INNOVATION AND INTEROPERABILITY:
THE LATEST CREATIVE AND PRACTICAL APPROACHES FROM THE FIELD

healthcare informatics
CUSTOM MEDIA

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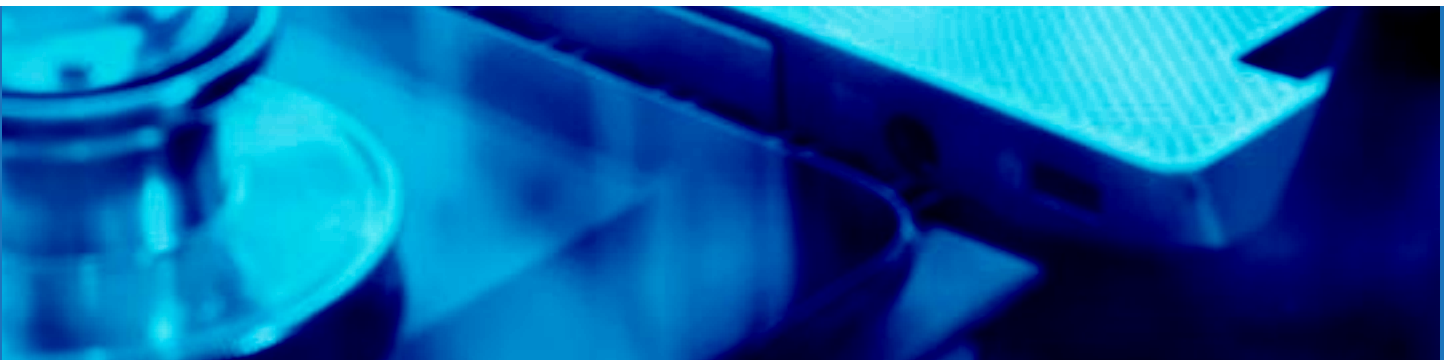
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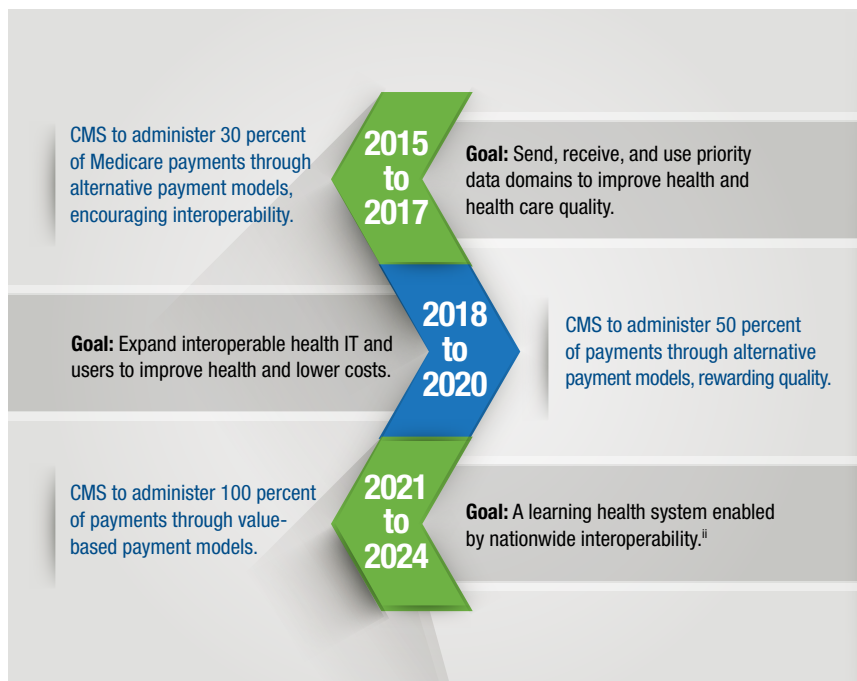*Staten Island University Hospital – Northwell Health System*

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FOREWORD—AN INDUSTRY NEED TO MAKE INTEROPERABILITY WORK

Interoperability is a rallying cry in healthcare, but how attainable is it? On the heels of U.S. Department of Health and Human Services (HHS) Secretary Sylvia Burwell's call to action for vendors to be open to interoperability efforts, organizations continue to grapple with data exchange between systems. Legacy systems continue to silo data, creating inefficiencies across the enterprise and significant overhead cost with contracted monthly expenses.

Interoperability is no longer just a vision, it is required. The Office of the National Coordinator's (ONCs) release of the Shared Nationwide Interoperability Roadmap Version 1.0 in late 2015 illustrates this sentiment clearly.[i] The Roadmap is ambitious, calling for providers to facilitate interoperability leading up to 2024 via the following eight-year development plan:

CMS to administer 30 percent of Medicare payments through alternative payment models, encouraging interoperability.

2015 to 2017

Goal: Send, receive, and use priority data domains to improve health and health care quality.

Goal: Expand interoperable health IT and users to improve health and lower costs.

2018 to 2020

CMS to administer 50 percent of payments through alternative payment models, rewarding quality.

CMS to administer 100 percent of payments through value-based payment models.

2021 to 2024

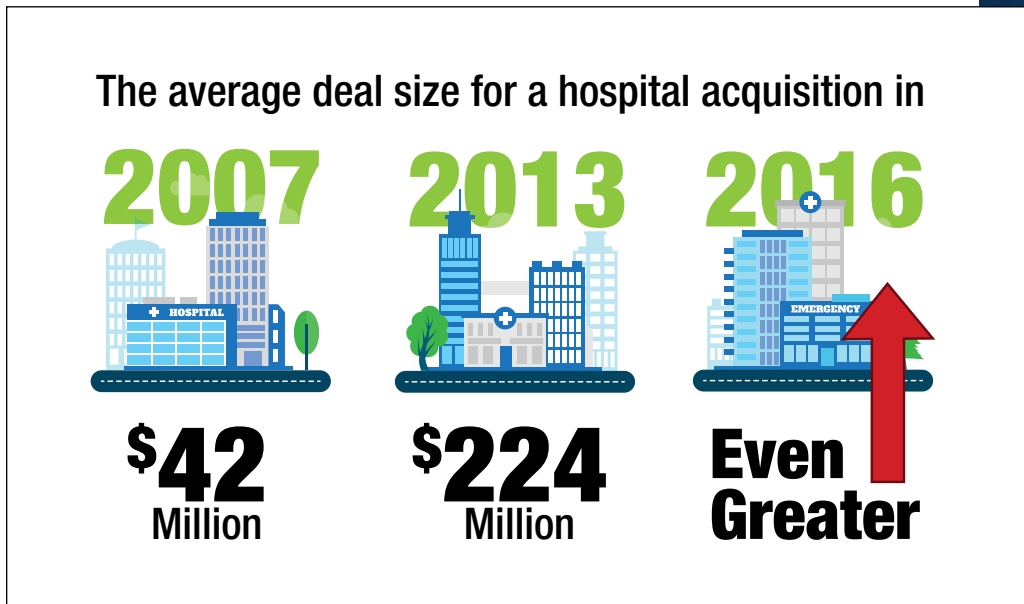**Goal:** A learning health system enabled by nationwide interoperability.[ii]

Providers face a practical yet critical concern, and the current enterprise EHR cannot get us there. This report seeks to answer how we can practice the art of the possible in the post-EHR era—a healthcare environment that by almost any measure can be described as checkered.

INTRODUCTION: ACCELERATING CONSOLIDATION

A 2014 report, "The Great Consolidation: The Potential for Rapid Consolidation of Health Systems,"[iii] by the Deloitte Center for Health Solutions estimates that only about half of current health systems will remain after consolidation. The deals are getting bigger even as the trend accelerates:

The average deal size for a hospital acquisition in

2007 $42 Million

2013 $224 Million

2016 Even Greater

For hospitals and health systems, the report says, "Staying the course is no longer an option. Organizations should prepare by either differentiating to maintain dominance in a clinical or geographic niche, or acquiring or aligning with other health systems. Those that do not act promptly and strategically may face major risks, including loss of significant market share or loss of local control as a result of being acquired."[iv]

As the industry consolidates through M&As and other forms of aggregation, the drive to become integrated health systems with centralized enterprise governance fuels even more demand for interoperability. Unfortunately, it also casts a glaring spotlight on the lack of interoperability in these new systems, which cobble together disparate IT platforms, apps and data sources under the new enterprise.

"The changing landscape in our healthcare industry requires health systems to be 'connected,' both internally and externally, to achieve business value, address regulatory needs, engage patients in their health,

and to evolve in the ways needed for both survival and to flourish in this changing environment," says Tim Smith, principal at Deloitte Consulting. "The need for discrete data integration and interoperability with core EHR capabilities across multiple vendors, applications and technologies is clear. Today, leaders in healthcare as well as other industries are already solving many of these interoperability challenges using readily available tools, techniques and architectures."[v]

This report examines how hospitals and health systems are building the patient-centered delivery systems of tomorrow by creatively leveraging the clinical, technical and financial resources available today. More specifically, we examine how healthcare organizations are using innovative strategies to achieve a practical interoperability among legacy IT platforms that will ultimately lead to a truly interoperable healthcare enterprise.

WAKE FOREST BAPTIST HEALTH
LOCATION: NORTH CAROLINA AND VIRGINIA
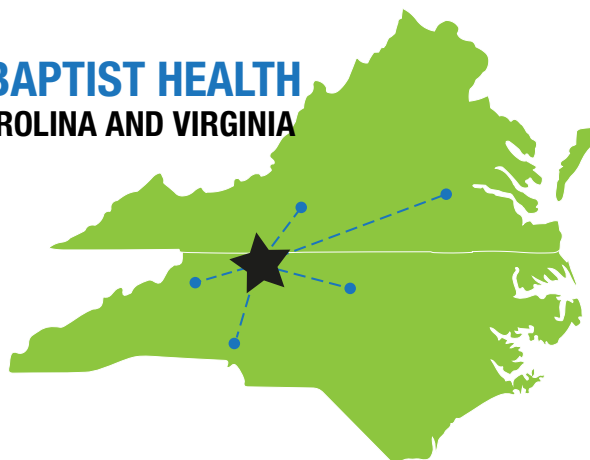
'Getting Synergy'

Wake Forest Baptist Health, a Winston-Salem-based organization, is an integrated system that operates 1,004 acute care, rehabilitation and psychiatric care beds, outpatient services, and community health and information centers. The health system is a prime example of a growing academic medical center with multiple hospitals working diligently on becoming truly integrated, especially in its information systems.

The $2-billion-plus health system, with a Level 1 trauma center and comprehensive cancer center, has made several hospital acquisitions in the past decade, including community hospitals. "We're working to grow within our service area," says Martin Sizemore, associate VP and chief data officer. "We service a key sector in the marketplace and have about 300 clinical subspecialties. The idea is to get synergy. We offer special surgeries and cancer treatments that you can't get anywhere else."

Wake Forest has also piloted telemedicine to more effectively and efficiently cover its region, centered around the triad of Winston-Salem,

Greensboro and High Point, a geographical mix of cities and rural areas. The service area encompasses more than 19 counties including many rural areas.

"It's the classic conundrum of a regional health system. We are a key provider of charity care. We're a key support structure in the community, being central to Winston-Salem. Having our relationship with Wake Forest University extends our already extensive academic research capabilities, and adds real value for our patients across the system," he says. "We need cost effective means of reaching all points in the service area."

Magic Milepost

Wake Forest Baptist has about 11,000 covered lives under a Medicare Shared Savings Program (MSSP). Wake will grow to 50,000 lives in the ACO in coming years.

Sharing data statewide is increasingly desirable for the regional health system, but North Carolina is struggling to fund its state level health information exchange (HIE). "Today we get by because of luck—most North Carolina healthcare systems use Epic and depend on Care Everywhere to share CCDs, acting like an HIE. But even a CCD [Continuity of Care Document, a standard for sharing patient care summaries] has its problems," notes Sizemore.

Improvisation is the order of the day.

"We've been exchanging hundreds of thousands of healthcare documents using Epic data networks as an alternative HIE backbone in North Carolina. When caring for cancer patients, for example, it's imperative to have a means of pushing information around to our participating healthcare organizations. In the last few years, we've done a marvelous job of leveraging Epic in North Carolina," he says.

DIRECT to FHIR

While Wake Forest Baptist makes incremental progress, it's also thinking big with plans to implement the DIRECT Project, the federal government's initiative to create a low-cost, practical, secure mechanism for exchanging health information over the Internet. DIRECT makes it possible for providers to securely email information to other trusted providers, such as specialists, pharmacies, and laboratories.

"We're going to have to extend interoperability, less hub and spoke and more distributed. We call interfaces 'mapping hell.'"
– Martin Sizemore

Participating in that initiative will position the health system to use Fast Healthcare Interoperability Resources (FHIR), a Health Level 7 International (HL7)-based open standard for exchanging healthcare information that is becoming an industry movement. "We're going to have to extend interoperability, less hub and spoke and more distributed. We call interfaces 'mapping hell.' We ended up picking an interface engine designed for HL7 that allowed us to develop interfaces in hours instead of days and weeks. It made it much easier," he says.

An innovative approach that is helping Wake Forest Baptist integrate the hospitals and clinics it acquired over the past decade is to move the new entities' data to a special archive. Wake Forest Baptist's acquisition agreements require acquired entities to provide a small export of their most recent data (within the last 3-6 months) for direct import into the Epic EHR, with the remaining legacy data being organized and archived in an XML format to allow for clinician access via a customized, user-friendly, clinical archive web application, a unique approach that has become a significant information-integration strategy.
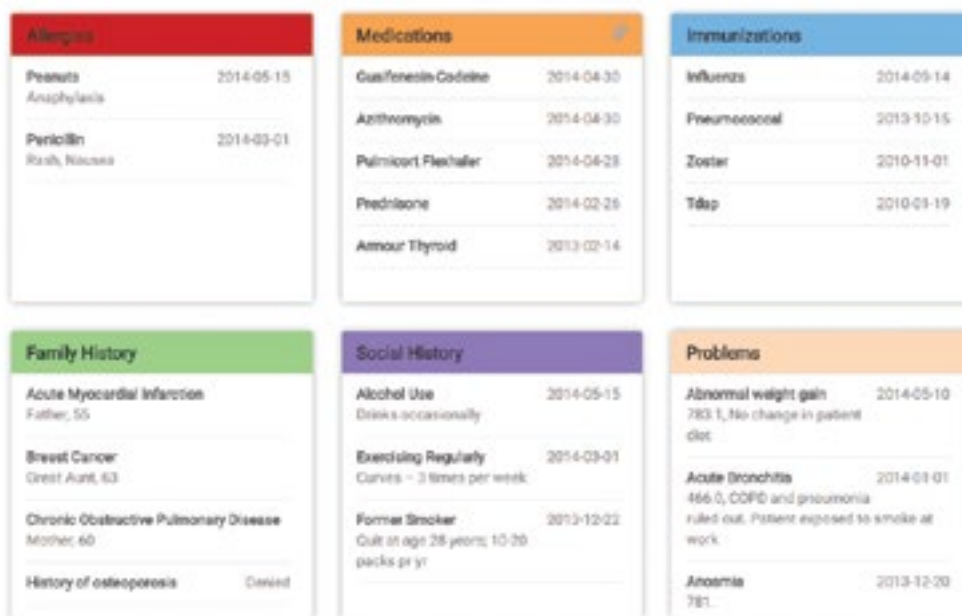
By moving the data to an archive, you're providing a secure repository that is much easier to access. We're not going to recreate the EHR," says Sizemore.

"Accessing that data means you're pulling lots of legacy data from their systems, which sounds simple, but is an overwhelming task. By moving the data to an archive, you're providing a secure repository that is much easier to access. We're not going to recreate the EHR application, but retain the valuable data," says Sizemore.

Better Than the Original

Feedback from those acquired hospitals and clinics—which access the repository using web pages and viewers—is that it is a better tool sometimes than their original application. For the few organizations currently leveraging this approach, their clinicians can access the archive from a link in the patient record within the EHR. Seamlessly, the user is forwarded to a user-friendly interface that often is designed to mirror the look and feel of the EHR platform in use. Most users can access the clinical archive web application via a single screen, with Wake Forest Baptist preferring the use of two separate screens to function seamlessly between the archive and the Epic patient record.

Allergies		Medications		Immunizations	
Peanuts Anaphylaxis	2014-05-15	Guaifenesin-Codeine	2014-04-30	Influenza	2014-09-14
Penicillin Rash, Nausea	2014-03-01	Azithromycin	2014-04-30	Pneumococcal	2013-10-15
		Pulmicort Flexhaler	2014-04-23	Zoster	2010-11-01
		Prednisone	2014-02-26	Tdap	2010-01-19
		Armour Thyroid	2013-02-14		

Family History		Social History		Problems	
Acute Myocardial Infarction Father, 55		Alcohol Use Drinks occasionally	2014-05-15	Abnormal weight gain 783.1, No change in patient diet	2014-05-10
Breast Cancer Great Aunt, 63		Exercising Regularly Curves – 3 times per week	2014-03-01	Acute Bronchitis 466.0, COPD and pneumonia ruled out. Patient exposed to smoke at work	2014-01-01
Chronic Obstructive Pulmonary Disease Mother, 60		Former Smoker Quit at age 28 years; 10-20 packs pr yr	2013-12-22	Anemia 781.	2013-12-20
History of osteoporosis	Denied				

The Wake Forest Baptist clinical archive web application manages data from an XML data import from legacy systems, and displays both structured and unstructured data in a meaningful way for clinical teams.

With the success of the clinical archive viewer, Wake Forest Baptist has been able to retire hundreds of software applications that have grown over years like a thicket threatening to strangle the IT infrastructure with costly interfaces and maintenance. Dubbed "Project Sunset," this application-rationalization initiative was considered critical to moving forward on data integration.

"When we started we had 1,400 apps and more than 280 interfaces. We discovered 600 apps that needed to be retired. It was an opportunity to reduce the total cost of ownership," says Sizemore, who credits his IT team, which included a former police detective, for the painstaking job of tracking each app down to determine its value.

"Project Sunset involved the grand idea that whenever we retired an app, we'd create a tombstone for it. We had RIP signs on the stairways. Twenty-six tombstones are a million dollars in savings," he says.

Bearing Apps

Technology giant EMC assisted in developing and implementing the clinical archive viewing application at Wake Forest Baptist, which offers a set of front-end tools to navigate an XML database. When Wake Forest Baptist buys a facility, that institution typically brings with it as many as 50 large apps such as PeopleSoft, eClinicalWorks and departmental software. Sizemore's IT team works with the newly acquired facility's IT team to gradually move that data over to Epic and retire the old applications.

With the simple, elegant design of these clinical archive web applications, the Wake Forest Baptist team has leveraged the open standard of XML data to consolidate, minimize storage, and manage data regardless of variety. The export is able to handle both structured data and unstructured data—including the data albatross of complex historical clinical documents, such as: images, diagnostic records, and laboratory records. These documents are stored in a PDF document and image format as well, allowing for the organization flexibility in which format the data can be stored (Word, RTF, PDF, Image, etc.).

"That one-two punch of usability and efficiency has Wake Forest considering turning legacy archiving into a business. It's got the potential to become another business line. Once we get secure public clouds, SaaS [software as a service] can help a hospital lower the total cost of ownership. I'd like to go to a service-oriented architecture in which we can replicate interfaces and APIs [application program interfaces]."

Project Sunset – Details

Goal:
To sunset legacy systems at Wake Forest Baptist to reduce overhead IT costs, and reduce burden of these systems on IT infrastructure.

The Starting Point:
1,400 applications, 280 interfaces

The Process:
Uncovered 600 legacy applications for retirement. Identified the top 26 applications through cost-benefit analysis.

The Results:
26 applications sunset. Providing a total of one million dollars in savings.

While the team typically must archive large volumes of patient data due to record-retention laws, it benefits from commodity pricing. So, in addition to the XML-driven, and user friendly interface of the clinical archive application, data storage has become far more inexpensive. "Years ago, a terabyte could cost as much as $11,000, then it dropped to $4,300 and today is $2,000," notes Sizemore, who highlights that much of this decrease is due to the emergence of new storage formats and technologies.

That one-two punch of usability and efficiency has Wake Forest Baptist considering turning legacy archiving into a business. "It's got a potential to become another business line. Once we get secure public clouds, SaaS [software as a service] can help a hospital lower the total cost of ownership. I'd like to go to a service-oriented architecture in which we can replicate interfaces and APIs [application program interfaces]. One of the things holding back ACOs, is we don't have integrated interoperability," he says.

> "First you have to define how you modernize your IT environment, second, automate it and third, transform your IT to do more innovative things like cloud-based apps." – *David Dimond*

EMC's global chief technology officer for healthcare, modernizing IT is one of three critical steps in building an interoperable system for coordinated care that supports population health. "First you have to define how you modernize your IT environment, second, automate it and third, transform your IT to do more innovative things like cloud-based apps." A chief component of IT modernization, he says, is building an efficient IT infrastructure through application rationalization and other streamlining initiatives.

NORTHWELL HEALTH SYSTEM
LOCATION: NEW YORK AND GREATER LONG ISLAND REGION

New York Giant

Large health systems like Northwell Health, formerly North Shore-LIJ Health System, are connecting their burgeoning enterprise using state-of-the-art, layered data warehouses and interfaces, standardized data language and a HIE which functions as a centralized repository service across all systems.

So, it's no surprise that Albert Villarin, MD, is busy. As Chief Medical Information Officer (CMIO) and associate CIO at Staten Island University Hospital, a part of Northwell Heath network, he helps manage clinical information, workflows and IT at the 714-bed, academic medical center in New York City's fastest-growing borough. Staten Island University Hospital occupies two campuses, in Ocean Breeze and Prince's Bay, has a slew of community-based health centers and labs, and continues to grow at a rapid pace.

Integration means interoperability with Northwell, a $9.5-billion, 18-hospital health system with 60,000 employees, 13,000 physicians and 15,000 nurses serving Long Island and other New York City boroughs, while expanding in the surrounding areas.

"During the last decade we've taken on several hospitals, including a two-hospital group in Westchester County," he says. Consolidating these and other hospitals into Northwell also means connecting them with Lenox Hill Healthcare Network, Northwell's insurance arm. "The word network implies the system has to share in interoperability."

The vision: to build a unified electronic health record across the system that integrates both inpatient and ambulatory information. However, like most major health systems undergoing consolidation the past two decades, Staten Island joined then North Shore-LIJ 15 years ago—Northwell now presents a hodge-podge of inpatient and ambulatory systems.

The New York Giant: Northwell Health System

- $9.5-billion
- 18-hospital health system
- 61,000 employees
- 13,000 physicians
- 15,000 nurses

Integration: 'A Lot of Work'

While many Northwell hospitals, including Staten Island, use Allscripts, the health system must integrate Cerner Soarian Clinicals on the back end and Allscripts Sunrise on the front end for mobile use by clinicians. Also, several hospitals use McKesson Horizon, which the vendor is sunsetting in 2018.

"We're changing the model across the enterprise, one hospital at a time," says Villarin. Villarin says that both Huntington Hospital and Staten Island Hospital have just been integrated into this system architecture, with leadership focusing on closing any minor remaining gaps.

It's a complex task. "On the front end, McKesson is easier to adapt than the back end," he says. ADT registration, which the staff has used for 28 years, will be replaced by Soarian. Ordering, billing, payroll and all ancillary services require integration.

Not surprisingly, "It's a lot of work," says Villarin, given that Northwell is the nation's seventh largest not-for-profit health system, and whose vision of being a truly integrated delivery network (IDN) means also integrating more than 60,000 employee and 13,000 physician users.

As CMIO and associate CIO at Staten Island, Villarin thinks and works both locally and globally. He collaborates with the hospital's CIO, Kathy Kania, and as CMIO focuses on driving improvement with clinical teams on workflows and the EHR—always in the context of integrating the health system as a whole.

Live Information

For patient care, Villarin guides everything from physician convenience—using graphical user interfaces (GUIs) on a common clinical platform—to data standards for protected health information (PHI). That includes radiology, laboratory, cardiology and all other specialties and clinical departments—plus all the information clinicians need.

"Live information to physicians wherever they need it. That's what interoperability is: the ability to bring in multiple sources of information to the physician for better care of the patient."
– Al Villarin

That includes clinical decision support (CDS) alerts, prescriptions and 24-hour surveillance. "How do we communicate and alert a physician that you don't see in front of you. That's where CDS has to go," says Villarin. "Live information to physicians wherever they need it. That's what interoperability is: the ability to bring in multiple sources of information to the physician for better care of the patient."

Staten Island is working with data-firm Truven to develop analytics on quality, which requires building interfaces to "all the data that lives in Allscripts," he says, so physicians can have access to clinical notes, documentation, back-end demographic information in real-time, 24/7.

This "live" data now resides in data warehouses and HIEs. Within two years, doctors will have access to data produced from a multitude of devices, including remote monitoring and mobile devices. "This interoperability is a very important question for the survival and success of health systems," says Villarin.

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Layers of Data

Today, Staten Island has layers of data warehouses, both local and network (a data warehouse for patient care resides in Yonkers, NY), as well as in a cloud-based HIE. Truven will begin the analytics process by pulling data directly from Soarian and Allscripts. A common local server will house the analytics software that scrutinizes all labs and patient profiles continuously in real-time.

"You don't want to alert physicians about everything. So, layering is very important. We have to work with Allscripts to get the data feed. We push information into the HIE which sits above the middle layer, while bedside monitors and mobile devices sit below," he says. Business Process Management (BPM) is also slated to become a governing system for these clinical alerts, says Villarin, who illustrates the importance of establishing a baseline of rules for these systems. "BPM is in it's infancy, but as we take on more risk-based contracting, it's just one more way to present value to our patients and clinicians."

A third-party creates the middle layer consistent with Staten Island's defined mobility strategy. As an academic medical center, the hospital has hundreds of medical residents each using their own mobile device,

a factor that greatly intensifies the heterogeneity of the computing environment. Westchester hospitals are currently on Meditech as an EHR platform, so the health system built a common data center on Long Island to which all of Northwell's EHRs feed, like a star pattern. The HIE in the cloud resides at the main data center.

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Common Data Center Long Island, NY

"Our EHR is really centered around data conduits," says Villarin. "So, we have to create a common master patient index (MPI) that traverses all the hospitals as well as all clinicians, whether inpatient, outpatient or ER-based."

Data from Staten Island's McKesson inpatient medical record has been transmitted to the main data warehouse. The medical center is now migrating the Allscripts ambulatory record to the same site and the goal is to complete that process by 2017. "We're one to two years away," he says.

In terms of data harmonization and consolidation, the hospital is now working with a suite of IBM tools to standardize to a common language, so that, for example, an MRI reading can be easily integrated in the EHR.

THE TECHNOLOGY VENDOR PERSPECTIVE: EMC

An Industry Seeks Clarity

Lack of interoperability is increasingly becoming a roadblock to data integration as health-system consolidation accelerates across the country, says Roger Burnett, leader for healthcare-sciences consulting at EMC. "The healthcare industry gets very poor grades in terms of integration. Most customers are looking for clarity in the form of a single, monolithic EHR, or relying on integration engines or HL7 bridges for apps like ADT," he says.

Health systems often rely on a vendor to solve immediate problems like the need for compliance reporting. One health system suffered from clinician turnover as a result.

"Most customers are looking for clarity in the form of a single, monolithic EHR, or relying on integration engines or HL7 bridges for apps like ADT." – *Roger Burnett*

"They said, 'What we need are CPT codes, but we don't understand our staffing pattern, and why physicians might leave as a result of frustration with the EHR and its limited data interoperability.' The health system opted to develop a data lake that enabled them to aggregate data from sources like public health that providers needed. Health systems can't depend on an EHR vendor for that," says Burnett.

Taking Ownership of Your Data

Burnett suggests the best solution is to extract data using *"schema on read,"* which allows data to be personalized in a way for purposes like discharge data instructions for a patient. "It's all about organizations taking ownership of the data. It means shifting away from traditional data warehouses—not completely—to more of a Hadoop strategy."

Hadoop is a free, Java-based programming framework that supports processing of large data sets—big data—in a distributed environment. Hadoop makes it possible to run applications on systems with thousands of nodes involving thousands of terabytes. Its distributed file system facilitates rapid transfer rates among nodes and allows the system to continue operating uninterrupted in case of node failure.[vi]

In contrast, data warehouses are built around a preconfigured data scheme. Even a data lake based on an extract, transform, load (ETL) model that allows data to be migrated from one database to another and to convert databases from one format or type to another, may be too structured for the unstructured information that clinicians need, such as images and text files.

Inclusive and Timely

Hadoop, Burnett says, is more inclusive of data and allows near-real-time queries of more data variety—essential for 21st-century health systems whose goal is coordinated care across heterogeneous environments as a result of M&A activity.

"Schema on Read" Definition:
Innovative data analysis strategy in new data-handling tools (e.g. Hadoop). Data is applied to a defined plan or schema as it is pulled from storage locations, as opposed to traditional methods which applied a schema as it was going into a database.

A challenge with HL7 interfaces is that they haven't yet become de facto industry standards. Usage hasn't yet become consistent and the fact that the interfaces are also event-driven requires health systems to aggregate data in innovative ways such as data lakes.

A data lake is a massive, easily accessible, centralized repository of large volumes of structured and unstructured data. As an open-source framework for processing and analyzing big data, Hadoop can be used to sift through the data in the repository.[vii]

Data lakes with Hadoop-supported architecture present a host of positives and challenges for healthcare organizations. Hadoop-based data lakes are dependent upon open source software, representing a large cost savings for healthcare IT organizations operating on a limited budget. [viii] Hadoop also can store and process a variety of different data sets and processes, both structured and unstructured. [ix] However, these data lake approaches can require a significant opportunity cost of time and staff to blend raw data sets, refine, experiment, define data governance, and keep data flows intact to achieve success.[x] Ultimately though, data lakes represent new levels of cost-effective potential for interoperability in healthcare.

"A data lake is a very dynamic archive," notes EMC's Dimond, because it's structured for a changing digital environment such as the Internet of Things and its continuing swell of new digital devices.

From a customization point of view, you need a lot more information than what's in an EHR. Social and demographic data, for example, may determine that a health system may be better off paying for cab fare for a patient to make a visit to her doctor." – Roger Burnett

The goal for data integration is to be inclusive as well as timely, especially where there's a variable such as in customizing discharge instructions for a patient. For example, a hospital strategy for medication adherence may depend on the fact that a patient who lives on the third floor without an elevator might struggle getting to the pharmacy. That insight is only available from socio-economic data that's not in the EHR.

"If a patient is at-risk, what can you do with that? From a customization point of view, you need a lot more information than what's in an EHR. Social and demographic data, for example, may determine that a health system may be better off paying for cab fare for a patient to make a visit to her doctor," Burnett says.

ST. CLAIRE REGIONAL MEDICAL CENTER
LOCATION: COVINGTON, KENTUCKY

Standalone in the Blue Grass State

Despite the industry's accelerating trend toward consolidation, independent hospitals remain—and they are buffeted by the same forces driving mega health systems toward population health and accountable care. According to a 2016 PriceWaterhouseCoopers (PwC) healthcare industry report, smaller regional hospitals are well served to formulate a well-defined enterprise strategy and collaboration can be a center point of this strategy.[xi] As an example of this model, the Mayo Clinic Care Network has affiliations or agreements with local hospitals in 20 states, which has served as an alternative to the traditional acquisitions.[xii] Creativity again reigns supreme, with many providers choosing collaboration with regional organizations as a model for success, requiring unique interoperability strategies.

St. Claire Regional Medical Center, a 159-bed regional referral center in Morehead, Ky. is a case in point.

Sponsored by the Sisters of Notre Dame in Covington, Ky., St. Claire Regional serves as an independent, standalone Catholic hospital serving the rural northeastern part of Kentucky and serves as a satellite campus for the University of Kentucky medical school (UK HealthCare) in Lexington. The medical center owns several primary care and specialty clinics, a regional telemedicine system and a comprehensive home-care service.

St. Claire's leadership fiercely guards its independence despite entreaties from larger suitors. "Our Sisters are not interested in selling as long as we make our margins," says Randy McCleese, Vice President of Information Systems and CIO. Unlike many urban and suburban health systems, St. Claire's population base is not growing. However, that doesn't mean it is happy with the status quo.

"Our Sisters are not interested in selling as long as we make our margins." – *Randy McCleese*

"We are seeking to increase services for our existing patients especially if we continue to partner with UK HealthCare," he says. Besides training UK residents, St. Claire refers its sickest patients to the academic medical center, a Level 1 trauma center with a neonatal ICU and a comprehensive cancer center.

Collaboration, Not Consolidation

Collaboration is a key to St. Claire's future. Six years ago it joined a coalition of healthcare organizations serving northeast Kentucky; nearly four years ago, St. Claire became part of the Bon Secours Good Health ACO. This year St. Claire joined the Kentucky Health Collaborative as one of 10 leading healthcare organizations in the state with the aim of improving quality standards while lowering costs. One of the goals is to pool IT resources, including costly analytics capabilities for population health.

"We're trying to collaborate with everyone we possibly can to learn about and manage population health," says McCleese, adding, "My role in IT is to push systems out to do a better job of population health management."
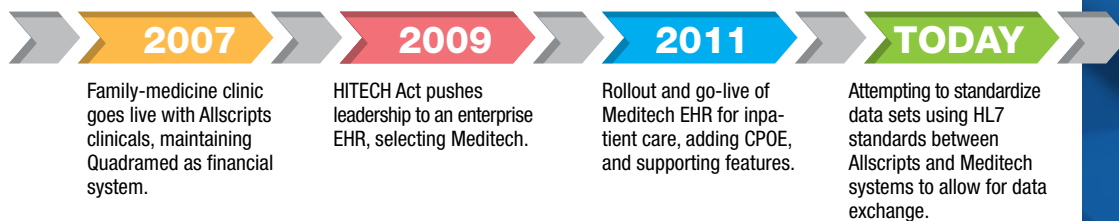
So, despite its small size, rural location, static population and lack of M&A activity—St. Claire's only acquisitions in the last 12 years were of the area's last two independent clinics—St. Claire is still challenged by interoperability and information integration.

In 2007, its family-medicine clinic went live with Allscripts for clinicals while maintaining Quadramed as its existing financial system. When the HITECH Act arrived in 2009, leadership decided to go the route of the enterprise EHR and selected Meditech, which it rolled out in 2011 for inpatient care, adding computerized physician order entry (CPOE), physician documentation and speech recognition components simultaneously. It also went live with Meditech practice management in its remaining ambulatory sites, which it will upgrade to Meditech's web-based physician platform in the next three years.

Matter of Trust

St. Claire also belongs to a regional HIE so it can exchange patient data with other healthcare organizations, however that initiative has hit snags— less technical ones than cultural. "If we bring in a CCD or HL7 message, our doctors do not trust that data," says McCleese, because they come from other vendors that likely define data elements differently.

2007	2009	2011	TODAY
Family-medicine clinic goes live with Allscripts clinicals, maintaining Quadramed as financial system.	HITECH Act pushes leadership to an enterprise EHR, selecting Meditech.	Rollout and go-live of Meditech EHR for inpatient care, adding CPOE, and supporting features.	Attempting to standardize data sets using HL7 standards between Allscripts and Meditech systems to allow for data exchange.

Like most hospitals and health systems, St. Claire even has interoperability challenges within its own information systems: between Allscripts and Meditech platforms, McKesson PACS and Meditech, and others. One of the impediments is the lack of a common patient identifier to ensure that the patient John Smith on Allscripts is the same John Smith on Meditech.

"We need common fields. When we can't match six fields about the patient, someone has to manually check the data. Large organizations often have a half-dozen FTEs assigned to do those checks. It's very expensive," he says.

Another problem is software upgrades. "If one of three or four vendors upgrade then they don't' match anymore. We're relatively small and we already have 100 interfaces running. When someone upgrades their system you have to make sure all those interfaces are changed to meet the new upgrade," says McCleese.

"We're relatively small and we already have 100 interfaces running. When someone upgrades their system you have to make sure all those interfaces are changed to meet the new upgrade."

Two Systems, Two Data Sets

A lack of interoperability negatively affects the patient experience. If someone visits the emergency room (ER) whose medical record is on Allscripts, for example, the ER physician cannot view her record on the Meditech system. "The patient gets very frustrated," he says, "because she has to explain, 'I see Dr. So and So who's in your clinic.' We as an organization cannot bring those records into one record."

APIs might offer a solution. An API is code that allows two software programs to communicate with each other, including helping integrate new features into existing apps or help those apps share data, which can help to integrate and enhance application functionality. Web 2.0 and cloud computing has driven interest in APIs because of their ability to pull data from multiple sources. However, APIs do have notable limitations when applied in practice.

The API involves extensive man-hours and resources to map data to its corresponding fields, and as McCleese highlights, EHR system upgrades and updates are continuous. Ultimately this presents a notable and continuous cost for McCleese's IT budget, which at a small hospital like St. Claire is not an option. This has resulted in a model focused around creating a data structure that meets HL7 standards for the databases powering it's Meditech and Allscripts systems.

"I have two systems, so I have two sets of data. That's the issue for us. We have clinicians in the ER saying, 'We need access to both Meditech and Allscripts, both visual and manual.' We're taking baby steps." – Randy McCleese

"We're not doing anything with APIs," says McCleese, who says his team is tackling backend databases to ensure that patient medical records match. That's the bargain many hospitals and health systems make.

"I have two systems, so I have two sets of data. That's the issue for us. We have clinicians in the ER saying, 'We need access to both Meditech and Allscripts, both visual and manual.' We're taking baby steps. We can build upon HL7 messaging and the CCD. Within a year we'll be sharing records between Meditech and Allscripts because we've laid the groundwork."

CONCLUSION

In the end, achieving data interoperability and integration may be a matter of will.

Says EMC's Burnett, "Data integration is a healthcare CIOs' problem to own. No vendor is going to solve it. Nobody is exactly like you, your apps, your IT platform."

Practice the art of the possible. Determine what's feasible with your existing data sources and ensure these priorities align with business objectives.

"Combine EHR data and decide what you can do with that data. You own it! What are you going to do with it? Because when you know what your priorities are, you can ensure access to data in real-time and build reports they believe in. We're dealing with data proliferation," he says, "so we need standardization to eliminate the issue of orphaned apps. It's not apps you care about but the information. We need to get rid of silos."

"Data integration is a healthcare CIOs' problem to own. No vendor is going to solve it. Nobody is exactly like you, your apps, your IT platform." *– Roger Burnett*

As the examples in this report show, CIOs don't have to wait for interoperability Nirvana. They can start today building a comprehensive and connected healthcare enterprise for value-based accountable care - with today's resources. Creativity and ingenuity, using the resources and partnerships available within the community, is the healthcare provider's loud response to Secretary Burwell's rallying cry. By determining your organization's long-term strategy, assessing your current resources and technologies, creating a roadmap and by incrementally building what you need—**the future is yours, and the time has come to seize it.**

EXECUTIVE RECOMMENDATIONS
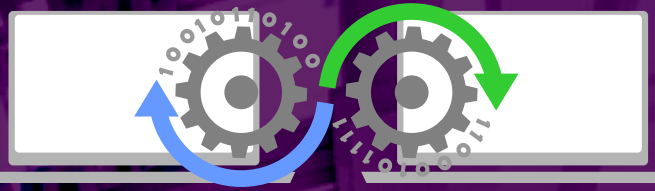
MODERNIZE IT

- Simplify your infrastructure from a software perspective. Sunset applications to reduce cost and boost the efficiency of IT.

- Archive data from legacy systems by leveraging robust XML databases.

- Catalogue data using industry standard formats, such as HL7 standards - CCD, CCA, FHIR, etc.

- Practice the art of the possible: distill catalogued data into what you can do with the technology available.

- Form your team of experts, and embrace creativity of solutions. Every organization's interoperability approach will differ based upon needs, marketplace, and structure.

AUTOMATE

- Explore alternative approaches to traditional APIs between systems, through the formation of a common data architecture that is EHR and platform agnostic.

- Create a data lake that offers access to digital data dynamically and accommodate the Internet of Things.

- Understand and explore cost-effective technologies to analyze and store data across the enterprise, including Apache Hadoop-driven infrastructure.

- Develop analytics to achieve quality of care through identification of populations, predictive analytics and decision support for both physicians and consumers.

TRANSFORM

- Provide the clinician with the full patient record in a well-organized presentation to enable the most informed clinical decision making. In this way, IT will contribute directly to evidence-based precision medicine resulting in improved outcomes.

- Transform care through population health, utilizing the modernized IT to drive patient engagement through transparency and availability of data.

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[xii] Ibid.