Analytics in Support of Health Care Transformation

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We have a good concept of the flawed state of health care, the critical need for change, and the future we want. Patient-centered, personalized care, provided by collaborating care teams, is a part of that vision. Many changes will be necessary to achieve that future, perhaps summarized best in Don Berwick’s “Triple Aim” for health care—improved population health, improved patient experience in health care, and reduction in per capita cost.

An obvious area for improvement is acute diagnosis and therapy. We know that avoidable decision errors occur in acute care processes.1,2 We want to reduce such errors. We also want to make health care more holistic, optimizing the outcome for the patient, not just treating a diagnosis. A focus on prevention and wellness, rather than solely on reactive medicine designed primarily to treat established or acute disease, is also necessary. Reducing unnecessary, wasteful, or harmful interventions is another critical component of improving the patient experience and lowering costs. IBM supports the transformation of health care, both in its role as a large company concerned about its employees and their dependents, and as a provider of technology resources designed to support the pursuit of the future vision.

Better decision making is central to all improvement efforts. Better means more evidence-supported, value-driven, and directed toward the individual. If we are going to make better decisions, we will need to gather and use relevant information. We have the ability to collect huge amounts of data, but data are not the same as information. Good decisions require that data be analyzed, prioritized, and delivered to the decision maker in an actionable way. The challenge we face is an increasingly complex world with more difficult decisions and higher expectations. The amount of data available is voluminous and increasing rapidly.4,5 On one hand, more data can be a positive thing if we use them effectively. On the other hand, we can be overwhelmed by the ocean of images, reports, numerical data, electronic health records, guidelines, journal articles, etc. The solution is a set of analytic tools that analyze data in the context of the question to be addressed (e.g., diagnosis, therapeutic choice, etc.) and provide the result of that analysis in a way that facilitates the decision-making process. The success of this analytic approach was demonstrated when IBM’s Watson computer successfully played Jeopardy!, and it is now being developed in health care.6

Until recently, we have had limited ability to use unstructured, text-like data, despite their volume and information content. The National Library of Medicine catalogued 699,000 articles in 2010.7 Eighty-one per-

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When 50 percent of internists spend 5 hours or less every week reading this new material and review fewer than 5 journals each month. Two out of three primary care physicians find literature volume to be unmanageable. The free-text entries in electronic health records are difficult to assimilate and prioritize. A tool that can understand the nature of the questions we have to address (e.g., diagnosis), read and process large volumes of text, and bring ideas from that reading to our attention would help us make better, evidence-supported decisions. IBM’s Watson is such a resource. It is currently being trained to read and understand medical information to support therapeutic decisions in oncology.

Personalizing health care for an individual may require new ways of using health care information. For patients with multiple diagnoses, outcome optimization is unlikely to be accomplished by focusing on each condition individually. Balancing potentially conflicting treatments, incorporating patient preferences, engaging the patient in the decision process, and coordinating among all the participants in the process requires a fundamental change in how health care is provided. One approach to personalization is a form of comparative-effectiveness research in which outcome differences in cohorts derived from populations very similar to the patient in question, based on potentially thousands of characteristics, are observed and provide information that can be applied to the individual. IBM’s Intelligent Clinical Decision Analytics (ICDA) is capable of performing population observation analytics to infer information that can be used for individual patients. By analyzing a cohort of diabetics with poor control, ICDA was able to determine the top 10 percent of physicians who achieved positive outcomes for patients in that cohort. This enables a health care organization to personalize health care by, for example, linking a patient with physicians who get good outcomes with patients like her.

We need resources that work together to analyze efficiently the different kinds of data available without requiring the user to work with multiple systems or possess great technological skill. Such tools must prioritize information so that it is relevant to the decision being considered and supports the decision-making process.

For example, decisions about prevention and wellness programs may require predictive analytics, as the goal is for them to be both clinically effective and economically efficient. If we can create a prevention program for the individual patient (or for groups of very similar patients), then we are more likely to help. Similarly, by providing precisely the intervention intensity that the patient needs, no more and no less, we are more likely to help. A one-size-fits-all program may over-treat some and under-treat others, resulting in poorer outcomes while also increasing costs. IBM Content and Predictive Analytics (ICPA) uses historical data, both structured and unstructured, to identify characteristics that predict which patients are more likely to develop problems, so that appropriate care plans can be developed. Seton Health in Texas is using the information developed by ICPA from their population-specific data to identify the top predictors of patients who need special intervention to avoid readmission for congestive heart failure. Data are valuable only if they can be used effectively to make better decisions. The transformation of health care will not occur without acquiring, analyzing, and using the data necessary to understand the health care environment and the changes that are needed. IBM recognizes the urgency of our current situation and is creating the data resources necessary to support the transformation.

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In his commentary, Martin Kohn, Chief Medical Scientist of Care Delivery Systems at IBM Research, discusses the opportunity and importance of structured approaches to application of emerging data and data analytics to advance health care decision-making, citing specific examples from IBM. His discussion touches on several issues and lessons central to delivery of care that is effective, efficient, and continuously improving, including the importance of:

- Efficient data analysis, prioritization, and actionable delivery to health care decision makers;
- Analytic tools capable of analyzing data in the care context and providing results in a way that facilitates the decision-making process; and
- Increased incorporation of comparative-effectiveness research in analyzing outcomes among similar patient cohorts to provide information that can be applied at the individual level to improve outcomes and lower costs.

Information on the IOM’s Learning Health System work may be found at www.iom.edu/learninghealthsystem.