Business Intelligence's Effect On US Healthcare Delivery

Emimal. K[1] Mohammad Saif N[2]

[1]MBA Student [2]M.Phil., Ph.D.

[1,2]Master Of Public Health

[1,2]School of Arts, Humanities and Management, Jeppiaar University, Chennai, India

Abstract — In today's payment environment, the difficulties of managing healthcare and achieving clinical integration have gained national attention. Research on using technology to help reduce costs and guarantee healthcare quality is still underway. Many sectors utilize business intelligence solutions to extract insights from operational and financial data in order to make better decisions that ultimately lead to efficiency and effectiveness.

In order to justify research on the influence of business intelligence on healthcare delivery in the United States of America, this paper will provide the reader with an overview of the current literature on two fundamental topics: business intelligence and healthcare delivery. In order to accomplish that, we look at how BI is being used in the healthcare sector, discuss pertinent problems and difficulties, and investigate how BI may support particular organizational skills. There are examples of how BI capabilities have helped organizations address issues related to healthcare quality, affordability, and accessibility.

This study, which presents BI as a tool to guarantee a strong and methodical approach to health care management with the ultimate goal of having a lasting impact on quality improvement and cost control, could be helpful to both practitioners and scholars.

Keywords: Healthcare, Business Intelligence, Quality, Cost, Capabilities, Sustainability.

INTRODUCTION

Enhancing the effectiveness, safety, and quality of healthcare is both economically and nationally necessary. The use of technology to guarantee healthcare quality and manage costs is a topic of continuous discussion in the field and one that researchers are interested in. Integrating patient health information from multiple sources and making it available to a wide range of users are necessary for providing high-quality healthcare; patients should be able to access their health information so they can self-manage their conditions, and healthcare providers should be able to easily access and use the appropriate information at the appropriate time.

Proponents of the use of cutting-edge technology in healthcare see it as a chance to improve real-time information availability, economic activity transparency, and the quality of healthcare services (Mettler, 2009).

Payers struggle to reimburse providers for expensive procedures made available by technological advancements. The issue is getting worse due to both inflated and plain false claims. Both public and commercial healthcare payers and providers are exploring technology as a way to save costs without sacrificing quality of service.

The healthcare sector is under greater scrutiny and complexity than any other single industry in contemporary history, therefore the dilemma doesn't stop with the quality vs. cost debate. Information security and privacy laws must be understood and followed by affiliates and health providers. The comprehensive view of high-quality healthcare is also influenced by a wide range of elements, including rules governing health care practices, patient records and standards, practice and staff management, training, financial stability, and facilities and equipment management. The Patient Protection and Affordable Care Act's (PPACA) passage is another factor changing the state of healthcare in the US today.

There is pressure on the healthcare sector to lower expenses and improve care management. According to Burke and Ingraham (2008), the United States' healthcare system is undergoing a massive transformation. The idea of managing quality and cost indicators is causing problems for the entire sector. Revenue and competitiveness are impacted by the overwhelming number of reimbursement systems and the increased emphasis on adherence to evidence-based care guidelines. Executives in the healthcare sector must analyze a growing amount of data in order to make the best decisions on the health and future of their company. Additionally, a lot of executive teams and care providers struggle with data overload and are searching for methods to make learning from raw data easier (Byrnes, 2012).

According to Coddington (2012), decision-support capabilities enable the collection of data from various sources, including electronic health records, cost accounting systems, and other sources, and make it accessible to physicians and other users. He contends that in order to deliver high-quality care, healthcare institutions must strike a balance between cost control and their other responsibilities. The creation of measuring objectives to identify validated metrics is the most crucial issue pertaining to high-quality healthcare. Given that high quality is typically associated with high cost, a claim like "cut costs while maintaining quality care" seems counterintuitive.

On the other hand, initiatives for process optimization made possible by business intelligence systems are an affordable choice. In order to make better decisions and ultimately achieve the efficiency and effectiveness that the healthcare industry sorely needs, business intelligence solutions enable the extraction of insights from financial and operational data. The first step in turning data into actionable insight that can impact financial, operational, and care management is realizing that "having ready access to timely, complete,

accurate, legible, and relevant information is critical to health care organizations" (Wagner, Lee & Glaser, 2009).

The healthcare sector is now understanding that a business intelligence framework that employs root-cause analysis can provide valuable and useful insights into areas that could use improvement. Businesses are realizing how crucial it is to employ a methodical and exacting approach in order to increase return on investment. The top five healthcare-specific features that organizations look for in their BI products are: (1) enterprise analytics; (2) predictive analytics; (3) ACO analytics; (4) healthcare data integration/dataware-housing; and (5) population health, according to a recent study conducted by KLAS, a research firm that specializes in tracking and reporting the performance of healthcare vendors. The second topic covered in this study is how business intelligence helps organizations develop their capabilities.

A comprehensive view of BI solutions can assist in addressing the complex issues of quality, cost, regulatory compliance, and patient-specific requirements that decision makers in the healthcare industry confront. These issues are based on both clinical and administrative data. Such comprehensive perspectives on business intelligence capabilities are provided by Sab-herwal and Becerra-Fernandez (2011). We examine how business intelligence skills can support organizational capabilities and base our argument on their perspectives. We cover pertinent topics and challenges, concentrate on the implementation of BI capabilities in the healthcare sector, and provide instances of how BI technology has affected the accessibility, affordability, and quality of healthcare delivery issues.

Learn more about BI as a tool to guarantee a strong and methodical approach to healthcare management if you're a scholar interested in BI research. This study, which supports BI investment with the ultimate goal of long-lasting influence on quality improvement and cost control, should be helpful to experts in the health sector.

The following is how the paper is structured: The literature review technique is explained in Section II. By outlining the state of healthcare in the US, Section III provides the study's context. The benefits of BI in the health sector are described in Section IV, which also addresses the (why?) query. By connecting the four BI capabilities to the healthcare sector, Section V answers the (how?) query. Examples of effective BI adoption in the healthcare sector are provided in Section VI. The challenges of implementing BI in the healthcare sector are covered in Section VII. The conclusion and further investigation are covered in portion VIII, the last portion.

METHODOLOGY

Between April and August 2013, an iterative process was employed to retrieve papers pertaining to the themes discussed in this research from Google Scholar and other academic databases, including EBSCO Business Source Complete. Business intelligence and healthcare in the United States were the initial search terms used in the literature search. These terms were later expanded to include the application of business intelligence to healthcare, business intelligence capability, organizational capabilities, and BI capabilities in the healthcare sector. The writers of this work independently reviewed fifty publications and several government papers, assessed the articles' applicability,

examined the key conclusions, and made decisions regarding the articles' "inclusion" or "exclusion." Evidently, the articles' applicability to the research topic and the use of business intelligence in general and business intelligence skills in particular in the healthcare sector were the inclusion criteria. To further support the goals of the article, we looked for real-world examples of BI applications in the health sector.

An essential component of this study was comprehending organizational capability, which acts as a mediator between BI capabilities and healthcare delivery. The subject of organizational capability has been extensively studied, and several scholars have written seminal works on the subject over the years. We focused on resource-based theory of organizational capacities and underlined the role of BI in empowering the users and elevating knowledge-based decision making. Several seminal publications on the subject were included because the application of BI in healthcare also involves building a new IT infrastructure, which is another aspect of resource-based organization capabilities. This study looked at and incorporated publications about electronic health records, which are a good illustration of how technology may be used to improve healthcare delivery.

However, the idea of using BI capabilities to enhance healthcare delivery is relatively new, and there aren't many significant studies that thoroughly address these problems. Even fewer academic articles on the use of BI tools to support organizational capacities could be found. As a result, we used actual work examples to bolster this part of our investigation. Our objective was to provide the reader with an overview of the most recent research on two fundamental subjects: business intelligence and healthcare. Additionally, we wanted to establish a foundation for the rationale of the study on how business intelligence affects healthcare delivery in the United States of America by enhancing organizational capabilities.

HEALTHCARE IN THE UNITED STATES

The Patient Protection and Affordable Care Act (PPACA), which was passed in 2010, has had a significant impact on the healthcare system in the United States. By making healthcare more inexpensive and accessible to a wider range of patients, this act aims to reform the current healthcare system. Among the numerous elements of the PPACA are the integration of technology and the coordination of healthcare among a number of providers.

The PPACA contains a requirement that healthcare facilities and practitioners use Electronic Medical Records (EMR). Electronic medical records (EMRs) are technology-based systems that are thought to have the potential to significantly lower health care costs, decrease medical errors, and enhance health (Hillestad et al., 2005; Meinert, 2005). All healthcare institutions and practices will have some kind of technology-based system in place to support improved efficiencies by the time the EMR mandate goes into force in 2014.

To communicate electronic health records with doctors, pharmacies, and hospitals, interoperability is required. Evidence-based clinical decision support that offers treatment reminders and recommended practices can even be integrated with individual records through interoperability (Hillestad et al., 2005). PPACA provides a technology-based framework to guarantee care coordination, improved quality outcomes, and reduced costs by requiring EMRs to be used in healthcare delivery.

The ACO model also depends on delivering evidence-based treatment that accounts for affordability and unique patient situations. ACOs encourage healthcare providers to collaborate in treating a single patient across care settings using this approach. ACOs' emphasis on affordability, access, and coordination differs from that of the US healthcare system today, necessitating the creation and application of software and business process management systems tailored to the healthcare industry in order to support the treatment of both individual patients and entire populations (Walker & McKethan, 2012).

As long as community-wide care processes are created to reflect a patient-centered vision of optimal care and all users who contribute to patient care are able to use new healthcare delivery tools, ACOs have the potential to succeed as delivery outlets (Walker & McKethan, 2012). It is crucial to integrate and use EMRs and transition to ACOs in order to coordinate care and make decisions that lead to the provision of high-quality, affordable healthcare. Because lives are on the line and there is tremendous pressure to cut costs and boost efficiency, Ghosh and Scott (2011, p. 396) examine quality and cost issues in healthcare and contend that "an analytical capability is especially critical in healthcare." Additionally, they contend that "business intelligence (BI) in healthcare has been stimulated to facilitate decision-making and improve health-care processes due to the rapid growth in clinical data repositories from increased use of EMR (Electronic Medical Record) systems in patient care facilities" (p. 396).

Although there is widespread support for the use of BI in healthcare "to guide more informed decisions on financial, administrative, and clinical questions" (Hennen, 2009, p. 92), the question of how to demonstrate the advantages of BI in a methodical and reliable way to support the initial investment in BI still needs to be answered. Prior to answering this issue, we must examine the advantages and difficulties of business intelligence (BI) in the US healthcare sector, as well as any potential distinctions from other sectors in terms of BI implementation.

BI BENEFITS AND CHALLENGES IN THE HEALTHCARE INDUSTRY

Like any other technology-based strategy, using business intelligence to address issues in the workplace has advantages, but there are drawbacks as well. Health businesses are using business intelligence (BI) solutions to use data for accurate decision-making in order to enhance patient outcomes, lower costs, and secure the future of the

healthcare industry as rules change and data volumes rise. The first step is having access to accurate, timely, and pertinent healthcare information. Effective healthcare practices depend on evaluation tools to convey information to researchers, practitioners, policymakers, and the general public in addition to the availability of public health data sources (Jinpon, Jaroensutansinee, & Jaroensutansinee, 2011).

It is possible to improve population health and streamline existing data by integrating business intelligence tools into healthcare practices. Business intelligence is a system that "provides decision makers with valuable information and knowledge by leveraging a variety of sources of data as well as structured and unstructured information," according to Sabherwal and Becerra-Fernandez (2011, p. 6). In general, BI systems may be seen from two basic angles: process-centric and data-centric. By gathering, converting, and integrating data, the data-centric perspective uses BI tools to comprehend an organization's capabilities and provide planners and decision makers with competitive, sophisticated information. Improving the promptness and caliber of decision-making inputs is the goal. According to Hammer and Champy (2001), the process-centric perspective sees an organization as a collection of interconnected processes, and BI is used to integrate the information into these processes.

The secret to a successful business is information. Like any other organization, the health sector relies on the straightforward Plan, Do, Check, and Act approach to successfully transform data into knowledge that can be used and put into action. Accurate data must be used in each of these processes in order to make the proper operational judgment. There are parallels and differences between the health sector and other industries. Healthcare, like other sectors, is concerned with revenue, costs, utilization, and quality. However, it differs, as it should, in that it uses information to change the behavior of a wider range of stakeholders, including doctors, patients, the government, insurance companies, hospital administrators, pharmacies, and more. Similar to this, BI operations can be difficult for any business, but the healthcare sector presents additional complexity due to factors including privacy concerns (Cucoranu et al., 2013). Sensitive patient data is gathered and analyzed by healthcare institutions under privacy regulations.

There is an abundance of data in the healthcare industry today; in fact, firms are sifting through an ever-deepening data pool. How to turn the enormous amount of data that is available into useful knowledge and information is the difficult part. With the use of new analysis and visualization tools, emerging business intelligence systems can give all four elements of the "who, what, when, and where" quartet faster than ever before, maybe with a higher degree of quality and confidence (Yi et al. 2008).

Healthcare providers have instant access to knowledge that enables them to offer high-quality care at a reasonable cost because to business intelligence skills (Hsia, Lin, Wu, & Tsai, 2006). According to Mettler (2009), BI systems act as catalysts for the gathering, processing, and distribution of information and data. The four synergistic qualities of business intelligence (BI)—organizational memory, information integration, insight production, and presentation—are introduced by Sabherwal and Becerra-Fernandez (2011). These capabilities make BI indispensable for all industries, but particularly for healthcare organizations. We must comprehend BI and its capabilities in order to recognize how it may be used as a tool and a facilitator to integrate the four capabilities into the organization's fabric.

CAPABILITIES OF BI IN HEALTHCARE INDUSTRY

The healthcare industry generates an overwhelming amount of data, and business intelligence capabilities are what provide value by combining data from multiple sources into a single repository, facilitating in-depth data analysis, and generating insights into routine operations while offering decision support mechanisms. By empowering users, facilitating the IT structure, and enhancing the use of both structured and unstructured data, business intelligence (BI) capabilities improve and foster organizational capabilities, regardless of whether data collection, transformation, and analysis are routinely deployed to support decision-making processes or are triggered by processes. The present study focuses on four essential business intelligence capabilities: (1) organizational memory; (2) information integration; (3) insight production; and (4) presentation and communication.

ORGANIZATIONAL MEMORY CAPABILITY

In order to create organizational memory—one of the most crucial skills needed in the healthcare sector—historical data must first be gathered and preserved. Organizational memory is typically developed over time, transmitted to new hires through meetings, mentor-protégé relationships, training programs, and personal contacts. If it is not properly stored, it can be destroyed by downsizing, frequent layoffs, unmanaged employee attrition, and/or natural disasters.

Numerous sources and providers contribute patient data, which makes it challenging to monitor the health of a particular population or follow history without easy access to this information. Figlioli (2011) asserts that data are neither the cause nor the remedy. The inability to meaningfully manage these data is the problem. According to him, information on a person's past medical tests and procedures, drug sensitivities, and prescription dosage are all included in their medical history. A doctor may only have access to 10 or 20 of these crucial bits of information, even if they are necessary to guarantee the best care possible. Because of this, patients are frequently treated in phases by healthcare professionals who have access to only a small portion of the essential clinical data.

A wide range of public and private data gathering methods are utilized in the health care industry, such as administrative enrollment and billing records, health surveys, and medical records that are used by different organizations such as hospitals, CHCs, doctors, and health plans. None of these organizations is capable of gathering all the data for the whole patient group. Furthermore, not all patient health data is currently gathered by a single organization.

A methodical and reliable strategy to gathering, organizing, and conceiving knowledge assets in a variety of healthcare environments begins with the organization memory capabilities of business intelligence made possible by data warehousing. The data warehouse, which stores and transforms population health data, relies heavily on input from electronic medical records (EMR) systems. These systems enable online access to individual records from numerous automated systems that are compatible and part of an electronic network (Hillestad et al., 2005). The amount of data available on emergency visits, ambulatory services, patient health, insurance, healthcare disparities, healthcare quality, healthcare spending, healthcare utilization, hospitalization, payer information, state healthcare data, Medicare, Medicaid, and other topics is astounding. The data is produced and consumed by researchers, patients, clinicians, buyers, and policymakers. An organization's cumulative history, which reflects prior experiences, insights, and knowledge, is represented by its organizational memory capabilities. Data warehousing, a part of business intelligence, is in charge of extracting, transforming (making data consistent), and importing this enormous amount of data gathered over the years. Organizational memory made possible by data warehouses benefits businesses by facilitating the generation of new knowledge based on historical information, claim Sabherwal and Becerra-Fernandez (2011).

INFORMATION INTEGRATION CAPABILITY

Improved data exchange and integration both inside and across health care organizations, as well as within a single organization, are required. The National Research Council (2009) states that further integrating data with data from outside sources is one method to make data more usable. Enhancing the quality of shared care within a professional team "depends critically on the ability to share patient-specific information and medical knowledge among care providers," according to Stefanelli (2001).

Organizational memory focuses on historical data, information integration; another organizational capability provided by BI, integrates and links past data from a range of sources that encom- pass organizational memory with the current, real-time content. It connects both organized and unstructured data from a range of sources, including knowledge repositories and corporate databases. The goal of BI integration capability is to address the issues of cost and quality in healthcare by drastically cutting down on the amount of time it would take a human to categorize these data. According to Peter Osborne (2013), an integrated approach to data may result in cost savings and increased efficiency.

He gives the example of a patient who arrives at a primary care facility, is checked by a physician, and then, if necessary, is sent to a secondary care facility for a follow-up examination and, if necessary, particular treatment. After that, the patient is released, but if a follow-up appointment is required, the entire procedure is repeated, along with all related expenses. In the healthcare environment, where a large and diverse set of documents containing various types of information about patients (clinical, personal, and financial) must be integrated to provide a comprehensive view of a patient that care providers and payers can use no matter where, when, or who they are, BI integration technologies like text mining, which enables the automatic reading of large documents of text written in natural language, are likely the most helpful.

INSIGHT CREATION CAPABILITY

Perhaps the most well-known use of business intelligence in health organizations is this skill, which allows the firm to comprehend past events and forecast future developments. The generation of insights is aided by the first two capabilities, integration and organizational memory. A technique to offer dependable and prompt replies is desperately needed in complicated sectors like healthcare, where rapid reflexes necessitate quick decisions based on information from varied sources. Real-time decision support systems and data mining are two examples of technologies that facilitate the generation of insights. Data mining technologies, which offer a thorough study of data with the goal of creating predictive models and providing answers, are growing in popularity in the healthcare sector, according to Koh and Tan (2011). The authors give instances of how they have assisted payers, like as insurance companies, in identifying fraud and abuse, care providers in enhancing patient relationship management, doctors in identifying best practices and treatments, and patients in receiving better and more efficient services. Additionally, they state that "traditional methods cannot process and analyze the vast amounts of data generated by health-care transactions due to their complexity and volume." The technology and methodology needed to turn huge data piles into information that can be used to make decisions are provided by data mining (p. 64). Healthcare companies can benefit much from data, according to Benko and Wilson (2003), but first the data must be converted into information.

PRESENTATION/COMMUNICATION CAPABILITIES

Throughout the health care system, it is well acknowledged that one of the main causes of avoidable patient damage is poor communication between medical teams. BI's presentation capacity facilitates efficient and rapid communication by displaying created insights in various ways that make them simple to understand and apply. For instance, multidimensional data views are supported by online analytical processing, which also enables users to drill down, pivot, aggregate, and filter the data. Dashboards facilitate presentation and let users personalize the data they want to track.

In conclusion, business intelligence's four primary skills are important contributors to organizational capabilities that build upon one another. "Organization's ability to assemble, integrate, and deploy resources, usually in combination or co-presence" is what Bharadwaj (2000) defines as organizational capacities. Data, information, and knowledge are the most valuable resources in modern business, where the idea of "big data" is essential to the operation of any company. The IT sector is evolving from a limited capacity for individual/functional reporting and analysis to one that is characterized by a linked, collaborative, and contextual world of business intelligence (BI), as indicated by Dinesh Kumar (2009). Business intelligence capabilities to gather, integrate, and deploy data to help strategize an organization's future are becoming increasingly relevant as the need for real-time data gathering, analysis, and decision making grows.

Furthermore, giving the user the ability to change data and pose "what if" queries is a crucial component of BI. Encouraging workers to take charge of their own work circumstances is becoming more and more crucial for businesses in a world that is changing all the time. According to business experts "implementing BI solutions for quick access of company resources and tools empower employees to become more adept in handling daily responsibilities with quick, positive ramifications (Blatche, 2012). When employees are empowered to use business intelligence (BI), the firm uses its people, IT infrastructure, and IT deployment—all essential components of organizational resources—more efficiently.

EXAMPLES OF BUSINESS INTELLIGENCE CAPABILITIES IN HEALTHCARE

The transition of the healthcare sector to a technology-driven, patient-centric system is made feasible by business intelligence technologies. The ability to manage many types of data inside intuitive systems that support decision-making is the benefit of integrating technology and healthcare. Contributions from business intelligence lead to a number of advantages for the operation of the firm. In the sections that follow, we give instances to illustrate these capabilities within the healthcare sector.

The first example illustrates how organizational memory captured in data warehouse helps pro- vend reliable data. Although business intelligence tools offer a number of benefits, their efficacy depends on the accuracy of the data they use. Data in the healthcare industry is gathered from a number of sources, such as doctors, hospitals, and patients. Data gathered from these structured and unstructured sources can then be used by business intelligence technologies to provide useful information. Since data is the cornerstone of business intelligence, improving data quality is crucial before implementing business intelligence solutions. The necessity of using data with great integrity is heightened by the fact that data quality is thought to be the most crucial technical component for successful business intelligence (Howson, 2008). Finding the most effective way to collect and handle data is a challenging task in the healthcare industry.

In order to deploy a robust and dependable business intelligence system, Cardinal Health, a multinational supplier of integrated solutions for the healthcare sector, first concentrated on building a powerful data warehouse (Carte, Schwarzkopf, Shaft, & Zmud, 2005). Cardi-nal Health's management recognized the potential benefits of an effective business intelligence system and the necessity of improving the quality of the data in their data warehouse prior to implementing business intelligence solutions (Sabherwal & Becerra-Fernandez, 2011). By making sure that high-quality data was integrated into their business intelligence solutions, Cardinal Health was able to create a software program that could help the company make the best decisions possible.

The second example demonstrates how integration capabilities aids in the identification of disease-risk patients. The capacity to detect people at risk for disease is one of the best aspects of business intelligence that has an impact on health management. This enables healthcare professionals to lower risk, stop pointless testing, and save patient lives. An illustration of a healthcare institution using business intelligence technologies to address a particular illness state is the NorthShore University Health System. Millions of people nationwide are at risk for heart attacks and strokes due to the difficult objective of detecting and treating hypertension. Therefore, North Shore University Health System made action to regulate this sickness in order to fight this epidemic (Degaspari, 2013). To eradicate undetected hypertension in their network, North Shore sought to create a method for connecting practicing physicians with research and quality enhancements (Degaspari, 2013). Through the use of EMR, the team at NorthShore was able to better identify hypertension patients who were undiagnosed or at risk, then established algorithms to decide which patients should be marked for more follow-up. More than 500 people with undetected hypertension have been identified, tested, and diagnosed using the technology since the new program went live (Degaspari, 2013). To help identify individuals at risk for disease and reduce the number of people who fall between the cracks in the healthcare system, programs such as NorthShore's can be deployed nationwide for a range of disease conditions.

The third example demonstrates how the capacity to generate insights aids in identifying procedural problems. Medical institutions can also identify any complications from treatments with the use of business intelligence systems. Business intelligence was utilized at Sahlgrenska University Hospital in Gothenburg, Sweden, to give physicians a quick, easy, and straightforward method of sorting test results to determine whether a patient recuperating from brain surgery had meningitis and the best course of treatment (Sabherwal & Becerra-Fernandez, 2011). In order to give clinicians access to a real-time decision support system that allowed them to view the most recent test findings in comparison to patient records throughout time, the hospital deployed a business intelligence tool (QlikTech International, 2007). In the absence of a business intelligence solution, the doctor would have to manually go through enormous volumes of data in the hopes of arriving at a precise diagnosis. In this case, business intelligence software was able to improve the treatment of critically ill patients, increase hospital efficiency, and resolve difficulties resulting from cranial

surgery (QlickTech worldwide, 2007).

The final example illustrates how BI's presentation capabilities enhance care communication. One of the main areas where business intelligence is enhanced is communication. In order to guarantee the greatest patient outcomes, it is essential to have effective communication channels due to the addition of numerous practitioners, different facilities for service delivery, and the involvement of insurers. An illustration of how a regional health information exchange, a sizable independent physician association, the area's largest hospital, and the regional health plan collaborated to share data in order to enhance care management and care communications throughout a sizable patient region is the Colorado Beacon Consortium (Hagland, 2013). The objective of the CBC was to integrate their business intelligence solution into the current EMR-based practice processes, despite the fact that these four Colorado care groups operated on distinct EMR platforms. Better patient care decision-making was made possible by this integration, which allowed data and information to be shared across all areas crucial to patient health in this area.

Table one illustrates business intelligence area in healthcare.

Table 1: BI Deployment in Healthcare			
ORGANIZATION NAME	INDUSTRY	BI TOOL	BENEFIT
Cardinal Health	Healthcare	Data Warehouse	Quality Data
Northshore University Health System	Healthcare	Integration	Ability To Identify At Risk Patients
Sahlgrenska University Hospital	Healthcare	Insight Creation	Discover Procedure Complications
Colorado Beacon Consortium	Healthcare	Presentation	Electronic Communication Between Multiple Care Sites

COMPLICATIONS

Even while the healthcare sector acknowledges the advantages of employing business intelligence for health management, a number of obstacles have kept new solutions from revolutionizing the sector. One of the primary hurdles is the difficulty in incorporating technology into present practice. According to RAND Corporation researchers, using health care technologies might save about $77 billion annually on average (Hillestad et al., 2005).

However, not all healthcare providers have adopted technology-based systems despite the cost savings and effectiveness. According to some experts, providers—particularly those in small group practices—are discouraged from implementing new technologies by the large upfront costs associated with BI technology (Tak-vorian, 2007).

Broad acceptance has been sluggish despite the government's mandate that healthcare providers deploy EMRs, as well as incentive schemes and implementation support. A fully functional system that can gather patient data, show test results, enable providers to enter prescriptions and medical orders, and assist physicians in making treatment decisions is actually uncommon, even among providers who have some kind of electronic medical record (EMR) (Takvorian, 2007). Technology-based systems must be completely functional and encompass all facets of patient health in order to effectively manage population health.

Concerns about security and privacy also arise when technology is used in patient care. Although consumers' private health information is protected by the Health Insurance Portability and Accountability Act, or HIPPA, it does not allay concerns about the electronic storage of medical records. According to polls, Americans are still quite worried about the security and privacy of health data that is held electronically (Blumenthal, 2011). Stronger security solutions for technology systems must be created in order to better protect patient data. Additionally, measures must be put in place to reduce problems that may arise from human error when utilizing healthcare technology. A crucial component of integrating business intelligence into population health management is creating tools that not only reassure patients that their private health information is secure, but also guard against possible security breaches.

Last but not least, business intelligence tools need to have excellent usability and presentation skills in order to be fully exploited. Even while some systems can produce enormous volumes of data and offer several technological advantages, end users are not always able to understand this data, decide what is pertinent, and avoid errors. Inadequate usability can lead to mistakes that endanger patient safety, lost productivity, and an inability to fully utilize the quality and efficiency advantages of health IT (Blumenthal, 2011).
Creating useful data is the primary benefit of integrating business intelligence into operations. Therefore, in order to give information that leads to better decision making, systems must be easy to integrate and browse. Furthermore, the data produced by business intelligence systems ought to yield insightful outcomes that are simple for end users to understand. Organization members require technology to support tactical and strategic decision making, which makes these presentation capabilities particularly important (Ward, 2012). However, the usefulness of the information generated depends on how simple it is to understand and implement (Sabherwal & Becerra-Fernandez, 2011). The end result is an expensive endeavor that produces information of little value if a business intelligence tool is built but is not user-friendly or does not display data that aids in strategic decision making.

CONCLUSIONS

The optimal strategy for population health management is a topic that is being debated more and more. The way healthcare is now delivered is changing as a result of systemic changes and growing concerns about quality and affordability. Coordinating the medical needs of patients is one of the most difficult tasks in adapting to this shift. Better management of the health of entire communities will result from the healthcare system's ability to efficiently coordinate healthcare amongst patients, providers, and facilities. Business intelligence tools provide solutions that help healthcare providers effectively manage population health. Healthcare firms must integrate the right business intelligence solutions into their operations because technology has become a crucial component of the healthcare sector.

To remain in a competitive market, healthcare providers need a robust BI foundation to correlate, analyze, and gain insight from financial and operational data. In addition to financial and departmental data analysis, including analytics for emergency, surgery, and pharmacies, providers are hopeful that BI tools will provide insight into patient outcomes, physician quality, and performance enhancement. As new accountable care organizations (ACOs) and changes to reimbursement arise as a result of healthcare reform, leaders can also benefit from the insights gained from these tools.

This study's contribution is to demonstrate how the four BI capabilities work together to leverage data and information to produce knowledge that is used as a basis for decision-making in the healthcare sector. A legitimate study subject is how these capabilities are implemented in various settings, which necessitates knowledge of the industry's peculiarities and environment. Based on this claim, we have cited previous research to demonstrate how BI capabilities enhance organizational capacities in the healthcare sector and offered instances of how they may be used to save costs and improve care quality.

All things considered, the literature search focused on the current understanding of fundamental ideas including business intelligence (BI), BI capabilities, healthcare in the United States, organization capabilities, and the application of technology in healthcare. We then expanded on that prior information to demonstrate how, when taken as a whole, they support the endeavors to enhance healthcare delivery in the US.

Future research might expand on these ideas by gathering information from healthcare providers to determine the degree of implementation of these BI capabilities and assess their influence on the effectiveness and efficiency of healthcare delivery. We may look at things like which capacity is most important, which is most expensive, and which is the best in terms of cost-benefit analysis. Through a case study, the writers of this paper are examining the viability of carrying out this line of inquiry.

REFERENCES

[1] Bharadwaj, A.S. (2000). A resource-based perspective on information technology capability and firm per- formance: an empirical investigation. *MIS Quarterly.* 24(1), 169-196.

[2] Benko, A. & Wilson, B. (2003). Online decision support gives plans an edge. *Managed Healthcare Execu- tive*, *13*(5), 20.

[3] Blatche, J. (2012). Business intelligence connectivity: Empowering employees and organizations. Re- trieved August 15, 2013 from http://smartdatacollective.com/johnblatche/45937/business-intelligence- connectivity-empowering-employees-and-organizations

[4] Blumenthal, D. (2011). Implementation of the federal health information technology initiative. *New Eng- land Journal of Medicine*, *365*(12), 2426-2431.

[5] Burke, J., & Ingraham, R. (2008). Path to insight. *Health Management Technology*, *29*(9), 12-14. Byrnes, J. (2012). Driving value: Solving the issue of data overload with an executive dashboard. *Health- care Financial Management: Journal of the Healthcare Financial Management Association*, *66*(10), 116-118.

[6] Carte, T. A., Schwarzkopf, A. B., Shaft, T. M., & Zmud, R. W. (2005). Advanced business intelligence at cardinal health. *MIS Quarterly Executive*, *4*(4), 413-424.

[7] Clarke, R. L. (2012). *Rethinking business intelligence*. HFMA retrieved August 15, 2013, from http://www.hfma.org/Content.aspx?id=3164

[8] Coddington, D. C., & Moore, K. D. (2012). Integrating physician perspectives into business intelligence. *Healthcare Financial Management: Journal of the Healthcare Financial Management Association*, *66*(6), 158-160.

[9] Cucoranu, I. C., Parwani, A. V., West, A. J., Romero-Lauro, G., Nauman, K., Carter, A. B., ... & Pan- tanowitz, L. (2013). Privacy and security of patient data in the pathology laboratory. *Journal of Pa- thology Informatics*, *4*(1), 23-39.

[10] Degaspari, J. (2013). NorthShore University Health System. *Healthcare Informatics, 29*(1), 12-16.

[11] Ferrand, D. (2010). Towards a business intelligence framework for healthcare safety. *Journal of Internet Banking and Commerce*, *15*(3), SS 1-9.

[12] Figlioli, K. J. (2011). Closing the healthcare communication gap. *Healthcare Financial Management: Journal of the Healthcare Financial Management Association*, *65*(9), 148 150.

[13] Frye, G.W. (2010). Using business intelligence to build optimal decision support. *Benefits & Compensation Digest, 47*(2), 1-21

[14] Ghosh, B., & Scott, J. E. (2011). Antecedents and catalysts for developing a healthcare analytic capability. *Communications of the Association for Information Systems*, *29*(1), 22, 395-410.

[15] Hagland, M. (2013). Healthcare informatics. *The Colorado Beacon Consortium, 29*(1), 22-26.

[16] Hammer, M, & Champy, J. (1993). *Reengineering the corporation: A manifest for business revolution*. New York: Harper Collins.

[17] Hennen, J. (2009). Targeted business intelligence pays off. *Healthcare Financial Management: Journal of the Healthcare Financial Management Association*, *63*(3), 92-98.

[18] Hillestad, R., Bigelow, J., Bower, A., Girosi, F., Meili, R., Scoville, R., & Taylor, R. (2005). Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health Af fairs*, *24*(4), 1103-1117.

[19] Howson, C. (2008). *Successful business intelligence: Secrets to making BI a killer app*. New York, NY: McGraw-Hill Company.

[20] Hsia, T. L., Lin, L. M., Wu, J. H., & Tsai, H. T. (2006). A framework for designing nursing knowledge management systems. *Interdisciplinary Journal of Information, Knowledge & Management*, 1, 13-22. Retrieved from http://www.ijikm.org/Volume1/IJIKMv1p013022_Hsia02.pdf

[21] Jinpon, P., Jaroensutansinee, M., & Jaroensutansinee, K. (2011). Business intelligence and its applications in the public healthcare system. *Walailak Journal of Science and Technology*, *8*(2), 97-110.

[22] KLAS. (2013). *Klas Report*. Retrieved September 15 from http://www.ndocsoftware.com/klas-homecare-hospice/?gclid=CITlrpHn8LkCFcuZ4AodeTQApQ

[23] Koh, H. C., & Tan, G. (2011). Data mining applications in healthcare. *Journal of Healthcare Information Management, 19*(2), 64-72.

[24] Kumar, D. (2009). Business insight = business infrastructure = business-intelligence platform. *The Archi- tecture Journal*, 22, 20-26.

[25] Meinert, D. B. (2005). Resistance to electronic medical records (EMRs): A barrier to improved quality of care. *Issues in Informing Science & Information Technology*, 2, 493-504.

[26] Mettler, T., & Vimarlund, V. (2009). Understanding business intelligence in the context of healthcare. *Health Informatics Journal*, 15(3), 254-264.

[27] National Research Council. (2009). *Improving data collection across the health care system, 2009*. Re-trieved, August 2013 from http://www.ahrq.gov/research/findings/final-reports/iomracereport/reldata5a.html#nrc09