) - Complete and unified view of all the patient's clinical assessments and care records drawn from across a wide region corresponding to all the providers who are seeing the patient.

Eligibility Checking - Process in which the determination is made whether a health plan will pay for the services that the patient is about to receive (in other words, if the condition to be treated is a "covered condition").

EMR (*Electronic Medical Record*) - Component of an electronic health record that is owned by the health care provider. The EMR is a set of applications and workflow tools that digitizes the creation, collection, storage and management of patient information -- but all within the reach of a single organization.

EOB (*Explanation of Benefits*) - Statement sent by a health insurance company explaining what medical treatment and/or services were paid for.

e-Prescribing - Electronic routing of prescription orders from a provider's office to the pharmacy. It replaces a paper prescription that the patient would otherwise carry or fax to the pharmacy.

ERA (*Electronic Remittance Advice*) - The electronic version of EOB. Set of accompanying documents that explain the payment (EFT) sent from payer to provider.

ERP (*Enterprise Resource Planning*) - Integrated computer-based system used to manage internal and external resources, including tangible assets, financial resources, materials, and human resources.

eRx – See e-Prescribing.

Evidence-based Medicine (*Evidence-based Medicine*) - The discipline of applying the best available evidence gained from the scientific method to clinical decision making. It seeks to assess the strength of evidence of the risks and benefits of treatments (including lack of treatment) and diagnostic tests.

HIE (*Health Information Exchange*) – HIEs provide the capability to electronically move clinical information among disparate health care information systems while maintaining the meaning of the information being exchanged. The goal of a HIE is to facilitate access to and retrieval of clinical data to provide safer, more timely, efficient, effective, equitable, patient-centered care.

HIN (*Healthcare Information Network*) – The "Network of Networks" which is a combination of next generation HIT technologies including: infrastructure, RCM, administration, clinical data exchange, and analytics.

HIPAA (*Health Insurance Portability and Accountability Act of 1996*) - Includes the establishment of national standards for electronic health care transactions and national identifiers for providers, health insurance plans, and employers, as well as addresses the security and privacy of health data. The standards are meant to improve the efficiency and effectiveness of the nation's health care system by encouraging the widespread use of electronic data interchange in the U.S. health care system.

HIS (*Hospital Information System*) - Comprehensive, integrated information system designed to manage the administrative, financial and clinical aspects of a hospital. This encompasses paper-based information processing as well as data processing machines.

HIT (*Healthcare Information Technology*) - Framework to describe the comprehensive management of health information and its secure exchange between consumers, providers, government, quality entities, and insurers.

HITECH Act (*Health Information Technology for Economic and Clinical Health Act*) - Enacted as a subtitle of the ARRA Act in 2009, HITECH brings new federal privacy and security provisions that will have major financial, operational and legal consequences for all medical practices, hospitals, and health plans. This subtitle extends the complete Privacy and Security Provisions of HIPAA to business associates of covered entities.

HMO (*Health Maintenance Organization*) - Managed care organization that provides a form of health care coverage in the United States that is fulfilled through hospitals, doctors, and other providers with which the HMO has a contract. An HMO covers only care rendered by those doctors and other professionals who have agreed to treat patients in accordance with the HMO's guidelines and restrictions in exchange for a steady stream of customers.

ICD-10 (*International Statistical Classification of Diseases and Related Health Problems, 10th Revision*) - Coding of diseases and signs, symptoms, abnormal findings, complaints, social circumstances and external causes of injury or diseases, as classified by the World Health Organization. The code set allows more than 14,400 different codes and permits tracking of many new diagnoses.

Interoperability - Property referring to the ability of diverse systems and organizations to work together.

LOINC (*Logical Observation Identifiers Names and Codes*) - Database and universal standard for identifying medical laboratory observations.

Meaningful Use - A set minimum guidelines to qualify EMR platforms for federal reimbursements.

NHIN (*Nationwide Health Information Network*) - A set of standards, services and policies that enable secure health information exchange over the Internet. This public-private venture is being developed by U.S. Office of the National Coordinator for Health Information Technology (ONC).

ONCHIT (*Office of the National Coordination for Health Information Technology*) - ONC is organizationally located within the Office of the Secretary for the U.S. Department of Health and Human Services (HHS). ONC is the principal Federal entity charged with coordination of nationwide efforts to implement and use the most advanced health information technology and the electronic exchange of health information.

Patient-Centered Medical Home - An approach to providing comprehensive primary care for children, youth and adults. The PCMH is a health care setting that facilitates partnerships between individual patients, and their personal physicians, and when appropriate, the patient's family.

Payment Posting - When a provider receives payment and an EOB/ERA notice, the information must be recorded into the provider's medical billing software / practice management system.

P4P (*Pay for Performance*) - Payers can employ analytics applications to identify and reward providers who consistently achieve positive health outcomes and reduce healthcare delivery costs under a data-driven pay-for-performance incentive structure.

PHR (*Personal Health Record*) - Electronic health record that is initiated and maintained by an individual or consumer.

PM (*Practice Management*) - Day-to-day operations of a medical practice such as the capture of patient demographics, scheduling of appointments, maintaining lists of insurance payers, various billing tasks, and generation of reports.

PNM (*Provider Network Management*) - The collection of provider information, services and applications needed by payers to recruit, manage, and service the members of their provider networks.

PoC (*Point-of-Care*) - At the site of patient care.

PPACA (*Patient Protection and Affordable Care Act of 2010*) - Federal statute that includes, along with the Health Care and Education Reconciliation Act of 2010, a large number of health-related provisions, such as: expanding Medicaid eligibility, subsidizing insurance premiums, providing incentives for businesses to provide health care benefits, prohibiting denial of coverage/claims based on pre-existing conditions, establishing health insurance exchanges, and support for medical research.

RCM (*Revenue Cycle Management*) - Tasks associated with getting payment for services rendered.

RHIO (*Regional Health Information Organization*) - These HIE-like entities are limited in geographic scope, with the idea being that to build a national network of interoperable health records, the effort must first develop at the local and state levels.

SaaS (*Software as a Service*) - Software that is deployed over the internet and/or is deployed to run behind a firewall on a local area network or personal computer. With SaaS, a software provider licenses an application to customers as a service on demand, through a subscription or a "pay-as-you-go" model.

SNOMED-CT (*Systematized Nomenclature of Medicine - Clinical Terms*) - Systematically organized computer-processable collection of medical terminology covering most areas of clinical information such as diseases, findings, procedures, microorganisms, pharmaceuticals, etc.

SOA (*Service-oriented Architecture*) - Flexible set of design principles used during the phases of systems development and integration. A deployed SOA-based architecture will provide a loosely-integrated suite of services that can be used within multiple business domains.

Stark Laws - Stark law governs physician self-referral for Medicare and Medicaid patients. The law is named for United States Congressman Pete Stark, who sponsored the initial bill. The relaxation of the Stark Law enables hospitals to subsidize up to 85% of the cost of Electronic Health Record (EHR) implementation for community physician offices.

STP (*Straight-through Processing*) – STP enables the entire trade process for capital markets and payment transactions to be conducted electronically without the need for re-keying or manual intervention, subject to legal and regulatory restrictions.

Transition of Care - Coordination and continuity of health care during the movement between health care practitioners and settings as their condition and care needs change during the course of a chronic or acute illness.

Value-based Benefits – Value-based benefits determine the amount of coverage based on the value a patient receives from the product or service. For example, if a procedure is deemed "high value", the consumer pays little or no co-payment. If a procedure is deemed "low value", the consumer would pay a larger portion of the expenses.

Wellness Management – Programs that help consumers balance the needs of their work, lives and their own mental and physical health.

xRx (*Prescription Referencing*) – xRx includes determining whether a pharmacy benefits administrator, HMO plan, or an insurance policy will pay for a prescribed medication (formulary support), determining whether a prescription drug has a generic alternative (medication alternative support), and checking prescription toxicity and contraindications (drug interaction support).

Table of Contents

Next Generation Healthcare Information Networks

Appendix > ***References***

(1) Investment banking and/or securities are offered to investors through Marlin & Associates Securities LLC. Member FINRA/SIPC. Marlin & Associates Securities is a wholly owned subsidiary of Marlin & Associates LLC.
(2) http://www.maadvisor.com/page/2007-ma-awards
(3) U.S. Department of Health & Human Services, Centers for Medicare & Medicaid Services, National Health Expenditure Data
(4) U.S. Department of Health & Human Services, Centers for Medicare & Medicaid Services, National Health Expenditure Data
(5) Emdeon, 2009 Annual Report
(6) McKinsey on Business Technology, Summer 2010
(7) HIMSS Analytics, 2009 Annual Report of the U.S. Hospital IT Market
(8) U.S. Department of Health & Human Services, Centers for Medicare & Medicaid Services, National Health Expenditure Data
(9) U.S. Department of Health & Human Services, Centers for Medicare & Medicaid Services, National Health Expenditure Data
(10) K. Davis, C. Schoen, and K. Stremikis, "How the Performance of the U.S. Health Care System Compares Internationally 2010 Update," The Commonwealth Fund, June 2010
(11) "Global Noncommunicable Diseases — Where Worlds Meet", Rollins School of Public Health and the Emory Global Health Institute, Sep 15, 2010
(12) American Hospital Association, 2006
(13) HIMSS Analytics, 2009 Annual Report of the U.S. Hospital IT Market
(14) Bureau of Labor Statistics, 2010
(15) Emdeon, 2009 Annual Report
(16) U.S. Department of Health & Human Services, Centers for Medicare & Medicaid Services, National Health Expenditure Data
(17) Institute of Medicine of the National Academies, 2006
(18) Office of National Coordinator for HIT, Press Release 2009; U.S. Department of Health & Human Services, Press Release 2010
(19) Institute of Medicine of the National Academies, 2006
(20) CBS News, "Charting a New Course" Sept 13, 2009
(21) Center for Studying Health System Change, November 2002