



# Harnessing the Power of Big Data in Healthcare

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The Internet age has afforded anyone with a cell phone, laptop, or other electronic device access to more information than most people are able to manage comfortably. Conversely, those devices, which are such an indispensable part of modern life, also provide unprecedented, ongoing access to countless pieces of personal information. Those ubiquitous membership cards and key tags for the local supermarket, Fitbit tracking your physical activity, and the app that leads you to the shoe sale in the department store as you are walking past it are all part of the enormous enterprise of collecting, analyzing, and interpreting disparate pieces of information that fall under the umbrella of “big data.”

By now, most people are aware of the many uses of big data and the virtual impossibility of going “off the grid.” Websites such as *youarewhatyoulike.com* are able to generate personality profiles in less than a second by comparing readily available personal information on Facebook with a vast trove of data on other users. Even older, established companies, such as 107-year-old United Parcel Service (UPS), are using sophisticated information to improve their systems and services. UPS makes use of special telematics sensors in more than 46,000 company trucks to track speed, direction, braking, and drivetrain performance.

In addition to tracking daily performance, this tidal wave of data allows the company to redesign each driver’s route so that the company was able to cut 85 million miles off of its pickup and delivery routes and save 8.4 million gallons of fuel in 2011.<sup>1</sup>

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Experts believe that a convergence of 3 factors has given rise to the notion of big data. These factors include tools that can treat almost any digital signal as useful data, increasing the means to gather such information, and ever-cheaper analytic power. Recent articles in leading management journals, such as *Korn Ferry Briefings*,<sup>1</sup> the *Harvard Business Review*,<sup>2</sup> and *McKinsey Quarterly*,<sup>3</sup> have all highlighted the explosive growth of big data.

In his article in *Harvard Business Review*, Thomas H. Davenport, MA, PhD, described the traditional types of analytics as “descriptive, which reports on the past; predictive, which uses models based on past data to predict the future; and prescriptive, which uses models to specify optimal behaviors and actions.”<sup>2</sup> Dr Davenport stressed the importance of prescriptive analytics, because it allows for large-scale testing of modeling, and offers opportunities to embed analytics into processes to help improve employee performance.

Can we find some healthcare equivalence regarding the use of big data? I think many such examples already exist, especially in the area of so-called mHealth (mobile health). For example, large managed care organizations, such as Aetna and UnitedHealth Group, have already jumped into the mHealth arena.

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Aetna acquired iTriage, which allows patients to check symptoms, find doctors, make appointments, and do medical shopping—all online. UnitedHealth Group, the nation’s largest insurer, is working with a few innovative mHealth companies, such as CareSpeak Communications, and has provided the Health4Me app. Health4Me helps patients find the most convenient healthcare provider using global positioning system (GPS) location, supplies current and personalized data on claims, and enables members to compare services and treatments based on quality and cost.<sup>4</sup> Imagine if one could compile data on millions of patients using the Health4Me app. We could perhaps predict the next flu outbreak and be prepared in certain zip codes to tackle these challenges.

Other health researchers claim that mHealth could actually lower healthcare costs and increase quality by<sup>4</sup>:

- “Facilitating communication with populations traditionally difficult to reach
- “Personalizing and targeting messages that better engage patients, allowing them to make better care decisions
- “Providing real-time lifestyle data through specific apps, such as those that can track physical activity for vulnerable populations, such as smokers; GPS locations of asthma sufferers; and instant blood glucose readings for diabetic patients.”

Finally, I believe we can integrate clinical, medical, and public health electronic systems to potentially enable providers, payers, and other stakeholders to better coordinate care for the entire community. When we connect big data and mHealth, are we practicing a new type of medicine, a sort of Population Health 2.0? Population Health 2.0 may be very important for any organization, such as an accountable care organization (ACO) that bears economic risk for clinical decision-making. I certainly would want to know as much as possible about any population I would have to manage, especially one in which every clinical decision has an economic consequence.

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Many have made the analogy that big data brings the concept of “moneyball” to healthcare. Let me enumerate some of the potential challenges we face in which big data may be helpful in making decisions based on performance data rather than mere guesses.

Perhaps we can use predictive analytics to reduce the risk of readmission for key patient groups, such as those with asthma, congestive heart failure, coronary disease, and the like. Hospitals now have a clear financial incentive to reduce patient readmissions. By studying certain key clinical characteristics, we can elaborate which of those characteristics are clearly predictive of readmission. Some clinical software already exists to help us

implement this type of predictive analytic work. Imagine connecting all potential readmission patients with some mHealth applications.

Prescriptive analytics would be useful in the comparison of primary care physician resource utilization, especially as it relates to conformance with pay-for-performance criteria. Simply put, we already have the capability of creating detailed physician practice profiles, and we also know which pay-for-performance criteria yield the highest payment from organizations such as our local managed care plans; using prescriptive analytics, we can then readily discern which primary care physician essentially “does it better.” We can also then benchmark this high-performing group against lower-performing groups in an attempt to “raise all boats” and to improve our overall pay-for-performance reward in each contract period.

The advent of ACOs presents a huge opportunity to use population health analytics to study the population at risk. For example, we could harness available data from the Dartmouth Atlas, the Robert Wood Johnson Foundation’s Community Tracking Study, the Pennsylvania Health Care Cost Containment Council, and other data sets by focusing on the zip codes represented by the patients in specific cohorts. I am confident that we could uncover some key population health trends that would allow us to focus our resources in the communities we serve to improve health status.

Leading organizational theorists believe that when we organize big data in this way, we may need to reorganize the leadership structure and appoint a chief data or a chief analytics officer.<sup>3</sup> Although I am not immediately advocating the creation of a chief analytics officer in your hospital or health plan, I believe we could indeed be witnessing these types of positions in the next 3 to 5 years. A recent article in the *Wall Street Journal* notes that “everyone” is trying to recruit a big data expert right now.<sup>5</sup>

What is your view of big data in healthcare? Is your ACO or health plan linking mHealth and the big data conversation? Do you have a chief analytics officer? As always, I am interested in your views, and you can reach me at david.nash@jefferson.edu. ■

#### References

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