



Steward Health Care - DataRobot case study

Hospitals, by law, have to record, collect, and maintain a lot of data. For Steward Health Care, the largest for-profit private hospital operator in the United States, all that data represented a massive opportunity, and a big question: How can they use predictive analytics, artificial intelligence (AI) and machine learning to drive value from all of this data?

The responsibility to find an answer to this question fell to Erin Sullivan, the Executive Director of Information Systems and Software Development at Steward Health Care. Erin was tasked with improving operational efficiency among Steward's network of 38 hospitals in the United States, with an eye toward reducing costs. In order to focus their efforts, Steward Health Care decided to tackle one of the most pressing challenges facing hospital operations – staffing volume. The answer to solving that challenge lay within the data.

“We have data – a lot of data – and we want to use it to our advantage,” she said. “The best way to use it to our advantage is to learn from it, and DataRobot has the tools to help us take historical data, manipulate it, and learn from it.”

The Problem of Hospital Staffing

Sixty percent of hospital operations expenses come from staffing alone, representing a massive line item on any hospital's budget. For planning and scheduling purposes, the typical hospital staffing model is set to average census and volume. Unfortunately, by working against a static average, this means that during peaks in patient volume, the hospital is often understaffed, and during valleys in patient volume, the hospital is often overstaffed. This is highly inefficient, and typically leads to hospitals incurring extremely high expenses for on-call staff and overtime pay.

Steward Health Care's CEO, Dr. Ralph de la Torre, challenged his team to find a more proactive approach. It was not enough to just come to a monthly close meeting and hand out reports that highlighted inefficiencies in the previous month's staffing operations. Steward needed to find actionable opportunities to be proactive in their approach toward predicting hospital volume and staffing more efficiently.



Erin Sullivan sharing Steward's story at AI Experience Boston



“We are using DataRobot to make some pretty huge decisions at Steward Health Care.”

– Erin Sullivan
the Executive Director of Information Systems and Software Development at Steward Health Care



“We’ve always had basic predictive trends for volume – day of week, time of day – but we needed something else,” Erin said. “We didn’t have the data scientists or the analytical depth. We had all this data, but we didn’t know what to do with it – how to handle our data and put it through models to get us the results we need.”

Taking the Next Step

Hospital staffing volume is predictable and trendable; the development team already knew this, and didn’t need DataRobot’s automated machine learning platform for this. But what DataRobot did bring to Steward was two-fold:

- **Providing the tools** to help Steward manipulate their data, quickly build and test models from that data, and ultimately learn from the data
- **Sharing data science knowledge** and expertise to help Steward address their skills and resources vacuum

With the consultative help of Sergey Yurgenson, DataRobot’s Head Data Scientist, working directly with Erin and Steward’s data engineering team, the project began by identifying sources of historical data from all the network’s hospitals. The more data they could feed into the model, the more they could fine-tune their predictions.

Inpatient volume contributors primarily came from two main sources: the emergency department (ED) and the elective operating room (OR) schedule. What the team wanted to identify were other external factors that might affect volume predictions. Some factors were expected – Saturday’s had fewer scheduled surgeries, Monday to Wednesday had more – while others were a little more unexpected: school vacation weeks, New England sports team schedules, and even moon phases!

The DataRobot automated machine learning platform helped Steward build and test new, more accurate models faster than ever before. Steward was able to quickly get 384 models working on day-specific volume and 1,152 shift-specific models into production in a dashboard built by Erin and her team. These DataRobot models are fed into Steward’s proprietary and patent-pending Proactive Labor Management (PLM) dashboard, a SaaS platform run on Microsoft Azure that is accessible to all 38 hospitals within the Steward Health Care network.

“In the current staffing model [working with DataRobot], we can staff to peaks and valleys, and also do it well in advance,” Erin said. “To do it in advance, you need to be able to trust it, and in order to trust it, we needed something other than ourselves: we needed DataRobot to help us.”

JUST A 1% REDUCTION

in registered nurses
hours paid per
patient day



NETTED \$2 MILLION

in savings per year

FOR JUST 8 OF THE 38

hospitals
in Steward's network



“Traditional healthcare isn’t on the cutting-edge of AI, machine learning, or even software and technology. We needed someone to help us get better with predictive modeling on all [our] data.”

– Erin Sullivan



Actionable Results = Bottom-Line Impact

Built within Steward's PLM dashboard is an accuracy tracker, one that currently has daily models at 95% accuracy. As the models and dashboard roll out across the entire Steward network, the development team is already finding new trends and tweaking accordingly. For example, some units – like psychiatric or the ICU – at some of the hospitals have proven to be more accurate than others.

Steward also used DataRobot to help predict and reduce patients' length of stay at the hospital. This project has dual benefits of not just improving patient outcomes and experiences, but also reducing costs. Having data that helps predict expected length of stay for certain diagnoses allows doctors to take proactive measures and get patients home sooner, without sacrificing quality of care.

Steward Health Care is already well on their way toward achieving their goal of decreasing costs:

- Just a 1% reduction in registered nurses hours paid per patient day netted \$2 million in savings per year, for just eight of the 38 hospitals in Steward's network.
- Reducing patient length of stay by 0.1% results in savings of over \$10 million per year
- A marked decrease in hospital operation disruption through proactive Reduction-in-Force (RIF)

And according to Erin, the team is still very much in its infancy with regard to the types of predictions and continued improved accuracy of models that Steward can achieve with DataRobot. Erin and her team have been challenged to go from 7-day predictions to 14 days, one month, or even two months in advance. Steward has also started working on predicting supplies, and being able to more closely manage costs and improve operational efficiency when it comes to providing physicians with the tools they want and need. As Steward keeps adding more hospitals - and more data - to its network, the potential gains from building predictive models with DataRobot's automated machine learning platform are unlimited.

“DataRobot is very much a part of our growth strategy,” Erin said. “We would not have been able to be successful with DataRobot without the relationship we have with the company in terms of being flexible and collaborative. We’ve been fortunate enough to have the guidance and expertise of Sergey, who’s taken our junior data scientist under his wing.”

“DataRobot is very much a part of our growth strategy.”

“DataRobot is uncharted territory for healthcare. A lot of people use the buzzwords of predictive analytics or machine learning, but we’re actually doing it. We have a product that’s out on the hospital floors now, and we see it work.”

– Erin Sullivan

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