

Application of “Big Data” in Today’s Healthcare Environment

In the first three installments of this four part HC Topics Series, the concept and relevance of “Big Data” was discussed within the context of the current healthcare delivery system in the U.S. The evolution of big data’s application to healthcare, the potential impacts on privacy and accountability regulations, as well as the reimbursement and regulatory implications were evaluated. While there is potential for significant impact of big data on these various segments of the healthcare delivery system, the question remains: how exactly can big data be harnessed to change and improve our current delivery of care to consumers? This final installment of this series will discuss how big data in healthcare will directly impact various stakeholders, and its practical application to medical research; quality of care; and, healthcare delivery.

The potential research areas considered for use of big data include the fields of comparative-effectiveness (CER) and outcomes research, and the research and development (R&D) arena. The former type of research is growing in importance as healthcare reform moves toward enhanced evaluation of providers with quality, efficiency, and outcome measures for patient care. Refer to the article regarding medical reversals in this issue of HC topics for a more in-depth discussion of the impact this type of research can make on informing appropriate medical care. By utilizing large datasets containing patient information, cost, and outcome data, CER can be better leveraged to inform providers of best practices to reduce inappropriate treatment or care regimens.¹ The R&D field is another area of research with the potential for making a tremendous impact on healthcare, and which can benefit from utility of big data. One study posits that by using and analyzing big data tools such as predictive monitoring and algorithms with clinical trial data, disease patterns, and genomic data sets to inform the emerging field of personalized medicine, the healthcare sector could reduce expenditures by approximately \$25 billion.²

In addition to the continuing need for medical research to improve care and treatment regimens, practical implications of changes affecting the reimbursement and regulatory environments (discussed in the previous installment of this series) are of increasing importance within the context of healthcare reform implementation. One of the many changes that will impact providers and

consumers is the increase provider transparency via public availability of certain healthcare data. Recent efforts from the Centers for Medicare and Medicaid Services (CMS) and the Centers for Disease Control and Prevention (CDC) highlight some of the successes in publicly releasing health data.³ This publicly available data serves the purpose of better informing consumers of their healthcare providers’ performance, and in turn, encouraging competitive drive among providers to improve facility performance for reported measures.⁴ Part of this competition revolves around the advent of Value Based Purchasing (VBP), developed as a means of holding facilities accountable for improving metrics that the healthcare system is struggling to improve: cost containment; efficiency; productivity; and, quality of care. The application of big data to improve these focus areas is also affecting healthcare and public health outside of VBP. As an example, the introduction of digital epidemiology for disease surveillance, tracking and controlling outbreaks such as H1N1 influenza, Severe Acute Respiratory Syndrome (SARS), and more recently, H7N9 influenza and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV), has become more real-time, and thus, more effective for identifying cases and implementing appropriate control measures.⁵ While many of these technologies have been in existence for years, the medical field has been slow to adapt them for practical use, inadvertently slowing the transition of knowledge from research to bedside. It is possible that VBP may provide the stimulus needed to facilitate the more widespread use and dissemination of knowledge gained by big data use and analytics, allowing providers to expand and disseminate knowledge to improve personalized medicine and patient-centered, evidence-based care.⁶

“Big data” has been successfully leveraged in several different industries to improve efficiency and quality of processes and work. Although the healthcare market has been relatively slow to adopt big data in comparison to others, it is rapidly being recognized as the next frontier for enhancing patient care. A recent article went as far as to state that, “*The advent of big data in health care marks a critical turning point for healthcare providers: Those that seize opportunities to use big data in improving value will become market leaders, and those that do not will likely be left behind.*”⁷

One analysis found that the cost savings recognized by early successes in utilizing big data over the past few years, when annualized, could account for \$300 to \$450 billion in reduced healthcare expenditures.⁸ As demonstrated by the examples noted throughout this series, the opportunities for the utility of big data within various areas of the healthcare industry are virtually limitless. And while various barriers still exist that impede the adoption of big data analysis to inform better care, several applications of big data already active within the healthcare system have succeeded in changing care for the better.⁹

¹ “Big Data: The Next Frontier for Innovation, Competition, and Productivity”, by McKinsey Global Institute, June 2011, p. 44

² *Ibid*, McKinsey Global Institute, June 2011, p. 47

³ Refer to the CMS “Hospital Compare” website

<http://www.medicare.gov/hospitalcompare/search.html>, and the CDC “National Healthcare Safety Network” <http://www.cdc.gov/nhsn/dataStat.html>

⁴ *Ibid*, McKinsey Global Institute, June 2011, p. 45

⁵ “Influenza A (H7N9) and the Importance of Digital Epidemiology”, by Salathé, et al., *The New England Journal of Medicine*, July 3, 2013 (e-pub), DOI: 10.1056/NEJMp1307752, p. 1-3

⁶ “The Inevitable Application of Big Data to Health Care”, by Travis B. Murdoch and Allan S. Detsky, *Journal of the American Medical Association*, April 3, 2013, Vol. 309, No. 13, p. 1351-1352

⁷ “Transforming Care Delivery with Big Data”, by Keith D. Moore, Katherine Eyestone, and Dean C. Coddington, *Healthcare Financial Management Associates*, August 2013, <http://www.hfma.org/Content.aspx?id=18550> (Accessed August 8, 2013)

⁸ “The Big-Data Revolution in US Health Care: Accelerating Value and Innovation”, by Basel Kayyall, David Knott, and Steve Van Kulken, *McKinsey & Company*, April 2013, p. 5

⁹ “Building Trust in the Power of ‘Big Data’ Research to Serve the Public Good”, by Eric B. Larson, *Journal of the American Medical Association* (June 19, 2013), Vol. 309, No. 23, p. 2443-2444



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