information
edge

Capacity Management: Visualizing Efficient Patient Flow

EXECUTIVE SUMMARY

ERs sometimes act as the canary in the mine for the larger-scale problems of care delivery. For example, lack of access to care can manifest itself when the poor and uninsured show up at the ER for what should otherwise be routine visits to primary care doctors. In the same vein, ER overcrowding and ambulance diversions—cast in the media as a national "Crisis in the ER" just a few years ago—is actually part of a larger, systemic problem. We now realize—validated by recent IOM and JCAHO reports—that patients get backed up in the ER due to bottlenecks to patient flow throughout the hospital.

The latter is a problem ripe for IT-enabled process change. Using automated bed-management software as the core IT tool, hospitals are attacking these bottlenecks and the inefficiencies of outmoded patient-handling processes in systematic, enterprise-wide initiatives to improve capacity management and patient flow. Highly graphical, these automated systems go way beyond the capabilities of traditional housekeeping systems by integrating all the information required to move a patient capably and efficiently through the care system.

Patient flow systems provide everyone from executives to housekeeping staff with what amounts to the first snapshot of a patient's trek through the course of care in a hospital, from preadmission to discharge. The benefits of these systems include real-time knowledge about when and where a patient is and is expected to be—and what's expected of staff at any point in the continuum. This issue of Information Edge highlights some leading examples of hospitals that have implemented patient flow systems. In addition, we talk to the founder of NaviCare, one of the first vendors of such systems and now a unit of Scottsdale Institute sponsoring partner Hill-Rom.

Whether it's called capacity management, patient flow or workflow processing, this is an area where IT has a clear ROI in terms of increased capacity, better labor productivity and increased revenues from better patient throughput.

Ready or not

Most hospitals these days may favor enterprise, single-vendor clinical systems, but they are clearly independent when it comes to capacity management/patient flow systems, according to Dave Richter, executive director for business development at Hill-Rom and founder of NaviCare. "The market is not going to wait for clinical IT vendors," he says. "The overall trend we're seeing is the ability of patient flow to exist as a discreet value-added layer within healthcare IT that is separate from, but interfaced with, systems offered by the large IT vendors, who seem to have adopted the philosophy that we'll just be able to add that capability later."

Dave Richter, executive director, Business Development, Hill-Rom, Batesville, Ind.

Richter attributes part of the growing popularity of these systems to their graphics, which use color-coded icons to represent whether beds are dirty, clean, occupied or open, and clever icons like mop buckets to denote housekeeping functions. "The old cliché about a picture being worth a thousand words is true. You can communicate so much information to so many stakeholder groups at once."

A significant driver for these systems' adoption is the increasing focus of hospitals on improving utilization of existing facilities to increase admissions revenue and productivity. "Folks are just beginning to attack utilization and labor productivity. If you can increase the flow of patients with the same level of staff and facility you can improve revenues and labor productivity," says Richter.

However, he estimates that market penetration of patient flow systems is tiny, probably fewer than 150 hospitals. "We're just scratching the surface when you consider the number of house-wide patient flow systems out there. The obvious question is why doesn't everybody have one? Culturally this is a big, political, complicated kind of issue with so many moving parts and variables, starting with the fact that, historically, there's never been any single owner of patient flow in the hospital. A COO told me that, prior to installing their new patient flow system, there were 25 different ways that doctors were getting patients into his hospital, including calling up admissions, telling the patient to show up in the ED and

wait and actually walking the patient up to a nursing unit and finding an empty bed for them. They've been 'back-dooring' patients into the hospital for years," says Richter.

Add to this a silo mentality that encouraged nurses to "hide" beds in order to better control the number of new patients during any given shift, and it's easy to see how the patient placement and bed management process became so byzantine. Richter says that's one area where simple, hospital-wide transparency of information from use of a patient flow system has been immediately effective. "A funny thing happened. They stopped hiding beds. They could see they weren't the only busy ones in the hospital."

Medical City Dallas
Anesthesiologists helped drive the installation of a NaviCare Patient Flow System in perioperative services at Medical City Dallas Hospital in Dallas two years ago. "We had capacity constraints and just needed better visibility," recalls Dane Peterson, associate administrator at the 660-bed adult and pediatric facility.
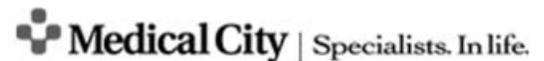
It only required 80 days to implement and was immediately favorably received by staff, he says. "The system is very intuitive with icons like scalpels and ambu bags. We put in touch screens in each room so the staff, including anesthesiologists, surgeons, radiology techs and others, wouldn't have to log in—just touch the screen. That helped a lot with implementation."

Peterson was immediately impressed with what he calls the "visibility effect," which resulted in noticeable improvements in patient throughput within only 30 days and continuing on for the next 120 days just

from having patient flow data visible to everyone. "We saw it in the OR and in turnaround times," he says. A year ago, the hospital extended the system to the ED, PACU and direct admitting, and now the patient flow information is available on every PC in the hospital. Staff can see that green room rectangles mean they are open and clean and therefore ready for patients. Even patients are listed there, albeit HIPAA compliant, because they are disguised through a special alphabetical code that staff quickly learns.

As a result of the system, the hospital has been able to dramatically cut the number of "OR on hold" days each month (times when the PACU was backed up so patients couldn't move out of the OR) to fewer than 10 from a whopping 30 to 70; and OR minutes on hold to 300 from a previous 1,200 to 2,000. "That means a lot less physician, patient and family disruption," says Peterson, whose background in automotive engineering led him to be skeptical of such dramatically improved numbers. "We didn't believe it. So, we checked the numbers again to validate them."

Other numbers have been as good: a year after hospital-wide implementation, Medical City cut the time it is on diversion for the ED to 12% from 67%—while experiencing 7% more patient volume. Also, environmental services response time was cut to an average in the low 20 minutes from a previous 36 minutes.

These benefits have been achieved as low-hanging fruit, notes Peterson, without yet the discipline of, say, a Six Sigma initiative.

Next steps for Medical City include a system upgrade that will automate nurse assignments, eliminating the last vestige of the manual white board as a communica-tion and planning device. "That will drive even more compliance with the system. The more people who use it the more success-ful it is," says Peterson. The ultimate goal is to incorporate not just charge nurses but everyone who works on a hospital floor. The vision: go beyond patient flow to become a workflow planning system for the hospital.

He says, contrary to what some hospitals do, Medical City has consciously kept the patient flow system separate from the clinical information system to keep it simpler and straightforward to use.

Yale-New Haven Hospital

In downtown New Haven, Conn., sits an historic colonial green bordered by a row of three equally historic churches, just a stone's throw from Yale-New Haven Hospital, a sprawling and bustling health-care campus that grapples with all the modern challenges of an urban academic medical center—including the need for more bed capacity.

Peter Herbert, MD, CMO, Yale-New Haven Hospital, New Haven, Conn.

Unlike churches, however, urban healthcare environ-ments can prove unforgiving places when it comes to meeting expectations of care, and that's why Peter Herbert, MD, Yale-New Haven's CMO, made it a priority to streamline patient flow and bed management at the 900-bed hospital.

"When I got here we were fundamentally managing beds with scraps of paper and telephones," he recalls. "I look back to the

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winter of 2000-2001 and we were overnight-ing 20 to 30 patients in the ED. In late after-noon I'd be sitting with people in bed control lacking an automated system to manage beds, which no 900-bed hotel in the coun-try would be without. We've come miles since," says Herbert.

That journey has been facilitated by the Bed Management Dashboard (BMD) from Hartford Conn.-based Premise Develop-ment Corp., a clinically integrated infor-mation system for managing bed placement and patient flow throughout the hospital. In December 2005 Yale-New Haven celebrated its first anniversary with the BMD.

"Our challenge now is to capitalize on its presence. From the perspective of upper-level management, I open the BMD every morning at 6:30 to see what the census is and where beds are available, and how those factors impact surgery, the ED and medical floors. It prepares me psychologi-cally, if nothing else, for where calls will be coming from. For others it's integral to work-a-day life," says Herbert, adding that use of the BMD at Yale-New Haven has translated into improved patient, physician and employee satisfaction. "It's been a major advance for us. We're very pleased with it."

Bed Czar

Victor Morris, MD, assistant chief of staff and "Bed Czar" at Yale-New Haven, recalls when he assumed the title of Bed Czar in fall of 2000. "It was chaos, a bunch of fief-doms. Everybody thought they controlled bed placement, especially the surgeons. There was no central authority. It was really complex and took too long to get a patient into a bed."

Use of the BMD and other process improve-ments, he says, has dramatically improved two factors at the hospital: 1) The number of patients sitting 'admitted' in the ED for one or even two days has dropped consid-erably; 2) Cancellation of elective surgeries during winter due to bed bottle-necks has vanished.

Those improvements have come in the face of rapid growth in Yale-New Haven's admis-sions—3% annually or 1,500 new inpatients each of the past three years. In terms of ERIPs (ER inpatients), "Last year we had 21, today our maximum number is 10," says Morris. Annual discharges have climbed to 49,000 from 45,000 two years ago. Along with that growth, the hospital's case mix has gone up, along with average revenue per discharge, partly the result of improved coding efforts by doctors.

In the last five years Yale-New Haven has made major strategic investments in clin-ical IT, and the BMD became the critical piece of the puzzle for reengineering patient flow. "Even when a patient was discharged via our [recently implemented] Eclipsys clinical IS, the patient might be sitting there hour after hour" before being actually discharged—until the hospital started using the BMD, says Morris.

Analysis of patient flow from a Six Sigma initiative identified a number of manage-ment, process and IT gaps, including the need for a day-time executive advisor and an integrated software solution. As a result, the hospital developed a formal bed policy and assigned Morris as the physician executive in charge, the Bed Czar.

"My job as Bed Czar is to oversee the process and get people to use the BMD," says Morris, in part as a tool to achieve CMO Herbert's policy objective of having all patient discharges completed by 11:00am. "Before the BMD we had no data. The BMD takes unknowns out of the equation," he says. That's especially important in address-

ing issues like the need for infection control, because a clean bed means more than just a change in linen, it signifies that every surface in a patient room is clean, including countertops, curtains, blinds and TV. "Spores can sit there for years" and cause infection to patients if not sterilized, says Morris.

But the BMD's reach extends even further. "Our bed-cleaning people have a real need to know—not just that Bed 5521A needs to be cleaned—but that also, Bed Cleaner A is across the hall and that that bed is a ventilator bed. The BMD does that," he says.

It took nearly three years before Yale-New Haven could even decide on a system. "We had to define the problem and the solution, find the money and weed out vendors," says Carol Holland, director of admitting. After making internal changes such as creation of the clinical advisor/Bed Czar role and scrutinizing the bed placement process, the third leg of the stool was to determine how to automate the process.

"Before, bed assignment was left by itself and it wasn't until a crisis arose—like being unable to schedule elective surgery—that top-level attention was paid. There was nobody to broker things" when there were backups, she says, because departments like admitting cannot be the decision-maker in such situations—it has to be the patient's physician. The problem was compounded by the fact that Yale-New Haven adheres to a strict policy of not diverting patients from its ER to other hospitals.

The answer was to centralize bed management, heretofore fragmented among three bed-management systems: clinical order-entry; patient registration; and a manual process. "We wanted to have one place where everyone in management could go and look" at patient flow throughout the hospital, says Holland. Today, the registration and clinical systems all feed data into the BMD.

"We liked the executive dashboard approach," she says, because it accommodates end users on the medical units—who can now do the patient-care work they wanted to do in the first place—and administrative staff who needed to regain control of the patient-flow process. "We needed some way to take care of both populations," she says.

University Medical Center—Arizona

As the University Medical Center in Tucson awaits the unveiling of its new, two-story, 70,000-square-foot cancer center, it's already rolled out another new technology for patient tracking in its existing 10,000 square-foot facility. Launched last spring, the new system takes ADT data from its patient scheduling system and, using "milestones"—when the patient is at the front desk, having a lab drawn, waiting for a physician or treatment, for example—builds a daily schedule for clinics. "The system tracks the patient's status and helps us more closely manage the 250 patients seen in the clinic on any given day," says Chris LaRue, Oncology Facilities and Technology Manager. "It tells the staff where a patient is and when the patient's treatment begins or an exam has started."

Physicians can use a filter on the system to view which of their patients have checked in and what milestones they've passed. "Our physicians have become big fans. We've replaced printed schedules. Now they just go to the computer. It's a very graphical display, kind of like an airport monitor with icons instead of words," says LaRue.

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Chris LaRue, Oncology Facilities and Technology Manager, University Medical Center, Tucson

"This has eliminated paper chasing. We also use it for communications. We use pagers like those in restaurants to notify the patient when to go to the lab or to the treatment area."

Alerts ensure a patient is not forgotten. When a patient has checked in and is sitting in the waiting room for a blood draw, for example, a chair icon appears on the display next to that patient's name with a timer icon that turns red after 20 minutes. When a milestone is completed, the timer reverts to zero.

Various staffers use the system to monitor patient status depending on the process. A phlebotomist using the laboratory screen can see only those patients waiting for a blood draw. "That list becomes their work list," says LaRue. "It's very focused. They can see if they're completely caught up or not. The filters allow them to view patients earmarked by 'Draw Complete,' for example, or review all their patients." Similarly a treatment nurse can see an icon that represents "Medication Ready," which the system requires before treatment can begin.

LaRue says users like the system a lot because it has replaced the old manual method of tracking patients. "This has eliminated paper chasing. We also use it for communications. We use pagers like those in restaurants to notify the patient when to go to the lab or to the treatment area." While the system is transparent to patients, he says it has resulted in a lot fewer complaints about wait times.

"We've been doing some manual benchmarks, using volunteers with a stopwatch. We definitely see a reduction in wait times, but the biggest improvement is we don't have outliers such as a patient sitting in the waiting room because the lab order was lost. Overall we probably reduced wait times 10 to 15 minutes in most areas of the clinic. So in some cases we've gone to five or six-minute wait times from 20-minute wait times," says LaRue.

Once all cancer services are moved to the new facility, the system will be well tested. Designed for a deluge of new cancer patients from continued population growth in Tucson, the new center has three exam clinics on the first floor, each one with 12 exam rooms. The second floor has two infusion treatment areas, each of which has 18 infusion chairs. Implementing the new system in the existing facility has provided more than a good rehearsal. "We'll still do the same patient-tracking process—the only difference is that the new cancer center has PCs in every exam room and the facility is much larger with several different waiting areas for the patients," says LaRue.

Shands Hospital at the University of Florida

Backups in the ER, PACU—even the lobby—and delayed discharges on medical/surgical floors led Shands at UF Hospital and its sister Gainesville Hospital, Shands at AGH, to implement the NaviCare Patient Flow System a year and a half ago. "We had backlogs in all the locations patients could enter," says Diane Valentin, director of the Patient Access Center at Shands Teaching Hospitals and Clinics, Inc., a 628-bed multi-hospital system based in Gainesville, Fla.

"We were on a totally manual system previously and were looking for solutions to improve patient flow. Any solution had to be easy to use, and allow us to anticipate what beds we would have and be able to

place patients in them in a more in timely manner. We also wanted to become more aware of discharges," she says. Shands implemented the new system on the two hospitals' nursing units, UF's OR, PACU and AGH's ED.

SHANDS HealthCare — affiliated with the University of Florida

"We used to rely on nursing units to call us regarding their bed status. Now, it's all electronic, all automatic. You can see where the bottlenecks are," says Valentin, adding that a big advantage of the new system is that staff can anticipate patient discharges with certainty and therefore prepare labs and rehab services and other patient needs prior to discharge in a more timely manner. "Before the automation, we didn't know until the patient was actually gone. This way we can expedite things," she says.

Georgiann Ellis, VP for operations, says the patient flow system has enabled the hospital to increase occupancy to 91% from 88%, resulting in increased revenues. Much of that has been achieved by being able to discharge patients earlier in the day. "We know more than 40% of the time physicians write discharge orders before 10:00am, and we know we're actually discharging patients around noontime," she says.

"We've improved throughput and increased our census. The patient flow system has paid for itself within a year. Our OR volumes have skyrocketed and they credit at least part of that to increased capacity by using the patient flow system. We can look in the OR and the icons show when anesthesia is done, surgery is being performed or the surgeons have "closed" the patient, so the PACU or ICU makes sure they have a bed available for that incoming patient," says Ellis.

Shands uses the software to produce monthly reports that are based on specific factors such as a patient visit, action or a particular physician. This makes it easier to differentiate bottlenecks that arise from, say, occurrences on the unit or larger process issues.

Staff can view the integrated bed management, patient transport and housekeeping data on large, wall-mounted plasma screens in each of the 30 nursing units, two such screens in the patient placement center—an independent department strictly focused on patient bed placement and transfers—as well as a large plasma screen in the PACU. Also, every hospital desktop and certain physician laptops have access to the system. "Our chief of staff is very good at monitoring patient placement and jumps in if he sees areas where patients need to go, including hospital-to-hospital transfers, since we get patients from all over the Southeast," says Ellis.

"In the past we were totally dependent on the number of telephone calls for bed management," she says. "We've significantly reduced that number by being able to visually assess bed status throughout the hospital. One of our goals is to have patients move in a reasonable time from critical care units to the med/surge floors. By being able to look at the OR system, for example, our staff can anticipate when patients need to be transferred. It's just an incredibly visual tool. It looks like an air traffic control center."

Nursing supervisors can monitor patient flow on portable wireless tablets and make requests like "stat clean," which signals the need for a bed to be cleaned immediately. Environmental services will see those requests on their housekeeping screen and receive an automatic text page with the

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room information through their pagers. Letter icons designate male or female patients; color coding such as green means the space is clean and ready. Bucket icons for housekeeping change colors to designate bed status: red when dirty; black when in the process of being cleaned; a flashing icon means stat clean.

Nurses can page the "bed man," a staffer who literally moves beds all day in and out of rooms as the needs occur. Bed icons show where actual physical beds are located in the hospital so the bed man can locate the appropriate PACU bed when needed. Housekeeping supervisors monitor the system and can escalate pages if they perceive delays.

Nursing uses the system extensively. "Unit clerks are on the patient flow system all the time," notes Ellis, adding, "There are hundreds and hundreds of users."

Hartford Hospital

Nobody wants to face the first major test of their automated bed-management system during a national disaster, but if such a test is unavoidable, it's good to come through with flying colors. That's what happened with 820-bed Hartford Hospital located in Hartford, Conn., only 110 miles from New York City, which sadly had to go on alert when the 9/11 terrorist attacks occurred—and urgently needed to identify available beds throughout its floors.

The good news was that the experience changed Hartford Hospital's entire bed-management process, successfully converting it 'under fire' to a bed management dashboard (BMD), a clinically integrated automated bed management system. Much of the graphical, high-tech solution was developed onsite under the guidance of Hartford Hospital's director of biomedical engineering.

Breaking the shackles

Prior to the disaster, the completely manual and phone-tethered process of tracking, managing and assigning beds was shackling the hospital—and increasingly wearing out staff. "In my old job I used to run between the care units," says Pat "Pepper" Sobieski, RN, Admission Coordinator and Director of Bed Management at the hospital, who previously managed care coordination at the hospital. "It was insanity. The biggest risk we faced was that you really can't make a mistake with this. You can't lose a patient."

That's the kind of stress in a hospital dealing with 45 to 62 ED admissions each day plus 15 to 25 direct admissions from the doctor's office. There are also internal transfers from the 48-bed ICU and a 10-bed neuro ICU to medical floors. Admissions peak at 2:00 p.m.

Admissions Coordinator Kathleen Race, RN, recalls how fragmented bed management was before the process was rigorously centralized using the BMD. "We did it all by hand. We'd call every unit every morning and ask who's going home, keep track of little markers, get descriptions over the telephone," she says. By noon, another wave hit as post-op finished and inundated the bed-management office with bed requests, bogging staff down in time-consuming tasks like determining the diagnosis and medical specialty of each patient case, calling the OR, and physically conveying lists to the OR and recovery room. Not surprisingly, those lists were often lost in the tumult of unexpected unit discharges or frantic calls from charge nurses asking for beds.

"Now, those nurses are crippled *without* the bed management system and they won't take a patient if it's not on the BMD," she says, adding understatedly, "We were successful in

Letter icons designate male or female patients; color coding such as green means the space is clean and ready. Bucket icons for housekeeping change colors to designate bed status: red when dirty; black when in the process of being cleaned; a flashing icon means stat clean.

implementing it." The BMD's success extends to patients' families as well, who, with the help of trained lounge volunteers, can instantly find out the specific bed and unit to which a loved one has been assigned.

A powerful tool

Stephan O'Neill, VP of Information Services at Hartford Hospital, says being able to understand the status of beds and accurately grasp overall occupancy poses a major challenge for any large hospital.

HARTFORD HOSPITAL

"Originally, managing occupancy was done with very large white boards and stickers. Most admitting people lost information," he says. The earliest automated bed-

Stephen O'Neill, VP, Information Services, Hartford Hospital, Hartford, Conn.

management system developed at the hospital had a small black and white screen that was basically used to record everything on the white board. Now, Hartford Hospital is installing the newest-generation BMD with exceptional graphics and the capability to create bed-status summary reports in a way whiteboards never could. This latest version also has integrated modules for housekeeping and transport.

"The BMD is a powerful logistical tool that allows us to manage the capacity of the hospital. It's integrated with the patient registration system so staff know who's coming in and going out, and allows us to report up to senior management. It's immediate, understandable and actionable," says O'Neill.

Measuring benefits in millions

"I'd measure the BMD's benefits in the millions of dollars. It's added the equivalent of 60 beds in capacity," asserts O'Neill. During fiscal year 2005, Hartford Hospital's admissions went up 6%, which generated a huge increase in discharges: 1,300 to 1,500 new cases at an average of $10,000 per case.

Dramatic benefits are apparent off the ledger sheet too.

"There are days and days when we are completely full," says O'Neill. "That was especially true last winter in the ICU. It was almost like a war zone. Imagine trying to do that with paper and pencil!"

Conclusion

Capacity management and patient flow systems automate the essential logistical process of the hospital: the patient's journey throughout the facility. By bringing intuitive, real-time graphical information to basic bed management, these systems help "rationalize," in the best sense of the word, a process that involves everyone from clinicians and administration to support staff. In so doing, it can have an immediate impact on patient throughput and productivity as well as patient and staff satisfaction. These systems operate successfully as separate from the hospital's clinical information system.

Because they cut through so many staff and functional levels, however, implementing a patient flow system requires an executive champion and deft handling of cultural and political issues. Few systems can bring as much positive visual backbone to hospital operations, especially considering they can provide a platform not only for patient flow but also for workflow planning.

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