
About “Healthcare Analytics for Quality and Performance Improvement”

Healthcare analytics practitioner and author Trevor Strome shares his experience developing and implementing innovative analytics tools for use in healthcare organizations to illustrate how and why clinical, business, quality improvement, and technology professionals must foster an innovative and collaborative spirit in their fields in order to achieve safer, more effective, and efficient patient care. Using real-world examples throughout, *Healthcare Analytics for Quality and Performance Improvement* provides the common ground of shared knowledge and resources necessary for healthcare teams to drastically reduce costs, improve patient outcomes, enhance productivity, and work together more cohesively.

The book’s accompanying website <http://HealthcareAnalyticsBook.com> contains downloadable resources (including form templates and other supplemental information) that is updated on a regular basis.

Chapter 1: Towards Healthcare Improvement Using Analytics

Most healthcare organizations claim to be undertaking quality and performance improvement initiatives, but only a few are consistently achieving significant and sustainable improvements that truly improve patient outcomes, patient safety, and operational efficiency. Analytics is one set of tools that can enable healthcare organizations to drive the innovation and change required to achieve their desired improvements. Despite growing volumes of data and the near-ubiquity of computers, however, healthcare organizations are struggling to become or remain competitive, highly-functioning enterprises. This is because data analytics alone are not a “silver bullet” for healthcare improvement; analytics must be combined with quality improvement methodologies and effective management systems that encourage decision-making based on insight gained from analytics. This chapter highlights the current challenges and pressures facing healthcare, identifies opportunities for healthcare transformation, and discusses the important role that analytics has in driving innovation and achieving healthcare transformation goals.

Keywords: *healthcare analytics, quality improvement, healthcare improvement, healthcare transformation*

Chapter 2: Fundamentals of Healthcare Analytics

Analytics enables robust and data-driven decision-making in healthcare by providing insight into operational performance. Effective healthcare analytics, however, involves more than simply extracting information from a database, applying a statistical model, and pushing the results to various end-users. The process of transforming data captured in source systems such as electronic medical records into information that is useful to and used by the healthcare organization to improve quality and performance requires significant effort. This chapter provides examples of how analytics can be successfully employed throughout healthcare to support transformation initiatives, and describes how quality, performance, and analytics are inextricably related. This chapter outlines the key components of a healthcare analytics system (including business context and metadata, clinical and operational data from source systems, analytical “sandboxes”, quality and performance management frameworks, and presentation/dissemination of information and insight). The chapter discusses how these components enable healthcare organizations to be efficient and effective users of information in making evidence-informed decisions and empowers them to achieve their quality and performance goals.

Keywords: *healthcare business intelligence, clinical decision support, population health management, fraud prevention, data warehouse, online analytical processing, OLAP, data mining, text mining, metadata*

Chapter 3: Developing an Analytics Strategy to Drive Change

Successful adoption of analytics that drive innovation and improvement requires an effective strategy. An analytics strategy, however, is more than simply a data utilization strategy, a data analysis strategy, a technology strategy, or a quality improvement strategy. In fact, elements of all these are required for an effective analytics strategy to ensure that an organization's analytics capabilities are aligned with its quality and performance improvement needs. This chapter discusses what an analytics strategy is, and will outline the steps necessary to develop an effective analytics strategy. This chapter also covers the components of and inputs to an analytics strategy, stakeholders who must be involved in developing the strategy, how to communicate the strategy, and how to implement the strategy for maximum success.

Keywords: *analytics strategy, healthcare strategy, data strategy, strategy execution, strategy development, strategy communication*

Chapter 4: Defining Healthcare Quality and Value

Quality and value are the cornerstones of healthcare transformation. Although there are many ways in which quality and value are defined and measured, healthcare organizations must adopt and internalize their own definitions of quality in order to create quality goals, objectives, and targets that are meaningful and relevant to the organization and, more importantly, the patients they serve. The adage “you can't improve what you can't measure” applies to healthcare analytics. This chapter begins with a definition of “quality” as it relates to healthcare, and discusses why and how quality must be defined in quantifiable terms so that data analytics can be effectively leveraged to measure, monitor, and maintain healthcare improvements. The chapter reveals that the complexity of healthcare demands that a robust approach to measuring quality be followed. Common quality improvement methodologies such as Lean, Six Sigma, and PDSA are described along with the similarities and differences in how these methodologies benefit from and leverage the use of analytics.

Keywords: *quality improvement, Lean, Six Sigma, PDSA, improvement methodology*

Chapter 5: Data Quality and Governance

Fundamentally, data used for healthcare quality and performance improvements must be high-quality, well documented, and easily accessible. This is because healthcare leaders and quality improvement (QI) teams rely on having the best possible evidence on which to base decisions and evaluate quality and performance. The best possible evidence requires effective and accurate analytical tools able to provide understanding and insight into quality and performance based on data. In other words, without good data, analytics and the evidence they provide are likely to be suspect. Having good data for analytics and quality improvement begins with effective management of data. This chapter focuses on how IT and quality improvement teams can work together to ensure that a data infrastructure can be developed (or existing ones further enhanced) to support quality and performance improvement teams with the high-quality and highly-accessible data and analytics they need. The fundamentals of effective data governance and data stewardship are also discussed.

Keywords: *data quality, data governance, data stewardship, data management, data quality improvement*

Chapter 6: Working with Data

Data is an essential component of analytics, and working with and understanding data is a critical analytical skill. Due to the nature of the information being collected, healthcare data is often more complex than that in many other industries. Despite this complexity, many analytical tools, dashboards, and reports often use simplistic (or even incorrect) approaches to analyze and represent the data. The chapter discusses why it is not wise simply to “dive in” and begin analyzing data, and why it is important to understand what the data means in addition to what can be done with it. This chapter will focus on the

key concepts behind understanding and effectively utilizing data (including data types common to healthcare and how to select appropriate analyses for these various data types) so that healthcare information analysts are able to extract the maximum information and value from collected data. As well, the chapter walks through the steps of preparing data for analytics, aligning data with business processes and workflows, and how best to communicate the results of analysis.

Keywords: *data analysis, data summary, data preparation, data types, statistics, statistical analysis, central tendency, frequency distribution, histogram*

Chapter 7: Developing and Using Effective Indicators

The demise of performance indicators has been greatly exaggerated. Healthcare organizations have more data available to them than ever before, yet raw data without context is rarely useful for healthcare quality and performance improvement. To tame these increasing volumes of data, indicators provide convenient performance snapshots of processes, financial measures, and outcomes critical to the quality and performance goals of the healthcare organization. This chapter discusses the difference between measures, metrics, and indicators, highlights the importance of indicators in quality and performance improvement, and describes how to create and/or choose indicators that are most effective for the requirements of your healthcare organization. The chapter focuses on the attributes of effective indicators, and provides examples of how the choice of indicators impacts on the ability to identify changes in performance or quality within a healthcare organization.

Keywords: *key performance indicator, KPI, indicator, metrics, measures*

Chapter 8: Leveraging Analytics in Quality Improvement Activities

Data and information alone is not sufficient to achieve transformation in healthcare. Information and insight need to operate within a framework or methodology for quality and performance improvement decision-making. When used in concert with quality improvement methodologies such as PDSA, Lean, or Six Sigma, analytics help to identify the most pressing quality issues facing the healthcare organizations based on needs defined by patient safety, quality goals of the organization, national standards, and legislative requirements. This chapter will focus on how to leverage analytics within a quality improvement environment to assist the healthcare organization in achieving its quality and performance goals. The chapter discusses how to leverage analytics to scope out current quality problems and issues, identify opportunities for improvement, how to monitor and evaluate the impacts of improvement efforts, and how to use analytics to help sustain improvements in quality and performance. The chapter will highlight tools and techniques for identifying the root cause of quality problems, and how to estimate an improvement initiative's impact and effort to better rank improvement priorities.

Keywords: *quality improvement, improvement methodology, baseline analysis, priority ranking, root cause analysis, impact assessment.*

Chapter 9: Basic Statistical Methods and Statistical Process Control (SPC) Charts

Analytics is comprised of the tools, techniques, and systems necessary for obtaining deeper insight into the performance of an organization. There are two primary methods to determine the impact of a change or innovation on quality and performance - statistically, and visually. Statistical methods to determine changes in performance rely on statistical tests to determine if changes in quality, performance, or other metrics are "statistically significant". Graphical analysis of performance data provides visual evidence of the variability inherent in a process. Graphical approaches use specialized charts known as Statistical Process Control (SPC) charts (and rules to aid the interpretation of those graphs) to determine if a change in quality or performance is actually occurring. This chapter discusses how both of these sets of tools can be employed for quality and performance improvement in healthcare.

Keywords: *statistics, hypothesis testing, statistical process control, SPC, run chart, process variation*

Chapter 10: Usability and Presentation of Information

In order to be useful, analytics must “work” for the end users. Besides accuracy and timeliness, usability and accessibility are two of the most important qualities of effective analytics. Designing the insights generated via analytics to be more accessible and easy to use by applying best practices in data visualization and presentation helps to ensure that the desired message is communicated clearly and effectively. This chapter discusses best practices for data visualization and graphing, design tips for building effective analytics-based dashboards, how to apply agents and alerts, and how to enable more accessible, “self-serve” business intelligence and analytics within your organization.

Keywords: *usability, visualization, dashboards, dashboard design, chart design, accessibility, self-serve analytics*

Chapter 11: Advanced Analytics in Healthcare

Analytical applications provide healthcare leaders much more power than simply reporting on past or current performance. In fact, simply just knowing what happened is usually not enough to make transformational decisions. Healthcare decision-makers can now leverage growing volumes of data being collected by clinical and other systems by using algorithms and other tools to better understand what is likely to occur given a certain change in process or workflow. Predictive analytics is not a single “formula” but rather a collection of tools and techniques that must be used in concert to achieve the goal of determining outcomes, and builds on the fundamentals of several disciplines, including computer science and statistics. This chapter discusses the tools and techniques commonly associated with “predictive analytics”, identifies where and how predictive analytics can best be employed within a healthcare setting, and uncover both the challenges and the many benefits associated with the use of computerized prediction models.

Keywords: *advanced analytics, predictive analytics, data mining, regression analysis, artificial neural networks, support vector machine*

Chapter 12: The Journey to Analytics Excellence

Analytics excellence (as it relates to healthcare quality improvement) occurs when the right strategies, people, processes, and technologies are applied to improvement initiatives and positively impact the quality and performance of a healthcare organization. Being an analytical organization requires more than simply acquiring or possessing the tools and technology of analytics; it requires that the needs of the organization are understood, that the right analytical skill sets exist within the organization, and that healthcare leaders, quality improvement teams, and other decision-makers actually use the information and insight available through analytics. This chapter discusses the reasons (including resistance to change and distrust of data) why an analytics “gap” may exist in many organizations, and explores proven approaches to overcome these barriers. The roles and contributions of leadership, strategy, technology, and agility in the achievement of analytics excellence are discussed, as are what organizational traits are necessary to attract (and keep) the analytics talent your healthcare organization needs. Finally, the chapter discusses the issue of information security and protection of privacy, and how healthcare organizations must safeguard the data entrusted to them for healthcare improvement or risk losing access to data altogether.

Keywords: *leadership, excellence, evidence-based decisions, analytics gap*