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Business Intelligence for Healthcare:

The New Prescription for Boosting Cost Management, Productivity and Medical Outcomes

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Executive Summary

- Healthcare organizations are swimming in an ever-deeper pool of data. But without a program in place to target, gather, deliver and analyze the most relevant data, these organizations will continue to be data rich but information poor.
- Forward-thinking healthcare organizations realize that data—and, thus, business intelligence (BI)—is at the center of informed and precise decision-making that will improve patient and service outcomes in addition to ensuring their organizations' future.
- To achieve the full benefits of BI, organizations must take an enterprisewide, strategic approach vs. tackling small tactical projects, and realize that the greatest efficiencies come from integrating data historically siloed in financial, operational and clinical systems.
- A strategic focus is the difference between simply recognizing the value of managing key information for analytical purposes and transforming the culture to prize evidence-based decision-making at all levels.
- Cost savings are the main driver for implementing BI in healthcare organizations, followed by the need to improve medical outcomes.
- A strategic approach to BI, which cuts across the organization, requires buy-in from not only top executives but also physicians and clinical staff.

Methodology

BusinessWeek Research Services (BWRS) launched a research program in late 2008 to determine the views of senior executives at large healthcare organizations on the benefits of creating a common business intelligence platform for analyzing clinical, operational and financial data. The hypothesis was that healthcare providers are realizing higher levels of decision-making effectiveness in terms of patient care, cost containment, organizational performance and customer satisfaction by integrating previously disparate data and providing users with an integrated, accurate, real-time view of information. Three key focus areas were covered in the research: clinical performance (including acute healthcare and wellness programs); financial performance (including service-line analysis); and overall operational performance (including asset management and customer satisfaction).

This report is based on contacting senior executives, consultants and industry analysts considered to be thought leaders in healthcare BI, particularly those who can point to the best implementation strategies that come from well-planned BI initiatives rather than tactical or departmental solutions.

The healthcare organizations included in the research for this report are:

- Denver Health and Hospital Authority
- Hartford Hospital
- Hospital for Sick Children in Toronto
- Lincolnshire Partnership Foundation Trust
- Nemours
- University Health Network

The following consulting and analyst firms were also contacted:

- Aberdeen Group
- Health Industry Insights, a branch of IDC
- McKinsey/London School of Economics and Political Science
- Palladium Group

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For more information about this project, please contact the Director of Custom and Syndicated Research at *BusinessWeek* at anthony_rosina@businessweek.com.

Introduction

Faced with a heightened focus on consumer-directed healthcare, cost containment, compliance and increasingly complex processes, healthcare providers are starting to embrace the idea of using information to their advantage. While the healthcare industry has historically been slow to turn to business intelligence (BI) tools, leading practitioners now realize data is at the center of informed and precise decision-making that can ensure their organizations' future (see figure 1, "The Drivers of Healthcare BI").

By integrating data previously dispersed in clinical, financial and operational systems, healthcare practitioners are providing users with more accurate insights into key areas such as service-line spending, quality of care and organizational performance. This data integration improves cost efficiencies, medical decisions and the alignment of activities from the boardroom to the back office and from the emergency room to the supply room.

Although healthcare still lags behind other industries in adopting BI, leading practitioners are seeing large gains from taking a more enterprisewide, platform-based approach to BI rather than focusing on point or departmental solutions. This platform approach to healthcare BI represents a shift from tactical thinking to strategic thinking.

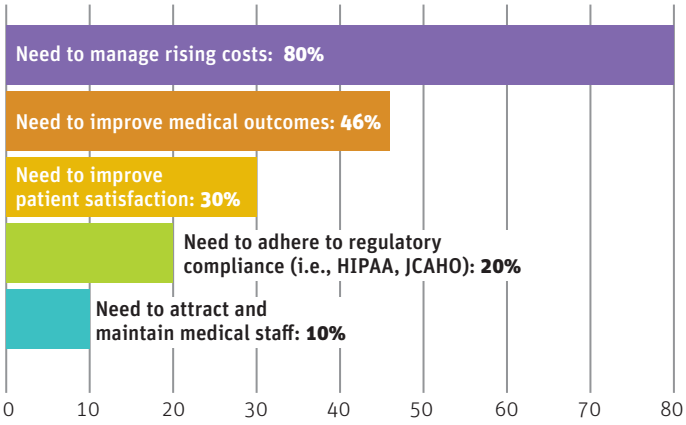
The results are evident:

- **Cost savings.** Healthcare organizations are using BI to eliminate waste and mine data stores to examine and recoup denied claims.
- **Improved margins.** Since implementing a BI/balanced scorecard program, Nemours—one of the largest pediatric health systems in the United States—has improved its gross margins by roughly 2 percentage points each year.
- **Improved patient satisfaction.** A new study from Aberdeen Group found that best-in-class healthcare organizations achieved a 15 percent increase in patient satisfaction scores by using BI and analytic tools.
- **Better care.** Denver Health and Hospital Authority is leveraging BI tools to improve patient outcomes using point-of-care information to identify high-risk and non-compliant patients.

Figure 1

The Drivers of Healthcare BI

Healthcare organizations say cost savings are the main motivations for them to focus on BI, almost double the importance of the next leading factor *(percentage of respondents)*.



Base: 95 healthcare providers
Source: Aberdeen Group, 2008 survey

Service-Line Focus

Because of the need for better cost-visibility, a common starting point for implementing strategic BI is service-line analysis. Even though healthcare organizations typically manage resources, staff and billing through service lines—such as emergency medicine, intensive care and cardiac surgery—most providers have been unable to get a clear view of whether their service lines are efficient or profitable.

"There is the growing realization that many organizations are losing money when it comes to managing patient information and operational flow," says David Hatch, vice president and principal analyst for the business intelligence practice at Aberdeen Group. This realization is causing a rapid increase in interest in BI (see figure 2, "BI Spending Tops Healthcare Agenda").

Case in point: Lincolnshire Partnership Foundation Trust. The mental health trust in the United Kingdom plunged into BI because of a specific need to better analyze the efficiency of its service lines. As part of the process of

Figure 2

BI Spending Tops Healthcare Agenda

Health Industry Insights, a branch of consulting firm IDC, predicted BI spending would be a top IT investment for healthcare organizations in 2008. When it reviewed these predictions in 2009, four received an A grade for accuracy:

- **Business intelligence** and related information management are leading categories of technology spending increases across all segments.
- **Electronic medical records** spending has increased by more than 10 percent.
- **Revenue cycle management upgrades**.
- **Patient safety improvements** drive investments.

Source: Health Industry Insights, 2009

applying for foundation status (since granted), Lincolnshire managers were required to demonstrate that they could manage financial and other forms of risk through access to complete, timely and accurate information.

To do this, Lincolnshire extracted data from a number of disparate systems, such as its patient administration system, HR, finance and clinical systems, and loaded it in a data warehouse. Then a front-end reporting and analytics interface enabled service-line managers to analyze the data. "Now service-line managers can see issues earlier and act quickly," says Steve Lidbetter, deputy director of performance and information for Lincolnshire Partnership.

The launching point was to ensure that patients for various service lines, such as adult, children's and learning disabilities, were seen in a timely manner. Now, managers are notified if a patient who should be seen in two weeks hasn't been scheduled after week one, allowing them to take action. "The trigger allows managers to act," Lidbetter says. "If there is an exception, now they know why."

After this successful foray, Lincolnshire is expanding the BI system to front-line staff and drilling down deeper into the data to improve operations. "We've already proven out the concept that we'll be able to compare different medical teams that are providing the same service, drilling down to individual staff members and individual patients," Lidbetter says. "If a certain condition is typically handled by 10 contacts with a patient, we'll be able to identify those patients who were treated with less than 10 contacts and see what the outcomes were."

The ramifications of such evidence-based practices are far-ranging. Lincolnshire, for example, plans to combine clinical data with mapping software to determine the ideal personnel and routes for house calls, thereby maximizing its resources. Even if healthcare organizations start BI with small, tactical projects—as Lincolnshire did—they want to be able to grow these efforts into a more all-encompassing solution. These adopters have realized that, ultimately, the greatest efficiencies come from sharing data across financial, operational and clinical departments.

Sealing the Cracks

A strategic approach to BI identifies and plugs gaps that appear within the chain of activities and can lead to inefficient or substandard care. For example, Denver Health and Hospital Authority, Colorado's primary safety net, provides 40 percent of the care administered to people in the metropolitan area who lack health insurance. Because of this responsibility, Denver Health CIO Gregory Veltri says BI is especially crucial to "avoid both waste and having patients fall between the cracks."

Several years ago, Denver Health began integrating clinical data—lab, radiology and pharmacy information—into the data warehouse that already contained financial data. One of the first projects was to create a registry to track patients with chronic diseases such as hypertension and colon cancer.

"We can now [sort] patients by clinic and provider, and send the information about a patient to the appropriate doctor," Veltri says. This is done in an easy-to-understand graphical manner. "Providers usually have that kind of information, but they may not have time to find it or know exactly how to get to it."

By coordinating patient information stored in various clinical systems, a doctor might immediately learn that a patient is allergic to a certain kind of medication. In the past, the patient's allergy might have been overlooked until the medication order reached the pharmacy, thereby wasting time and effort because the order would need to be revised.

"It can be difficult to quantify the value of those types of things," says Veltri. "However, it makes sense that if you can provide better care, and keep patients from being harmed, their stays will be shorter and they will need fewer resources." Veltri cites a study indicating that 60 percent of all healthcare costs could be attributed to waste. "I think using business intelligence to provide understandable information at the point of care allows providers to make informed decisions, eliminating waste and improving safety and quality," he says.

Denver Health has also used BI to build prototype management dashboards that manage business processes and monitor financial and clinical indicators. Monitoring high-risk patients' diabetes indicators allows physicians to ensure that the highest risk patients keep the disease under control. Furthermore, by using these tools, the health organization can monitor process changes that reduce medication turnaround times (the time from medication ordering to availability on the patient floor) from 84 minutes to about seven minutes. "That's a huge difference when you're talking about things like pain medication and antibiotics," Veltri notes.

Buy-In from the Top

A strategic approach to BI, which cuts across the organization, requires buy-in from not only top executives but also physicians and clinical staff (see figure 3, "Getting Doctors Involved Pays Off"). "Currently, many managers believe and act with the attitude that if the data stays compartmentalized, they maintain power," says Dr. David B. Friend, a former hospital administrator and currently the CEO at performance management consultancy Palladium Group. "To thwart this, you need not only agreement on the part of management but commitment. You need to align every part of the organization, so everyone knows their piece in the mission."

This need for enterprisewide buy-in is doubly true, given the unique challenges of healthcare. "I've been in healthcare for 10 years, and it's rapidly changing and heavily regulated, with many stakeholder groups that are difficult to reconcile," says James Gregware, director of revenue cycle and financial systems at Hartford Hospital, one of the largest medical centers in New England.

Perhaps because of these pressures, while healthcare organizations lag behind other industries in implementing BI, a survey by BusinessWeek Research Services indicates that healthcare executives are more likely than their counterparts in other industries to see performance management—which uses BI as its platform—as an important component of meeting their strategic goals (see figure 4, "Healthcare High on Performance Management").

Figure 3

Getting Doctors Involved Pays Off

When physicians are involved in the business side of the hospital, performance management improves dramatically. *(Clinical leadership score reflects level of clinicians' involvement in business side of hospital. Performance management score is based on an ascending scale of 1 to 5.)*

Clinical Leadership Score	Performance Management Score
Top Quartile	**2.8**
2nd Quartile	**2.6**
3rd Quartile	**2.2**
Bottom Quartile	**2.1**

Source: *The McKinsey Quarterly*, "A healthier healthcare system for the United Kingdom," June 2008

Nemours is a prime example of using strategic BI as the underpinning of its enterprisewide performance management efforts. The 4,200-employee pediatric health system's overarching goal is "one Nemours," which was designed to get the widespread operations to work in a coordinated effort to improve patient care.

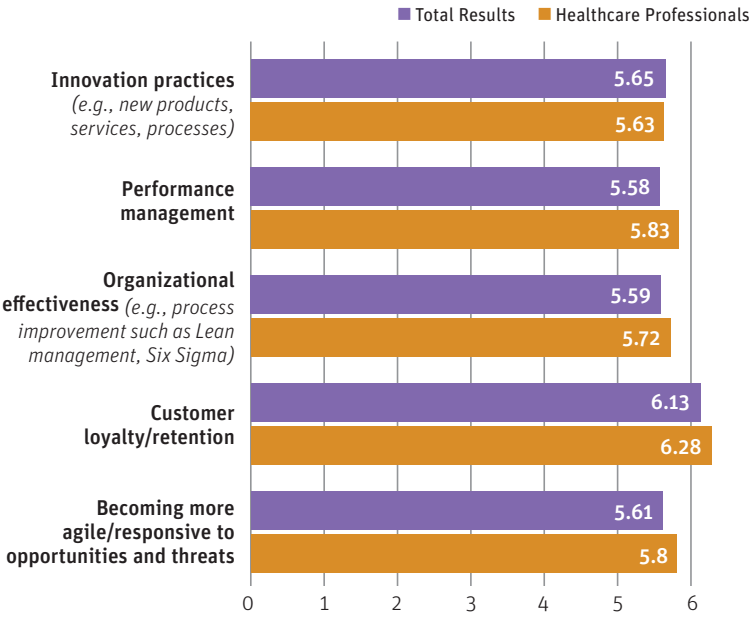
After formulating the strategy, the executive team implemented a balanced scorecard, which is a performance management tool that measures small operational activities that are aligned to enterprise vision and strategy. BI provides the real-time data that enables managers to monitor those activities and make rapid course adjustments.

Significantly, Nemours made headway with the program only after top executives held a two-day retreat in which they candidly discussed how their own behavior didn't mesh with meeting their organizational goals. "We used to come to meetings late, with no agenda, and everyone would be on their Blackberries," says Gina Altieri, vice

Figure 4

Healthcare High on Performance Management

Healthcare executives are more likely to see performance management as a key to meeting their strategic goals than their counterparts in other industries. *(C-level executives' rating of the importance of performance management on an ascending scale of 1 to 7; mean scores.)*



Source: BusinessWeek Research Services and SAS Institute survey of more than 300 executives of organizations with at least $500 million in annual revenues, 2007

president of corporate services at Nemours. After the retreat, "we started coming on time, submitted agendas, and stopped with the Blackberries."

The top-down focus got others involved. One of Nemours' goals was to capture body mass index (BMI) on every patient, seeing it as a key measure of well-being across the entire pediatric patient base. Though recording BMI had long been an official duty of every department, "No one thought it was their job," Altieri says. After it became a focus of the balanced scorecard program, the number of patients whose BMI was captured rose from 10 percent to 60 percent.

Aberdeen Group's Hatch says that kind of focus is the difference between simply recognizing the value of managing key information for analytical purposes and developing an information culture where everyone has a vested interest in capturing and using the information.

Every month now, Nemours posts key metrics—including actual vs. budgeted expenses, the number of patients likely to recommend the organization and specific practice to a friend, and the number of employees who have completed prescribed training programs. "One of our core strategies is that we want learned, competent people, and that requires training," Altieri says.

Before Nemours started to measure training, only about three in four people got mandatory training in a timely way. After, that figure rose to 99 percent. "Behavior changes once people know something is being tracked," she says.

Since the business intelligence/balanced scorecard program started, Nemours has seen its gross margins improve by roughly 2 percentage points per year.

Show Them the Iceberg

Many aspects of a strategic BI program are not immediately visible and thus may not be highly valued by users throughout the enterprise. One of these functions is to show the amount of back-end work that is necessary. Steve Pevere, senior project manager at University Health Network (UHN), made up of three Canadian teaching hospitals, began carrying around a picture of an iceberg, demonstrating to department managers the preparatory work that was necessary to reconcile disparate systems and build data warehouses. It was Pevere's way of reminding the managers that they only saw the tip of the iceberg, but not the massive bulk underneath their radar.

"You have to manage their expectations," Pevere says. Part of managing those expectations was having a steering committee of strong advocates who could communicate the work going on behind the scenes.

When the system rolled out, UHN was careful to choose a motivated department whose BI effort would dovetail with a key organizational goal—promoting self-service. The project aggregated a number of HR reports, such as sick time and benefits, and allowed department managers to pull the information they needed themselves. End users were delighted that the "self-serve" reports provided timelier access and allowed them to easily drill down to the information they needed. HR was happy to eliminate the cost of producing the paper reports and fielding many phone calls.

When successes like this occur, organizations must be prepared for rapid expansion of their BI efforts. For instance, the Hospital for Sick Children in Toronto started with three metrics that eventually expanded to 40 as the initiative spread across the Ontario-based organization. Access to BI was first granted to 25 executives and then expanded to 75 directors a year later. Now, 6,000 employees have access.

"This is getting toward the goal of case costing," says Jeff A. Mainland, vice president, corporate strategy and performance at the hospital. "With the BI tools, we'll be able to determine the resources that should be allotted to a tonsillectomy, like X-rays and post-surgical care, and plan appropriately."

Since implementing the BI program, the hospital has seen an 8 percent to 75 percent improvement in each of its measured metrics, such as controlling the rate of infections. "People are inspired to do better when they see the data," he says.

Conclusions and Recommendations

With the increasing amounts of data that healthcare organizations collect, BI solutions are a natural answer to the challenge of improving patient satisfaction and medical outcomes while reducing costs and meeting ever-more-stringent regulatory standards. Though lagging behind other industries in adoption, healthcare organizations are highly interested in improving performance management—which BI enables—and, as such, they are beginning to embrace BI programs that provide better visibility across clinical, financial and operational systems.

Spreading this technology successfully throughout the organization depends on adopting the following best-practice techniques and philosophies:

- Create a culture of accountability as part of the deployment of dashboards and balanced scorecards.
- Go beyond top-management agreement to top-management commitment.
- Prepare stakeholders for the fact that a long period of data preparation and cleansing may be necessary before applications can roll out, but assure them that that will position the organization for even greater gains in the future.
- Improve capabilities to track patients and assets.
- Incorporate information from not only business systems but also diverse clinical systems.
- Involve physicians and other key stakeholders in the planning process, conduct training sessions on the tools specifically designed for them and be prepared to prove the clinical benefits of BI.
- Team IT with a highly motivated stakeholder to create an immediate win that will generate enthusiasm throughout the organization for evidence-based decision-making. ■

Sponsor's Statement

How Microsoft Business Intelligence Leverages Healthcare Data into Better Financial and Patient Outcomes

The vast majority of healthcare organizations are data rich and information poor. But according to a research study by BusinessWeek Research Services, some forward-thinking organizations are now able to peer into their rich data stores to make business decisions based on realities they never knew existed. These organizations are using the principles and technologies of enterprisewide business intelligence (BI), which is the key to creating better financial and patient outcomes, according to Paul Smolke, senior director of industry solutions for the healthcare sector at Microsoft® Corp., and Guy Weismantel, the company's director of marketing. We spoke with Smolke and Weismantel to discuss how Microsoft's approach to BI can benefit healthcare organizations.

Healthcare costs are rising faster than revenues. How can a BI initiative help healthcare organizations improve efficiencies and better control overall costs?

Smolke: By combining operational, clinical and financial data, healthcare organizations can analyze trends in areas they couldn't have in the past, which improves operational efficiencies and financial performance. An example is Wandsworth Primary Care Trust in London, which used BI to gain a more accurate view of its performance in administering child vaccinations. The BI system speeds data aggregation between general practitioners and district nurses, and it presents the data as a series of easily accessed scorecards and key performance indicators. The result: Reported immunizations increased by 5 percent. (For more information, see http://www.microsoft.com/casestudies/casestudy.aspx?casestudyid=4000002422.)

Healthcare organizations can take analysis a step further. By creating a unified intelligence strategy that drives high performance, data assets can be leveraged, which in turn drives business transformation, discovery and innovation. The need for such a strategy prompted the development of Microsoft® Amalga™. This new solution empowers users to answer their own questions, thus enabling agility and real-time performance improvement.

When the two strategies work together, Amalga—the unified intelligence system—creates a data platform from which traditional BI can be more easily applied, because of the ease of use and re-use of healthcare data. Organizations deriving value from this combined approach include MedStar, Wisconsin Health Information Exchange, Moffitt, St. Joseph Health System and El Camino.

What is the role of BI in helping healthcare organizations gain better visibility into their service-line spending?

Smolke: Service-line analysis has been of interest since the mid-1980s, but until now, organizations haven't had the ability to bring the data elements together. Nor have there been tools that can easily show them where the costs are, how to gain efficiencies and how to improve service to the patient populations they serve. With both Amalga and our BI platform, all users can analyze performance, see trends and make better decisions with tools that are graphical and intuitive. Because the BI platform is based on the Microsoft® Office desktop productivity suite, which has hundreds of millions of users worldwide, people are already familiar with the look and feel of these tools. For example, a significant amount of data analysis and reporting is conducted using Microsoft® Excel, so it's not difficult for users to pick up the BI capabilities in this spreadsheet application.

Why should all users have access to BI tools?

Weismantel: Look at the scene today: 15 percent to 20 percent of users are employing BI tools to get answers to their questions. What if you expanded that to 75 percent? That's three-quarters of the organization's employees making more informed decisions and getting insights into all types of information to drive the business forward. A good example is CHOP Pathology and Laboratory Medicine, which now delivers real-time operational data and reports to 100 technologists and pathologists via Excel and Microsoft® SharePoint® portal. (For more information, see http://www.microsoft.com/casestudies/casestudy.aspx?casestudyid=4000001805.)

Smolke: We're lowering the bar so that essentially anyone can apply these tools without extensive training. As more healthcare professionals make decisions based on the data, the more accurate the data is and the more useful the tools are, leading to better informed decision-making. For example, the Wisconsin Health Information Exchange's ED Linking Project is currently aggregating data across more than a dozen area hospitals and 120 clinics to make it available in the emergency departments of participating hospitals. Amalga is the data platform for exchange, freeing up information from multiple data systems across corporate boundaries and delivering secure, accurate and timely health information in an easy-to-use environment. The system has been rapidly adopted into the routine workflow of the physicians and, as a result, participating hospitals are realizing improved quality and reduced costs. (For more information, see http://www.mshealthstories.com/HealthStories.aspx.)

What can be done to enable clinicians to quickly access correct, consistent information to improve the quality of patient care and medical outcomes?

Weismantel: We're making strides with integrating aspects of search technology with our portfolio of solutions. The idea is that doctors could easily search for information on individual patients and be served key performance indicators of trends they're tracking among patient populations. We're bringing relevant content to them in an intuitive and familiar way.

"Evidence-based clinical decisions" are popular. Why should a healthcare organization pursue this goal?

Smolke: A lot of organizations have implemented electronic health records, but these are just a step in the process. The ability to analyze clinical data once it's been digitized allows healthcare organizations to pursue evidence-based clinical decisions, and that's really the value BI can bring from a clinical perspective. It allows you to go from digitized clinical information to better clinical knowledge, which can improve outcomes. The pace of change and the need for agility is quickly creating a need for a real-time view so that the processes and patient care can be impacted immediately, not just retrospectively. Data is critical for influencing behavior change in physician practice patterns, and real-time or near-time data has more impact on the quality of care for patients while they are still in the hospital.

What are the benefits of approaching BI as a strategic project for the entire enterprise, based on a standardized platform vs. a more tactical, single-department approach?

Smolke: If each department has its own BI solution, information is fragmented, and you can't get a cross-enterprise view aligned around organizational objectives.

Weismantel: You can lower your overall cost of ownership and reduce complexity by moving away from multiple BI projects and tools. A standard platform enables you to focus on what users want to do and what types of information they need as it relates back to broader organizational objectives.

What is the best way to get started with BI?

Smolke: With Microsoft's approach, you may already have components of BI deployed in the hands of people who need it. If you have Office, Microsoft® SQL Server® database software and SharePoint in place, for instance, you already have components of our BI platform. On another level, Amalga allows organizations to reduce the complexity of creating an enterprisewide data strategy, thus accelerating the time to value for bringing all healthcare data assets together. The result is a data platform that is built for cost-effective and rapid change. Microsoft delivers a comprehensive set of solutions that allows organizations to create a data strategy tailored to their objectives, resource requirements and budget. Typically, our technologies are less expensive per user, and they're easier to configure and deploy. (For more information, see http://www.microsoft.com/sqlserver/2008/en/us/compare-oracle.aspx and http://www.microsoft.com/amalga.)

What new investments is Microsoft making in BI?

Weismantel: Our core strategy is bringing BI capabilities into the tools and products you use today, whether it's e-mail, instant messaging, Office, search, etc. The last thing organizations need is more BI tools, so we're looking at how to integrate BI capabilities into existing investments in technologies like SharePoint, SQL Server and Office. Second is ease of use. Microsoft is continuing to invest in how to do BI in more simple ways. We're wrapping BI around something that's been around for years, which reduces the need to learn the BI tool and gets BI out to more people. ■

For More Information

Microsoft's Web site offers an extensive collection of information on BI solutions for healthcare. Please visit: http://www.microsoft.com/health

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