Big Data in Health Care

Educational Briefing for Non-IT Executives

Executive Summary

Rapid adoption of electronic health records (EHRs), the rise of consumer mobile devices, and increasing use of clinical biometric sensors are generating floods of new data at unprecedented sizes and varieties. This "big data" challenges traditional database technologies with both its volume and variety of formats. New "big data" technologies are designed to manage and drive value from this new flood of data. Big data isn't right for everyone; HCOs[1] need to weigh the potential benefits of tapping into new kinds of data against the cost and complexity of adding a relatively young and rapidly changing set of technologies into their IT portfolios.

What is big data?

Big data is defined by three main characteristics: it is high volume, must be acquired at high velocity, and is composed of a wide variety of data types. These traits make big data challenging and often expensive to manage on traditional platforms. These traits are referred to simply as the three "Vs":

Volume
The physical size of the data and number of records are dramatically higher than what is typically managed on a traditional data system.

Velocity
Data is received in near real time or as a continuous stream and should be made available to inform decisions as quickly as possible (predictive, prescriptive analytics)

Variety
Data includes structured records, unstructured text, images (medical imaging), audio, video, and biomedical sensor traces.

An implied fourth "V" represents the intrinsic *value* the data can provide if it is analyzed properly. "Knowledge discovery"[2] techniques are a common way organizations unlock insights hidden in big data. Data mining and machine learning algorithms mine these mountains of data to find new relationships and models that predict future outcomes, deriving meaning from raw data. Big data platforms change the economics of data at scale to make storing and analyzing these previously untapped data assets technically and financially practical.

How could big data improve health care?

Big data can open up a much broader universe of data for operational analysis, predictive modeling, and clinical research. Medical researchers may be able to derive better predictors of stroke, acute heart failure, and other serious conditions from the streams of biometric data we are capable of capturing. Genomic medicine has the potential to help personalize treatments to the individual, improving the efficacy and safety of medications and other interventions. Social media has already been shown to be effective as an early indicator of disease outbreaks. Data from wearable devices may be able to refine risk projections and identify deterioration in some conditions.

Examples of Health Care Applications of Big Data

- Demand projection for emergency departments
- Prediction of acute health events such as strokes, seizures, and heart attacks
- Readmission risk prediction
- Patient engagement and care plan adherence
- Precision Medicine
- Research into the genetic and behavioral causes of disease
- Disease outbreak prevention

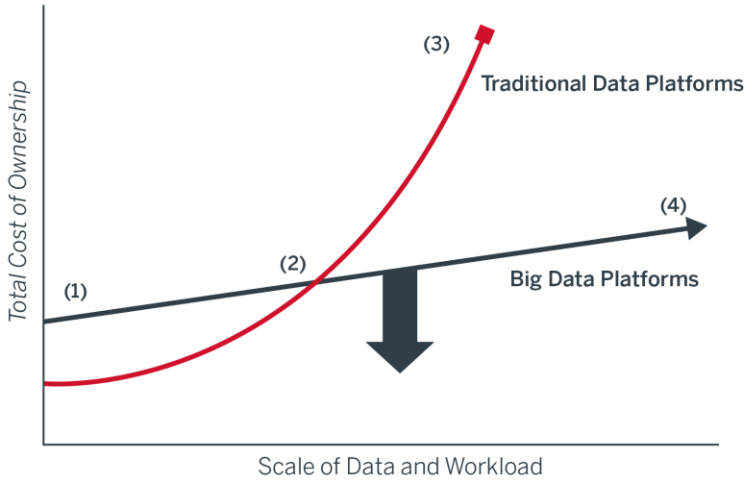
Source: Health Care IT Advisor research and analysis.

1) HCO = Health care organizations; 2) Knowledge discovery is a broad field that includes data mining, machine learning, and other techniques.

Why is it important?

Big data has the potential to improve on the many demonstrated successes of traditional analytics in health care. Bringing new data sources to bear may accelerate medical research, improve clinical and financial risk projections, reveal new operational efficiencies, and more closely tailor clinical decisions to an individual patient's biology and disease state. Retail, marketing, manufacturing, transportation, and politics have already incorporated big data techniques into their operating models, and a number of health systems are incorporating it into their research programs.

Big Data Technologies: Cost vs Scale



1. At modest scale, traditional platforms can have lower costs due to greater maturity and skills availability. Most health system and payer analytics based on traditional patient chart or administrative data live within this region.
2. As scale increases, traditional platforms are forced onto higher-end, less cost-efficient hardware. Details vary by vendor and usage, but cost curves frequently cross in the tens to hundreds of terabytes.
3. Beyond a certain point, no "bigger box" exists to support the growth of the traditional platform. A horizontally scalable big data platform can continue adding commodity hardware incrementally.
4. Big data platforms can address workloads far beyond the scale traditional platforms can reach.

How does big data affect health care providers and IT leaders?

Big data has been successfully deployed in several industries, but the technology is still maturing rapidly. IT leaders should weigh several factors before jumping into the technology. First, there is a currently a shortage of staff experienced with big data, which drives up salaries and can make retention a challenge. Prepare for this and start your search in advance, if possible. Numerous big data technology startups are competing in a very crowded technology landscape, so IT leaders need to plan for the potential sunset or acquisition of their selected vendor. Consider contingency plans in the event of a fall out. New data platform technologies often lag in their integration with enterprise IT management tools for monitoring, backups, and tuning. As an organization determines whether a move into big data is right for them, IT leaders should help realistically evaluate their organization's overall readiness, evaluate the capabilities of incumbent platforms, realistically rank analytics priorities, select vendors, and finally, execute the implementation. Technology is ever changing, so you can guarantee big data will follow suit.

Questions That Hospital Executives Should Ask Themselves

1. What clinical, financial, or operational outcomes are we interested in improving through big data analytics?
2. Does my organization have the capabilities to be successful with big data analytics?
3. What kind of contingency plan do we have in case our big data vendors don't work out?

Additional Advisory Board research and support available

Report: Big Data in Health Care

Report: The Business Intelligence Maturity Model

This report does not constitute professional legal advice. The Advisory Board Company strongly recommends consulting legal counsel before implementing any practices contained in this report or making any contractual decision regarding suppliers and providers.

Source: Health Care IT Advisor research and analysis.