The Demands of a Digital Future

Exploring Transformative Technologies at Health Care Systems

Webinar recap and key takeaways

A report from the Center for Connected Medicine

Center for **Connected** Medicine

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INTRODUCTION

Digital technologies are transforming many aspects of modern life, and health care is no different. However, compared with some other industries, digital transformation at health systems is only beginning. Nearly 60 percent of respondents to a survey of global health care organizations said they had no digital health strategy or were behind schedule implementing their strategy.

The need for digital transformation in health care is great. Consumers are demanding convenient digital services such as apps that allow access to information at the tap of a screen, and the government and other payers are pushing for greater efficiencies and high-value care as they look to control health care spending. In the United States, health care costs are predicted to account for an unprecedented 20 percent of the nation's Gross Domestic Product (GDP) in a few years.
Yet for all this spending, health outcomes in the U.S. remain stubbornly behind those of other developed countries.

There are digital technologies that are key to addressing long-standing challenges of delivering patient-centered care, communication, increasing efficiency while lowering costs, and improving health outcomes. The Center for Connected Medicine (CCM), which convenes thought leaders to discuss pressing issues in digital health, assembled a panel of experts to provide information and examples of such digital transformation in health care.

The result was a one-hour webinar, "The Demands of a Digital Future: Exploring Transformative Technologies at Health Care Systems," broadcast in August 2018. This report summarizes key points from the webinar panelists' presentations, provides answers to follow-up questions from our audience, and links to additional resources.

Keep reading to learn about the strategy of using technology to become a real-time health system, how one of the nation's top pediatric hospitals is advancing high-value care with digital solutions, and the ways networks can usher in advances in automation, security, and analytics at health systems.

KEY TAKEAWAYS

1. A framework for health system success in the digital future is the "real-time health system," which requires provider organization IT leaders become chief architects of a health care "smart machine." A primary responsibility of the chief architect is to deploy technologies that enable acquisition and creation of real-time operational intelligence.

2. There are challenges in the real-time health system strategy, including ensuring the responsiveness, availability, and rapid recoverability of data networks. Other challenges include a strong focus on cybersecurity, identity and access management, mobile device management, integration and interoperability, and cloud computing.

3. The homegrown readmission risk predictor employing clinical data from UPMC Children's Hospital of Pittsburgh was able to predict 30-day all-cause pediatric readmissions. By using the predictor to target at-risk patients, the hospital reduced readmissions with post-discharge interventions, including follow-up phone calls to check on medication adherence, appointment scheduling and other post-discharge instructions.

4. Establishing clinical pathways that are focused on high-cost and high-volume conditions bring standardization to clinical practice and can reduce costly variations in care.

5. Health care organizations that are following the strategy of a real-time health system should consider three fundamental requirements of a network built for increasing data demands: scalability, quality of service, and security.

6. With huge amounts of new data, health systems have found they can't continue to scale the size of their data centers economically. This realization has given rise to multi-tenant data centers, private cloud connections and the outsourcing of some services to public cloud providers.

PANELISTS

Barry Runyon
Vice President of Research, Gartner

Barry Runyon is a health care provider analyst and researcher. His research agenda includes enterprise and point-of-care technologies and solutions such as interoperability, clinical communications and collaboration, nurse call, interactive patient care, vendor-neutral archives and an operational and technology framework called the real-time health system. Mr. Runyon has held lead architect and technical management positions with both consulting and vendor organizations and has been in the IT field since 1978, both inside and outside of health care. He was involved very early in the development of the HL7 standard. Prior to joining Gartner, he served as the Chief Technology Officer at the University Medical Center in Tucson, Arizona.

Srinivasan Suresh, MD, MBA
Chief Medical Information Officer, UPMC Children's Hospital of Pittsburgh

Dr. Suresh is responsible for the planning and execution of an information technology vision at one of the nation's top pediatric hospitals. His expertise includes the application of business intelligence tools and advanced data analytics to improve patient and provider satisfaction, mHealth, and clinical decision support tools in the EHR. Prior to joining UPMC Children's Hospital of Pittsburgh, Dr. Suresh served as the CMIO of Children's Hospital of Michigan. He also is a member of the section of emergency medicine and the council of clinical information and technology of the American Academy of Pediatrics. He chairs the medical informatics SIG of the Academic Pediatric Association.

Chris Janson
Senior Product Marketing Manager, Optical Networks, Nokia

Chris Janson is Product Marketing Manager in Nokia's IP and Optical Network business unit where he follows trends in optical networking technology and its application to finance, health care, utilities, government and educational network operators. Over the past 30 years, Mr. Janson has held product development, management and marketing roles in the communications equipment and semiconductor fields. He has been a speaker at many conferences including Interop, Internet2, and other executive forums. He has also shared his work through many webinars, written publications, on-line videos and articles, and serves on the board of directors of the Rural Telecommunications Congress and the non-profit OpenCape Corporation.

Becoming a "Real-Time Health System"

Health systems that want to make improvements in patient outcomes and efficiency should consider the framework of a real-time health system, a concept developed by Gartner. The real-time health system, which acquires and analyzes up-to-the-minute operational intelligence, addresses the current shortcomings of many health systems struggling because the awareness of events in real time is limited, their information is not easily shared, and business processes are disconnected, said Barry Runyon, Vice President of Research at Gartner.

> "Just as a car is rapidly becoming a computer with wheels, the hospital is becoming a smart machine with beds."
>
> **Barry Runyon**

> "This transformation of the health care provider is underway and along with it, a new way for the chief technology officer to think about health care IT and their role within the enterprise."
>
> **Barry Runyon, Gartner**

The paradigm of a real-time health system requires that provider organization IT leaders become chief architects of a health care provider "smart machine," Runyon said. Their primary responsibility should be to deploy technologies that enable acquisition and creation of real-time operational intelligence and the means to take advantage of it.

As an information system that delivers medical services, the real-time health system has the following characteristics:

Adaptive: Data can be used to anticipate situations and speed responses.

Aware: Have visibility into important patient-related activities and event data to address revenue, cost, quality and experience expectations.

Collaborative: Seeks to extend influence across inpatient, outpatient, long-term and home care settings.

Demanding: With a prodigious appetite for information, it has the resources necessary to handle, house, process, share and analyze data.

Mobile: Workflows are better coordinated and optimized, and patient information is accessed quickly.

The shift to becoming a real-time health system is not without challenges, particularly for traditional information technology functions, which need to focus on the patient and experience of end-users. The system must ensure responsiveness, availability and rapid recoverability of data networks. Other new challenges include cybersecurity, identity and access management, mobile device management, integration and interoperability, and cloud computing, Runyon said.

The RTHS as a Smart Machine

DIVERSE DATA SOURCES

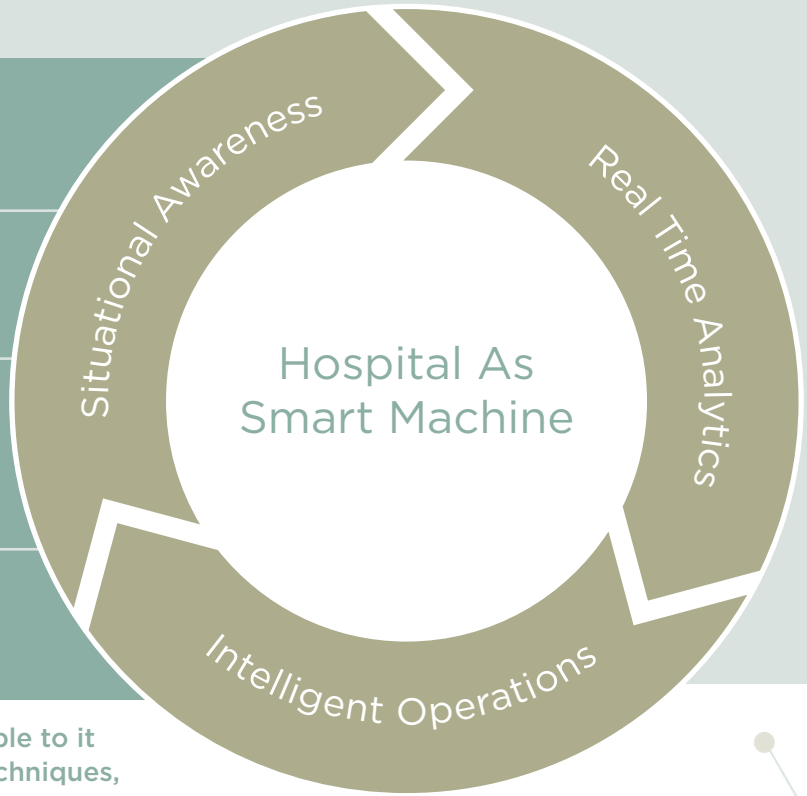
Patient: Registration, discharge, transitions of care, HL7 trigger events

Clinical EHR: EHR, laboratory, pharmacy, medical imaging, ED, PHM, telemedicine

Clinical Ops: CC&C, nurse call, PTCM, IPC, patient monitoring, smart patient room, infection control, infant protection, bed management

Facility/Other, IoTH, location and condition-sensing, CRM, supply chain, environmental monitoring, GPS, wayfinding

REAL TIME HEALTH SYSTEM



The RTHS will exhibit smart machine behavior as the operational intelligence available to it becomes richer and higher quality. Smart machines use artificial intelligence (AI) techniques, advanced analytics and machine learning (ML) to extract insight from operational intelligence.

For more from Runyon's presentation, **watch the webinar**.

Transformative Technologies at UPMC Children's Hospital of Pittsburgh

UPMC Children's Hospital of Pittsburgh had more than 1 million outpatient visits and 22,000 admissions in 2017. Children's has set a strategic goal centered on digital health that aims to reinvent primary care pediatrics with a focus on population health and chronic disease, said Dr. Srinivasan Suresh, the Chief Medical Information Officer of Children's. Aspects of this strategy involve the development and deployment of point-of-care clinical decision support tools, including a readmission risk predictor. These digital solutions, which employ natural language processing, are tapping some of the 250 GB of clinical data produced each month at one of the nation's top pediatric hospitals.

> "At Children's we do a fair amount of reporting and analysis and monitoring. And we have two to three prediction tools in use and we are exploring how we can get into the world of simulation using model scenarios."
>
> **Dr. Srinivasan Suresh**

> “Patient data on medications, lab studies, vitals, clinical notes, ICU stay status and nurse assessments, plus demographics and length of stay were incorporated into the algorithm, which was validated with data from two years of patient encounters.”
>
> **Dr. Srinivasan Suresh**

The readmission risk predictor was homegrown at UPMC to serve a pediatric inpatient population. The predictor uses machine learning techniques to predict 30-day all-cause pediatric readmissions. During a “silent” three-month pilot test at Children’s, the predictor was 79 percent accurate in predicting readmissions. By using the predictor to target at-risk patients, the hospital reduced readmissions with post-discharge interventions.

Impact of clinical pathways, focused on high-cost and high-volume pediatric conditions, are focused on bringing standardization to clinical practice and reducing costly variations in care.

Dr. Suresh said the hospital has had success over the previous 12 to 18 months in reducing variations that align with the following outcomes:

Reduce:

- Unnecessary variation in care
- Unplanned readmissions
- Length of stay

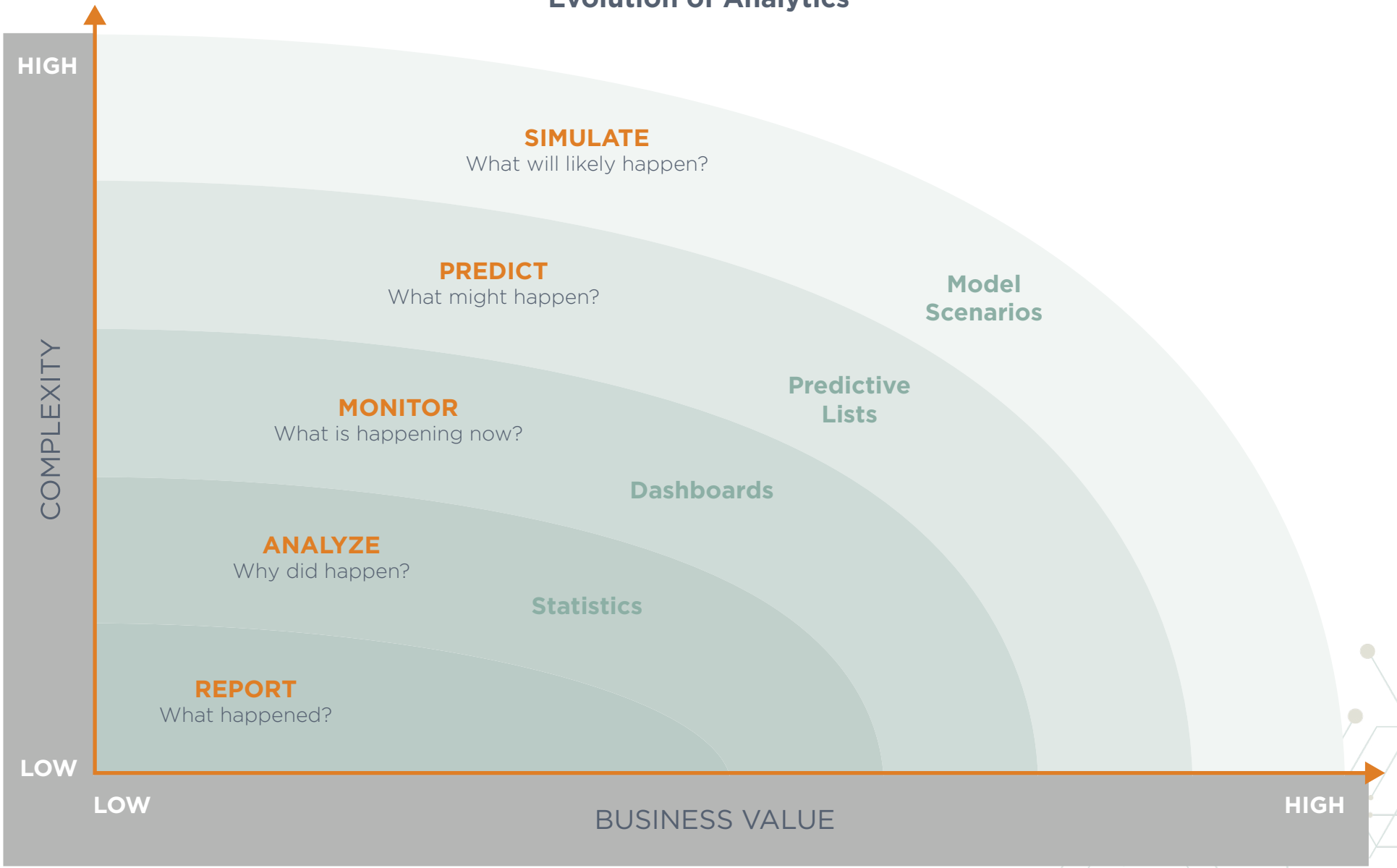
Improve:

- Outcomes in quality, safety and financial metrics
- Continuity of care
- Patient, family and provider satisfaction

Eliminate:

- Non-value-added testing
- Waste

Evolution of Analytics



For more from Dr. Suresh's presentation, **watch the webinar**.

Connections That Bring Health Care Digitization to Life

Computers are moving beyond the traditional enterprise data center, more data is being generated and more storage is being occupied creating an impact on networks in this digital transformation. Across all industries, there has been a greater than 400 percent increase in cloud and data center traffic. As a result enterprises have transitioned from a model where data is stored near where it's generated to one that adopts a combination of owned, leased and public data centers, said Chris Janson, Senior Product Marketing Manager of Optical Networks at Nokia.

> "This all translates into a set of fundamental requirements, and this is more than just about bandwidth. You need to also think about performance in terms of latency, agility, ease of scale, security, and adoption of best of breed solutions."
>
> **Chris Janson**

> “Cloud is fundamentally about connecting data centers together, whether they are owned, or leased or connected out to public services, or the public cloud.”
>
> **Chris Janson**

Health care organizations that are following the strategy of a real-time health system require the use of a wide variety of devices and technologies to provide situational and operational intelligence. To employ this strategy, health systems need a network that can handle these new demands. Janson said there are three fundamental requirements of a practical and affordable network that organizations should consider:

Scalability: The ability to handle increased bandwidth demands in an efficient and cost-effective way.

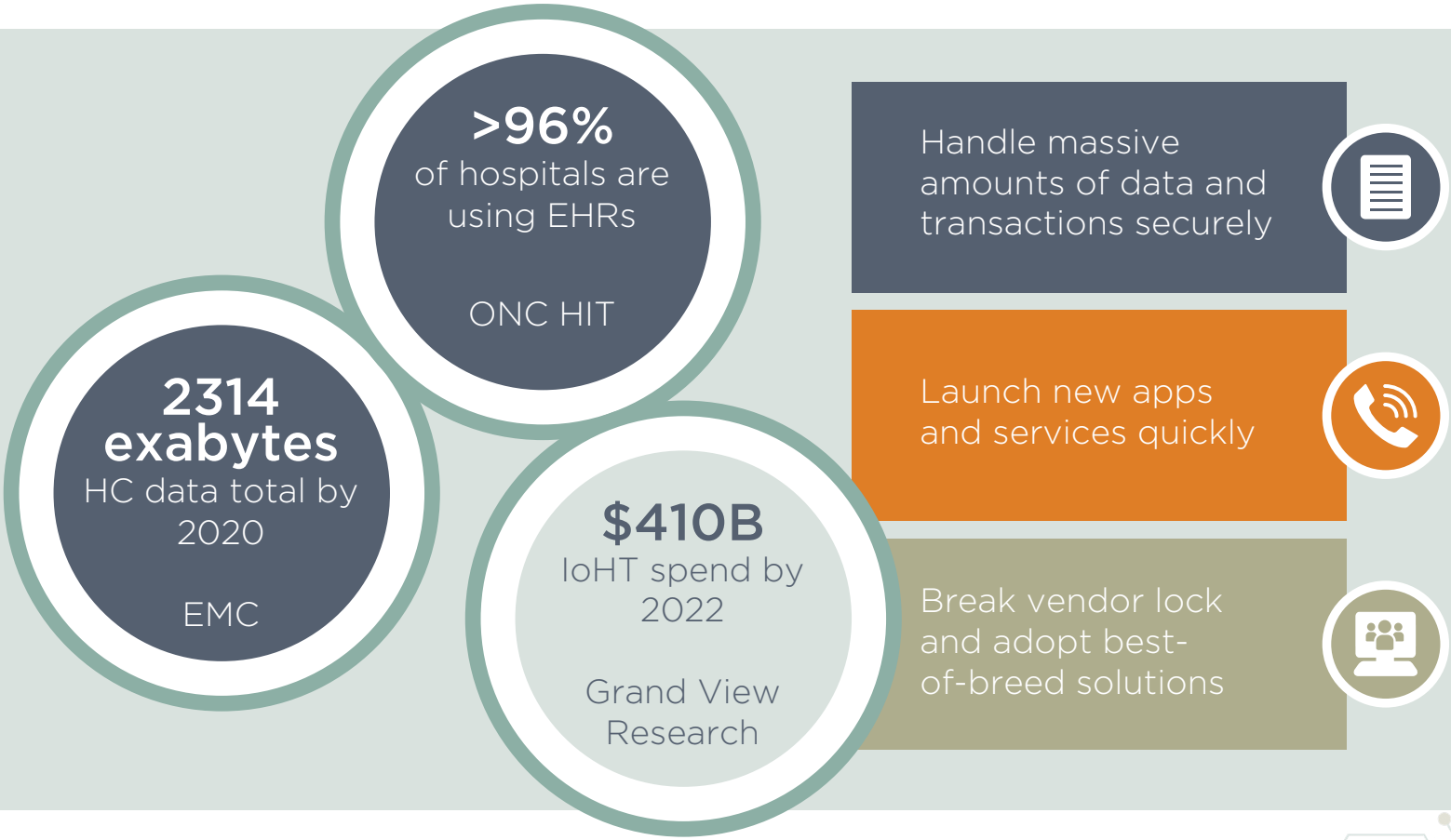
Quality of Service: Ensure high reliability and resiliency while adapting to “Internet of Healthcare Things” applications and supporting legacy applications.

Security: Protect the network with in-depth security through encryption key management and intrusion detection.

Health systems can expand their capabilities for storage and compute without having to expand the physical resources and capacity that would otherwise would be in the realm of the enterprise. With huge amounts of increasing data, health systems have found they can’t continue to scale the size of their data centers economically.

This realization has given rise to multi-tenant data centers, private cloud connections and the outsourcing of some services to public cloud providers. Janson said most industries, including health care, have adopted a strategy of keeping the most critical functions, which need the most security, within enterprise-owned data centers and letting less critical functions move to facilities.

Network connections bring real-time healthcare to life...



For more from Janson's presentation, **watch the webinar**.

Q&A with our Experts

These are some of the questions submitted by the audience from "The Demands of a Digital Future" webinar.

"How are patients at home engaged, both acutely and over time? What role does the informal family caregiver play in adoption/engagement in high-cost and high-risk patients? And what does your mapped workflow framework to engage informal caregivers look like?"

Dr. Suresh: The engagement process for patients and caregivers at home is an ongoing initiative and evolving. Currently, the engagement is through an in-person conversation by the care manager in the hospital setting with the family just prior to discharge from the acute care unit.

The in-person conversation is followed by a phone conversation a few days later with the parent or caregiver to ensure (a) compliance with follow up appointment with primary care physician, (b) adherence to medications and other instructions that were provided at time of hospital discharge, and (c) to address any care issues or any other questions the family may have. We are evaluating a text-based interaction with families whose children have a high probability of avoidable readmissions.

"How accurate are the alerts that screen for child abuse and how does machine learning improve these alerts?"

Dr. Suresh: The purpose of the "child abuse alerts" is not necessarily to diagnose child abuse, but to alert us to the possibility of child physical abuse based on presenting signs and symptoms. The alerts remind the emergency provider to perform the appropriate work-up in these suspected cases such as lab tests, x-rays, involvement of social workers, consultation with our child advocacy team, or filing a "childline," which is a state mandated report.

We have set up the clinical decision support system in such a way that it is very sensitive to pick up every single case of suspected physical abuse. This may not lead to high specificity, but that trade-off is acceptable. We have also been successful in reducing alert fatigue. At this point, we are not using machine learning (ML) to create these alerts. There is certainly an opportunity to use ML to refine the child abuse alert. We will be using ML for another clinical decision support initiative – developing an alert for clinical deterioration for patients in our cardiac intensive care unit.

"Do you foresee blockchain being used in the secure exchange of data or the connection of public and private systems?"

Mr. Janson: At this point, I am not aware of blockchain in use within the health care setting. Blockchain is usually thought of as a distributed ledger for bitcoin. That's not to say it may evolve into some future role as a way to certify payments among providers.

We encourage adoption of a defense-in-depth security architecture: multiple defenses against threats that could attack the network, the data center or the user. As an example, protection mechanisms should be deployed in multiple layers of the OSI stack, including IPSec, Network group encryption and layer 1 encryption.

"Most of the vast amount of info that is fed into these systems is done by health care providers who are not IT professionals who are year by year given more devices to use to share their information. How can we keep pace with more IT support for these increasing demands?"

Mr. Janson: A similar concern is shared by people in other sectors such as government, railroads, and power utilities. These enterprises also face an increasing number of devices peppered throughout their operations, often exceeding the capabilities or knowledge of existing staff.

The nature of the so-called Internet of Things (IoT) is that many small computing devices provide control or reporting of data on something important to the organization's central mission. In doing so, the IoT returns value, which should be recognized as a strategic asset. Organizations, including health care systems, should invest in appropriate levels of staff or outsourced support to keep pace because it is in their best interest.

The results reported by Dr. Suresh in this webinar is evidence of the value and need for that support. The improvements he reported in patient outcomes and efficiencies prove the need to support evolving health care IT.

"What part do you see for medical imaging platforms to assist in this transition to real-time health systems, and which players are already doing a good job of this? What gaps would you like to see addressed on the medical imaging software side?"

Mr. Runyon: The medical imaging platform that most supports a health care provider's transformation to a real-time health system is the vendor-neutral archive (VNA). The VNA is now central to the health care provider's enterprise imaging strategy, and it is evolving to include all unstructured clinical content, in addition to its traditional imaging role.

The VNA is no longer a passive archive of DICOM images and studies, but rather, includes all manner of unstructured clinical

content required to support a real-time health system. The VNA was originally a market response to the prodigious storage growth associated with picture archiving and communication systems (PACS), and the cost and complexity of PACS migration. Since then, the VNA value proposition has evolved to include standards-based information access and sharing, universal image viewing, and sophisticated workflow capabilities. More recently, the VNA has been promoted for its contributions to operational efficiency, interoperability and the clinical benefits that it enables.

The VNA is critical to the health care provider's ability to leverage the wealth of clinical insight trapped within medical images and other unstructured clinical content surrounding patient care, including that captured across vendor. It is also essential for a health care provider to get control of the fragmented data surrounding the patient, which has and will experience ownership issues by vendor. Leveraging the VNA is a step in the right direction to enable the transition of control from vendors back to the enterprise.

The domains of enterprise content management and medical imaging are now actively converging within the VNA platform. Gartner's long-term view is that this convergence will continue in healthcare, and while the name of the technology may change, the functional need for neutral storage of healthcare data will endure and grow.

The core capabilities of the VNA surround vendor independence and the adoption of industry standards. These characteristics complement the mission of the real-time health system — whose justification for existence is enterprise-wide situational awareness achieved through the progressive adoption of industry interoperability standards for patient-related data, and the timely application of up-to-date operational intelligence. The VNA is as much a response to inaccessible and siloed data as the RTHS is a response to the current state of the health care delivery organization — where awareness is often limited, information is not easily shared, workflows and business processes are disconnected, and data is not available when and where it needs to be.

The real-time health system collects and analyzes data gathered during the course of doing business. It uses that information to optimize workflows and business processes, balance resources with demand, and improve decision making. The VNA is not a passive actor in this process, but a rich source of patient history and event data — a key information source providing visibility into important patient-related activities and event data to satisfy revenue, cost, quality and patient experience expectations. The VNA is an important component of a real-time health system migration plan — where the awareness must be addressed, and consolidation, standardization and integration play a critical role in adopting the real-time health system vision.

ADDITIONAL RESOURCES

Find out more about the **"The Demands of a Digital Future"** by watching the webinar.

Learn about real-time digital networks from Nokia.

Read Gartner's report **"Industry Vision: The Real-Time Health System Transformation"** (client log-in required).

Center for **Connected** Medicine

ABOUT THE CCM

The Center for Connected Medicine (CCM) is a gathering place where those seeking to drive improvements in health care through technology come to connect and inspire each other, both in the real and digital worlds. The CCM, jointly operated by GE Healthcare, Nokia, and UPMC, connects and inspires leaders and innovators to join the CCM community by cultivating thought-leadership activities, creating a relevant content hub, and fostering trusted relationships through exclusive events.

To learn more about the CCM's thought leadership content and events by visiting our blog.

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