Using Analytics, Machine Learning, and Simulation Technology to BETTER MANAGE PATIENT FLOW
MANAGING PATIENT FLOW is a growing and complex challenge for hospitals and healthcare systems of all sizes. Poor patient flow planning creates waits and delays that frustrate patients and practitioners alike, diminishes the quality of care, wastes medical resources, and costs hospitals money. Hospitals have traditionally relied on separate IT systems to support such critical daily functions as bed, case, and operating room management and department staffing. But to be truly useful to decision makers, the data that such systems generate must be quickly aggregated, analyzed, and distributed across multiple disparate systems.

According to a comprehensive report published in 2017 by the Institute for Healthcare Improvement, “Failing to achieve hospital-wide patient flow — the right care, in the right place, at the right time — puts patients at risk for suboptimal care and potential harm. It also increases the burden on clinicians and hospital staff and can accelerate burnout. Yet, while many understand the problem, they often lack the comprehensive strategies to address it.”¹

On the surface, the problem may look like simple overcrowding. Too many patients show up in the emergency department (ED). Doctors admit patients from the ED but inpatient units have no room for them, so the ED “boards” them on stretchers in a hallway while they wait for an inpatient bed. Meanwhile, upstairs in a critical care unit, staff have patients they hope to transfer to intermediate care or telemetry units, but must also wait until beds become available.

The seemingly obvious solution — build more wings, add more beds — won’t necessarily fix the problem, which is far more complex than simple undersupply. In fact, the Medicare Payment Advisory Commission reported in 2016 that the United States actually has an oversupply of hospital beds. But at many hospitals, daily demand for ED and inpatient beds often exceeds capacity, particularly in large academic medical centers.
SYSTEMIC PROBLEMS REQUIRE SYSTEMIC RESPONSES

A hospital is an interdependent system. Like all systems, events in any one area will “ripple” throughout the system. The patient flow problem cannot be solved with piecemeal improvements. An emergency department might make internal adjustments — in staffing or procedures — that successfully improve its efficiency and reduce wait times. But as the 2017 IHI report points out, “Improvements on one area could create problems, even chaos, in another part of the hospital. For example, when EDs improve efficiency and increase throughput, they typically need to accelerate the transfer of patients from the ED to inpatient units. However, if inpatient beds are unavailable when needed, patients are often placed in hallways and on ‘off-service’ units. So, improving flow must be orchestrated at the system (hospital) level.”

System-wide improvement must be an interactive, two-way, coordinated, proactive, and constantly adapting process. Each area in the hospital or healthcare system has its own bottlenecks that its leaders must proactively identify, understand, and work to resolve internally. But that won’t be enough to “unclog” the entire system unless leaders understand how each of the areas interact — they must anticipate and mitigate the impact of bottleneck shifts across the system. All areas must work together to identify, understand, and address how events in one area affect all the others.

Conversely, system-wide improvements imposed from above have no hope of success unless they take into account the full range of their potential impacts on individual areas. All areas must work together to match their capacities to anticipated demand — the number of physicians, nurses, procedures scheduled and beds and rooms available must all align to patient needs.

BED MANAGEMENT SYSTEMS BUILD THE FOUNDATION

For most health systems, taking the first step toward better patient flow involves implementing a bed management system, either by adopting one from their electronic health records system or acquiring one from another vendor. These systems offer immediate benefits: their “real-time” visibility and communication capacities enable the hospital to streamline workflows, improving both staff and patient experiences.

Bed management systems can also provide hospital management with more granular workflow data for such key functions as patient placement, environmental services, and patient transport. Bed management systems offer hospitals invaluable resources and can be a critical component of an effective patient flow plan, but by themselves they are not enough to unlock the full potential of seamless patient flow.
LEADERSHIP AT THE HIGHEST LEVELS IS ESSENTIAL TO DRIVING CHANGE

System-level change requires system-level planning and system-level support. Hospitals are no different from all other organizations in this regard: leaders identify the priorities, leaders set the tone, and leaders are responsible for generating consensus and for ensuring follow through. Each department has its own strategic objectives, which can make system-level change particularly complex: it requires integrating competing priorities and coordinating across various departments (e.g. emergency departments, operating rooms, inpatient units, and ancillary service providers) to ensure effective patient care.

Many hospitals have recognized they have a patient flow problem but have seen their initiatives fail because of a lack of support. The teams tasked to develop improvement plans must have support from senior executives to be successful. They must be empowered to:

- gather solid, reliable data from individual areas and establish baselines;
- design, test, and implement improvements;
- follow-up and measure results; and
- continuously “tweak” and refine improvements.

Buy-in from up, down, and across the hospital system is crucial. Leaders and staff within the individual areas must be included in the process — they know how their departments work and they experience the consequences of poor patient flow management on a daily basis. For many of them, the incentives to support patient flow planning initiatives will be obvious. But they are far less likely to help if they suspect senior level managers aren’t fully committed to the process, that other areas won’t “pull their fair share” — that, in short, their efforts “won’t go anywhere.” Assistance from the hospital system’s operational improvement staff, if such roles exist, can be particularly helpful. Those trained in running improvement projects can take some of the burden from staff whose primary job is to provide quality patient care.

Finally, senior level leaders must visibly demonstrate their long-term commitment to patient flow management if they want these processes to become institutionalized. They can do this by prioritizing patient flow management as a system-wide initiative, by reviewing patient flow problems and progress on a regular basis (quarterly or monthly), and by committing to continuous updating and adaptation of patient flow plans and procedures when necessary.

BEGIN WITH GOOD DATA

Successful patient flow planning begins with good data. When does the ED see patient surges? What causes those spikes or dips, and can they be predicted? How many patients does the hospital treat in each inpatient unit? How long do admitted patients wait for a bed? Do certain kinds of patients — for example, those with particular kinds of complex medical needs — create gridlock? Are patients discharged when they are ready, or are discharges delayed? Do medical and surgical units know when current patients are likely to be discharged so they can act quickly to turn over beds? How long does it take to turn over a room or a bed?

In some cases, industry-standard measures already exist, and many hospitals are likely to have benchmarks for how long it should take the housekeeping staff to clean a room and turn over a bed, for example. But patient flow planning is a relatively new discipline, so few comprehensive standards exist. And because every community and every hospital is unique, few processes will work in every situation: most hospitals will need to design individualized plans.
Most hospitals have already amassed the data they need to effect change, stored within electronic health records and other hospital systems. This data needs to be gathered, aggregated, and analyzed, however, before it can be used to improve patient flow. An effective plan will use this data predictively to enable staff to anticipate where and when gridlock is likely to occur, but effective prediction depends on accurate description – you can’t predict what will happen without knowing what has happened, so basic baseline data gathering is the right place to start.

Because changes in any one department affect the entire hospital, it is essential that departments can share, access, and understand relevant data from other departments. This means the data must be comparable, standardized, and unified. Staff will need to agree about which measures should be included on scorecards and other measurement tools – in other words, everyone needs to be on the same page.

Benchmarking is particularly crucial for establishing the financial impact of poor patient flow planning. For example, how many ambulances were diverted to a different hospital last year because of ED overcrowding? How many emergency patients left without being seen by a doctor? Were surgeries rescheduled because of inadequate staffing or lack of beds on surgical floors? Each of these represents lost revenue for the hospital, and quantifying that lost revenue can be critical for building consensus for patient flow planning throughout the hospital.

**LEVERAGE THE POWER OF PREDICTIVE AND PRESCRIPTIVE DATA ANALYTICS**

Once a hospital has amassed and aggregated its data, it can use data analytics to begin to forecast demand and plan its supply of beds and staff accordingly. Advanced data analytics technologies can integrate the hospital’s own current data (i.e., ED visits, surgical schedule, hospital census) with other relevant information such as historical demand, weather patterns, seasonal fluctuation, and local events, and forecast increased demand days in advance to predict the number and type of patients (critical care, med-surg, etc.) and mix of acuities arriving in the ED hour-by-hour.

Advanced data approaches can forecast across the entire hospital or health system to predict well in advance when the hospital could experience surges in the ED, for example, or a shortage of critical care beds. In addition, they use simulation modeling to predict the impact of various responses to the surge and how those responses will ripple through the system, effectively preventing bottlenecks before they occur and giving hospital leaders the opportunity to plan for and manage patient flow issues proactively, not reactively.

In addition, the new advanced data analytics technology platforms run thousands of simulations with real data and capture variable metrics. They don’t just predict and pinpoint problems: they provide timely and accurate recommendations, and enable hospitals to test “what-if” solution scenarios so they can avoid putting staff through stressful and time-consuming trial and error processes.

Implementation of advanced data analytics can reap speedy rewards for hospitals by, for example, providing helpful information and tools to the groups responsible for managing patient flow. Effective patient flow management processes help leaders and staff see both the “big picture” and the small details.
Big-picture responses to gridlock and delays can include taking steps to reduce demand by providing needed care outside the hospital, for example. Or a hospital could choose to better align capacity with demand by creating a seasonal “swing” unit to add or reduce bed capacity during anticipated surges or declines (i.e., flu season). For example, one large Midwestern university medical center uses trusted patient flow analytics to determine when it should open and close an ICU flex-care unit and transport low-acuity ED admits to less crowded community hospitals in its system. Further, using flexible bed capacity to reduce ED boarding can help decrease inpatient lengths of stay across the hospital.

Data analytics can also help leaders better manage the length of patients’ stay by helping them drill into the details of patient sub-populations to uncover information about patients who might otherwise be “lost in the shuffle.” For example, by focusing on the predicted lengths of stay for observation patients, the hospital can more efficiently convert them to inpatients or, when appropriate, discharge them more speedily, with clinical benefits for patients and financial benefits for the hospital.

EMPOWER FRONT-LINE DECISION MAKERS

Hospitals can redesign systems to be more efficient without adding resources by eliminating unnecessary steps or synchronizing tasks. Reducing discharge delays by promptly discharging patients who meet clinical readiness criteria is a simple but effective way to reduce delays, improve flow, and save money. But to succeed, such initiatives require both cross-functional coordination and the engagement of front-line leaders.

At this stage, the first goal of an effective patient planning process is to put simple analytical tools in the hands of the doctors and nurses in charge of moving patients around the hospital, including emergency physicians, hospitalists, house supervisors, and care coordinators. These tools can range from simple lists (i.e., patients predicted to be discharged) to a more complex identification of outliers currently in the system (i.e., observation patients with long stays and certain post-acute care needs).

Most importantly, such a process empowers front-line staff to plan, to decide, and to act. Does the patient census indicate overcrowding is imminent? Is it time to call in additional staff? If several patients are ready for discharge, who should be prioritized? Which patients are approaching or past the allotted geometric mean length of stay?

Hospitals may choose to implement improvements in stages, then measure results against a baseline before tackling the next round of improvements. Complex solutions that require more extensive changes will obviously take longer to implement.

Whatever tools and processes the hospital chooses, staff must understand their importance: they must be held accountable for using the tool or for explaining why it doesn’t work. In turn, the hospital must commit to refining any tools and procedures that don’t work. Flexible, two-way input and feedback channels guarantee that everybody learns how the system works and what makes it work better, and that everyone stays engaged in and committed to the process of better managing patient flow.
HOSPITAL IQ: POWERFUL, PRECISE, CUSTOMIZED DATA ANALYTICS FOR PATIENT FLOW MANAGEMENT

Hospital IQ’s Patient Flow solution supports better patient flow management by enabling hospitals to predict and manage capacity surges and dips. The platform’s powerful analytics capabilities combine historical demand patterns, the upcoming surgical schedule, ED status and other data sources to accurately forecast capacity, boarders, and bottlenecks days in advance, and provide recommendations for appropriate staffing levels. And because Hospital IQ’s Patient Flow solution features dashboards that break down information silos between hospital departments, everyone can see, understand, use, and update the same data and analysis in real time. This “radical transparency” generates trust and promotes engagement, consensus, and overall organizational alignment.

With Hospital IQ, hospitals can proactively make centralized critical patient-flow decisions, understand the impact of upcoming demand, and then distribute highly targeted action plans as required. This includes adjusting staffing plans well in advance of anticipated need, opening flex beds to prevent gridlock, redirecting external transfers, and identifying and prioritizing discharges.

The Hospital IQ platform also helps hospitals and health systems substantially improve capacity planning and patient flow through powerful simulation and what-if analysis to understand the performance impact of changes in policy, patient volumes, length of stay, and capacity. These capabilities help improve decision-making and gain alignment by presenting both the operational and financial impact of the proposed changes to key stakeholders.

Hospitals paradoxically confront an era of unprecedented promises and unsettling challenges. The American healthcare system faces huge political and economic uncertainties, while advances in scientific discovery and biomedical technology hold enormous potential to improve human health and well-being. Amidst this ever-changing landscape, hospitals wage a daily battle to ensure the best outcomes for patients while managing their operational challenges, controlling costs, and enhancing revenue.

Powerful predictive and prescriptive analytics combined with robust simulation capabilities, such as those developed by Hospital IQ, can help hospitals and health systems unlock the potential of their own data to build a more efficient, adaptive, and strategic institution.

FOR MORE INFORMATION on leveraging advanced data analytics to better manage patient flow, visit www.hospiq.com/patientflow or call 617.960.8600


