



THE HEALTH CLOUD DATA ANALYTICS HUB

The Foundation for Effective Healthcare Data Analytics

Production Supported by





EXECUTIVE OVERVIEW

The U.S. healthcare industry is undergoing tectonic change. Market and economic forces, as well as the legacy of the industry's past business and technical practices, are causing every healthcare enterprise to look for untapped opportunities to realize a greater return on data and data infrastructure investments. The historic shift from a fee-for-service-based (FFS) revenue model to value-based healthcare is causing an industry-wide reevaluation of the effectiveness of clinical, business, and financial processes. This transition will allow the industry to serve patients and members more equitably with high quality, cost-effective healthcare services. Healthcare enterprises of all kinds have turned to cloud computing to better leverage their data assets to drive new innovations in analytics and reporting.

To capitalize on this innovation opportunity, healthcare enterprises must partner with vendors who can deliver not only cloud-native technology, but also bring a strong understanding of the unique challenges presented by healthcare data. Healthcare data is highly variable in its formats, expressions, and degree of standardization. The industry's own standards are not always followed; local variants often become the norm inside many organizations. Healthcare data types are proliferating and the data itself is becoming more widely available for uses across the healthcare system. Healthcare is also massively siloed, which has led to enormous data redundancy inside and across different enterprises. Healthcare enterprises must be able to cope with these challenges to effectively source, prepare, and stage this data for healthcare analytics.

This research brief introduces the idea of a Health Cloud Data Analytics Hub. It shows how the combination of cloud computing and advanced tools for healthcare data management can help healthcare enterprises enable both users and developers to do more with data. It describes how cloud and other technology vendors can support organizations with varied skills and people resources available to work on analytics efforts. It will also help set some reasonable expectations for selecting and working with such vendors.



WHAT IS A HEALTH CLOUD DATA ANALYTICS HUB?

Cloud computing – defined as the on-demand delivery of information technology (IT) resources over the Internet with pay-as-you-go pricing – has been widely adopted in healthcare. Instead of acquiring and maintaining computers, storage, and networking, customers access as much of each resource as they need from a cloud provider. It permits a healthcare enterprise to treat its costs as operating expenses (OpEx) in the current year. Adopting this approach enables it to source capacity and IT services from a cloud vendor – a far less onerous process than purchasing and running the same capacity on-premises.

Preparing and staging data for use in analytics and reporting in healthcare is a complex and resource-intensive process. Conventionally, IT personnel with specialized expertise in diverse data management technologies and techniques perform and control this process. Figure 1 summarizes some of the steps and activities involved in creating analytics-ready data from the multiplicity of data sources and systems of record in healthcare.

A Health Cloud Data Analytics Hub can bring automation and orchestration to this process. Importantly, it also empowers a wider set of people to provision analytics-ready data. Many non-programmers who work in clinical, financial, and operational roles in healthcare enterprises are deeply involved in developing applications. Most of them have access to a data warehouse, mart, or data lake but no ability to meaningfully add, change, or enhance these data stores. Instead, they must rely on their IT organization, with its long lead times, to manage every aspect of sourcing and building analytics-ready data. A capability like a Health Cloud Data Analytics Hub, as described in this white paper, can drastically improve an organization's ability to rapidly take advantage of all the data it can access by empowering non-programmers to perform many of the tasks normally done by people with specialized data management skills.



HEALTHCARE INDUSTRY DRIVERS

and economic forces acting on it, as well as the legacy of some of its past business and technical practices, are causing every healthcare enterprise to look closely at its data

The U.S. healthcare industry is changing rapidly. Market assets and practices. Most will acknowledge untapped opportunity to realize a greater return on their data and data infrastructure investments.

Need to Control Health Spending	 Consumers, concerned about out-of-pocket costs, are demanding pricing information Businesses and government searching for ways to make healthcare less costly Broad consensus that healthcare spending growth must be controlled
Expanding Data Availability	 Information blocking rules discourages inclination to hoard data New and emerging data types (e.g., genomics, social determinants, consumer) FHIR becomes a lingua franca across every healthcare sub-sector Greater focus on developer enablement than in the past
Rise of Value-based Healthcare	 Rewards providers for value not volume New care models, care delivery organizations, and hybrid payer-providers Increase access to home- and community-based delivery options Lower cost, higher quality provider networks will succeed
Need to De-siloize healthcare	 Organizations, users, and consumers need to use data from every organization and system of record in healthcare Hundreds of different systems of record create massive data redundancy inside and between different enterprises Clinician burden stems from interacting with too many applications and data sources Leverage advantages of cloud computing models
	Figure 2. Healthcare Industry Drivers Summary







21st Century Cures Act Expands Data Availability

The 21st Century Cures Act (and its follow-on rules) established a base set of requirements for data sharing and interoperability between different kinds of healthcare enterprises and consumers. These new rules promise more straightforward access to healthcare data sources through application programming interfaces (APIs). They define a set of data elements and data types that must be available for authorized uses based on the new standard from Health Level 7, FHIR (Fast Healthcare Interoperability Resources). They also put in place rules against information blocking, designed to disincentivize organizations from refusing access to their data holdings by individuals and other organizations. This new tone on data sharing is welcome news to an industry long frustrated by its inability to fully use its vast data resources. Soon, more and different data will be available for a greater number of use cases around the healthcare system. These expanded data catalogs present an opportunity for organizations to build more effective analytics for their users.

New and Emerging Data Types

A Healthcare Data Analytics Hub should enhance the value delivered by healthcare analytics by using data from newly created or previously untapped sources. For example, genomic data science will soon enable researchers to use

powerful computational and statistical methods to decode the functional information hidden in DNA sequences. Genomics will allow clinicians to tailor medical treatments to the individual characteristics of the patient. Genomics research is expected to generate between 2 and 40 exabytes of data over the next decade. This data, and data derived from it, will have many uses in healthcare analytics.

Consumer-oriented organizations and others not traditionally associated with healthcare increasingly can contribute data for healthcare analytics. Patient-reported data is also becoming more widespread and better able to contribute to data-driven insights. Many parts of the wider healthcare community have also not been major users of IT (e.g., home health and post-acute care) but collect valuable data during their interactions with patients. There is also pervasive belief that valuable data lies fallow in unstructured clinician notes. This free text could supplement structured data for multiple purposes. A Health Cloud Data Analytics Hub should be able to easily accommodate new and emerging data types.

Additionally, the availability and variety of social determinants of health (SDoH) data is expanding rapidly. This high-value data will vary in its sources, formatting, and expressions. Some of space needed, typo originate in organizations not typically associated with healthcare such as credit agencies, large consumer-facing organizations, and



5

community-based civic or religious organizations. Other sources include the U.S. Census, open cities data, grocery-shopping history, or home-town weather information. This data type will be not only be more common but will originate in far-flung parts of the healthcare system. Some of it will be document-based while some may be delivered in discrete, structured forms. Regardless of the format, expression, or source healthcare users and developers will want to make use of SDoH because it gives a more complete picture of each patient than past claims and electronic health record (EHR) data alone.

Value-based Healthcare Requires Strong Provider-Payer Alignment

Existing healthcare business models are evolving rapidly, particularly the relationships between providers and payers. The industry is seeing the rise of hybrid "payviders" and new care delivery entrants that provide more consumer-oriented services into the market. Over the last ten years, the Centers for Medicare & Medicaid Services (CMS) and commercial payers have introduced health plans aimed at moving the overall healthcare system away from FFS payments. Such value-based health plans reward providers and HCOs for meeting or exceeding cost and care quality targets, instead of for the volume of services delivered. This shift in incentives has caused healthcare enterprises to work more closely together to achieve the cost and quality goals of value-based contracts.

Value-based healthcare demands that payers and providers have the same understanding of what is happening with



their mutual patients. They also must be on the same page with respect to progress toward the goals specified in their contracts. The only way to achieve this level of alignment is with solid data-driven analytics.

An important element of value-based healthcare is an emphasis on better coordination of care activities between different healthcare enterprises. For example, most value-based plans aim to help patients avoid utilization in high-cost care venues such as hospitals. Such efforts require community-based providers and hospitals, who often are unrelated business entities, to coordinate their activities and interact differently than in the past. If such value-oriented efforts are successful, patients stay out of hospitals, overall spending is less, and providers earn higher payments. This example illustrates how moving away from FFS, which incents healthcare enterprises to treat patients more intensively, can be less costly and more effective.

Uncontrolled Healthcare Cost Growth

One reason the industry is moving away from FFS-based payments is to help contain healthcare spending growth. Healthcare costs in the U.S. continue to outgrow the economy generally. The strain this growth places on federal, state, business, and household budgets is unsustainable. Many efforts are underway the help address this problem. Healthcare enterprises of all kinds are aggressively searching for ways to become far more effective and efficient at delivering patient care, operating as businesses, and managing risk.

Massive Siloization of Healthcare Data

Healthcare applications and data were purpose-built and designed for a particular organization or function with little thought to reuse. Every healthcare sub-sector has numerous categories of systems of record (SoR), all of which contain data that could deliver value more broadly in the individual enterprise and to many other external organizations.

One consequence of siloization is data redundancy. Many healthcare enterprises create and maintain the identical information about their patients, members, partner organizations, networks, suppliers, etc. several times over. The problem is dramatically multiplied when the focus expands to a wider healthcare community consisting of multiple organizations. This level of redundancy is a genuine obstacle to building and delivering comprehensive analytics. It contributes to the problem of excessive cognitive burden experienced by many healthcare end-users.





HOW CLOUD COMPUTING IMPROVES HEALTHCARE DATA ANALYTICS

Cloud computing has grown explosively over the decade as enterprises seek its benefits: faster time-to-market, rapid innovation, and the freedom to focus on core competencies. More recently, healthcare enterprises have begun to rapidly adopt cloud computing to achieve the same benefits. Forward-thinking healthcare leaders see cloud computing as not just a path to cost and efficiency gains, but as a primary way to better leverage analytics for insights across their connected communities. Cloud computing is delivering numerous benefits to healthcare enterprises today.

Match Costs to Usage

Cloud computing helps organizations closely align their ongoing costs with the value they receive from IT. Cloud computing's pay-as-you-go pricing model allows healthcare enterprises to treat costs as operating expenses (OpEx) in the current year, which means that capacity can be added without competing with other parts of the organization for capital allocations. Cloud computing ensures that an organization is using the most modern and stable technologies, continuously and for the long-term. The healthcare enterprise can avoid spending time and effort on undifferentiated IT-related activities and focus on its core healthcare competencies and constituencies.

Scale Up or Down with Ease

Cloud computing imposes no capacity limits on an organization's use of IT. It can respond quickly as new users, applications, or processing demands arise. Successful applications can be deployed to new parts of an organization rapidly and efficiently. If transaction loads decrease on a seasonal basis, the organization can easily scale back its usage. Healthcare enterprises will no longer need to acquire and operate resources to be always ready for peak loads.

Healthcare Expertise

Deep Understanding of Healthcare Data Complexities

Healthcare has traditionally enjoyed mixed returns on its data infrastructure investments. Healthcare's complex data challenges stem from the large number of standards, vocabularies, formats, and data technologies used in its large variety of systems of record. Healthcare enterprises need the ability to support any combination of healthcare standard,



7





Figure 3. Health Data Technologies, Formats, and Standards

coding system, or local variants to protect investments in their SoR and other applications. They should be able to support incoming and outgoing data regardless of whether it is streamed, comes as a message, is file-based, or is in structured or unstructured documents.

Self-service Data Management Capabilities

In most analytics projects, end-users in healthcare enterprises actively develop reporting applications using commercial business intelligence (BI) tools. For these users, the data they use is presented to them in their data warehouse as a kind of black box. However, they frequently encounter circumstances in which they need access to certain kinds of data that may exist in or out of the enterprise. That necessary data may be inaccessible to them via their data warehouse. They must rely on IT to add the necessary data, invariably a time- and resource-intensive process. These analyst-super-users need tools that work





the same way as their BI tools to source, transform, and stage data from underlying data stores. A self-service data management, made available to users and analytics, would vastly increase the value and utility of all data sources in a healthcare enterprise.

Experience with Healthcare Process Change

An important qualification for any vendor is experience supporting process change inside and across organizations. A healthcare cloud data warehouse vendor should be able to help project teams understand how change affects other parts of the enterprise and its external partners.

Expertise with Diverse Healthcare Sectors

Healthcare enterprises need a technical foundation for building and delivering end-to-end analytics solutions, based on a variety of clinical, administrative, financial, and other healthcare applications and data sources. Healthcare enterprises collectively have numerous patient touchpoints backed up by diverse applications and data sources. Making sense of this cacophony of heavily siloed, often redundant data requires a solid understanding of the processes and workflows used to capture and record it.





Technology and Data Management Expertise

No healthcare enterprise has all relevant data about a patient within its own applications and databases. All must rely on organizations across their connected community to assemble a complete complement of high-quality patient data. A Health Cloud Data Analytics Hub must support data in any relevant healthcare standard, vocabulary, codeset, or valueset that arrives from, or is exchanged with, any organization in the wider healthcare community. It needs to be able to fully normalize and standardize any data to produce clean, computable, analytics-ready data. It should accommodate incoming data regardless of the mode of transmission: streams, files, transactions, or messages.

Enable Analysts and Skilled Users with Data Management Capabilities.

Many healthcare users are already familiar with the no-code, drag-and-drop interface of modern BI tools. Enabling healthcare super users and analysts to source and ingest diverse and disparate healthcare data with a similar capability will greatly expand the utility and value of a Health Cloud Data Analytics Hub. Such a capability would reduce and, in some cases, eliminate their reliance on IT and provide them with a single pane of glass to support their data management, analytics, visualization, and reporting needs.

Ensure Data Quality and Completeness

Data is the critical resource necessary to build effective analytics. Data quality – or the lack of it – determines both the performance and effectiveness of analytics and reporting applications. Ensuring that data is clean, complete, and consistent is an absolute requirement for a Health Cloud Data Analytics Hub.

Solid DevOps Capabilities

A Health Cloud Data Analytics Hub should reflect an underlying philosophy that implementers, developers, and

analysts should receive cloud-native tools and supporting resources to maximize their effectiveness. They should have the ability to develop applications and data flows according to any data integration style or technology to maximize their organization's business or clinical innovation capabilities. Solid DevOps support is a necessary precondition to any successful healthcare analytics and reporting project.

Support Healthcare Data Standards

Healthcare enterprises also routinely receive data in a cacophonous array of healthcare-specific formats,

vocabularies, and encoding. It is commonplace in healthcare for enterprises to have their own variants of wider standards or vocabularies. Enterprises need to be able to ingest and process data regardless of how it is expressed or delivered to the organization. A Health Cloud Data Analytics Hub must be able to support scores of different healthcare standards and expressions to produce standardized and uniform data suitable for downstream analytics use cases and process needs.

Support Rapid Data Provisioning

The bottom line is that a Health Cloud Data Analytics hub should be able to rapidly provision analytics-ready data. In addition, the hub can enable a new class of users to control and manage all the processes needed, regardless of their organizational or application sources, the complexity of the data itself, or how it is encoded or expressed. The capabilities described here will expand an organization's capacity to create and stage consistent, deduped, and high-quality data for analytics.

Hybrid and Multi-cloud Support

Many healthcare enterprises want to be able to blend existing on-premises applications with new cloud-based applications. They may also want to run applications in different clouds. A Health Cloud Data Analytics Hub should meet both requirements. Hybrid and multi-cloud support can be an important consideration for healthcare enterprises

> seeking maximum flexibility or negotiating leverage with cloud and technology vendors.

Enable Real-time Data Availability

Increasingly, healthcare enterprises are finding ways to use data immediately. At the very moment some data is created or captured, applications and users in or out of the enterprise may be able to use it to improve performance or react to specific business or clinical challenges. Predictive analytics that anticipate safety-related

issues in an acute care setting would be an example of where real-time data from sensors or medical-grade devices could help an organization make more effective decisions faster to serve their patients. In a post-discharge scenario, if a payer or a hospital had up-to-the-minute access to patient data from a skilled nursing facility (SNF), either could act to coordinate with the SNF to avoid a rehospitalization or ED visit. Provisioning data for use in real-time involves performing all the steps necessary to make raw data computable – and then staging it for consumption by an application.



By 2025, the CAGR for healthcare data will reach



10

CONCLUSION

The Health Cloud Data Analytics Hub described here can be a major contributor to better organizational performance. It provides a solid foundation for seeding clinical, financial, or operational workflows with actionable data and insights. Healthcare enterprise will be better prepared to undertake performance improvement programs of any kind, because data-driven insights will be more widely available to users inside and out of their organization.

The Health Cloud Data Analytics Hub will address some of the shortcomings of conventional, on-premises-based, IT-driven efforts to deliver analytics and reporting. It will empower non-technical people to assume many data management responsibilities. Effectively, it will enable user organizations to assume responsibility for data-related tasks normally performed by highly specialized technical personnel. This will reduce the time required to provision data for use in analytics and increase the organization's capacity to support more applications and downstream uses with better applications.

The Health Cloud Data Analytics Hub will deliver enhanced abilities to rapidly provision analytics-ready data from the low quality, non-standards adherent raw data sources so common in healthcare. Ultimately, the Health Cloud Data Analytics Hub allows healthcare enterprises to realize a better return on their investment in data and data infrastructure. The cost advantages of the public cloud, coupled with democratized healthcare data management capabilities, means that the healthcare enterprise will be able to accelerate value production from its siloed, redundant data sources. Further, opening up data access to a broader set of non-IT professionals will accelerate time to insights and improve the iterative process that often underpins innovations in clinical, operational, and financial models and process, propelling value-based healthcare outcomes.





About the Author



BRIAN MURPHY - REPORT AUTHOR

Director of Research

Brian Murphy joined Chilmark Research as an industry analyst in August 2012 and brings a wealth of experience to the table. He is an outspoken advocate for true interoperability being the key to unlocking the potential of health IT and has centered the majority of his research efforts with Chilmark around this subject. He also currently heads research for the Analytics domain.

Brian has worked in the IT business for over 25 years, beginning his career in the field-sales organization of IBM. He then joined Yankee Group as an analyst, where he managed an enterprise software service and led research on the dynamics of the database market. Leaving Yankee, Brian joined Eclipsys prior to its acquisition by Allscripts in 2010. At Eclipsys, Brian worked with product managers to refine and harmonize value propositions in light of the organization's broader goals.

Brian is a graduate of both Harvard College and Suffolk Law School. When not thinking about health IT, he's a runner and armchair Boston historian.

CONTACT BRIAN

Email: <u>brian@chilmarkresearch.com</u> Schedule: <u>Book a Meeting</u>





ABOUT CHILMARK RESEARCH

MISSION

Improve the delivery of care and the patient experience through the effective adoption and use of IT. Leveraging our expert knowledge of healthcare and healthcare IT to guide the industry into the 21st century.

DEEP DOMAIN EXPERTISE

Chilmark Research is a global research and advisory firm whose sole focus is the market for healthcare IT solutions. This focus allows us to provide our clients with the most in-depth, objective research on the critical technology and adoption trends occurring throughout the healthcare sector. Areas of current research focus include among others: Analytics, Artificial/ Augmented Intelligence and Machine Learning, Care Management & Coordination, Clinician Network Management, Cloud-computing Models for Healthcare, Consumerization of Care, Patient Enaggement, Interoperability, Payer-Provider Convergence, Population Health Management, and Value-based Care.

OUR APPROACH

Using a pragmatic, evidence-based research methodology with a strong emphasis on primary research, Chilmark Research structures its reports to serve the needs of technology adopters, consultants, investors and technology vendors. In addition to reports for the general market, CR performs research for clients based on their specific needs. Such research has included competitive analyses, market opportunity assessments, strategic assessment of market and vendors for partnership and/or acquisition.

OUR SERVICES

From its inception in 2007, CR has offered its research reports for individual purchase and aided clients with expert insights through customized consulting projects. In 2012, Chilmark Research launched the Chilmark Advisory Service (CAS) in direct response to clients' request for a continuous feed of research on the most pertinent trends in the adoption and use of healthcare IT. This annual subscription service provides not only access to our research reports throughout the year, but also direct access to Chilmark Research analysts to answer specific client needs. Please contact us directly for further information about CAS.

CLIENTS AS PARTNERS

Chilmark Research is proud of the clients it has had the pleasure to serve including Abbott Labs, Allscripts, Anthem, athenahealth, Bain, Cerner, Cleveland Clinic, Epic, HCA, Health Catalyst, Highmark, IBM Watson Health, Kaiser-Permanente, Mayo Clinic, McKinsey, Medtronic, Merck, Microsoft, and Verizon to name a few. Regardless of the form an engagement takes, we always view our clients as crucial partners in executing on our mission to modernize healthcare delivery for an improved experience and better outcomes for all.

CONTACTING CHILMARK

- 占 John Moore III, VP of Growth Strategy
 - 🗾 (617) 823-7623 (Direct)
 - 🗾 (844) 969-4687 (Office)

🔁 john3@chilmarkresearch.com





One Beacon Street, 15th Floor Boston, MA 02108 www.ChilmarkResearch.com info@chilmarkresearch.com 617.615.9344