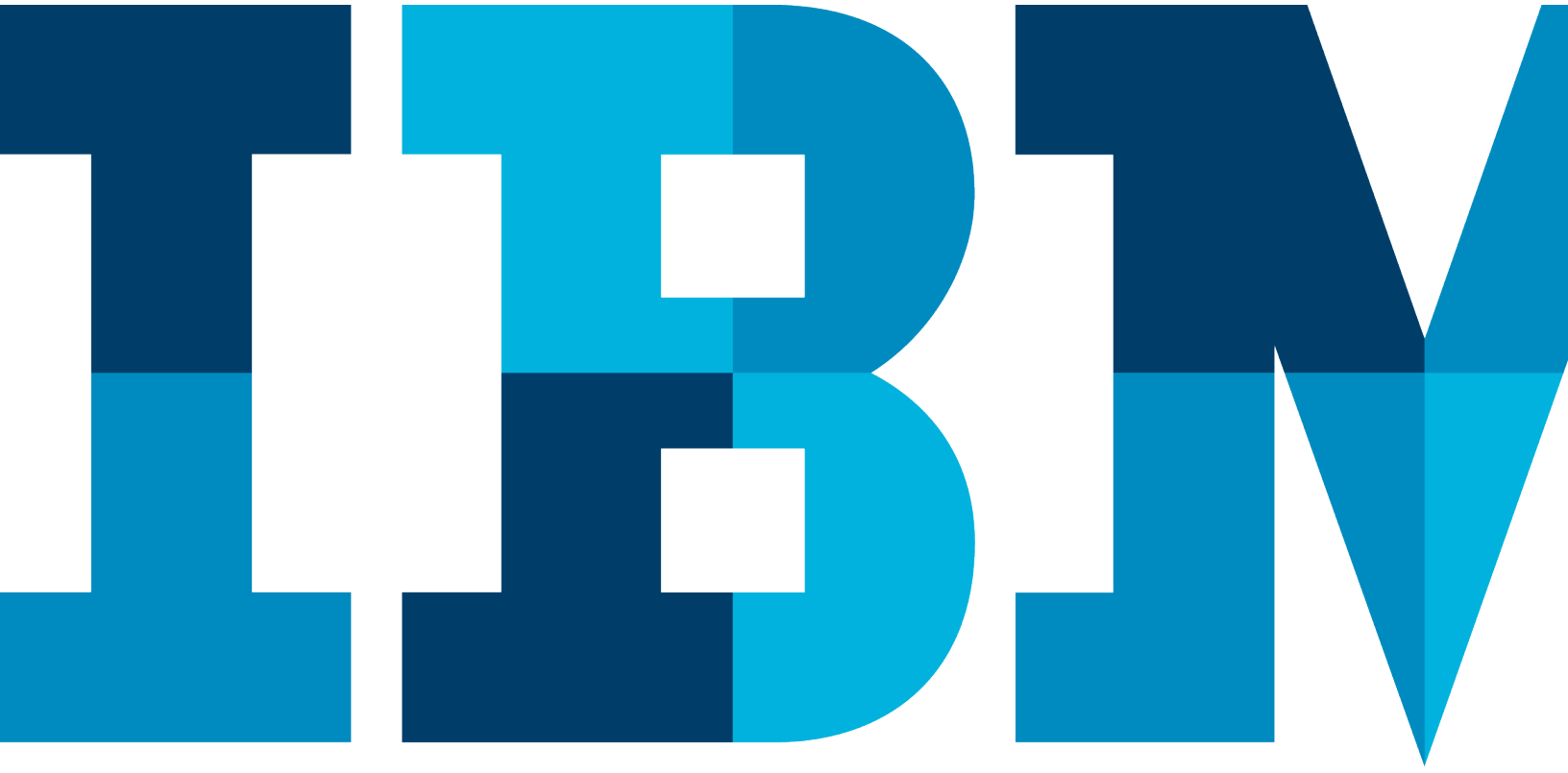
Successful healthcare analytics begin with the right data blueprint



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Executive summary

Regulatory and market issues are driving change within healthcare provider organizations. Meaningful Use and Affordable Care Act regulatory requirements are leading the shift from fee-for-service to pay-for-performance reimbursement. Consumer advocacy groups and individual consumers are demanding better consumer safety, access and value, as well as higher-quality, patient-centric care. Payer organizations are mandating more cost-effective and efficient care. And growing competition is putting pressure on organizations to increase referrals, revenues and profitability.

To address regulatory and market pressures, healthcare provider organizations must look for ways to build more sustainable healthcare systems that control costs, boost operating margins, grow market share, improve care collaboration and outcomes, and flexibly respond to changing conditions. One way for organizations to achieve these goals is with enterprise analytics systems. In the short term, these systems can help organizations:

- Measure and track progress against the metrics required to ensure reimbursement for services.
- Demonstrate compliance with various consumer and payer quality rankings.
- Prove that care is being delivered cost effectively and efficiently.

In the long term, analytics systems can provide organizations with the comprehensive understanding of operational and clinical processes and costs they will need to improve financial, administrative and clinical decision making, increase operational efficiency, improve patient safety and care quality, and reduce fraud. Analytics also help healthcare organizations meet future business requirements, including:

- Identifying process and cost inefficiencies by determining the true cost of delivering care by patient population.
- Decreasing the risks of hospital-acquired conditions and readmissions by analyzing vital indicator trends in patients.
- Increasing profitability by managing resource and utilization costs and identifying the best services to invest in or to outsource.

Health systems will be challenged to deliver enterprise-wide analytics at the current rate of change and transformation within the healthcare industry. Provider organizations need a strategic blueprint and additional skills to successfully implement an enterprise-wide strategy. The skills required include a deep knowledge of how to converge complex data across clinical, operational and financial domains to deliver trusted and meaningful insights that drive new business decisions and transform healthcare.

This white paper discusses how enterprise analytics systems can assist provider organizations in building sustainable healthcare systems and achieving their vision for accountable care—from near-term demands for regulatory and quality reporting to transforming care delivery. In addition, it provides an overview of the implementation requirements to successfully integrate complex data into an enterprise analytic system, and reviews how organizations can accelerate the delivery of mission-critical analysis.

Streamlining regulatory and quality reporting with analytics

Analytics can help healthcare organizations track their compliance with regulatory requirements and identify opportunities to improve patient safety and clinical care quality measures. They enable organizations to:

- Accurately track hospital readmissions, avoidable admissions, hospital-acquired conditions, adverse events and shared savings.
- Measure quality and outcome improvements of care processes and treatments.
- Report on the quality of care delivered by providers and by service lines across the health system.

To ensure that complete and accurate information is reported to regulators and quality organizations, provider organizations need to be able to review and analyze all acute and ambulatory clinical data across all facilities. Reporting can be challenging as regulatory and quality control organizations request ad hoc reports that are difficult to gather and verify, such as those for specific patient sub-populations or cross-sections of patients within specific time periods.

Although most provider organizations already collect and store most of the data required, they must make the data accessible to analytics systems for timely analysis and reporting without interfering with day-to-day operations and the delivery of patient care. The best way to accomplish this is for organizations to bring the required data together in a central location to create a complete picture that can be then be reviewed from different angles to ensure that accurate results are reported.

Provider organizations that can accurately measure performance and report metrics will realize a number of benefits including faster and more accurate payment for services, higher performance rankings and patient safety improvements. In addition, organizations can proactively monitor quality metrics in advance of reporting results, and make adjustments as necessary to keep their rankings high.

Increasing operational efficiencies and controlling costs with better analytics

Once analytics systems are in place for regulatory and quality reporting, the next priority is to identify opportunities to improve business outcomes and operational efficiencies, optimize resources, minimize fraud and reduce costs. Organizations will need to expand enterprise analytics systems to collect and analyze facility utilization and workflow performance information across departments. For example, throughput, capacity and staffing management information is needed to accurately forecast the number of lab technicians needed to fulfill orders in a timely fashion based on upward trends in admission rates for patients with chronic conditions. Accurate analysis of facility utilization and workflow performance can be a key driver in reducing a patient's length of stay, which increases patient satisfaction and reduces the cost of care.

Additional data must also be analyzed to measure processes, outcomes and costs, including supplies utilized for each episode of care, to identify areas that will yield the greatest benefits from process improvements or outsourcing of services. To track the total cost of performing a medical procedure, organizations need to combine operational and clinical metrics,

such as inpatient, outpatient, pharmacy, surgical, maternity, labor and medical equipment utilization data, with physician compliance rates, procurement costs and contract data (see Figure 1). Once all of this data is aligned, actual costs can be compared to revenue for a better understanding of which procedures are the most profitable, and which require greater efficiencies or should be outsourced.

Designing an integrated data model that supports this type of complex analysis is a difficult process. It requires a blueprint for enterprise analytics that defines how to integrate data from both clinical and operational systems, and ensures the required code management compliance and data integrity needed for timely operational analysis. In addition, the blueprint needs to account for how to deliver comprehensive, meaningful and actionable insights, and supplement current data with forecast information to enable what-if analyses, which further increases its complexity.

However, the benefits of implementing an integrated data model to support operational analytics systems are unlimited. These systems can be highly effective in helping organizations to reduce and control procurement and operational costs; increase operating margins, referrals and market share; and improve patient satisfaction.

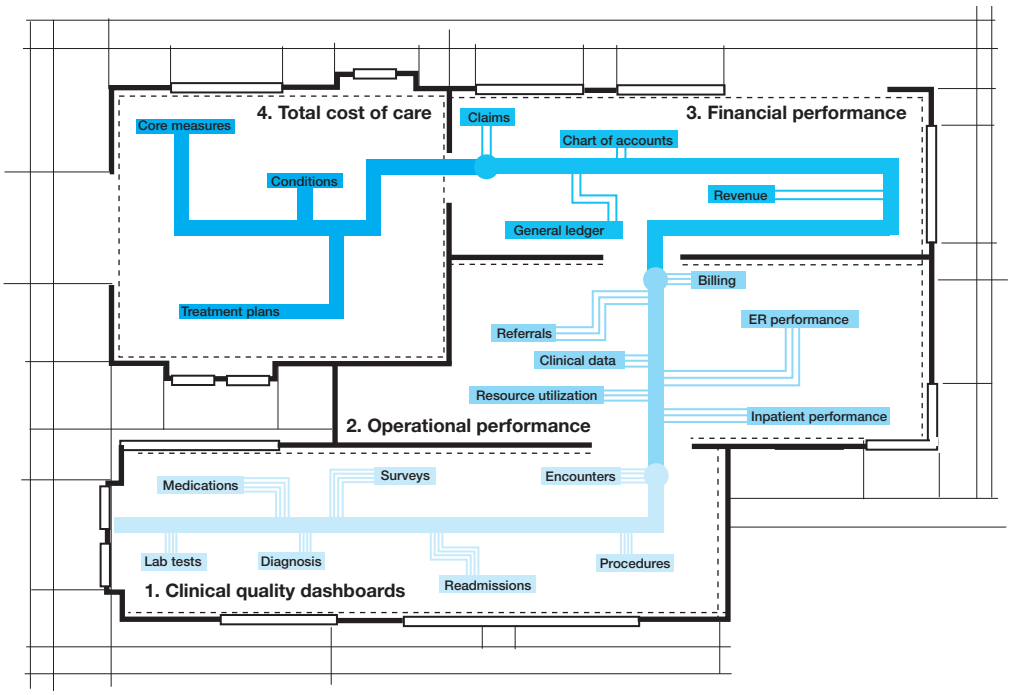

Figure 1: Deriving analytical insights requires integrated clinical, financial and operational data. This blueprint illustrates how the data model progresses to include more types of data as the value of insight increases. A less-complex insight such as a clinical quality dashboard requires clinical and operational data; a highly complex insight such as measuring total cost of care requires all of the data supporting the dashboard as well as financial data and surveys.

Transforming care delivery with advanced analytics

In addition to the previously discussed benefits, enhanced business intelligence will also help organizations transform care delivery, better manage aging patient populations and chronic diseases, and innovate by designing new cost-effective care plans. Over the next few years, most provider organizations will implement the following care transformation programs:

- Predictive analytics and up-to-date evidence-based healthcare to help prevent chronic diseases, improve outcomes and reduce risks.
- Chronic disease care plans that utilize community-based care, in-home monitoring and automated tools to proactively manage care and improve care collaboration, processes and outcomes.
- Patient and clinician portals that increase access to information and decision-support tools to improve tracking of treatments and outcomes, and assist in compliance with clinical pathways and proactive analysis and treatment of patients.

Although most healthcare provider organizations are currently focused on implementing analytics that meet short-term imperatives, many recognize that advanced predictive analytics can help to significantly improve and transform healthcare delivery.

Care transformation efforts require having the right infrastructure in place to provide timely access to comprehensive and accurate data, including structured and unstructured historical clinical data and the research-driven data needed to model future scenarios. A range of analytics tools and technologies will leverage this information to provide accurate insights about how new processes and treatments can potentially impact patient health and transform care delivery.

Healthcare provider organizations that deploy analytics systems will clearly be at an advantage. Not only will they be able to deliver real-time clinical insights and optimized treatment plans to internal care providers, but they will also be able to more effectively coordinate care with outsourced providers, and increase patient engagement, accountability and value. These systems will also assist organizations in achieving leadership and care innovation recognition within their communities and with consumer and industry quality organizations.

Critical requirements for comprehensive analytics systems and healthcare data models

Healthcare providers need to deploy comprehensive streamlined analytics systems to maintain or achieve competitive advantages and ensure the sustainability of their organizations. Some organizations have deployed or are considering single-purpose business intelligence and data warehousing solutions to achieve their immediate regulatory or quality reporting requirements. Others are attempting to create their own healthcare data models to establish a single source of trusted administrative, clinical and research information that can be used by all analytics systems across their enterprise.

There are limitations to both of these options. Analytics systems that merely meet specific tactical needs limit an organization's ability to apply analytics to emerging healthcare scenarios. A healthcare data model that is designed in-house can take two to four years to implement, compared to months to deploy a prebuilt data model, as the resources in many organizations do not have the skills needed to successfully design the type of complex, multi-faceted data model that is required to produce intelligence insights across so many different types and sources of data.

To successfully deliver strategic accountable care initiatives, provider organizations should deploy an enterprise-wide analytics system and implement a healthcare data model designed by an experienced partner. This approach will help them respond to changing needs for advanced insights across different departments, continue to be innovative, and rapidly transform their businesses.

When evaluating prebuilt healthcare data models, healthcare providers should look for models that include the following characteristics.

1. **Extensibility and completeness**, which enable the model to encompass a breadth of integrated complex clinical, financial and operational data across acute and ambulatory environments. The model must have a multi-layered data architecture that makes it easy to add new data structures and derive new insights as the healthcare landscape changes and new issues and opportunities arise. The model must support:

    - Alignment of data from internal systems with payer data to ensure proper and timely payments.
    - Interoperability and comparability of data across systems to enable accurate analysis, and support for multiple applications and previous investments.
    - Incorporation of data from third parties as needed for performance assessments and information exchange.
    - Robust data governance policies and procedures across all data and systems for efficient and precise data management and security.

2. **Support for future and historical analytics**, including as-is, as-was and what-if scenarios for care plan evaluation and redesign, resource utilization and cost analysis, and regulatory and quality reporting. The model must be able to:

    - Record auditable historical changes to data over time to ensure accuracy when patients change payer plans or primary care providers, or when hospitals merge, form new systems or break systems apart.
    - Track system-wide temporal data to enable clinicians and business managers to produce accurate reports based on time series requirements and analyze information at different points in time, such as before and after a certain treatment was performed on a patient (see Figure 2).

3. **The ability to create patient-centric longitudinal views of medical history and health information** that aggregate and integrate data contained in disparate systems within and across organizations, including complete structured data and unstructured data such as clinical images and physician notes. The model needs to:

    - Match populations of patients with internal data to meet the reporting requirements of outside quality organizations and regulatory agencies.
    - Protect the security and privacy of patient data, through data masking and anonymization, while enabling analysis to detect key insights regarding patient care.
    - Understand HL7 clinical messages, such as admit/discharge/transfer (ADT), lab results and patient care plans to track compliance with prescribed care plans, measure outcomes and variances, and identify opportunities to redesign how care is delivered.

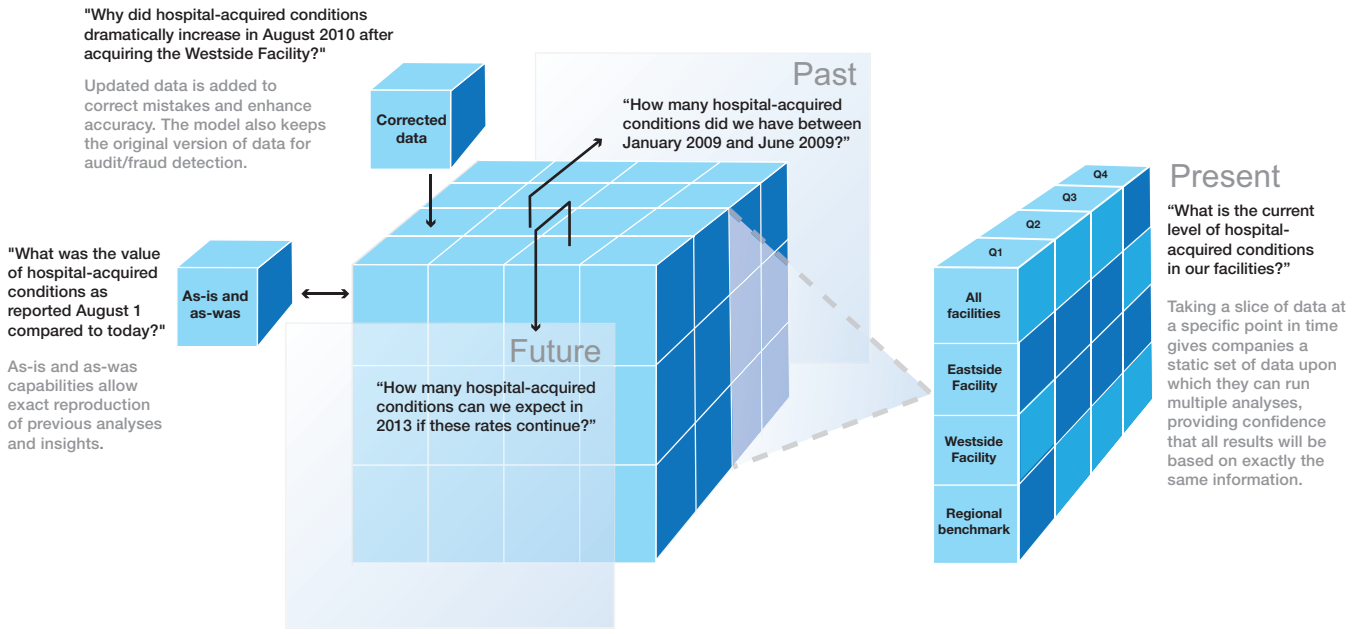

Figure 2: Advanced insights require complex centralized storage and alignment across past and present data to extrapolate future outcomes from existing data, yet protect the same data for compliance and privacy requirements.

4. **Flexible access to data and business intelligence for all authorized users**, and interoperability with analytics systems already in use in facilities and departments. The model needs to support:

    - Multi-tenancy, including the logical separation of data as necessary, to give authorized users from multiple facilities the ability to view the information they need.
    - Report generation by multiple business and clinical users without impacting the transactional and operational systems that run the organization and keep patients safe.

5. **Intuitive, flexible and platform-neutral technology,** so that the model can run separately from transactional platforms and is traceable from the original business drivers to individual data elements and across all layers required for analytics. The model must also include:

    - Support for atomic and/or dimensional design-level data models to provide flexibility and incremental deployment options.
    - Graphical modeling and common terminology to help business and technical teams understand each other's analytical needs and innovate more rapidly, and to provide an infrastructure and tools for effective information governance.

- Extract, transform and load (ETL) data integration tools to streamline implementation.
- Built-in best practices and healthcare intelligence to help ensure rapid and successful deployments, as well as the ability to easily add new analytics capabilities.

Provider organizations should carefully evaluate the capabilities of a prebuilt healthcare data model to ensure that it will support all of their current and future requirements for enterprise-wide analytics. It is also important for organizations to select an implementation partner with proven healthcare expertise and knowledge that can rapidly and successfully deploy the data model and analytics systems.

Delivering smarter analytics with the IBM Healthcare Provider Data Warehouse Model

The IBM® Healthcare Provider Data Warehouse Model delivers the strategic blueprint that organizations need to rapidly deploy comprehensive enterprise health analytics systems. The IBM model enables organization-wide accountability and decision making that ultimately contributes to improved patient safety and care quality. By correlating complete clinical, financial, operational and claims data into a uniquely cohesive and flexible schema, the IBM model provides healthcare organizations with a solid foundation to build a sustainable healthcare analytic system and deliver insights that improve the experience of healthcare.

With the IBM Healthcare Provider Data Warehouse Model, provider organizations can more rapidly achieve an analytics vision, and flexibly deliver new insights as the healthcare landscape evolves. The prebuilt, optimized IBM model helps reduce the implementation time involved in building an analytics infrastructure, accelerating the delivery of meaningful insights about population health, operational efficiency, operating margins and risk and enabling providers to better identify and act on transformation and innovation opportunities.

For more information

To learn more about how the IBM Healthcare Provider Data Warehouse Model can help your organization build a blueprint to accelerate and optimize the analytics journey, visit **ibm.com**/software/data/industry-models/healthcare-provider

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