Institute for Healthcare Improvement

Innovation Series 2003

Optimizing Patient Flow

Moving Patients Smoothly Through Acute Care Settings

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We have developed IHI's Innovation Series white papers to further our mission of improving the quality and value of health care. The ideas and findings in these white papers represent innovative work by organizations affiliated with IHI. Our white papers are designed to share with readers the problems IHI is working to address; the ideas, changes, and methods we are developing and testing to help organizations make breakthrough improvements; and early results where they exist.

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Optimizing Patient Flow

Moving Patients Smoothly Through Acute Care Settings

This paper is based on work funded, in part, by Pursuing Perfection: Raising the Bar for Health Care Performance, a national program supported by The Robert Wood Johnson Foundation with direction and technical assistance by the Institute for Healthcare Improvement.

Executive Summary

Because waits, delays, and cancellations are so common in health care, patients and providers assume that waiting is simply part of the care process. But recent work on assessing the reasons for delays suggests otherwise.

Optimizing Patient Flow is part of a series of innovative programs developed by the Institute for Healthcare Improvement (IHI) in Cambridge to help hospitals improve the care they provide patients. With the Optimizing Patient Flow program, IHI offers new perspectives on the impediments to timely and efficient flow of patients through acute care settings. The program offers a model for evaluating patient flow, testing changes for improvement, and measuring results.

IHI and approximately 50 hospitals have been working together to evaluate what influences the smooth and timely flow of patients through hospital departments, and to develop and implement methods for improving flow. Specific areas of focus include reducing waits for inpatient admission through emergency departments, achieving timely and efficient transfer of patients from the intensive care unit and the post-anesthesia care unit (PACU) to medical/surgical units, and improving flow from the inpatient setting to long-term care facilities.

While few hospital areas are designed to achieve optimal flow of patients, the emergency department, intensive care unit, and operating rooms and their related pre- and post-care areas tend to be major bottlenecks because they are non-interchangeable resources. Reducing delays and unclogging bottlenecks depends on assessing and improving flow between and among these departments, and throughout the entire system, rather than in isolated departments.

IHI believes that the key to improving flow lies in reducing process variation that impacts flow. While some variability is normal, other variation is not and should be eliminated. Hospitals working with IHI have tested a range of changes to reduce process variation and improve flow. These changes are described in this paper.

Introduction

Patients and providers alike regard waits, delays, and cancellations as a normal part of getting and giving care. Particularly in hospitals, waiting seems intrinsic and, to many, intractable.

Acute care settings are plagued with waits, delays, and diversions. Nowhere is this more observable and its impact more palpable than in hospital emergency departments (EDs). These are busy places, and getting busier.

In the United States, EDs experienced a 20 percent increase in patient visits over the past decade.[1] Not surprisingly, ED waiting times have also increased. According to the Centers for Disease Control and Prevention, the average wait time for non-urgent visits increased between 1997 and 2000 by 33 percent, from 51 minutes to 68 minutes.[2]

Diverting ambulances away from hospitals that are at capacity is another problem on the rise. An October 2001 government study in the US showed that "ambulance diversions have impeded access to emergency services in metropolitan areas in at least 22 states since January 1, 2000. More than 75 million Americans reside in the areas affected by these ambulance diversions."[3]

Examples abound, according to the study. "In Tucson, Arizona, so many hospitals diverted ambulances that paramedics had to struggle to find any place to bring patients. In the Boston area, ambulance diversions last year ran as much as ten times higher than in previous years. On some days in Atlanta, eight to ten hospitals diverted ambulances at the same time. In Los Angeles, two dozen emergency rooms at the heart of the area's emergency system were closed to ambulances almost one-third of the time in June 2001."[4]

The so-called "ED problem," however, is actually a system problem. EDs do not exist in isolation, but are part of a system of care through which patients flow. Increasing capacity in the ED to accommodate more patients, a solution chosen by many hospitals, is like broadening only the large end of a funnel. Increasing input without facilitating a smooth exit (in this case, transfer to other hospital units) worsens the problem.

In a recent report on ED crowding, the US General Accounting Office (GAO) noted the connection between the ED and the rest of the hospital system: "While no single factor stands out as the reason why crowding occurs, GAO found the factor most commonly associated with crowding was the inability to transfer emergency patients to inpatient beds once a decision had been made to admit them as hospital patients rather than to treat and release them.When patients 'board' in the emergency department due to the inability to transfer them elsewhere, the space, staff, and other resources available to treat new emergency patients are diminished."[5]

The units to which ED patients are often transferred must be viewed as integrated parts of the whole system. Most often EDs divert because the hospitals to which they are appended lack the space to move patients forward. A recent study of ED overcrowding showed that the primary reason hospitals go on diversion is the lack of available critical care beds.[6]

According to one expert, "…the frequency of ambulance diversion now correlates better with total occupancy than with ED volume. Increasing average occupancy levels, particularly in specialized units, often become a constraint leaving less room for unscheduled admissions. Admissions through the emergency department must be diverted, denied, or placed in a line or queue. As this pattern continues, the quality of care declines as all patients are increasingly placed into holding patterns."[7]

The costs of delays in care are many, including these:

- The ED becomes an inappropriate and expensive holding area when patients are not transferred to an inpatient unit in a timely manner. "Parking" patients in hallways to await transfer is an issue affecting service, care, and safety.
- When the ED is overcrowded because patients cannot be transferred quickly to care units or operating rooms, incoming patients can experience harmful delays in receiving care. Some even leave without being treated.
- Patients waiting to be transferred from the ICU to a patient care unit represent not only a service but also a cost issue: the ICU is a very expensive place to wait.

When surgical schedules back up, patients and providers are affected across the continuum of care.

Techniques that are used to manage ED flow itself will not have a strong impact on either hospital diversion rates or manage the problem of patients being "boarded" in the ED as they wait hours for an inpatient bed.

Waits and delays, bottlenecks and backlogs, are not the result of lack of effort or commitment on the part of staff. These problems cannot be solved by working harder. Rather, they illustrate what Donald M. Berwick, MD, MPP, President and Chief Executive Officer of the Institute for Healthcare Improvement, calls the first law of improvement: "…[E]very system is perfectly designed to achieve the results it achieves."[8]

The answer to improving flow of patients lies in redesigning the overall, system-wide work processes that create the flow problems.

Optimal care can only be delivered when the right patient is in the right place with the right provider and the right information at the right time. Improvement efforts in hospitals around the US are showing that it is possible to reduce waits and delays in hospital care, improving the flow of patients and information throughout the care system. The results of improving flow can include increased access, shorter waiting times, lower costs, and better outcomes.

Background

The Institute for Healthcare Improvement has been working with approximately 50 hospitals in the US and the UK in a year-long collaborative project to improve flow through acute care settings. An additional 100+ hospitals are also addressing the issue as part of IHI's IMPACT network, a group of change-oriented health care organizations committed to ambitious levels of improvement on a broad scale.

Through this work, hospitals have been testing the theory that the key to improving flow throughout the acute care setting lies in understanding the variability throughout the hospital system. This work focuses chiefly on the variation in waits, delays, and cancellations that occur when capacity does not match demand. Capacity and demand may match *on average*, and on paper it may look as though the system ought to flow smoothly. Indeed it will, if demand (patients) flows in predictably and capacity (staff) is ready to manage it. *However, even when capacity and demand are matched on average, the degree of variation in the timing of the arrival of patients (demand) and the ability of the staff (capacity) to absorb that demand results in waits, delays, and cancellations.*

Developing the ability to shape, predict, and manage variability and to allocate resources appropriately at the front line of care can improve patient outcomes, increase staff morale and retention, reduce costs, and improve quality of life for both patients and caregivers.

IHI's Challenge for Hospitals

The Institute for Healthcare Improvement has developed a process and methodology for hospitals to use in evaluating and improving patient flow in acute care settings. As part of its effort to foster improvements throughout the health care system, IHI invites hospitals to engage in this process, using the methods described in the following sections.

Step 1: Evaluate Flow: How Much of the Time Do You Get It Right?

The first step in evaluating the flow of patients through your acute care setting(s) is to find out, on average, how much of the time your hospital "gets it right" in moving patients through the system in a timely and efficient manner. In considering this question, your hospital needs to look at both the frequency of "parking" patients (i.e., keeping or placing admitted patients in a "holding" location—sometimes in the ED, sometimes simply in a hallway—when they cannot be moved immediately to their intended bed or location) and hospital occupancy as key indicators.

Two key questions help bring these issues into focus:

1. Do you "park" more than 2 percent of your admitted patients at some time during the day at least 50 percent of the time?
   Example: In a hospital with a midnight census of 500 patients, 10 patients (2 percent) were "parked" during the day, waiting for admission to the final destination bed. This occurs more than half the time during the sample period.

2. Does your hospital have a midnight census of 90 percent or more of your bed capacity more than 50 percent of the time?
   Example: A 500-bed hospital had more than 450 patients in the hospital at midnight (90 percent of capacity) more than half the time during the sample period.

If you answer "yes" to one or both of these questions, your hospital is likely struggling with flow problems on a regular basis. "Parking" patients is a clear indication that the system is inhibiting the smooth forward movement of patients to their appropriate destination. And if your midnight census is typically high, you probably experience capacity problems, since your hospital is virtually full at the start of the day, leaving little capacity for new admissions. To address these issues, you will have two tasks: working to reduce flow variation *and* "extending the chain"—that is, working with others along the continuum of care, including those outside your hospital, to smooth the flow of patients into and out of your organization.

Even if you answer "no" to both these questions, you may still feel that patients do not consistently move smoothly through the system. This may indicate a need to reduce flow variation (described in the next section).

Action: Evaluate patient flow by reviewing occupancy and "parking" of patients.

Step 2: Measure and Understand Flow Variation

Variation is intrinsic in health care. It is the result of clinical variability (number of patients presenting with certain clinical conditions), flow variability (the ebb and flow of patients arriving throughout the day), and professional variability (the variation in skill levels and techniques among providers). Eugene Litvak, PhD, Professor of Health Care and Operations Management and Director of the Program for Management of Variability in Health Care Delivery at the Boston University School of Management, has suggested that only the following scenario would eliminate variability:

1. All patients have the same disease with the same severity.
2. Patients arrive at the same rate every hour.
3. All providers (physicians and nurses) are equal in their ability to provide quality care.[9]

Some kinds of variability (so-called "random variability") cannot be eliminated, or even reduced; they must be *managed*. This is true of patient variability. We cannot eliminate the many types of problems from which patients suffer, nor can we control when they arrive in the emergency department.

Other types of variability ("non-random"), on the other hand, are often driven by individual priorities, resulting, for example, in surgical schedules that are heavy on Wednesdays but light on Fridays due to surgeons' preferences rather than actual demand. Non-random variability should not be managed; it should be *eliminated*.

Volume, census, and occupancy rates are often calculated and displayed as means or averages. However, it is the *variation* in these metrics that causes most of the flow problems in our hospital systems. Consider this example: The *mean* elective surgical volume for two hospitals for one week may be 125 patient cases each. Hospital A has a steady flow of surgical cases throughout the week, allowing for optimal scheduling and predictable demand for staffing and patient beds. Hospital B, which also has a mean of 125 cases, schedules 50 percent of its cases on Mondays and Wednesdays, and 50 percent on the remaining days. Because the caseload is so high on Mondays and Wednesdays, there is no room for the seemingly random but historically predictable surgical complications and added cases. The demand for staff, beds, and equipment is at a maximum. Any added volume or decrease in capacity is felt quickly as waits, delays, and cancellations.

Another helpful exercise is to look at the variation in census *between* each day of the week and the variation in census *within* each day. These measures often point to different problems and solutions.

Action: Measure and evaluate variability from all sources. Display the full range of the variability of measures like waiting times and daily surgical volume.

Step 3: Test Changes to Improve Flow

Hospitals that want to improve flow should consider testing two main groups of changes:

1. Changes that can be made within the hospital; and
2. Changes that result in cooperative relationships with other health care providers outside of the hospital.

1. Changes Within the Hospital

Smooth the Surgical Schedule

The surgical schedule is a major source of variation in flow. Several methods are showing early promise in smoothing the surgical schedule and making it more predictable, including the following:

- **Smooth the number of elective scheduled cases and case hours per working day.** Scheduling the maximum number of elective surgeries into the schedule, even just on some days, leaves little flexibility for emergency surgeries. If your unscheduled surgery time currently averages 10 percent or more, adequate space should be left in the surgical schedule or you will routinely experience untenable waits for some surgical patients.

- **Designate separate ORs for scheduled and unscheduled surgeries.** Since the vast majority of surgery is scheduled, most of the OR space should be so assigned. Utilization of the scheduled rooms then becomes predictable and controllable, and wait times for unscheduled surgery become manageable. Concerns about the cost of designating a surgeon strictly for emergencies are unwarranted, compared to the cost of canceling and delaying scheduled surgeries when an emergency surgery disrupts a day's elective schedule.

Schedule the Discharge

Admission bottlenecks are often created because discharges are not managed efficiently. Creating a more consistent and predictable discharge schedule can help improve flow. Some change methods include the following:

- **Provide a process for scheduling the date and time that patients will be discharged at least one day in advance.**
  Although the date and time of discharge may be uncertain for some patients one day in advance, the usual hospital system behaves as if this were the case for all patients. In fact, early data indicate that nurses, doctors, and other health care providers can usually predict one day in advance which patients will be discharged the following day with more than 80 percent accuracy. They can predict with less accuracy which patients will be discharged the day after that and so on. However, in most cases this knowledge is not used to optimize, plan, or synchronize the work of discharging patients. This work will most likely require a centralized planning and scheduling function. Planners can record data about the ability of the system to comply with the schedule and can document reasons for noncompliance to identify bottlenecks and processes needing improvement.

- **Orchestrate the discharge.**
  A set series of tasks must occur prior to discharging a patient. These tasks include examination and sign-off by appropriate providers and patient education. For each patient, the time of discharge and the tasks that need to be performed and in what order will be provided one day ahead of time. This allows all responsible persons to schedule their work accordingly.

- **Provide a process and a team for discharging patients with more complex issues, using data from discharge coordinators.**
  Because of the condition of their health, lack of support, or psychosocial problems, some patients are difficult to place in appropriate settings after discharge. Although the time and date of discharge should be scheduled as for other patients, the orchestration of the discharge of these patients should be handled separately from the normal flow of patients. A special team that is capable of crafting customized and unusual solutions to meet the needs of these patients should do the orchestration.

- **Synchronize other movements to the discharge schedule.**
  Once a discharge schedule is in place, internal transfers of patients, such as from an ICU to a patient are unit, can be synchronized to that schedule. Individual units can begin scheduling and orchestrating movements of their patients at a local level. This synchronization allows local, unit-level control and system-wide optimization to occur simultaneously.

2. Changes Involving Providers Outside of the Hospital

"Extend the Chain" of Flow Improvement

Responsibility driven by geography—that is, addressing only those problems in one's own area—is the source of much variation in hospitals. Particularly for hospitals with patient flow problems, working with physicians and long-term care facilities—those with the power to impact both admissions and discharges—is an effective strategy to improve flow.

A common bottleneck in the ICU, for instance, is the inability to transfer chronic ventilator patients off the unit because there are not enough ventilator beds in other settings. One hospital solved this problem by partnering with an unaffiliated nursing home. The nursing home was able to open a ventilator unit because the hospital assigned an intensivist to serve as a part-time medical director for the unit. This helped improve flow out of the ICU and provide predictable income for the nursing home, and also resulted in high-quality, lower-cost care for the patients.

Other methods of "extending the chain" include promoting advanced access scheduling (sometimes referred to as "open access") in physicians' offices so patients can get timely access to ambulatory care in an appropriate setting, rather than resorting to the hospital ED, and working with hospice services to assure that end-of-life care is provided in the most appropriate, but least intensive, setting.

Action: Select and test the changes that seem to hold potential for improving flow, both within the hospital and with providers outside of the hospital, based on your evaluation of flow variability.

Conclusion

Understanding patient flow requires looking at the whole system of care, not just in isolated units. Reducing variation in flow has been shown to improve overall patient flow. Providing patients with timely access to appropriate care is an essential element of high quality care, because *when* care is provided is often as important as *what* care is provided.

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