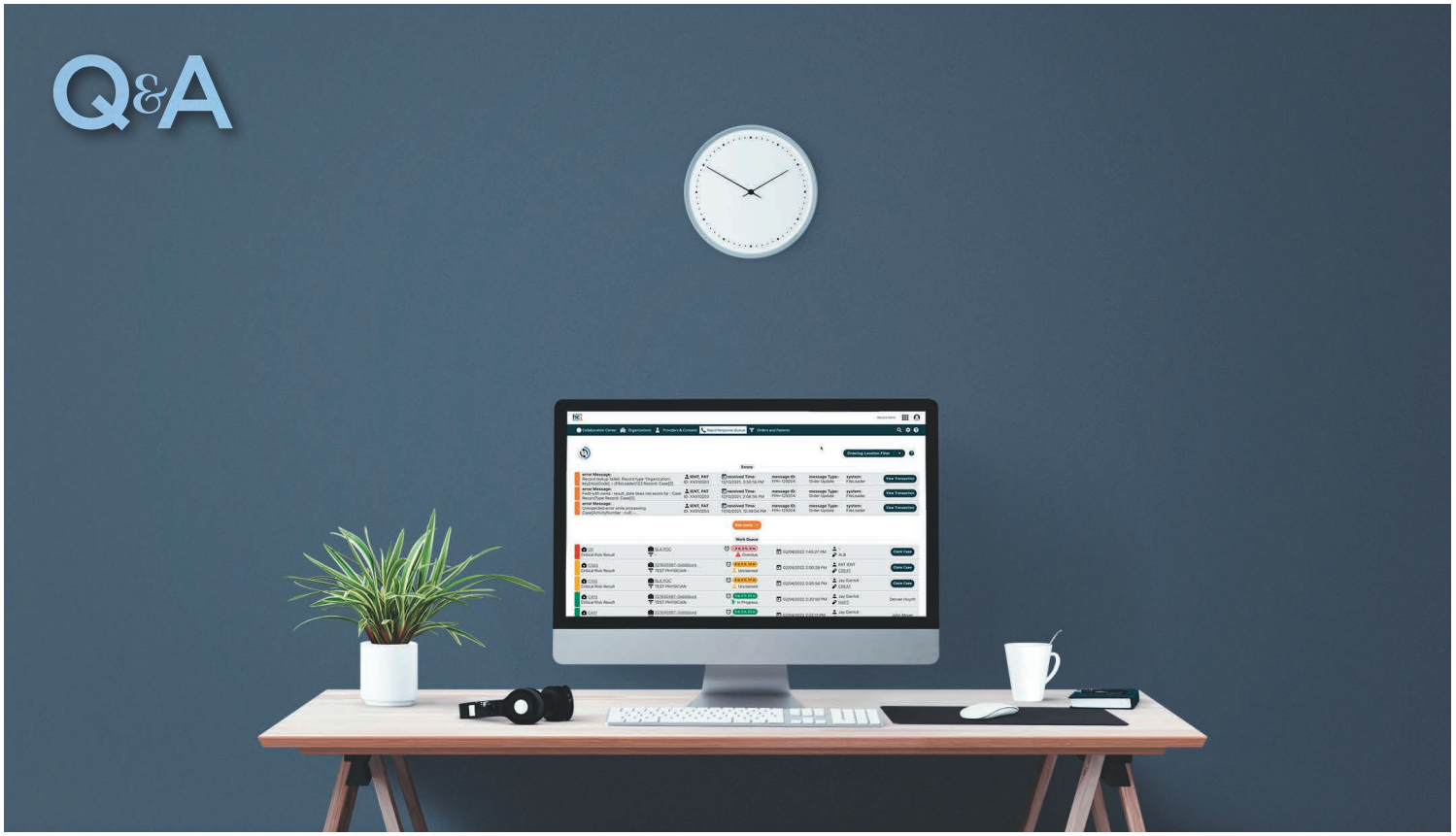


Advancing on a path to precision health by revealing the hidden signals in our healthcare data

An interview with Brad Bostic and Charlie Clarke of hc1 and Dr. Brian Patty of Medix Technology

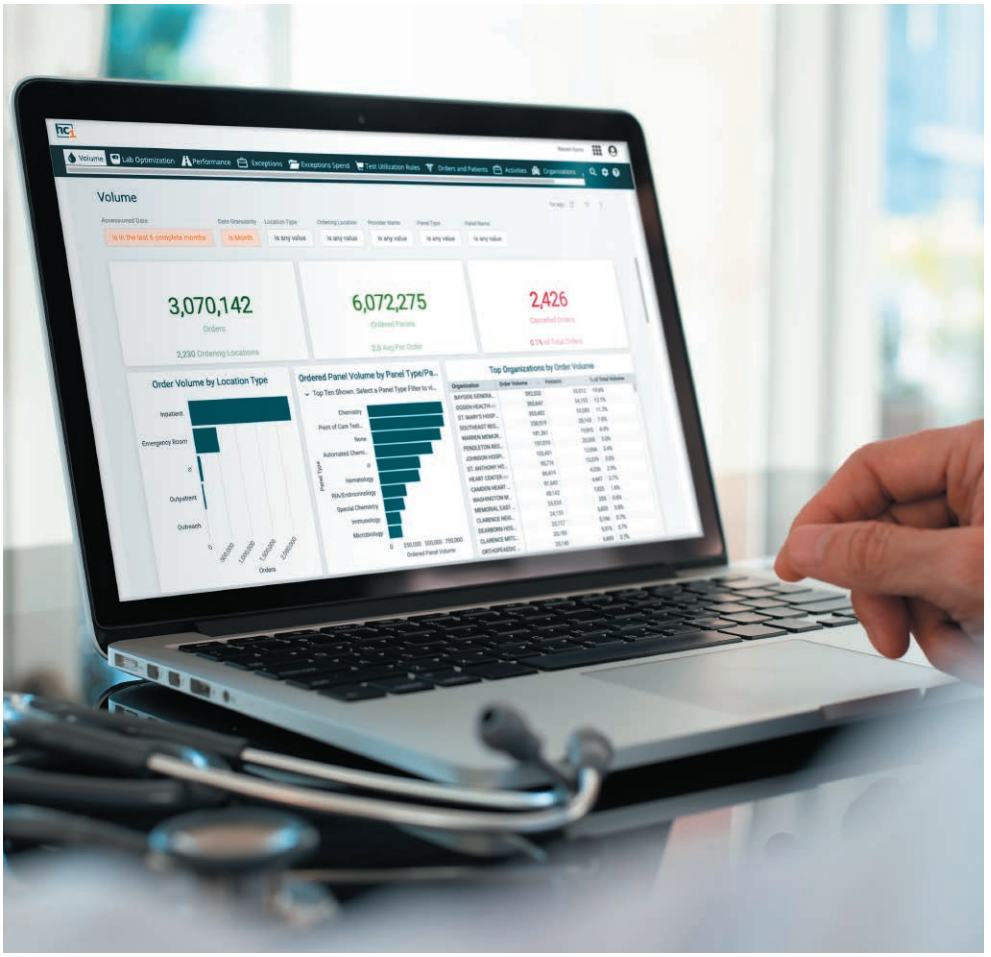
DESPITE EXPECTATIONS for individualized care, the U.S. healthcare system operates under a one-size-fits-all, trial-and-error model. To address this fundamental issue, hc1 has developed a precision health approach that begins by connecting healthcare professionals with hidden risk signals that uncover unmet patient needs.

hc1 is pioneering Precision Health Insight Networks (PHINs) that enable personalized healthcare by securely and intelligently integrating, normalizing, enriching, and transforming health data into the signals that identify risk and drive care decisions that cater to each patient's unique needs.

For more than ten years, hc1 has been transforming diagnostic laboratory data into personalized healthcare insights. The hc1 Precision Health Cloud™ has been designed to connect patient health data sources from various silos in health IT to uncover actionable signals across patient populations and cohorts that inform individual patient care decisions. By creating PHINs to organize volumes of live data, including clinical laboratory results, genomics, and medications, hc1 can deliver easy-to-adopt, scalable solutions that ensure that the right patient gets the right test and the right prescription at the right time.

Dr. Brian Patty, Medix Technology CMIO; Brad Bostic, hc1 chairman and CEO; and

Charlie Clarke, hc1 SVP of technology, discussed "Three Ways to Advance on a Path to Precision Health" on a Precision Medicine Leaders' Summit webinar on Wednesday, March 30. The discussion focused on the practical application of precision health and the steps you can take to advance toward precision health on an organization-wide scale. They agreed to answer a few questions about scaling precision health so organizations can better equip physicians to deliver personalized medicine.



Q. As noted above, hc1's Precision Health Insight Networks are designed to identify risks and drive care decisions that cater to each patient's unique needs. PHINs achieve this aim through a three-fold strategy: increase transparency and visibility, decrease readmission rates, and better manage physician-physician and physician-patient healthcare relationships. Could you expand on each leg of this strategy and how it impacts patient outcomes?

• Increase transparency and visibility

A. [Brad] Clinicians, care navigators, and administrators don't have time to hunt down and assess all of the relevant data points to construct a comprehensive view of each patient's health and proactively address all critical risk factors. Their view is limited to the contents of their EMR, which is largely a digitized version of the files that used to hold paper medical records. Today's healthcare practitioners need technology that delivers recommendations to assist in delivering optimal care. hc1 launched the Precision Health Insight Network category to address this issue.

To construct a comprehensive picture of patients, Precision Health Insight Networks (PHINs) span multiple care settings, harmonizing diagnostic results and therapies, and alerting health professionals of high-impact interventions including diagnostic tests, preventative measures, and medication therapy changes that patients need to achieve the best possible outcomes. The hc1 Precision Health Cloud was created to lead the PHINs category by ingesting, normalizing, and organizing disparate healthcare data at scale. Constructed with a secure cloud architecture on AWS from day one, hc1 has amassed more than 200 million unique patient profiles to drive millions of precise patient interventions per year.

• Decrease readmission rates

A. [Dr. Patty] Typically, U.S. Healthcare systems operate on a one-size-fits-all, trial-and-error model that results in missed diagnoses, adverse drug reactions, protracted illnesses and premature death, wasting anywhere from $700 to $900 billion dollars. Precision health takes into account genetics, environment, and lifestyle to formulate treatment and prevention strategies based on a person's unique background and conditions. If a patient does get sick, precision health insights can help a provider identify which treatment will perform best with fewest risks.

• Better manage physician-physician and physician-patient healthcare relationships

A. [Brad] To establish and maintain long-term, trusted relationships with patients and caregivers, clinicians and healthcare administrators must be proactive by identifying key risk signals from comprehensive patient data and intervening when needed to achieve optimal outcomes. When a physician lacks a comprehensive view of the patient and is not empowered through technology that directs their attention to those most in need, patient relationships suffer. When physicians are armed with the insight and notifications required to proactively diagnose and treat patients, costly care episodes are prevented, and patient relationships are maximized.

Q. Notable on the hc1 website is the concept that precision health begins with connecting healthcare professionals with hidden patient stories. These hidden patient stories are a powerful and understated resource for precision personalized medicine. Could you provide more details or a brief case study on how hc1 enabled physicians to leverage these hidden stories?

A. [Dr. Patty] Most physicians and healthcare professionals work tirelessly to provide effective patient care. But they are doing so while fatigued, stressed and overworked and without the information or tools necessary to achieve patient care goals. It is simply impossible to learn, recall and act on the infinite and ever-changing base of patient-specific clinical information within a seven-minute patient visit.

The information required to deliver personalized, precise care is buried in clinical journals where it is lost in the din of more than 220,000 studies

published annually. Moreover, research can take as long as 17 years to make its way into accepted clinical best practices.[1] This prevents clinicians from easily accessing the comprehensive patient information required to practice accurate personalized medicine.

A. [Brad] hc1's Precision Health Cloud securely manages complex connections across billions of healthcare data points, including lab orders and medications. The results are data-rich records that provide a complete picture of the healthcare sites, providers and patients a health care organization interacts with. These data-rich records then fuel solutions that enable real-time collaboration across care and service departments to support efficient operations and personalized patient care.

hc1 solutions focus providers on the signals that are important to patient care, support evidence-based standards and provide a feedback loop to track successful implementations of high-value care initiatives.

Q. Interoperability and data standardization are two capabilities cited by several groups as key to pooling databases and improving access to siloed data.

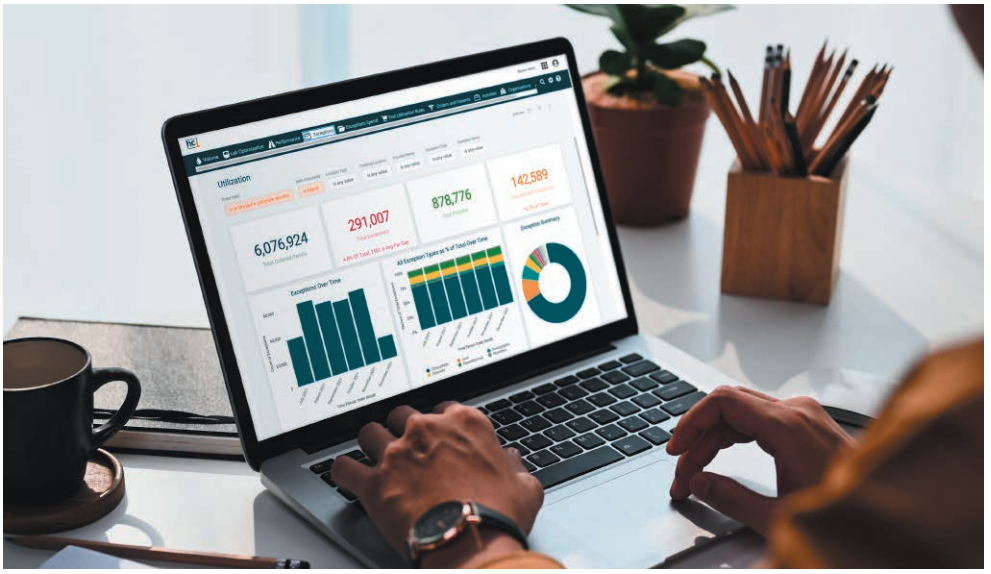
- What is the current status of these capabilities at hc1? How might approaches such as federated databases play a role in this regard? Has hc1 been involved in either HL7 or FHIR activities?

A. [Charlie] hc1's proprietary integration engine can ingest and organize HL7, FHIR, and other data from all of a healthcare organization's systems. We normalize and enrich data, standardizing codesets and abbreviations, and enriching incomplete information about providers to ensure the organization gets the maximum value out of this vital resource.

Federated databases become possible as data standardization progresses, particularly with regard to tokenization. A federated database is limited in scope by how data can be linked.

We process an average of 5.4 million HL7 transactions a day through real-time connections and near real-time batch files. Peak days can see over 10 million transactions. The foundational premise of our first product in 2011 was rather than create specialized interfaces, to instead use the HL7 interfaces that already existed to drive our solutions. Internally, we transmit data between applications using FHIR.

Recently, the hc1 Platform and the corporate headquarters located in Indianapolis, IN, met the HITRUST CSF® v9.3 Risk-based, 2-year (r2) certification criteria. The (r2) validated assessment certification is a tailored assessment for the highest level of assurance that an organization may earn from HITRUST.



Q. Social disparity in healthcare has been highlighted recently, especially in the context of including more diverse populations in the consideration of developing population-specific precision medicines. How can hc1's approach lead to reducing or eliminating social disparity issues in health care access, affordability, and delivery?

A. [Brad] Precision Health Insight Networks (PHINs) deliver the capabilities required to usher in a new era of scalable precision medicine – capabilities that, before now, have been unavailable. By treating each patient as an individual, precision health inherently reduces social disparity issues that are otherwise caused by a one-size-fits-all approach.

Through precision health, health systems, and health plans deliver markedly better outcomes while significantly reducing healthcare costs. Consider the benefit of aligning a patient with certain genetic abnormalities to a "digital twin" made up of a composite of data spanning dozens of similar patients across the country to understand not only what diagnostic testing is required but then what treatments will be safest and most effective.

Further, consider the potential to present clinical trial options automatically when a specific patient is failing conventional therapy or has a complex disease state that could be treated effectively by a little-known experimental therapy. PHINs will save lives and advance therapeutic testing and discovery through this ability to optimally match people with medications.

Q. Healthcare costs constitute a significant proportion of personal and government expenses. Many have pointed out that pay-for-performance or pay-for-value-based care cost models are better than pay-for-service approaches. Can you comment on what approach hc1 has taken in this regard?

A. [Dr. Patty] A more value-based care model can decrease costs. An average organization has about $20 million dollars in unwarranted care variations through the orders of low-value tests and not ordering tests that are potentially more medically appropriate for a patient. Lab testing is the single highest volume of medical activity within a health system, yet 21% of diagnostic tests are overused and nearly 45% of opportunities for medically appropriate testing are missed.

A. [Brad] In 2011, hc1 was born because I believe every patient should be treated as a unique individual. At the outset of the high-value care movement, healthcare organizations focused on increasing value simply by cutting costs, but hc1 knew that sustainable value enhancement could only come from reducing cost by improving outcomes – a goal we could achieve by tapping into the heartbeat of healthcare, namely, laboratory data. We believed that if labs could organize every individual's information intelligently, they could unlock an unprecedented level of clinical decision support to personalize and »

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- Payment models that reward person-centered, team-based care that includes the clinical pharmacist
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CMM is a service delivered by an interprofessional team, to include a clinical pharmacist, collaborating with a physician to ensure appropriate use of medications and gene therapies. It influences medication selection, use and monitoring to ensure safe, effective and appropriate use of medications. CMM is patient-centered, comprehensive and ongoing.

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- Nearly **30%** of adults in the US take **5+ medications.**
- **10,000** prescription medications are available on the market today.
- **49 seconds:** Is the time spent by physicians and patients talking about new medications during a 15-minute office visit.

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improve care for all patients. hc1 has been able to build in the intelligence of the smartest lab experts and clinicians to instantly analyze all the diagnostic testing across an entire health network. This capability automatically identifies and prompts clinicians not only on the tests they should not be doing but also guiding them to the tests they should be doing for a more effective and efficient diagnosis. It also results in getting people on the right medications and navigating a process that results in a better outcome.

Q. Clinical data locked away in password-protected, disconnected databases spread across multiple patient data silos prevent clinicians, who have limited time with each patient, from accessing information critical to personalized precision medicine.

- How does hc1's model enable physicians to overcome this hurdle in a timely manner?

A. [Brad] Technology and data. We are able to utilize technology to gather and organize medical data from multiple locations and get it in front of providers in real-time. Technologists can capture all the data from disparate sources, aggregate it and turn it into a knowledgeable decision-making tool providers can access easily and offer this knowledge as part of the patient care process.

- Can you discuss how hc1's laboratory customer relationship management (CRM) solution is used in these situations?

A. [Brad] hc1 Operations Management™ offers a complete picture of how that provider interacts with a lab – from ordering location, panel and test order details to ongoing service issues and activities. This solution enables increased cross-departmental collaboration. All data related to a specific account, provider or patient – from specimen records and phone numbers through ordering locations and panel codes – is easily accessible in a HIPAA-compliant environment.

hc1 Rapid Response Queue™ further enhances Operations Management with standardized and automated critical and urgent workflows across departments based on clinical lab results. This ensures providers are notified of time-sensitive results so immediate and appropriate care can be given.

Q. Islands of automation created by multiple EHR systems result in databases ill-equipped to allow physicians to communicate with each other. What capabilities does hc1 provide that enable cross-team and cross-discipline communication?

A. [Brad] Our hc1 Precision Health Cloud is built on Amazon Web Services (AWS). By leveraging AWS services through hc1, laboratories and health systems gain a cloud platform that's optimized for performance, scalability and security, which are all essential elements for a successful value-based care delivery model.

The hc1 Precision Health Cloud integrates, normalizes and enhances siloed data from multiple sources and organizes that data into account, provider and patient profiles that streamline complex healthcare relationships. The analytics reveal insights for teams to create strategies, measure progress, and take other actions to achieve their desired care goals.

Ultimately, this connects patient health data sources from various silos in health IT to uncover actionable signals across patient populations that inform individual patient care decisions. JoPM

About hc1

For more than ten years, hc1 has been transforming diagnostic laboratory data into personalized healthcare insights. The hc1 Precision Health Cloud™ has been designed to connect patient health data sources from various silos in health IT to uncover actionable signals across patient populations and cohorts that inform individual patient care decisions. By creating PHINs to organize volumes of live data, including clinical laboratory results, genomics, and medications, hc1 can deliver easy-to-adopt, scalable solutions that ensure that the right patient gets the right test and the right prescription at the right time.

Brad Bostic, Chairman and CEO, hc1

Brad Bostic has been founding, leading, and investing in high-growth technology companies for the past 25 years. Frustrated by the prevalence of one-size-fits-all, trial and error patient care, Brad founded hc1 to save lives, save money, and eliminate wasteful practices with precision health insights that empower patients, providers, and health plans to make tailored care decisions. Recognized as an innovator, investor, entrepreneur, and business advisor, Brad Bostic's transformational leadership has rapidly propelled growth and enterprise value in public and private companies yielding billions in market value. He has been recognized as a premier business leader, awarded as the "2020 Dynamic Business Leader of the Year" by the Indiana Chamber of Commerce, honored as a "Becker's Healthcare Top Entrepreneur" by Becker's Healthcare, and named to Indianapolis Business Journal's "40 Under 40" list of Indiana's high impact business leaders.

Charlie Clarke, SVP, Technology, hc1

As Senior Vice President of Technology, Charlie is responsible for driving execution across the hc1 Engineering and IT Operations. He oversees the development, delivery, and maintenance of new products and features to hc1 applications. In addition, he ensures the continued security, availability, and performance of the hc1 platform. Prior to hc1, Charlie spent 15 years delivering healthcare technology solutions for Anthem Inc. While at Anthem, he led the delivery of a mission-critical enterprise customer service solution for the Medicare program providing 24×7 technology solutions for more than 55 million Medicare beneficiaries. Charlie graduated from the University of Notre Dame with a Bachelors degree in Business Administration.

Dr. Brian D Patty, CMIO, Medix Technology

With over 20 years experience in healthcare informatics, Dr. Patty is currently CMIO at Medix Technology where he is part of the Consulting and Advisory team providing services across the full duration of an organization's Epic journey including implementation planning, implementation project directorship, post-live performance improvement, physician satisfaction and efficiency improvement and Epic optimization. Previously, Dr Patty was Vice President Clinical Information Systems and Chief Medical Informatics Officer (CMIO) at Rush University Medical Center where he oversees the optimization of Epic and related clinical applications.

He was named as one of 30 leading CMIO Experts by Health Data Management Magazine in 2016 and again in 2017 and one of 50 Hospital and Health System CMIOs to Know by Becker's Hospital Review in 2017. Dr. Patty's long-standing quest to promote quality improvement through evidence-based medicine led to an AMDIS Award in 2005 for his success in a CPOE implementation at a community hospital and ultimately to his role as the CMIO for HealthEast. In 2011 Dr. Patty received another AMDIS award for his championing the EHR's role in the quality improvement efforts at HealthEast. He was also named to Modern Healthcare's Top 25 Clinical Informaticists in that same year and was the winner of the 2012 Healthcare Informatics/AMDIS IT Innovation Advocate Award.

Reference

1. Luciano M, Aloia T, Brett J. 4 Ways to Make Evidence-Based Practice the Norm in Health Care. Harvard Business Review. August 2, 2019. Available at http://bit.ly/3bmd11s

Resources for more information

White papers posted by hc1: https://www.hc1.com/resource-categories/whitepapers/

PMLS Webinar On-Demand: https://register.gotowebinar.com/recording/14551359044756227

hc1 on YouTube: Our Vision for Precision Health: https://youtu.be/CWNSCIsDDPY