Patient 360: Improving Patient Care and Care Coordination

Background

As healthcare organizations deploy systems like EHRs to meet enterprise needs or department-level systems to address specific specialty needs, or as they enter into dynamic business relationships such as Accountable Care Organizations (ACOs), an enterprise-level goal arises—leveraging the critical data in disparate data silos to get a complete view of the patient, or “Patient 360.” Achieving a Patient 360 has many benefits and advantages for healthcare organizations. Consider just a few examples:

- Organizational care coordination will improve when the full care team (providers, case managers, patients, and family members) can see and understand all the active issues or potential complications.

- Population level analytics on a more complete patient view can more accurately help the healthcare organization refine and prioritize its care delivery.

- Accountable Care Organizations or Medicare Advantage Organizations can more accurately measure and report on the quality of care that is being delivered and more accurately bill for their patient population.

- Patient compliance and family member support for patient behavioral changes is enhanced by more complete and more timely access to patient health indicator trends and analytics based on the rich Patient 360 data set.

A typical healthcare organization has dozens of different data silos, and even when organization-wide EHRs are deployed, the creation of business relationships such ACOs requires the integration of specific patient populations across traditional organizational boundaries. To get the necessary comprehensive view, IT architects need to integrate and unify data for specific patient populations. They want to avoid disrupting existing best practices, ownership, and well-defined processes already in place. The unifying technology should seamlessly integrate with existing systems to complete the enterprise-wide architecture.

The MarkLogic® Enterprise NoSQL database platform is such a technology. Global organizations use MarkLogic to create an active, searchable system that presents a unified view of unstructured and multi-
structured patient data across organizational silos. Deployed as a Patient 360 solution, or “patient data cloud,” MarkLogic provides a patient data store, services for connecting with the multiple remote data sources, and APIs for delivering data to multiple applications. A Patient 360 solution based on MarkLogic provides data services such as master patient index, search, discovery, analytics, update, enrichment, normalization, transformation, and delivery, while adhering to role-based security controls.

The Challenge of Creating a Comprehensive Patient 360 View

Unifying enterprise-wide patient data involves capturing metadata about existing data assets from the disparate silos which are communicated in multiple different formats (such as CCD, HL7v2, CCDA, FHIR, PDFs, Word documents, scanned images, direct ODBC or SQL access, etc.) into a centralized, searchable system. The challenge is efficiently tying together the multi-structured, heterogeneous metadata formats.

Traditional systems based on relational database management systems (RDBMS) and search engines are a poor technology fit for meeting this challenge. Neither technology is ideal for unifying multi-structured data. RDBMSs require significant work because they use rigid, predefined database designs (“schemas”). To take advantage of data structure (i.e. for enabling robust queries), IT architects must create a universal schema up front to accept all known data formats in the enterprise. Any format change or update requires a schema redesign, which often takes months to complete. Search engines also fall short because they do not sufficiently capture the structure within data that enables the precise, sophisticated queries required in mission-critical environments.

Given the dynamic nature of business relationships such as ACOs, and the movement of patients in and out of them, the sharing of data for ever-changing sets of patient populations also needs a new rapidly adjustable security paradigm.

The MarkLogic Enterprise NoSQL Database Platform

MarkLogic is designed to overcome the aforementioned challenges. It combines best-of-breed capabilities of database management systems, application servers, search engines, and flexible role-based security. This
architecture, in conjunction with an open data model that is very friendly to XML/JSON-based healthcare standards, provides the ability to deliver a security-compliant roles-based, 360-degree patient view across a siloed infrastructure.

Organizations achieve agility by using MarkLogic, because it can accept new data sources immediately. Any data changes can be accommodated without the expensive redesign effort required by RDBMS-based solutions. All structure is dynamically captured to ensure users can run sophisticated queries. MarkLogic provides high performance, near-linear scalability on commodity hardware, reduced administrative effort, and standardized APIs to lower the total cost of ownership of implementing and maintaining a comprehensive view of data. MarkLogic solutions are generally implemented in development iterations spanning only a few weeks, quickly and incrementally driving new value to the organization.

Because MarkLogic is an Enterprise NoSQL database with full ACID compliance, it can be used to ingest and manage not only metadata but also any other type of multi-structured mission-critical Big Data. When legacy systems are too expensive to maintain, organizations can consolidate data into MarkLogic, where it can be securely managed and analyzed.

**Example Patient 360 Deployments**

Below are a few examples of how a Patient 360 solution built on MarkLogic can help organizations gain an advantage.

**Accountable Care Organizations (ACO)**

By creating a Patient 360 view of a very specific population of patients (changing yearly) as part of its participation in an ACO, ACOs can properly identify risk, improve quality, and reduce costs for this population. Normally, setting up an ACO requires the implementation of a costly HIE and takes many months or years to implement with legacy technologies. With MarkLogic bringing the data in “as is” from all the identified sources – and using role-based security to expose just the right patient population to the ACO – organizations simplify the process of implementing and managing these dynamic relationships. Analytics and trends based on an individual’s Patient 360 data can be exposed to patients and their immediate care teams helping to enable healthy behavioral change.

**Private Health Information Exchange (HIE)**

By creating a central repository for patient data, with malleable role-based access, healthcare organizations can get a complete medical history for patients. However, if HIE members must invest in transforming data to a standard format, they have reduced incentive to share. With MarkLogic, HIE members can share data “as is” to a central system, with no transformation overhead, while still maintaining their own master
records of their patients’ histories. In addition, MarkLogic’s real-time alerting capabilities can enable rapid and timely care coordination.

**Clinical Process Improvement Analytics**

By creating a Patient 360 view of patient data across all of its data silos, healthcare organizations can run more timely and accurate analytics on processes such as care coordination that span internal and external systems. The insights gained from these analytics can be used to help reduce variations in care.

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**Conclusion**

Creating a unified view of enterprise-wide patient data is a challenge with RDBMS-based solutions, particularly in dynamic environments such as ACOs. The overhead of maintaining a universal schema reduces agility and cost-effectiveness.

MarkLogic overcomes this challenge with its Enterprise NoSQL database. It accepts new data types “as is” to lower the overhead of aggregating new or changing data, while supplying real-time search and alerting, government-grade security, and a robust set of data services and APIs. This gives organizations the agility to respond to changing requirements in a cost-effective solution for creating a comprehensive view of their data.