



SCALABLE
SYSTEMS

LEVERAGING

BIG DATA ANALYTICS

BIG DATA INSIGHTS ARE CRUCIAL FOR IMPROVING PATIENT CARE WITHIN THE EVOLVING US HEALTHCARE MARKET.

EXECUTIVE SUMMARY

Competitive and legislative pressures are forcing the healthcare industry to find ways to more efficiently manage their resources, reduce healthcare costs and improve patient outcomes. Meanwhile, the push to expand access to primary care, combined with social media and mobile technologies, are transforming the ways care is obtained, delivered and paid for.

The data that can allow for more-timely, informed and cost-efficient care already exists. The challenges to utilizing such data include not just that pertinent records are spread across patient, physician, clinical lab, hospital, health network and other databases, but that roughly 80% of such data is composed of “unstructured” natural language files such as doctors’ dictated notes, social media traffic and scanned images. The growth of EMRs and the public release of massive government health databases is further increasing the size and complexity of such records.

Regulatory and marketplace changes are necessitating the better management and deeper understanding of patient populations. This is forcing the industry to improve the quality and efficiency of care through improved engagement and healthcare personalization. Fortunately, the emergence of effective methods for manipulating and analyzing Big Data dynamics can address the ever-increasing complexities of digitized information to deliver key operational, business and clinical insights in near-real time.

When choosing a physician, hospital or insurance plan, people often rely on the advice of others. The growth of social networks is therefore of significant importance. As people increasingly broadcast their opinions, concerns and criticisms of providers, their services and their quality-of-care, such content exerts ever-more-powerful influences on patient’s health care choices. Providers that fail to manage and respond to the daily deluge of social media tweets, posts, blogs, reviews and reports do so at their peril.

While the implementation of a Big Data strategy can seem like a daunting task, its insights are of critical importance. Its benefits include improving communications between patients and providers, the timely utilization of information into patient states, the most effective prescribing and management of medications, and the better understanding of patient classes. While forward-looking industry participants move to profit from combining and leveraging Big Data insights from historic, procedure-based, social, cloud and mobile data, those who lag behind will be hard pressed to deliver improved treatment regimens and standards-of-care.

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Research firm IDC predicts that between 2009 and 2020, digital data will grow 44-fold, to 35 zettabytes per year.

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THE MECHANICS OF BIG DATA ANALYTICS

The evolution of healthcare IT is being driven by data. The increasing wealth of information being captured by the industry is creating major opportunities for extracting profitable insights for delivering improved patient outcomes and care. This new data paradigm must be seamlessly integrated with a company's traditional databases in order to transform and position healthcare businesses for optimal performance and success.

In addition to the staggering Volume, Variety and time-sensitive Velocity intrinsic to Big Data, there is an intrinsic need to assure the validity of the data. Successfully tapping such massive resources, and profiting from the dynamics of a hyper-connected world, requires leading-edge expertise. The ability to manage the potentially damaging tsunami of daily social media data across internet sites and mobile devices likewise demands new business tools and vigilance.

Although Big Data is complex, and seemingly unwieldy, it can be effectively processed by combining low-cost cloud solutions with the existing IT architecture that most companies already have in place. This enables more productive and profitable decisions to be made. This process requires a holistic approach to understanding a great variety of data types.

All of this requires the efficient extracting and cleansing of data, ranging from electronic health records and structured data generated from sensors and measurements to transcribed physician dictations, data from scanned images and social media traffic. Data integrity, data masking and master data management can empower an enterprise by taming these data sources in ways that increase patient-provider communications, treatment and medication modalities, operational efficiencies, patient outcomes and standards-of-care.



Big Data utilizes server clusters, processing engines such as Hadoop, and new interactivity tools to store, mine and analyze virtually unlimited amounts of highly complex statistical data. To maximize the information's value, these complex data sets must then be presented in effective real-time dashboard visualizations. This requires the creative insights of a data scientist, who must possess math and programming skills plus scientific insights to evaluate huge numbers of factors, ask the right questions, and then produce meaningful visualizations.

Social business intelligence models can deliver relevant real-time data that enables more advanced approaches to customer relationship management. Predefined healthcare-specific dashboards, powered by solution accelerators, data models, advanced reporting tools and predictive analytics can produce real-time measurements that can be inexpensively interfaced with a business's existing data, dashboards, metrics, KPIs and applications. These technologies are available today, and their insights offer the ability to deliver profoundly improved health care.

Merely with respect to analyzing social media, the potential benefits of leveraging Big Data are substantial. Unlike traditional sources of costly consumer intelligence, such as from surveys, focus groups and corporate research, social data is instantly available. Voluntarily given by individuals, it can not only help track and improve the spread of health information but its sentiment analysis capabilities can provide instantly actionable information by revealing preferences, emotions and concerns.



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If U.S. healthcare were to use big data creatively and effectively to drive efficiency and quality, the sector could create more than \$300 billion in value every year.” McKinsey Global Institute, May 2011

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BIG DATA IMPACTS FOR IMPROVING PATIENT CARE

The ability of Big Data solutions to improve healthcare operations is unprecedented. An integrated Big Data approach can allow organizations to personalize health services to reduce variability, costs, and adverse incidents, improve quality-of-care and keep patients healthy. Such enhanced analytic capabilities allow for the harnessing of historical and current trends to better manage clinical and operational activities and better predict what might occur in the future.

The use of Big Data mining to spot health trends and improve communications with patients can enable providers to earn rewards by reducing admissions and keeping patients healthier. Through harnessing and combining existing BI tools with low-cost, cloud-based resources, physicians can access tablets or smartphones to see live data on patient flows and to improve scheduling, diagnostic support and evidence-based medicine. This also allows providers to quickly identify patterns and problems and streamline decision-making.

As patients become increasingly knowledgeable about and personally involved in their healthcare choices, providers can respond by exploiting mobile devices and social media to improve their communications and reduce patient concerns. Likewise, Big Data insights and tools can better target and deliver valuable prevention and wellness information to individuals and groups and improve the effective remote monitoring of outpatients and the chronically ill.

An effective Big Data governance program must first define and prioritize policies and processes. This allows for the successful management and manipulation of high-velocity data from such sources as monitoring and sensing devices, embedded chips, clinical data and social media. The variety of relevant inputs includes unstructured data in emails, messages and other text formats, audio and video from images and procedures, and scanned documents. Natural language processing, and semantic normalization using standard ontologies, allows for the successful utilization of such data.



The increasing sharing of healthcare data by the US government, public insurance programs and others improves the ability for selective and specific analyses, allowing the understanding of patient populations at previously unobtainable levels of granularity. Big Data tools can be utilized to compare cohorts of several million similar patients, evaluate hundreds of clinical features, and compare numerous therapeutic pathways to provide highly specialized treatment recommendations. These data silos can not only provide valuable insights for safer and more efficient care delivery, and better epidemiology surveillance, but for the identification of patterns of fraud and abuse.

An example of the benefits of improved analytics is the experience of Partners HealthCare System's utilization of its clinical data repository on patients, their conditions and treatments. This data was mined to help reduce medical errors. As a result, they were soon able to report adverse drug events of fewer than six per 1,000 inpatients, compared to a U.S. average of 14 per 1,000 inpatients.

In another example, a mobile application was utilized to track patients with specific health conditions through their mobile devices. and assisted with behavioral-health therapies. Information was recorded included from calls, texts, survey responses, geographic locations and even physical movements. That data was then integrated with public behavioral health patient data from sources including the National Institutes of Health. Among the actionable insights gained was that a significant reduction in movement helped identify physical illness, irregular sleep patterns and the imminent onset of anxiety attacks.

Big Data analytics can help healthcare organizations:

- Determine patient prognoses and their potential for responding to particular treatments
- Identify patients likely to be at increased risk for serious adverse reactions to specific therapeutic products
- Monitor treatment responses to adjust and improve treatment regimens
- Enable better patient education, decision support and the following of best practices
- Develop new standards and rules related to diagnostic and treatment protocols
- Enhance the flow of information during patient care transitions and after discharge
- Share clinically significant test results with physicians
- Track social media postings to assure that patients' concerns and complaints are not overlooked
- Develop powerful dashboards and scorecards to enable greater quality control and management purviews.

Big Data analytics is an incredible tool for understanding relationships and trends within massive data sets. Modernizing all applications and their maintenance through the employment of new social business intelligence tools and technologies can also drastically reduce some existing application costs. The integration of personal and public medical data can also enable the improved identification and closer monitoring of high-risk patients. Each of these important developments is powering the movement toward more-timely, informed and cost-efficient care.

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Today's expanding US medical insurance market, with a near doubling of those who are individually insured and as many as 32 million more people soon to be insured, will overwhelm those providers who rely on traditional BI. Likewise, telemedicine and “virtual care” require real-time Big Data analytics.

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CONCLUSION

Successfully harnessing and capitalizing on the ever-expanding data landscape is of critical necessity in the era of Big Data. Its insights create opportunities to improve patient management and treatment pathways, optimize the use of pharmaceuticals and treatment modalities and increase profitability – all while delivering improved patient outcomes and experiences.

When combined with robust visualization tools, Big Data analytics can reveal and improve the effectiveness of physician, hospital and enterprise management initiatives, clinical services, payer and government regulations compliance and interactions, risk management activities and social media influences. The ability to deliver improved standards-of-care will in turn deliver financial benefits to providers as a result of new CMS Innovation Center and Independent Payment Advisory Board reimbursement initiatives.

Optimizing a client's enterprise for success is our main motivation at Scalable Systems. For healthcare enterprises, we have developed a comprehensive suite of services customized to help leverage operations through the implementation of sound database development and modeling, master data management and data masking solutions. We focus on providing a holistic approach to overcoming the challenges of cleaning, storing, searching and analyzing unstructured, structured and raw data - and then presenting it in ways that provide incredibly valuable insights.

We view our dynamic approach to social data as an art form, embracing processes that are both creative and constantly evolving. Our team of strategists can customize an organic solution to fit any company's specific needs. By utilizing social, mobile, cloud and Big Data analytics in combination with the general knowledge from nurses, doctors and IT professionals, we can empower a healthcare enterprise to optimize its performance and success. And by incorporating services from our India-based operations, we can provide the low-cost solution.

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About Scalable Systems:

Scalable Systems is a global software consulting, development and IT outsourcing company providing both onshore and offshore software solutions and integration services to business enterprises around the globe. Scalable Systems has proven expertise encompassing low-cost but high-quality and reliable software solutions and services in areas including Data Management, Business Intelligence, Content Management and Applications Development.

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