National Digital Medical Archive promotes higher quality medical imaging through analytics.

Overview

- ***Business Challenge***
  With medical imaging accounting for a large and growing share of healthcare costs, the U.S. government, health insurance companies and healthcare providers need a way to improve the efficiency and quality of medical imaging processes.
- ***Solution***
  Leveraging its real-time integration with healthcare provider imaging systems across the U.S., NDMA created a first-of-a-kind quality control measurement system that provides a data-driven framework for promoting best practices in medical imaging across the healthcare industry.
- ***Key Benefits***
  - *Improved quality of medical imaging processes, enabling more effective diagnosis and treatment*
  - *Greater than 10 percent reduction in imaging expenditures due to better quality images*
  - *Ability to direct patients to the most effective medical imaging facilities, resulting in more efficient healthcare resource allocation*

Based in Philadelphia, National Digital Medical Archive (NDMA) is a recognized leader in clinical intelligence and clinical performance management solutions for the healthcare industry. NDMA provides cutting-edge products and services that streamline the delivery and sharing of healthcare information among healthcare providers, payers and patients.

As the issue of healthcare reform has risen to the top of the national agenda, a number of visions have been put forth and debated. One thing they all have in common is an increasing reliance on information technology to deliver healthcare services more effectively and efficiently. One of the key benefits of integrating technology into healthcare service delivery—a practice referred to as information-based medicine or healthcare informatics—is the ability to extract potentially life-saving insights from large amounts of clinical data from a wide variety of sources. This can range from identifying patients who are

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> – *Derek Danois, CEO, NDMA*

Business Benefits

- Improved quality of medical imaging processes, enabling more effective diagnosis and treatment
- Greater than 10 percent reduction in imaging expenditures due to better quality images
- Reduced exposure to excess radiation due to repeat imaging procedures
- Ability to direct patients to the most effective medical imaging facilities, resulting in more efficient healthcare resource allocation
- Ability to provide targeted quality control guidance to imaging facilities based on measurable best practices

predisposed to specific diseases to creating more targeted, personalized treatment regimens based on genetic profile. Gleaning these insights required breakthroughs on two levels. The first was the ability to extract, transform and integrate enormous volumes of data from heterogeneous hospital information systems. The second was the ability to process and analyze this information rapidly so that clinical insights could be discerned, tested and put into practice as fast as possible.

The fact that information-based medicine remains at an early stage of development attests to the technical, organizational and resource challenges healthcare providers face in achieving it. The National Digital Medical Archive, Inc. (www.ndma.us) stands out in the healthcare industry not only for its leadership in information-based medicine, but also for the unique and successful business model it has followed. In the formative years after its founding in 2003, NDMA focused its efforts on establishing the technological foundation for the aggregation, sharing and analysis of digital medical images such as x-rays, MRIs, CT scans and ultrasounds. To that end, it worked closely with IBM to design and implement an imaging architecture capable of delivering medical image archiving and collaboration as a shared service. Consistent with the cloud computing model the architecture is based on, NDMA's hospital and clinic customers can access its service without having to invest in, support or control the technology that underlies it. They do so through a locally deployed device known aptly as the WallPlug™, which enables healthcare facilities to essentially "plug into" an enormous, real-time medical image archive—running invisibly in the background—through a secure and standardized interface.

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From archiving to intelligence

In the initial phase of its business strategy, NDMA's primary technical requirements were transactional in nature, specifically the ability to support high volumes of medical image files going in (storage) and out (access) of the central repository. To do this it relied on a large cluster of IBM System x® servers running IBM DB2® Extended Enterprise Edition to perform high-volume parallel processing and IBM Content Manager to manage the solution's content. With that technological foundation in place and proven, NDMA embarked on the next phase of its business strategy and the focus of this case study: the leveraging of its vast reservoir of medical imaging data through the use of advanced analytics. An integral part of the company's business plan, this strategic evolution brought NDMA closer to the core value proposition it offered customers—namely, that it could improve the quality and effectiveness of medical imaging while at the same time lower its costs.

At roughly $100 billion annually, spending on radiology services represents a large and growing share of U.S. health costs. Indeed, the consistently rapid growth of radiology spending over the last decade—at between 20 and 30 percent per year—makes it an important contributor to the upward spiral in U.S. healthcare

costs. This rapid growth has led to efforts among key industry stakeholders to contain this growth, without reducing patient access to the benefits of advanced medical imaging technology. It's increasingly clear that the quality of imaging services represents one of the most important variables in this equation. Ultimately, medical imaging is about providing the best information to support clinical decision-making. As such, any factors that impede this flow have the potential to adversely impact clinical outcomes and—by making it necessary to repeat an imaging procedure—add to medical imaging costs as well as radiation exposure for patients.

Data-driven quality

Addressing the need for imaging quality is a key thrust of NDMA's strategy. Its ability to do so ties back to its unique archiving infrastructure, which provides a direct connection to healthcare provider systems. While it may not be apparent to a patient receiving an x-ray or an MRI, the way such procedures are performed is subject to literally hundreds of measurable parameters, including the position of the table, the strength of the radiation, the duration of the scan, and the distance scanned over an anatomical region, to name just a few. Not surprisingly, these same factors tend to correlate closely with medical image quality. NDMA's breakthrough is the ability to extract these parameters automatically for every procedure performed across hundreds of imaging facilities and to aggregate them into a database of real-world medical imaging activities. More importantly, having access to that data—along with the NDMA's deep process expertise—gives it the means to create rigorous quality benchmarks and best practices for specific procedures, and thereby measure each and every procedure according to those benchmarks. That isn't to say that imaging quality standards don't exist. The problem is that until now there's been no consistent way to gauge compliance with the standards, either at the facilities level or for individual technologists who perform the imaging procedures. Moreover, the fact that quality information is more often than not self-reported significantly undermines the case for traditional certification.

Each time an imaging procedure is performed, metadata associated with it is extracted by the NDMA WallPlug and uploaded to the central archive as a transaction. From there, the metadata is run through a series of algorithms developed over 18 months by in-house NDMA experts, resulting in a quality profile or score for that procedure. Because of the granularity of its metadata, NDMA can calculate and report procedure quality at several levels, from individual technologists to a particular imaging device to the facility as a whole.

In terms of addressing the pressing issue of medical imaging cost containment, NDMA's service provides a direct and powerful benefit. For health insurance companies that reimburse facilities for the imaging procedures they perform, NDMA's ratings provide a far more accurate and reliable measure of the procedural quality

Solution Components

Software

- IBM DB2® Extended Enterprise Edition
- IBM Content Manager

Hardware

- IBM System x® servers
- IBM EXP300 Storage Expansion Units

Services

- IBM Global Technology Services

Smarter Medical Imaging

By combining advanced analytics with its nationwide medical imaging database, NDMA created a revolutionary process for measuring radiological quality control. Because it is purely data-driven, NDMA's offering provides a rigorous and reliable means of identifying and promoting imaging best practices, thus supporting the more efficient allocation of healthcare resources and cost-containment across the entire healthcare ecosystem. Insights drawn from its database enable NDMA to provide imaging facilities with proactive guidance on improving the quality of their procedures.

of facilities. By the same token, the service provides health insurance companies with a mechanism by which they can direct their patients to highest-quality medical imaging facilities, which—because they tend to require fewer repeat procedures—end up costing health insurers less. By following this approach, one national health insurance company plans to use the NDMA service to reduce its overall imaging spend by an estimated 10 percent annually. Such proven cost containment capabilities are a big reason the U.S. government's Medicare program—in preparation for new regulations on radiology—plans to make programs like the NDMA service the centerpiece of a pilot program designed to tie reimbursement rates to quality. The NDMA solution can also benefit facilities with quality problems by helping to pinpoint factors, such as inadequate training or unfamiliarity with a specific imaging device, so that the facility can take remedial action to improve its quality.

Keeping vigilant

As the NDMA's business strategy has changed, its technology requirements have intensified. CEO Derek Danois explains: "The evolution of our business toward analytical services has introduced the need to perform extremely advanced statistical calculations on tens of millions of transactions daily. To support this, we needed to complement our transactional capabilities with an equally powerful computational platform—one that can handle the roughly 4 trillion separate calculations the system performs in a typical evaluation." The other key requirement is speed. If the quality of a test raises the risk of a medical problem being missed or misinterpreted, NDMA needs to notify patients and clinicians within the shortest possible timeframe, thus ensuring the best possible outcome.

With the NDMA seeking to build on its early leadership in transforming healthcare delivery, Danois expects the company's long-standing partnership with IBM to grow even stronger. "IBM's technology and support have been an important foundation for our success thus far," says Danois. "In the future, we expect our services to help healthcare providers deliver their services more intelligently and efficiently, and we see IBM technology as central to that effort."

For more information

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