Healthcare's Future is in the Cloud

What do we know about the future of healthcare? While no one can predict exactly what the healthcare industry will look like 10 – or even two – years from now, a few predictions are emerging based on current industry trends. For example, it is likely that:

- Healthcare provider reimbursement will reward value rather than volume;
- Providers will increasingly rely on data and analytics to improve patient outcomes and increase the cost-effectiveness of service delivery; and
- Collaboration among all stakeholders – providers, payers and patients – will be essential to realizing optimal patient outcomes.

Based on these predictions, a fourth prediction is possible: the industry will not be able to deliver the healthcare of the future without the cloud. The value-based, data-based, collaborative healthcare industry of the future will require an affordable technology infrastructure that supports business agility, innovation and collaboration. This is exactly what the cloud has to offer: information technology (IT) resources, delivered on-demand, over the internet, with pay-as-you-go pricing and no lock-in or long-term contacts.

The value proposition

Before electronic health records (EHRs), patient data was maintained in miles of paper files that threatened to consume every square foot of extra space in a provider's facility. The file-folder era has been followed by the digital-data era, wherein providers have replaced millions of square feet of file folders with millions of square feet of servers in on-premise data centers. Today's technology trends, however, may end up turning those on-premise data centers back into patient-care spaces, as providers turn to cloud-based technology to support patient care.

"Healthcare organizations have to improve their value proposition by delivering higher quality care at a lower cost," said John Halamka, MD, chief information officer (CIO) at Beth Israel Deaconess Medical Center. "It is impossible to do that by hosting on-premise hardware. It's capital intensive, and there are security, physical and logical issues. The staff required to maintain the equipment and the applications is expensive and hard to hire and retain. The cloud provides an alternative. There are cost and quality and security imperatives to move to the cloud. It's really not even a choice."

On-premise data centers are not only expensive, they are also slow to deploy, making it difficult to keep up with advances in technology. "Technology changes so rapidly," said Halamka. "Sometimes I'm asked, 'Why can't you keep everything reliable and secure? ... while changing it continuously?'" As CIO of Beth Israel Deaconess Medical Center, he oversees information technology (IT) at 450 different locations, including affiliate sites. "Trying to maintain modern, innovative products at 450 sites is an impossible task, whereas with the cloud, the ability to provide updates and optimization is provided from a centralized location. It's much more scalable for a CIO to procure that service than to try and do it on their own."

Mark Johnston, director of global business development, healthcare and life sciences at Amazon Web Services

> *"Because the cloud is pay-as-you-go with no lock-in, as soon as new technology is available, you can immediately switch to new technologies if it makes business sense. That is really important as progress continues to be made in areas like event-driven computing and serverless computing."*
>
> **Mark Johnston** | *Director of Global Business Development* | *AWS*

(AWS), agrees that on-premise infrastructure can negatively impact an organization's technical agility. "With on-premise infrastructure, the moment you buy it, you risk technology obsolescence," Johnston said. "You are encumbered by the type of processor you purchased or the amount of RAM you have. Because the cloud is pay-as-you-go with no lock-in, as soon as new technology is available, you can immediately switch to new technologies if it makes business sense. That is really important as progress continues to be made in areas like event-driven computing and serverless computing."

Placing an organization's technology infrastructure in the cloud allows healthcare organizations to reduce capital investments in IT and refocus on their core business: providing high-quality healthcare to patients. "Capital is hard to come by in healthcare today," said Halamka. "Asking your board for a $10 million capital infusion is very, very hard. And small doctor's offices have an even harder time coming up with the funds for capital investment. Migrating from the practice of making massive investments in hardware or licensed software to the idea of buying your technology infrastructure as a service, where you only pay for what you use, is a much more scalable and agile model than anything we've had before."

Managing big data and gaining insight

The healthcare industry of the future will also be characterized by an increasing reliance on big data and analytics to both optimize patient outcomes and deliver services cost-effectively. Data storage is an issue that providers are grappling with as the size and volume of patient data increases exponentially. The widespread adoption of EHRs, the burgeoning number of connected health devices, the immense increase in imaging file sizes and the new wave in genomic medicine are all contributing to increases in the amount of data healthcare organizations need to manage.

"My challenge today is that I am getting telemetry from patient homes, I'm collecting data from three thousand doctors and I'm capturing thousands of digital images," said Halamka. "I'm exceeding the physical and logical capacity of a lot of systems to store that data in one place. But major cloud services providers offer services that distribute data across multiple processors, in multiple physical locations, so that you are able to increase to multi-petabyte scale. The scale of what we have to do with data in healthcare today exceeds the capacity of any one organization to do it on their own."

Healthcare data management involves not just scalable storage, but also data security. Data security includes disaster management and security against bad actors on the internet. Halamka believes that a cloud-based technology infrastructure bests on-premise infrastructure in both of these areas.

"The cloud provides a geographically diverse storage of your data and hosting of your applications," Halamka said. "It is much more resilient to any one regional issue, such as fire, flood or earthquake, than an on-premise data center could be." With respect to internet threats, he said, "I have five security professionals who work with me and keep my infrastructure from being hacked. Most of the major cloud services providers have thousands of security professionals. If a new threat emerges on the internet, who do you think is going to know about it first? My five guys? Or the major cloud services provider? Because of that, it is actually risk mitigation to move to the cloud, rather than an increase in risk."

The cloud also supports robust tools and applications that help healthcare organizations pull actionable insights from patient and business data. After all, merely collecting large amounts of data is not an end in itself. For that data to be

valuable, a healthcare organization has to have the ability to pull meaningful, actionable insights from that data. The cloud supports many analytics solutions that help healthcare organizations accomplish that task.

Collaborative healthcare

Patricia Mechael, executive vice president of the Personal Connected Health Alliance (PCHAlliance), a HIMSS organization, understands the importance of patient engagement and collaboration to the future of healthcare. PCHAlliance supports the personalization and optimization of health by leveraging technology in a way that enables people to take personal responsibility for their own health, according to Mechael. Mechael sees the proliferation of wearable devices as a positive trend that demonstrates how patient access to personal health data via the cloud can be used not just to treat disease, but to prevent disease by encouraging patient engagement. "From a prevention perspective, we're starting to see a lot of technologies being used to create healthy competition among people using various wearables to track things like steps, sleep patterns and other behavioral health, and wellness and fitness activities. That alone is increasing healthier behavior among individuals, and a lot of that is facilitated through cloud-based technologies," she said.

Cloud-based services play a critical role in enabling access to healthcare information across the continuum of care. "When you are looking at improving the quality of care or health outcomes, it is really important to consider how data is accessed, shared and updated so you can get a complete picture of each individual's health. The cloud enables the ability to combine data from multiple sources – the patient, other providers and caregivers – in new and interesting ways that provide greater insight into everything from how individuals can prevent disease to individualized treatment recommendations," said Mechael.

Clear vision of the future

Halamka has a clear vision of the future of healthcare, in which value-based reimbursement, data-based clinical decision support and patient-provider collaboration all come together to facilitate more effective care delivery and better patient outcomes.

"If we are going to be paid purely based on outcomes, I think we'll evolve beyond the EHR to what I'll call the post-EHR era," he said. "I think we will see a seamless integration of telemetry and wearable devices that the patient has in their home, with cloud-hosted services and decision support. If you are healthy, these services will be designed to keep you healthy, rather than to simply treat you when you are sick. If you have a given disease or a given problem, the patient and the patient's healthcare providers are going to track the patient's progress against a care plan, guideline or protocol. This will all be done with cloud-hosted services."

Johnston agrees that doing business in the cloud will soon become "the new normal" for healthcare organizations, pointing out, "The cloud provides a growth pathway for the future."