Real-time Length of Stay Predictive Model Saves 5,000 Hours of Nursing Labor

UnityPoint Health

Over 1.5 years, the **LOS predictive model**, paired with other LOS improvement initiatives, has **reduced expenses by $41M**, **eliminated 38K excess LOS days**, and **saved 5,000 hours of nursing labor**.

PRODUCTS

- Health Catalyst® Data Operating System (DOS™)

EXECUTIVE SUMMARY

In today's healthcare environment, accurately estimating patient discharge dates isn't just important; it's vital for effective planning and resource allocation. Recognizing this challenge, UnityPoint Health took action to streamline the process. The organization developed a real-time length of stay (LOS) predictive model integrated into its EHR system. By harnessing historical data and advanced analytics, this innovative solution provides clinicians with automated, precise discharge estimates, effectively meeting the need for accuracy in discharge planning.

INACCURATE AND INEFFICIENT PATIENT DISCHARGE ESTIMATES

Accurate estimation of a patient's expected discharge date is critical for managing discharge planning, throughput, and capacity. While critically important, care team estimates are often inaccurate, and burdensome manual data entry processes create a work burden that may not produce the desired results.[1]

DIFFICULTY OBTAINING ACCURATE PREDICTIONS ON LENGTH OF STAY

UnityPoint Health focused on improving discharge planning and progressing patients to safe discharge by developing a process for clinicians to document the estimated discharge date in the EHR. Unfortunately, this process was not effective: the overall estimated fill rate for discharge dates was less than 60 percent, and fewer than a third of patients had an estimated discharge date/LOS within the first few days of their encounter. The organization also identified that long encounters became progressively more challenging to predict. UnityPoint Health needed a new, workable solution at the enterprise level to accurately estimate the expected LOS early in the patient's stay.

LOS PREDICTIVE MODEL PROVIDES A PATH FORWARD

UnityPoint Health's solution was to develop a real-time LOS predictive model, generating automated estimates delivered to clinicians within the EHR workflow. UnityPoint Health used historical data in the Health Catalyst Data Operating System (DOS™) platform to curate the data needed to develop and train the predictive model.

The data science team used 120K encounters with discharges over two years and 225 different data elements. The team created a snapshot that shows an effective clinical picture of the patient. The team built a data-gathering record in the EHR to gather the data required for model scoring. The model's aggressiveness can be adjusted, enabling targets to be moved up from historical estimates, and factoring in that estimated LOS is more aggressive for longer LOS.

The data science team engaged with physicians, operational leaders, and nursing staff to generate understanding, trust in the model, and buy-in to adopt and integrate predictions into daily management activities. When presenting to physicians, the data scientists placed comparative studies regarding predictive model utility at the beginning of the presentations, ensuring physicians had access to recent literature to support decision-making.

SUCCESSFULLY IMPLEMENTING THE LOS PREDICTIVE MODEL

For three months, the data science team ran the predictive model silently in the background, allowing the team to test and refine the model before engaging the broader team. The test also generated clinical validation data to share with physicians, increasing trust. The data science team uses physician terminology when describing the feature list to physicians, translating analytics into more consumable content.

UnityPoint Health provided education and support when implementing the model. This included introductory presentations for various stakeholders, including frontline staff and executives. The team provides an analytic brief that contains the technical details behind the model and a comprehensive list of all the features included in the model. End users receive brief fact sheets and opportunities to engage in discussions and question-and-answer sessions. The data science team collaborated with end users to build region-specific LOS reports.

The model is deployed directly into the EHR, runs daily at 0700, and is integrated into existing workflows. Multidisciplinary teams meet daily to review inpatients, discharge plans, and progress toward goals.

ABOUT UNITYPOINT HEALTH

UnityPoint Health is one of the nation's most integrated health systems, providing care to both metropolitan and rural communities across Iowa, western Illinois, and southern Wisconsin in its hospitals, clinics, and home care settings.

> *We recognize the importance of predictive analytics in optimizing hospital operations. Our collaborative effort to develop a real-time length of stay predictive model, using data from the Health Catalyst Data Operating System platform, signifies our focus on leveraging technology for tangible improvements in patient care and workflow efficiency.*
>
> Ben Cleveland, MS, Principal Data Scientist, UnityPoint Health

RESULTS

UnityPoint Health successfully developed and deployed a real-time LOS predictive model, automating LOS estimates and providing care teams with the information they need to initiate effective discharge planning and patient progression toward discharge.

- **Over 1.5 years**, the **LOS predictive model**, paired with other LOS improvement initiatives, has **reduced expenses by $41M** and **eliminated 38K excess LOS days**.

The LOS predictive model has also resulted in:

- **5,000 hours of nursing labor saved annually**, the result of eliminating manual data entry.
- **40 percent increase** in LOS prediction accuracy.
- **4X increase** in the number of patients with an estimated LOS within 24 hours of admission.

WHAT'S NEXT

UnityPoint Health will continue to use its data, analytics, and AI to identify actionable insights the organization can use to improve operational and financial performance and clinical outcomes, fostering a culture of continuous improvement.

> *We deliver precise discharge estimates by harnessing data and artificial intelligence, resulting in tangible benefits. With 5,000 nursing hours saved annually and a 40 percent increase in prediction accuracy, we enhanced operational efficiency and provided care teams the information they needed to improve patient flow.*
>
> Rhiannon Harms, Vice President, Chief Data and Analytics Officer, UnityPoint Health

REFERENCES

1. Piniella, N.R., et al. (2023) Early Expected Discharge Date Accuracy During Hospitalization: A Multivariable Analysis. *J Med Syst 47,* 63. Retrieved from https://link.springer.com/article/10.1007/s10916-023-01952-1

ABOUT HEALTH CATALYST

Health Catalyst is a leading provider of data and analytics technology and services to healthcare organizations committed to being the catalyst for massive, measurable, data-informed healthcare improvement. Its more than 500 clients leverage the cloud-based data platform or its other software applications—powered by data from over 100 million patient records and encompassing trillions of facts—as well as its analytics software and professional services expertise to make data-informed decisions and realize measurable clinical, financial, and operational improvements. Health Catalyst envisions a future in which all healthcare decisions are data informed.

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