Data Analysis in a Private Cloud Helps Drive Healthcare Improvements

GE Healthcare’s MQIC* and an Intel® Xeon® processor-based cloud help practices track and increase quality

As healthcare providers adopt electronic medical records (EMRs) and other digital health information tools, they’re creating a wealth of data—and looking for ways to gain added value from it.

GE Healthcare’s Medical Quality Improvement Consortium (MQIC, pronounced “M-quick”) helps users of the company’s popular Centricity EMR* and Centricity Practice Solution* (CPS*) do exactly that. Established in 1996, MQIC is a community of practice whose providers contribute de-identified data from their Centricity EMR and CPS deployments and use the resulting data warehouse and analytics capabilities to enhance their quality and reporting activities.

With its data warehouse of 1.6 billion documents representing 30 million de-identified patient records and 209 million office visits, MQIC is an innovative solution that helps physician practices and ambulatory care clinics deliver their best care more efficiently, according to Mark A. Dente, MD, chief medical officer for GE Healthcare IT in the Americas. MQIC also supports a range of population-based research and public health activities of its participating providers, serving on the front lines of what Dr. Dente says is a revolution in the practice of medicine.

MQIC is powered by server and networking technologies from Intel, and runs on GE Healthcare’s secure, private cloud. A recent upgrade that includes the Intel® Xeon® processor 5600 series and Intel® Ethernet 10 Gigabit Server Adapters has significantly increased database performance, helping the company keep pace with 40 percent annual data growth and a fast-growing customer community. Moving forward, GE Healthcare has added the Intel Xeon processor E5 family to its mix of deployment options, and says the processor’s I/O enhancements will be especially useful to handle the future growth of MQIC’s data-intensive workloads.

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Jon D. Morrow, MD
Senior Medical Leader
GE Healthcare

The Heart of Healthcare
Physician practices and ambulatory care clinics are at the heart of healthcare delivery, and they’re facing unprecedented challenges and opportunities. With an aging population,
HEALTHCARE ANALYTICS IN THE CLOUD

At a Glance

Project
- Securely analyze de-identified data in more than 30 million health records to help healthcare organizations improve quality, benchmarking, and population-based medical research

Accomplishments
- Implemented a robust, secure, and high-performance cloud that supports MQIC’s rapid growth in users, data volumes, and analytics requirements
- Solution meets MQIC members’ needs for resource-intensive analytics of massive data volumes without a performance drain on their own systems
- Solution supports peak demands during month-end reporting periods without costly overbuilding

Lessons Learned
- Look for new ways to capture value from your existing data. Cloud computing provides opportunities to aggregate and analyze data from multiple sources
- Standardize the data center on server and network technologies from Intel to gain the processing performance and throughput for deep analysis of massive data stores
- Plan ahead for data growth. With GE Healthcare’s new data center, rearchitected data platform, and choice of Intel® technologies, the MQIC team is ready to handle further growth in members and data volumes

MQIC enables healthcare providers to analyze data and demonstrate their success in applying clinical best practices. “The information in MQIC can help practitioners go deep on the data about a particular patient and go long across a patient population,” says Jon D. Morrow, MD, senior medical leader at GE Healthcare and director of MQIC. “If practices or providers want to know what percentage of their younger asthma patients received a corticosteroid or how many of their diabetic patients had the recommended foot or eye exams, the provider’s data view can tell them that very quickly. With the patient-level views, MQIC can then allow the practice to hone in on which patients are outside of the guidelines, reminding their providers to offer the recommended care and allowing the practice administrators to drive the necessary quality-improvement efforts.”

The Third Revolution: Bringing Data to the Bedside

MQIC is part of what Dr. Dente calls the third revolution in healthcare. “The first revolution was the germ theory of disease of the late 19th century, when physicians were encouraged to wash their hands prior to surgery,” Dr. Dente says. “Then came the use of antibiotics in the 1940s and ’50s. Now we’re entering an era of understanding the importance of data analytics and translational medicine, bringing discoveries from informatics, genomics, and proteomics to the bedside, and bringing them much faster than has been possible in the past. It is revolutionary.”

That blend of analytical breadth and depth helps providers improve patient care. “We’re aggregating this wonderful set of real-world data, and providers are analyzing it and using it to reinforce best practices and treatments that have been recognized through evidence-based research,” says Dr. Morrow. “We’re retaining the art of medicine, but amplifying the science through data analysis, to the ultimate benefit of the patient.”

All these trends point to EMRs and tools such as MQIC as key elements of the solution. Using MQIC’s data warehouse, analytics, and reporting capabilities, the community of healthcare providers at more than 550 practices across the U.S. are enabled to better manage their complex patient loads, implement new care models, adhere to best practices, demonstrate meaningful use, and save time and effort while participating in value-based-payment and accountable-care programs.

MQIC data come from more than 30 million longitudinal EMR records that geographically and demographically reflect the overall United States population. Information is stripped of
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patient identifiers and handled in strict accordance with governmental and industry regulations, to protect patient confidentiality. In addition to the direct clinical application supporting provider quality-improvement initiatives and pay-for-performance incentive programs, the de-identified MQIC data are also used to drive customers’ population-based research ranging from disease surveillance to treatment comparisons. “Research allows the power of MQIC to benefit patients well beyond the office setting,” says Dr. Morrow.

Data Analytics in the Cloud

MQIC members access its quality reporting and submission services through a Web-based portal or through their Centricity Practice Solution interface. Submission reports are aligned with leading value-based payment and quality programs, making them easy for providers to use in selecting their reporting measures. In some cases MQIC can submit reports electronically on behalf of members, streamlining the submission work that practices must do to qualify for incentive payments.

Since MQIC runs in GE Healthcare’s private cloud, members get the analytics capabilities they need without having to build and maintain additional local infrastructure.

“When you’ve got billions of rows of data, the reports are very resource-intensive, and the performance and storage requirements are significant,” explains Andre Sublett, chief architect of the GE Healthcare Analytics Center of Excellence. “Because we do the storage and infrastructure maintenance in our cloud infrastructure, our customers can focus on providing great care and meeting the criteria to qualify for the incentive payments.”

With its foundation of Intel technologies, this private cloud also meets GE Healthcare’s own requirements. “The cloud is a great opportunity to manage total cost of ownership, manage our data growth, and get the performance we need to deliver the analytic insights from a multi-terabyte database,” Sublett adds. “Cloud computing is also well suited to aggregating data across multiple healthcare providers and organizations, which is important for customers’ research insights.”

Standardizing on Intel Xeon Processors

To stay ahead of the dramatic growth in healthcare IT, GE Healthcare recently opened a 40,000 square foot Tower Annex Data Center and re-architected its MQIC infrastructure. The MQIC technology team moved its Oracle 10g database, which previously ran on HP Integrity servers with Intel® Itanium processors and HP-UX, to an Oracle Exadata data machine. The Exadata system uses the Intel Xeon processor 5600 series for both servers and storage controllers, with an InfiniBand interconnect to increase data throughput. MQIC’s web tier and SAS statistical software engine run on HP ProLiant DL380 G7 servers, also powered by the Intel Xeon processor 5600 series.

“Intel Xeon processors are a standard in our data center,” says Ron Brahm, program manager of technology services for GE Healthcare. “They give us the performance we need, and we like the versatility, since we can support a wide variety of program loads while maintaining consistency in our infrastructure. They’re extensible, supportable, and upgradeable, and the Intel road map means we’re always looking to the innovations in the next generation.”

Intel Xeon processors also contribute to an energy-efficient data center—a plus for a company with GE’s strong record on energy-saving innovations. The Intel Xeon processor E5 family and 5600 series provide capabilities that automatically regulate power consumption and intelligently adjust server performance to application demand, maximizing both energy cost-savings and system performance.

Performance and Scale to Handle Data Growth

With its choice of Intel Xeon processors, the MQIC technology team met the critical requirements it established for its cloud infrastructure. “We need affordable horizontal scaling so we can maintain the same high level of services against an exponentially expanding set of data and increasing analytics demands,” Sublett says. “We need to support multiple operating systems, since we’re aggregating information from multiple sources, including many on older systems. We also need the processing power for complex statistical data compilation over billions of records. We have a big requirement to pull data into memory, so we need the ability to scale up on the back end and scale out at the front end and application tier.”

The new environment has improved performance and processing capability, delivering a consistent experience for customers despite rising data volumes and increasingly sophisticated analytics. “We have seen performance gains of 20 percent,
30 percent, even up to 40 percent in certain areas,” says Sunil Luhadia, senior database administrator at GE Healthcare. “We are also able to process the increased workloads of our membership, which is growing by 40 percent per year. It would have been unthinkable to support this growth without our recent upgrade.”

GE Healthcare is looking toward Intel’s next-generation processors to handle future growth. “The Intel Xeon processor E5-2600 product family provides excellent energy efficiency and a significant increase in performance,” Braham says. “The new integrated I/O capabilities will be very significant for data-intensive workloads like MQIC. Intel’s security features are also of interest, including Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) for hardware-accelerated encryption, and Intel® Trusted Execution Technology (Intel® TXT) to help protect against malware in a cloud environment.

Putting Analytics into Practice

All that high-powered technology is happily transparent to Diane Hollingsworth, RNC, MAOM, CPHQ. Hollingsworth is director of quality and education at MedStar Physician Partners, a member of MedStar Health. As a veteran of paper-chart auditing, she says MQIC not only makes her job easier, but is enabling MedStar Health to utilize reporting tools to help deliver higher-quality care in a more efficient, sustainable fashion.

MedStar Physician Partners is an ambulatory care leader with nearly 35 offices and more than 129 healthcare providers in Washington, D.C. and Maryland. Many of the group’s practices are Level 3 Patient-Centered Medical Homes (PCMHs), and the remaining practices are in the process of certification. MedStar Health provides care to 1.5 million patients each year, and has an MQIC member since 2003.

Hollingsworth uses MQIC analytics to assess the quality of care delivered and documented by MedStar providers and offices. She also benchmarks MedStar against others in the region or across the nation. “MQIC is a phenomenal help in showing us the opportunities to improve care, and we can drill down on the data so that providers can trust the data and are really willing to make changes based on it,” she says.

When the data shows room for improvement, Hollingsworth collaborates with the affected individuals and groups to identify root causes and develop new approaches. “Sometimes providers are delivering the recommended care but not documenting it, so they need education on the use of the EMR,” she says. “Sometimes the vocabulary isn’t aligned, so we’ll work to clarify that. Sometimes we modify office procedures and workflows.”

MQIC also helps MedStar save time and money in demonstrating meaningful use and qualifying for this and other key incentive programs available through the U.S. Centers for Medicare and Medicaid Services (CMS) and other organizations. “MQIC has taken the time to validate and ensure that the filters they have created are appropriate for CMS standards, so we don’t have to have someone in the back office trying to do that,” Hollingsworth says. “With many of these programs, it’s not just one report. It would take a tremendous amount of time to run these reports individually and make sure that all the filters are correct. MQIC lets us maximize our efficiency, supporting us in pursuing incentive opportunities and making it much, much easier.”

Ultimately, says Hollingsworth, MQIC elevates the whole conversation around practice management and clinical quality. She shares the de-identified data by office and provider, so everyone can see their performance on key metrics and track how it compares to others within MedStar and externally—and members of the practice are paying close attention.

“MQIC raises awareness of clinical guidelines and best practices, and supports providers to improve their practice overall!” Hollingsworth says. “We have common-knowledge-based discussions much more than we did when we were on paper charts. When the medical director does his road show and meets with each practice, they talk about the MQIC reports. Everyone knows where we are with the metrics, and we talk about what the data is telling us. We have a level of conversation regarding performance metrics across a large medical group that you wouldn’t have had without the common base platform.”