Six cases where big data can reduce healthcare costs

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As the use of electronic health record becomes widespread across the United States, due in large to the implementation of the Affordable Care Act, the quantity of clinical data that will become available for research and analytic purposes will also dramatically increase. Additionally, experts in healthcare have become increasingly focused on clinical analytics that analyze large quantities of data for the purpose of gleaning insights that have the potential to improve the value of patient care – a process that is known as big data.

In a new research study published in *Health Affairs* on July 8, 2014, researchers highlight some of the clearest opportunities to reduce costs through the use of big data.

Specifically, researchers discuss the role of algorithms in reducing cost in the following categories: high-cost patients, readmissions, triage, decompensation (when a patient's condition worsens), adverse events, and treatment optimization for diseases affecting multiple organ systems .

"The examples we present in this study provide key insights to the 'low hanging fruit' in healthcare big data and have implications for regulatory oversight, offer suggestions for addressing privacy concerns and underscore the need for support of research on analytics," said David Bates, MD, MSc, chief quality officer at Brigham and Women's Hospital and lead author on the study.

High-cost patients

Only five percent of patients account for about half of all U.S. health care spending. Bates and his co-authors articulate the issues that need to be addressed to identify and then manage these high cost patients. They include formalizing an approach to predict which patients are likely to be high cost, what measurements can be incorporated to improve this prediction, particularly those focused on mental health, and how to make these predictions actionable. Researchers underscore that making new analytic systems effective will hinge on the ability to make these predictions easily available to clinicians in a way that does not disrupt current workflow. Additionally, they suggest that developing predictive models requires the development of analytic systems using data from high risk patient groups.

Readmissions

Researchers write that as many as one-third of readmissions may be preventable, which provides a significant opportunity for improvement in care and reduction in cost. Bates and his coauthors suggest that all health care organizations should use algorithms to predict who is likely to be readmitted, but highlight the challenges of implementing such algorithms. They include: tailoring the intervention to the individual patient, ensuring that patients receive the interventions intended for them, monitoring specific patients after discharge to ensure they do not develop issues that would cause their condition to deteriorate, and ensuring a low ratio false positive rate of patients flagged for an intervention to patients who experience a readmission.

Triage

Effective triage is essential to estimating the risk of complications when

a patient first receives care in the hospital setting. This is iimporant in order to manage staff and bed resources, ensuring the patient is sent to the correct unit for care and overall it informs the management of the patient's care. Researchers suggest integrating a triage algorithm into clinical work flow, and underscore the importance of having a detailed guideline to clarify how specifically the algorithm will inform care. Researchers examine two pilot studies which provide lessons learned in establishing effective triage algorithms.

Decompensation—when a patient's condition worsens

When a patient's condition worsens, there is often a period in which physiological data can be used to determine whether the patient is at risk for decompensating. Researchers explain that the initial rationale for intensive care units (ICUs) was to allow patients who were critically ill to be closely monitored for this purpose. Researchers emphasize such systems can now be used throughout the hospital, and that effective analytic systems in this area must use multiple data streams to detect decompensation, as many new technologies are becoming available that can be used to better monitor patients.

Adverse events

Adverse events, while expensive and can result in high rates of morbidity and mortality, are preventable at high rates. Researchers call out three areas, renal failure, infection and adverse drug events, as specific opportunities to utilize big data to reduce costs.

Treatment optimization for diseases affecting multiple organ systems

Chronic conditions that span more than one organ system or are systemic

in nature are some of the costliest conditions to manage. Autoimmune disorders such as rheumatoid arthritis and lupus frequently fall into this category and the ability to predict the trajectory of these diseases would immensely assist the caregivers deliver expensive therapies in a more targeted way. Focusing on the usefulness of big data in this area could result in effective approaches that can combine the many measurements taken as part of routine care to predict the progression of a patient's disease and personalize treatments and therapies appropriately. Access to health records with pertinent data has been the biggest limitation in adopting the use of big data in treating chronic diseases, but as the use of electronic health records becomes widespread, advances in this area are ripe for both improving patient care and reducing costs.

Researchers emphasize that these six cases are not an exhaustive list of the ways in which big data can be useful in improving value in healthcare. Specifically, they note that these examples, which focus on inpatient settings, will likely be transferrable to the outpatient setting as well.

"Support for research that evaluates the use of analytics and big data to address these six use cases, as well as thoughtful consideration of regulation and payment is warranted," says Bates. "Additionally, as multiple streams of data become available for analytic purposes, consideration of patients' privacy and their desire to link disparate sources of data will be of the utmost importance."

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