

Cloud-based Analytics:

Supporting Healthcare's Digital Transformation



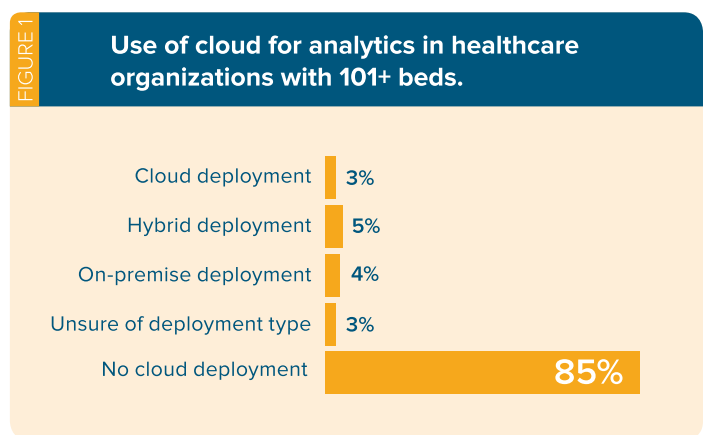
In healthcare analytics, size matters. The volume and complexity of digital healthcare data grows exponentially each year. Factors driving this big-data scenario include changes in the payer environment, such as incentives for the meaningful use of electronic health records (EHRs) and a shift toward value-based payments.

Technology changes are also driving data increases as patients employ the latest in mobile digital devices, including activity monitors and chronic disease monitoring applications such as blood glucose trackers for diabetics. Growth in the use of Internet of Things (IoT) applications and the use of patient genomic information are also increasing healthcare providers' data-storage and data-analytics needs.

Healthcare providers need big technology to manage and analyze this big data. But the healthcare industry has been slow to embrace technologies – such as using the cloud for analytics – that could help them leverage their growing information assets. Cloud vendors, like Amazon Web Services, offer data-storage capacity and analytics

functionality that on-premise deployments cannot match. However, a recent HIMSS Analytics survey, *Analytics and the Cloud in Healthcare*, revealed only 3 percent of surveyed healthcare providers with 101-plus beds have deployed a cloud-based model for analytics (see Figure 1).¹

“The digital transformation of healthcare is only going to be possible by embracing the cloud,” said Shez Partovi, MD, chief health information officer, vice president of informatics, Dignity Health. “But healthcare is moving very cautiously.”



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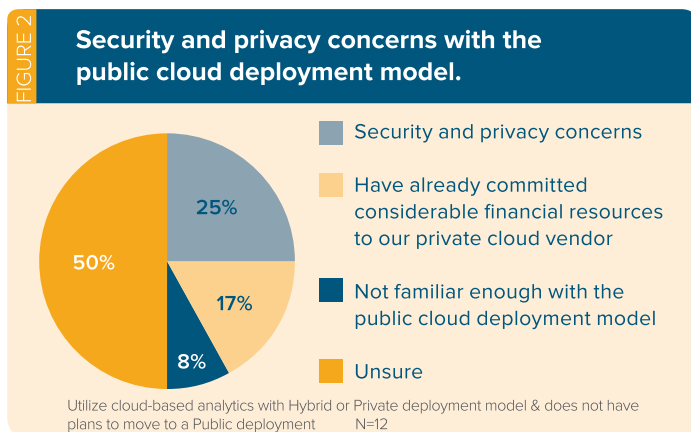
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Chief Health Information Officer & Vice President, Informatics
Dignity Health

Resistance to deploying cloud analytics

In HIMSS Analytics’ survey of healthcare providers, only 15 percent indicated they have plans to adopt a cloud-based model for analytics within the next two years.² In many cases, the very characteristics that make the cloud ideal for healthcare analytics are the same characteristics that give healthcare providers pause. By definition, use of the cloud moves the data center infrastructure outside of the organization. The cloud offers on-demand delivery of IT resources and applications – including compute, storage and database services – via the internet. Therefore, cloud usage moves healthcare providers out of the business of “racking and stacking.”

Outsourcing the ownership and maintenance of the data center to a cloud vendor can solve many problems for healthcare organizations. However, the outsourcing of data center operations is also a source of concern for providers. In the HIMSS survey, security and privacy concerns topped the list of reasons why providers have not planned a move to cloud deployment (see Figure 2).³



“Everyone in healthcare is concerned about cybersecurity,” said Lee Kim, director of Privacy and Security for HIMSS North America. “There is less of a comfort level in

healthcare with trusting a third party, such as a cloud provider. If you don’t have the assurances you need with regard to security practices, policies and procedures, you might decide, ‘I want it all in-house.’”

The healthcare industry is understandably risk-averse. Almost every aspect of healthcare is regulated, particularly protected health information (PHI) under the Health Insurance Portability and Accountability Act (HIPAA). HIPAA breaches can be expensive, incurring costs for providers including breach investigation, remediation and regulatory fines from the Office for Civil Rights, regulatory fines from the Attorney General’s Offices and class-action lawsuits.⁴

“Healthcare operates under a two- to three-percent margin,” said Partovi. “That by itself makes the industry risk-averse.” A Ponemon Institute study estimated the average cost to respond to and remediate a data breach is \$3.8 million.⁵ Furthermore, the report noted the per-capita cost of a data breach in healthcare is the highest of the 16 industry verticals studied.⁶

“Even with activities that don’t involve PHI, we do a dance with cloud providers,” he said. “Healthcare systems are wondering how much liability they want to accept or displace, and what requirements about ownership and access they want to maintain. No real precedent has been set as to how a major cloud healthcare breach would shake out.”

Benefits of cloud-based analytics for healthcare

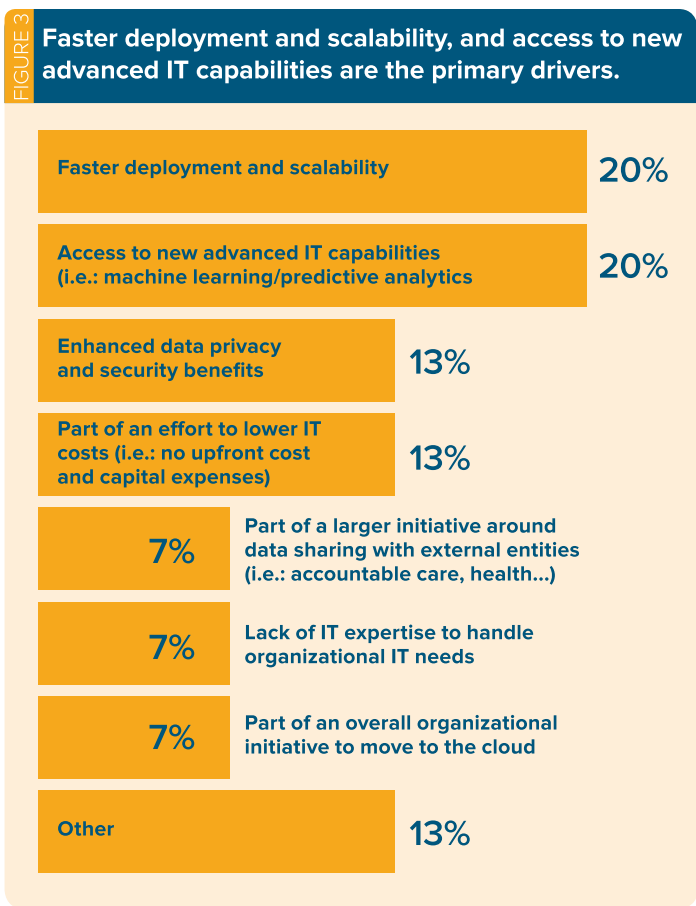
Nevertheless, the pull toward the cloud for healthcare analytics is compelling. In the survey, the top four drivers identified by organizations considering cloud-based analytics included faster deployment and scalability;



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Director, Privacy and Security
HIMSS North America

access to advanced IT capabilities such as machine learning and predictive analytics; lower IT costs (i.e., no upfront cost and capital expenses); and, ironically, to enhance data privacy and security benefits (see Figure 3).



The fact that data privacy and security is considered both a “pro” and a “con” with respect to cloud deployment is not as surprising as it may seem. Although not all cloud providers are alike, large, well-established cloud providers may offer superior security in comparison to what healthcare providers can develop in-house. “There are so many emerging threats and vulnerabilities,” said Kim. “Most healthcare institutions are concerned about patient care and compliance from an operational perspective. They don’t

have the time and resources to devote to cybersecurity that an established cloud provider might have.”

As a clinician, Partovi sees three powerful reasons for moving healthcare analytics to the cloud: scalable data storage, scalable computing power and machine-learning capabilities. “Those three points are what make the cloud ideal for analytics in healthcare,” he said.

Scalable data storage

“Healthcare has an amazing ability to generate data, from textual patient data, to image data, to video,” Partovi said. “A cloud provider has the ability to scale data storage.” Accommodating increasing data storage needs in-house means up-front capital expenses. The cloud uses a pay-as-you-go model, so organizations aren’t constantly investing in new hardware and services.

Scalable computing power

“Whether it is clustering of data to look at trends or other types of analytics, computing power requires large amounts of RAM,” said Partovi. “Cloud-services providers have the ability to provide a really rich environment for scaling your computing power, so you can compute on a scale that is meaningful and, ideally, real time.”

Machine learning

Machine learning – the capacity of computers to construct predictive algorithms based upon patterns in the data – is becoming an important tool as healthcare providers seek ways to improve patient outcomes. “Machine learning is something healthcare providers can’t do in a data center of their own,” he said. “Machine-learning platforms are offered by the big cloud-services providers because they have the scale to support them.”

The combination of big data and machine learning may hold the key to some of healthcare's most intractable problems. Partovi envisions a time when the combination of big data and machine learning will provide real-time predictive information about, for example, which patients in the intensive care unit may be most likely to die from overwhelming infection (sepsis). The Centers for Disease Control and Prevention state there are more than 1 million cases of sepsis each year in the United States, leading to more than 258,000 deaths annually.⁷

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| Shez Partovi, MD

“By the time the physical manifestations of sepsis start to appear, it's sometimes too late to help the patient,” he said. “Somewhere, buried in the data – in the blood values, the blood-pressure values, the heart rate, the temperature – is a prediction that *this* patient is heading toward an overwhelming infection and is likely to die. If you could predict that, you could intervene very early, making it less likely the patient would die.” Partovi said although some predictive modeling related to sepsis is already underway in the U.S., there is more work to be done.

The cloud: the future of healthcare analytics

Partovi believes the demand for innovation in healthcare will ultimately break down the stalemate between healthcare

providers and cloud-services providers and lead to increased cloud adoption.

He pointed to a recent study of medication adherence among asthmatic children. It is known that children who do not adhere to their prescribed medication regimen are more likely to present in the emergency room with acute asthma attacks than medication adherent children. In the study, participants' inhalers were equipped with Internet of Things (IoT) technology that uploaded medication adherence data to the cloud. When participants were not adhering to their medication regimen, alerts went out to the children and their care managers. By reminding the children to take their preventative doses and alerting care managers to follow up, providers were able to head off acute attacks before they happened. “Medication adherence improved,” Partovi said. “The cost of care went down. The quality of care went up. The children were happier, and their parents were happier.”

Partovi believes innovations like these are a harbinger of what is to come. Scaling of these innovations to reach the larger population will require the resources of the cloud. “This study is a real-life example of bending the cost/quality curve and leveraging digital transformation,” he said. “We can't do this with the legacy thinking of having a spinning disc in our own data center. We need partners who can scale, and those partners operate in the cloud.”

- ^{1,2,3} Healthcare Information and Management Systems Society (HIMSS). (2015). Analytics and the Cloud in Healthcare.
- ⁴ HIPAA Journal. (2015, April 30). Calculating the cost of a HIPAA data breach. HIPAA Journal. Retrieved from <http://www.hipaajournal.com/calculating-the-cost-of-a-hipaa-data-breach-6534/>
- ^{5,6} Ponemon Institute© Research Report. (2015). 2015 Cost of Data Breach Global Analysis. Retrieved from <http://www.prnewswire.com/news-releases/ponemon-institutes-2015-global-cost-of-data-breach-study-reveals-average-cost-of-data-breach-reaches-record-levels-300089057.html>
- ⁷ Centers for Disease Control and Prevention. (2015). Sepsis questions and answers. Retrieved from <http://www.cdc.gov/sepsis/basic/qa.html>



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