



SPECIAL REPORT

BUILDING A CLINICAL DECISION ENGINE PLATFORM WITH RED HAT DECISION MANAGER



The role of “intelligent systems” in healthcare should be to augment or enhance – not replace – the hands-on services of physicians, clinicians and caregivers. Technology should empower providers to do their jobs even better, in a more informed and cost-effective way, and exponentially improve patient care.

One healthcare institution delivering the right mix of technology to empower caregivers is New York’s Northwell Health. The organization employs state-of-the-art technology, while ensuring that the patient experience is welcoming, warm and well-informed.

DECISION TIME

The key to Northwell’s magic is a system designed to provide clinicians and caregivers with tools and resources to easily create their own applications, using patient information. Its system is designed to pull data from a variety of clinical sources and give recommendations for patient care. Access to suggestions and reports from this system is configurable by the clinician or caregiver, or team/committee – including physicians, nurses, technicians, and therapists – with little or no intervention from the organization’s information technology department required.

Vipul Kashyap, Director of Clinical Information Systems and Enterprise Information Architect for Northwell Health, says the Clinical Decision Support system is designed to “enable a view of the business logic that is easily understood by a clinician, without the need to know a software programming language like SQL or Java.” The easy-to-adapt decision engine is part of his organization’s goal to “identify new and innovative ways of using technology to enable digital health and to enable better care, better outcomes, lower cost, and improve efficiency.”

Kashyap defines the role of the engine as “the ability to provide recommendations and feedback to a physician at the point of care, or to a care coordinator when he or she is interacting with a patient.” The goal is to provide clinicians and caregivers a self-service environment in which they can provide clinical care in a more “rapid and innovative manner,” with the IT department in the background, continuing to provide basic infrastructure and tools.

Information that flows through the decision engine comes via the health information exchange team at Northwell, of which Kashyap’s team is part. “We have built up hundreds of interfaces to multiple EMR, lab and other systems across the enterprise,” he explains. “It’s a huge challenge. The health information exchange team has been at it for the last five to six years. But we are in a good position where most of our data is integrated and easily available in a single place. That data can be mined for analytic insights, or leveraged by a decision engine to make recommendations.”



Red Hat Solutions Used by Northwell Health

- Red Hat Decision Manager
- Red Hat Process Automation Manager
- Red Hat Enterprise Application Manager
- Red Hat Enterprise Linux®

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– Vipul Kashyap

RECOMMENDATIONS

Northwell's Clinical Decision Support system is built on Red Hat® Decision Manager 7, a decision management platform that simplifies the development and deployment of rules-based applications and services. Red Hat Decision Manager 7, formerly named Red Hat JBoss® BRMS, is the next generation of the company's business rules management offering, which is designed to let organizations quickly build applications that automate business decisions. Red Hat Decision Manager is part of a new generation of low-code development tools that enable users – be they in the healthcare or business professions – to take a more active role in application development, and therefore dramatically accelerate the application development process.

Northwell's decision engine is designed to help identify clinical risk factors for patients and recommends treatment options. The system supports Decision Management Notation (DMN) models, which enable clinicians and business analysts to exchange decision models across systems and organizations.

In its initial rollout, the decision engine delivers recommendations to clinicians and care coordinators in terms of assigning patients to particular care programs. Adoption of these recommendations has been close to 100 percent, Kashyap reports. “When you run the rules, the decision engine identifies the subset of patients who need to be viewed for a particular program. That person appears on a list for a care coordinator to reach out, and make a phone call.”

The decision engine “provides recommendations and feedback to a physician at the point of care, or to a care coordinator when he or she is interacting with a patient,” says Kashyap. In addition, recommendations are provided “in business- and clinician-friendly terms. If the recommendation is for the physician to order a particular lab test, or to remind the care coordinator that the patient has not done a lab test, it will provide the reasons why it thinks so. The physician or the care coordinator will be able to decide whether to accept the recommendation or overrule it.”

RAPID DEVELOPMENT

The decision engine is intended to encourage the rapid development of configurable, reusable functionality for identifying patients for enrollment into care management programs, providing and updating complex decision support rules and models without IT intervention. Employing Red Hat partner, Trisotech's DMN authoring environment, the decision engine enables Northwell Health clinicians to add insights right into applications, with support from a knowledgebase built into the system.

It is intended to provide clinicians tools with which they can easily design their own applications and formulate business rules. The functionality is also being exposed through an API that will make it available across all locations and settings. The system enables “a business [user] or a clinician to quickly specify the logic, he or she wants to be used, for monitoring the patient condition and giving recommendations to the caregiver, the care provider, at the point of care,” Kashyap explains.

In the early stages of the decision engine rollout that is currently taking place, Kashyap's team is first targeting the “power user” clinicians and caregivers, who already have some in-depth understanding of technology and programming. “The power users will create the business logic, test it, and tune it,” Kashyap says. “The next step will be to further simplify the creation of business logic so end-consumer types of a physicians may be able to specify some limited types of logic. For example, we can provide them with template forms for building the logic.” Already, the system is enhancing “the understandability of the decision model and the ability for a clinician to test and refine the model in the authoring interface,” says Kashyap.

Building the decision engine and its capabilities is an evolving process that will continually be refined and improved as time goes on. As Kashyap relates, the development process itself “involved vetting out the architecture for transforming data into an expected input and to process the output of the REST-based API.” The major challenge encountered was “primarily around the scaling of the system – which involves retrieving data from the different data stores and transforming it into the format and data model expected by the REST API,” he relates.



DRUG INTERACTIONS

Drug interactions is a leading example of an area in which the decision engine will provide early value, increase care and potentially save lives. This has been one of the most challenging aspects of healthcare, as many drugs are available that help manage or cure many diseases or conditions. However, many physicians – with private practices as well as hospital settings – will prescribe drugs without awareness of other drugs a patient may be taking, unless verbally informed or alerted by the patient or his or her pharmacist.

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– Vipul Kashyap

With its Clinical Decision Support system, Northwell Health will be able to tackle this issue head-on, providing informed recommendations about the risks of various interactions, along with patients' treatment regimens and histories. To build a model addressing drug interactions, the clinician would open up an authoring interface and specify rules and logic around "drugs which a patient is already taking, and drugs which are being ordered," Kashyap explains. "Then that power user will test the logic for false positives and false negatives, and further tune it, identify the actions to be taken when a drug interaction is discovered, within in the context of a clinical walk-through."

After the authoring and testing phase, the model is published to the system, and deployed in the context of a clinical workflow that includes data from the patient's electronic medical records. "For example, maybe the physician is ordering a particular drug to the order entry system, which interacts with a drug which is already part of the patient's record, and it issues an alert: 'please consider this drug before you order and here is the reason why,'" Kashyap explains. This example also illustrates the flexibility of recommendations, he continues. "At the point of care the physician would not only see the recommendation, but would also see the reasons why the engine is making that recommendation, in clinician- and business-friendly terms."

FUTURE VISION

Looking forward, Kashyap sees great potential in employing the decision engine to support mobile apps, mobile devices and health monitoring equipment, in which patients can be monitored 24 hours a day and tracked in real time. This will bring clinical, financial and wellness data into a common environment. "We had a successful prototype in which we have been able to integrate eight different devices into health information exchange, and use that to trigger rules, to make recommendations."

Kashyap reports his team is now searching for a first clinical use case on which to build the remote monitoring capability into the decision engine. However, this phase of the project will take more time. "It would require some changes in our IT infrastructure, we would need to add additional functionality, and it may end up changing some policies on how much to trust the data on making a decision, and maybe have the potential to change some clinical workload. So, we have to be careful about introducing it into the clinical enterprise."

Mobile apps that access information and recommendations from the decision engine are being deployed on two levels. "They are two types of mobile apps – one is the wider-facing mobile apps, which, for example, which can send clinicians notifications about lab results and patients. For the most part, those apps are very well designed, and physicians are pretty comfortable with them. They don't need training, because everyone knows how to go on an app and order a book these days." The other category of mobile app, which is to be used by patients, is still a challenging area, Kashyap adds, as it may be "a challenge to get patients an affordable device and also to get them using it. There is potential value but in achieving the value, there might be some investments required. There are practical issues which need to be addressed before we can incorporate these technologies into [the] mainstream."

Work continues on tweaking the capabilities of the decision engine to open up capabilities and greater ease of use to clinicians and caregivers. Kashyap's plans include developing "a common mechanism to represent decision models which may be implemented in a wide variety of implementation languages, such as those related to business rules." Further down the road, he sees an opportunity for also integrating financial exchange data into the system, to develop a more holistic picture for business-related decisions.



In addition, Kashyap sees the decision engine eventually becoming an integral component for helping clinicians and staff to meet Meaningful use stage 3 directives, which require wider adoption and leveraging of electronic health records.

Northwell's Clinical Decision Support system is a cornerstone to a comprehensive digital makeover being undertaken across the organization's sprawling network of 23 hospitals, 600 outpatient facilities, nearly 15,000 affiliated physicians, more than 15,000 nurses and 4,725-plus volunteers. Over the past three years, the organization has been committed to putting the power of digital technology and information sharing into the hands of all members of its staff and community.

In doing so, Northwell is freeing up staff to focus on achieving greater innovation in their roles, improving the quality, speed and compassion in the delivery of healthcare services. Northwell's decision engine, built on Red Hat Decision Manager 7, is the cornerstone of this effort, and is playing a leading role in enhancing the online patient experience and providing greater digital capabilities to clinicians and staff – ensuring the same attentive care that attracted healthcare providers to their professions in the first place.

The system is still in its early stages of adoption and implementation, and therefore exact cost savings data is not available. Northwell's leaders are confident, however, that once fully implemented, the Clinical Decision Support system will deliver significant financial benefits and more importantly, vastly improve patient care.

Northwell's Clinical Decision Support System, powered by Red Hat Decision Manager 7, promises the following advantages to Northwell Health:

- Increased speed of decision making
- Increased attention to patient needs
- Cost savings
- More rapid diagnosis
- Greater communication between hospital staff members
- Higher-quality communications between hospital staff and patients
- Enhanced ability of clinicians and caregivers to design care plans
- Real-time alerts to conditions and drug interactions



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Red Hat is the world's leading provider of open source software solutions, using a community-powered approach to provide reliable and high-performing cloud, Linux, middleware, storage, and virtualization technologies. Red Hat also offers award-winning support, training, and consulting services. As a connective hub in a global network of enterprises, partners, and open source communities, Red Hat helps create relevant, innovative technologies that liberate resources for growth and prepare customers for the future of IT.