The Vital Role of Business Intelligence in Improving Healthcare Delivery

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A Structured Information White Paper

Business intelligence (BI) has been recognized by many businesses as a valuable tool to reach strategic goals, increase profitability, improve customer satisfaction and ensure regulatory compliance.

This white paper explores BI's impact on the healthcare industry and provides examples of how BI tools, such as business activity monitoring and multidimensional reporting and analysis, can be applied in high-acuity departments of a hospital to improve operational efficiencies.

Business intelligence (BI) can be defined as the technologies, applications and practices for the collection, integration, analysis and presentation of business information to enable employees across an organization to gain deeper business insight and make informed decisions.

BI tools are used by most Fortune 500 companies to mash and merge data from disparate sources to deliver insights that help managers and front-line employees react immediately to solve problems or take advantage of opportunities. BI systems designed for the healthcare industry go beyond transaction processing systems by providing actionable information that can be used to make better decisions. The healthcare industry is increasingly embracing BI with the goal of improving business processes in order to increase revenue, reduce costs and improve patient satisfaction.

BI top technology priority of corporate America

Over the last five years or so, BI has been recognized by most large and many medium sized businesses as a valuable tool to help them reach their strategic goals, increase profitability, improve customer satisfaction, ensure regulatory compliance and address a range of other issues. Forrester Research analyst Keith Gile estimates that 40 percent of the 2,000 largest companies use the technology.[1] The 2008 Gartner Executive Programs' survey of 1,500 chief information officers of major corporations listed business intelligence as the number one technology priority for the third year in a row.[2] "The survey indicates that CIOs are looking to increase their budgets for BI by about 11 percent this year," said Dan Sommer, senior research analyst for Gartner.[3] A few of the prominent chief executives that rely upon BI include Steven Ballmer of Microsoft, Larry Ellison of Oracle, and Ivan Seidenberg of Verizon. Specific to healthcare, Scott Lundstrom, Vice-President of Research at Health Industry Insights, projects that "there will be accelerated investment in 2008 in the business intelligence segment with spending growing more than 13 percent over the next 12-18 months."[4]

There is a variety of business intelligence tools designed to report, analyze and present data. Among them is multidimensional reporting and analysis, a powerful BI tool that enables users to retrospectively aggregate and analyze metrics across core business dimensions to gain a deeper insight into business trends and drivers. This technique was initially used by finance to assist department heads in managing their business units. More recently, operational departments have begun using it to deliver insights that enable managers to make decisions and fine tune business strategies in order to gain competitive advantage and improve business operations and profitability.

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Business activity monitoring (BAM) is another BI tool, which was first coined by Gartner, Inc. Gartner defines BAM as "the delivery of real-time access to critical business performance indicators to improve the speed and effectiveness of business operations."[5] BAM usually provides this information in an operational dashboard format that makes it easy to immediately understand and react to the current situation. Today, operational dashboards can provide staff throughout the organization with information that they can use to make better decisions. For example, purchasing agents can see exactly what their company is spending with a certain supplier to help negotiate a better deal. A human resources manager can call up statistics on attrition in different departments and develop programs to retain staff.

Challenges of managing healthcare delivery

The challenges of managing healthcare delivery are numerous, particularly in the high-acuity areas of the hospital. These high-acuity areas – including the emergency department (ED), the operating room (OR), and the intensive care unit (ICU) – represent up to 60 percent of a typical hospital's costs and revenues. High-acuity areas care for the sickest patients in the hospital. As a result, they are among the most complex environments in a hospital, with management responsibilities over a wide range of functions such as scheduling patients and clinicians, managing supplies and materials, optimizing staff utilization, managing clinical documentation, administration and billing, and more.

Because of their fast pace, complex and rapidly changing care regimens, and mountains of diverse clinical data, the high-acuity care areas have traditionally been underserved by technology. In most hospitals today, the information that is required to manage all of these functions is scattered across a wide range of different people and systems. Some of the functions are managed on paper, some on grease boards or whiteboards, some on spreadsheets and others on niche applications that focus on one particular function. Different people typically own different pieces of some of these systems and they often do not have time to keep them updated because they are busy caring for patients.

Transaction processing systems provide information base for BI

A major step has been taken towards improving the situation in many hospitals through the implementation of clinical information systems (CIS). A typical CIS is a comprehensive, integrated information system designed to manage the clinical documentation of care delivery. This encompasses paper-based information processing as well as computers. The CIS can cover a wide range of clinical and managerial applications such as anesthesia care, integration of patient monitor information, medications, fluids, patient scheduling, patient and case tracking, nursing documentation, physician documentation, supply chain management and interfacing with the hospital information system (HIS).

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Clinical information systems are optimized for the immediate capture of information for clinical record-keeping; typically, they also provide some limited operational reporting. The data captured by these systems can also be used to produce retrospective reports and multidimensional analysis, on a time frame ranging from days to years.

BI penetration in healthcare industry

Compared to other industries, the adoption of BI technology has been relatively slow in the healthcare industry. The tremendous stakes involved in healthcare naturally lead to considerable caution about changing the status quo. The practice of medicine is as much an art as a science, so many physicians are understandably reluctant to instead put their faith in recommendations generated by a database. Another reason is that there is relatively little flow of people in and out of the healthcare industry so that innovations developed in other industries take longer to be adopted. Finally, the data generated by the healthcare industry is often more voluminous and complex than that generated within other industries.

But today the unprecedented challenges faced by the healthcare industry to improve clinical care and patient satisfaction while reducing costs are generating a new focus on process improvement. BI stands out as a technology that has been proven in many other industries to have delivered substantial improvements in quality and reductions in cost.

Multidimensional analysis in healthcare

Multidimensional analysis was initially used in healthcare for financial analysis and more recently has been used for departmental analysis and retrospective reporting. Within any industry, multidimensional reporting and analysis typically starts off comparing time periods and departments and then grows to incorporate other key attributes of the business. In healthcare, these attributes include care provider, level of acuity, procedure, and diagnosis. These techniques can be used to answer questions such as: Are late cases associated with a certain day of the week, procedure, surgeon, or anesthesiologist? Is the consumption of supplies normal and if not, why not? The performance of each team can be compared to others and to internal benchmarks. Users can quickly drill down on any disparities they uncover to identify root causes. This kind of interactive, retrospective analysis is time-consuming and thus is done as part of a monthly or sometimes weekly review of performance.

Putting BAM to work to improve decision-making and processes

BAM builds on multidimensional analysis by taking the information captured across CISs and delivering it in real-time in an actionable format designed for use by front-line personnel. An operational dashboard shows clinical and support staff what is impacting business processes at any given time. This makes it possible to react to the day's events and

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anticipate the consequences in time to have to have a positive impact on the outcome. As a result, BAM tools such as operational dashboards can improve key business performance metrics in the high-acuity environment including throughput, quality, and regulatory compliance on an incremental basis, one day at a time.

Three features are critical to providing real-time business activity monitoring:

1. Color coding focuses immediate attention on important information, such as an operating room that is running well behind schedule;
2. Drillable performance indicators make information actionable by providing the ability to click-through to easily gain more information on the problem;
3. Personalized dashboards enable users to customize their dashboard, choosing the indicators they want to see where they want to see them.

BAM in the perioperative environment

The potential benefits are particularly great in the perioperative environment because of process issues that lead to late case starts, underutilization, overtime expenses, case delays and unpredictability. First case delays are particularly troublesome because they cascade and worsen across subsequent cases. The surgeons, nurses, equipment and support personnel involved in each subsequent case in that particular OR are left waiting. Many consequent problems can be avoided by providing early warning to the person who can take action to prevent the initial problem from occurring.

To get first case late start statistics, nursing managers traditionally run a report that selects all the first cases of the previous day or week and manually compare their scheduled start time with the actual start time – a time-consuming process. Alternatively, a dashboard can provide the charge nurse with color-coded graphs that can immediately identify current first-case delays in the OR. She can then drill down for more information about the root cause of the problem and then see the impact: the scheduled start time and surgeon of the to-follow case. The charge nurse can immediately walk into the room, talk to the team, find out what the problem is and react by, for example, assigning another person to assist. Furthermore, when everyone knows that the impact of their performance is being measured they are much more likely to be on time.

A dashboard can also enable more efficient scheduling of staff. The charge nurse can see at a glance which rooms are running on time, which are late, where additional emergency cases can be slotted, and the estimated finish time for each room. She can easily see how many teams will be needed at 3 PM, 5 PM and 7 PM much earlier in the day. For example, if she sees that a room is an hour behind she may assign a team

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that is coming in at 3 PM to handle it, eliminating the need for the original team assigned to that room to stay late. Staff morale can improve because there is less need for overtime, overtime is only asked for when it is really needed, and more advance notice is given.

The dashboard can also help to identify potential process improvements. In one hospital a dashboard that flagged incomplete preoperative documentation helped the nurse manager to determine that outpatient urological surgery was often delayed while residents performed the history and physical (H&P) exam by the bedside on the day of surgery. A new rule that the H&P had to be taken prior to the day of surgery eliminated these delays.

Operational dashboards have already demonstrated the potential to help substantially reduce first case late starts. At Lahey Clinic Medical Center (located in Burlington and Peabody, Massachusetts), the perioperative department improved on-time first case starts from 45-50 percent to 80-85 percent by applying a real-time BAM solution coupled with the Lean process improvement methodology.

BAM in the emergency department and intensive care unit

An operational dashboard can improve throughput and staffing ratios in an emergency room by identifying patients who will consume significant resources. It can also provide visibility to critical risk management indicators such as timely administration of thrombolytics and beta blockers for heart attack or stroke patients.

Using an operational dashboard to track key time milestones such as ‘time to triage’, ‘time to room’, ‘time to doctor’ and ‘time to disposition’, emergency department leadership can better manage department throughput and capacity. This is increasingly important since, according to a January 2008 study published by Harvard Medical School researchers at Cambridge Health Alliance, emergency department wait times increased by 36 percent – from 22 minutes in 1997 to 30 minutes in 2004, on average.[6]

In the ICU, where managing patient census and appropriate staffing are among the significant business process challenges, real-time business activity monitoring can assist unit leadership by displaying key indicators such as census, length of stay, length of time on ventilator, return to ICU less than 24 hours after transfer, central line infections, and ventilator associated pneumonia.

Summary

Applications of BAM have enabled major performance improvements in manufacturing and service industries by providing front-line workers with actionable real-time information that helps identify and correct problems before they impact performance. Similar systems have been developed for

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use in the healthcare industry and they have demonstrated the ability to make similar gains in efficiency, quality, and patient satisfaction. BAM systems have the potential to generate increases in quality and clinician satisfaction. BAM systems can also improve throughput which can increase revenues, reduce overtime expenses, and reduce patient wait times which in turn normally leads to higher patient satisfaction.Subtitle example

Bio

Jerry Fireman has written on business intelligence for leading industry publications such as DM Review and CIO and has published many white papers. He is also a frequent contributor of articles on healthcare information technology for publications such as Healthcare Management Technology and Healthcare Informatics.

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