Case Study: Predictive Modeling

Parkview Regional Medical Center
Fort Wayne, Indiana

Challenge

When the Parkview (PRMC) flagship hospital opened in March 2012, the new campus-based, 440-bed facility almost immediately encountered high admissions demand. With a highly-valued brand, a unique patient/family-oriented design, a convenient location, and a thriving affiliated physician community, PRMC attracted new admissions that, at times, stressed its bed capacity. PRMC leadership had prudently planned the new facility to include two floors of unbuilt but licensed capacity. Within 60 days of opening, it was clear that leadership had to implement the build-out of that space. With the build-out accomplished, PRMC still faced a significant demand for inpatient services and patient care.

PRMC had made a systematic commitment to information technology in the planning and implementation of the new hospital and healthcare campus. The campus and the acute care facility are an ecosystem, with all campus services connected and the new acute care facility internally networked. Thus, PRMC had access to useful data streams and pools. Moreover, it had analytics staff and leadership buy-in to using such data to optimize operational and clinical outcomes.

Resolution

Faced with this bed capacity challenge, the proactive PRMC leadership sought the help of hMetrix, a Bala Cynwyd, PA-based data analytics firm. hMetrix works exclusively with healthcare partners, and that focus has generated deep experience in the nuances and complexities of collecting, integrating, and analyzing healthcare data. More importantly, hMetrix works in an intense partnership model with its clients, seeking to jointly define problems and tailor data resources and processes to solve those problems.

Adopting this partnership approach, PRMC and hMetrix staff collaborated to address the bed capacity challenge. The partners worked to develop an initial predictive model that would serve as an early warning system that enables a planned response to an impending bed capacity challenge. Armed with the knowledge of the technical merits of the initial predictive model that had limitations as noted in Takeaways below, the partners designed a new preventative solution and developed a predictive model seeking to answer the question: Can we predict in the first 24 hours of an admission, those patients that would remain in the hospital more than six days? The goal: If hMetrix could create such a model, then PRMC staff could structure clinically appropriate and focused care interventions to reduce the need for longer stays, thus freeing up beds.

Working in close collaboration with PRMC staff, hMetrix' new predictive model identified such longer length of stay (LLOS) patients with 78% accuracy. PRMC calculated the average length of stay (ALOS) for those identified patients to be 7.72 days. This became the baseline for assessing any implemented interventions.

PRMC chose to create an outlier team that would work with those patients identified as having potential LLOS to decrease stays through closer coordination with the hospitalists, nursing staff, and other clinical support services. The outlier team intervention was essentially a plan-do-study-act cycle. In the initial phase, using a physician and nurse practitioner, the ALOS reduced to 5.56 days. When PRMC added a dedicated case manager to the team, the ALOS reduced to 5.33 days. When PRMC added a pharmacist to the team, the ALOS reduced to 5.21 days.

Overall, through the full intervention period, the ALOS reduced to 5.45 days. Interestingly, these LOS reductions applied to all non-ICU admissions, suggesting that the intervention activity of the outlier teams spread in some Hawthorne-type dynamic to all the hospitalists. With such increased throughput, PRMC has somewhat mitigated the bed capacity issue, substituting intensive, daily management of patients for increased beds.

Partners' Perspectives

The key to the success of this intervention approach, according to Mark Pierce, MD, CMIO, is the hMetrix collaborative partnership approach. "By engaging in an ongoing and probing conversation with me and our group, hMetrix helped us identify potential interventions. And we treated all interventions as provisional. So, when the very neat visual model of predicted bed use we jointly developed turned out to have action limitations, we just buckled down and tried another approach. By identifying the potential outlier admissions through algorithms that hMetrix developed, we were able to implement incremental interventions that materially impacted our bed capacity issue."

Based on the success of this partnership model that melds the data management resources of hMetrix and PRMC, Dr. Pierce noted that "We are exploring other issues where we can apply this partnership approach. I believe that we will be going into the future arm-in-arm with hMetrix, focusing upon a broader range of issues and strengthening our own intervention skills."

From the hMetrix perspective, CEO George Chalissery identified the partnership as an opportunity to apply the company's experience, skills and platforms. "It is a pleasure to work with a partner that is so focused upon the use of data to resolve real operational and clinical problems. Such opportunities strengthen us and Parkview, building a better future."

Takeaways

1) The intensely collaborative partnership model enables a robust, problem-solving persistence that integrates the clinical/operational capacities of the healthcare provider and the data management capacities of hMetrix, leading to creative, actionable problem resolution.

2) The first model that the partners created graphically showed, by department, the projected bed use a week into the future. This allowed PRMC staff to respond early to predicted capacity issues. However, even with the early warning, there were limitations related to the finite options that PRMC staff could employ in their response. For partners that are not constrained by such limitations, this model could provide high value and be easily integrated into ongoing clinical management operations.

3) The eventual resolution, the predictive model of LLOS patients, enabled PRMC to develop a continuously-improved intervention based on the model, monitor its performance, and manage a serious bed capacity restraint—improving its relationship with its patient and physician communities. Other potential hMetrix partners could use this model to reduce costs, improve efficiency, and succeed in value-based reimbursement environments.