Optimizing Patient Flow
Advanced Strategies for Managing Variability to Enhance Access, Quality, and Safety

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This chapter outlines how variability in admission and discharge of patients is the most critical driving force for problems with capacity. Reducing this variability through specific interventions described below can dramatically improve capacity, and has the potential to eliminate boarding, improve flow through the operating room (OR), and increase availability of intensive care unit (ICU) beds. These interventions are challenging and require a clear goal and strong leadership. However, these interventions will improve flow, patient safety, capacity, staff satisfaction, and the financial health of the institution. Without addressing variability and its consequences, even major efforts in other areas are likely to yield little improvement.1

To Fix the Problem, Fix the Cause

Because institutional bed capacity is the problem, effective solutions should be measured by their ability to increase capacity. Lowering levels of bed occupancy reduces inpatient mortality.2,3 The bottleneck caused by lack of capacity is not just due to the overall volume of admissions but also by variability of how and when patients enter and exit the system.4 Variability is the driving factor for problems with capacity.5 Reducing this variation can dramatically improve capacity.6,7 Fixing problems that do not directly impact on the bottleneck can have only a small impact on flow. Thus, the failure of many process improvement efforts stems
from failing to target the right intervention, or failing to implement the intervention to a sufficient degree. Insofar as lack of capacity is driven by variability in how patients enter and exit the hospital, reduction of this variability should be the primary focus in efforts to improve capacity and decrease boarding.8

Initiatives to divert nonurgent patients from the emergency department (ED) have had little impact on crowding and boarding, and raise safety issues.9,10 Many of these “nonurgent” patients seen in the ED undergo testing, and some will require admission.11,12 Diversion of ambulances have proven to be an ineffective solution to ED crowding.13 Worse, diversion imperils patients.14,15

Improving flow within the ED itself is highly desirable but does not address lack of hospital capacity. Decreasing the turnaround time to admission accomplishes little if there is no inpatient bed for the patient when admitted. Of note, expanding the ED to accommodate admitted boarders only serves to increase the number of boarders and does not improve the overall flow.16–18 Similarly, providing inpatient nurse staffing for boarders does little to decrease delays in care19 because it does not address space constraints created by boarders. Boarding thus reflects an institutional problem, and demands an institutionwide solution.20 Getting patients to the right place, with the right staff to care for them, should be the paramount goal. Doing so is safer for the patient, better for the staff, and in the financial interest of the institution. To do so in an efficient manner is of utmost importance, given the high cost of adding beds to solve the problem.21

Institutions facing capacity constraints must focus on these interventions to improve capacity. There is an interplay of multiple factors that drive these problems. As such, efforts to address these factors are admittedly challenging, and changes needed for success require strong and committed leadership. That being said, the end result is improved capacity, enhanced capacity, improved work environment for staff, and financial benefits for the institution.

**CRITICAL ACTION 1**

**Control the Distribution of Elective Admissions**

Variability in emergency admissions cannot be controlled. However, although unscheduled and unpredictable from hour to hour, they are highly predictable on a daily basis, with minor variations from day to day. In that sense, ED admissions are “smooth,” meaning there is approximately the same number from day to day. Absent a dramatic unexpected change in overall ED volume, the number of emergency admissions next Tuesday will be, with small variations, the same as previous Tuesdays.

Elective admissions, scheduled and therefore controllable, typically are not smooth, with a large influx of patients at the beginning of the week, tapering off as the week proceeds.22,23 Elective admissions are scheduled primarily to suit the convenience of the physician, based on long-standing practices. In one study, elective surgical admissions varied from day to day during the weekdays by a factor of 3, leading to overcapacity on some days and unused capacity on others.24,25 On heavier elective admission days, elective patients compete directly with emergency patients for the same resources.26 With large fluctuations in census, nursing staff are overwhelmed.27 Elective scheduling may not account for the number of patients who will need postoperative ICU care, creating significant fluctuations in ICU bed demand. Large variations in admissions lead to logjams at the beginning of the week. Elective patients and patients in the ED compete for the same ICU and floor beds. With no floor beds, ICU patients cannot be downgraded because of lack of floor beds. With no floor beds, recovery room patients have difficulty exiting from the recovery area to an inpatient unit. Days of high ICU flow are associated with poorer patient outcomes and higher readmission rates.28
In summary, variability in elective scheduling is a major driver in creating lack of capacity and patient harm.

Part of this scheduling pattern may be influenced by availability of resources on weekends. When hospitals limit available resources on weekends, there are justifiable reasons for loading up the beginning of the elective week with cases. An orthopedist, for instance, may wish to schedule elective hip surgery early in the week, knowing that the patient is critically dependent on physical therapy postoperatively, a resource that may be limited on weekends.29

Limited off-hour and weekend resources have other serious consequences.30–32 Patients with stroke or acute myocardial infarction are more likely to die if admitted off-hours or on a weekend.33–35 In-hospital survival from cardiac arrest is lower off-hours than on weekdays.36 Patients are less likely to get life-saving interventions on weekends.37 “Never” events occur with a higher frequency on weekends.38 Overall mortality rate is higher on weekends.39–41

Because elective admissions are scheduled, there is an opportunity to distribute (or smooth) electives across the week, both in number and by predicted ICU need. Doing so minimizes fluctuations in the census, thus improving bed availability overall.42–44 Smoothing of elective cases has led to a substantial decrease in boarding and diversion, and improved availability of both floor and ICU beds. The impact of smoothing has raised the question of whether inadequate capacity is actually a real problem, or an artificial one driven by the vagaries of the elective schedule, in conjunction with the limited services available and lack of discharges on weekends.45 Managing variability in elective surgical scheduling can have a profound effect on overall capacity as well as the functioning of the OR itself.46

Smoothing of elective surgical admissions is accomplished in a series of steps. The first step is to separate the unscheduled and scheduled surgical cases, dedicating a number of ORs to urgent cases. By doing so, ORs dedicated to elective cases can run at near full capacity without having to cancel or delay cases. The second step is to smooth elective cases to each inpatient destination so that the volume of cases is similar from day to day. Cases predicted to need postoperative ICU care are smoothed across the week, so there is a steady and predictable need for ICU beds. When smoothing of elective flow is accomplished, one can more rationally calculate long-term OR, ICU, and inpatient bed need across various services, to ensure the right care at the right time and place for each patient.47 Smoothing does not mean that an individual surgeon has to spread cases across the week, but it does mean that a surgeon may have to operate on a different (but permanent) day of the week to smooth the schedule for particular hospital ward admissions.

CASE STUDY

Controlling the Distribution of Elective Admission at Boston Medical Center

Faced with diversion and boarding, Boston Medical Center, a 547-bed facility with 120,000 ED visits, evaluated the drivers contributing to ED boarding, crowding, and ambulance diversion. In their assessment, they found that the ED was not the driver of boarding. The major contributor was variability in elective surgical admissions. This variability also drove lack of access to ICU beds.48

After an assessment of the urgent and scheduled case load, dedicated OR suites were set aside to care strictly for the unscheduled cases. Cases were defined as emergent (within 30 minutes); urgent (30 minutes to 4 hours); semi-urgent (4–24 hours); and nonurgent (> 24 hours). Cases in the first three categories would be done in the urgent/emergent ORs. Scheduled cases were then analyzed and smoothed across the week in the step-down unit to maximize OR efficiency and distribute cases known to need ICU care across the week to minimize daily variation. Smoothing required that some surgeons had to move their usual operating day to a different day; this sometimes required that their clinic day needed to be moved as well. But offsetting this necessary rearrangement was the guarantee that their cases would never be bumped. Changing the schedules for cardiac and vascular surgery alone reduced variability in ICU and step-down need by 55%.49

Smoothing of the elective surgical cases across the week resulted in decreased ambulance diversion and less
boarding in the ED, and reduced ED length of stay (LOS) by almost one hour. There was greater accessibility to ICU beds for ED patients. Cancellation of scheduled procedures dropped by 99.2% (from 778 the previous year to 6 the year after implementation). There was also a significant reduction in overtime.49

In summary, smoothing of elective admissions can have a profound impact on capacity.50–52 The transition from variable to a smooth schedule is challenging and requires strong leadership and clear goals. In the end, the benefits to the surgeon, the patient, the staff, and the institution can be dramatic.53 The following have been noted benefits of smoothing of elective admissions (in most cases, smoothing of elective admissions has focused on surgical admissions, but the same logic would apply to any source of elective admission):

1. Improved overall bed capacity50
2. Improved OR capacity and performance42
3. Marked reduction in surgical cases either cancelled or rescheduled
4. Improved ICU capacity53
5. Less overtime costs27
6. Lower turnover of staff42
7. Ability to increase volume of surgical cases without creating a capacity issue
8. Fewer medical errors
9. Fewer readmissions
10. Decrease in boarding of admitted patients
11. Decreased overall LOS
12. Dramatic improvement of financial performance for the hospital42

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11. Decreased overall LOS
12. Dramatic improvement of financial performance for the hospital42

As noted earlier, boarded patients have a longer LOS compared with a similar patient with ready access to an inpatient bed. In many institutions where there is boarding, beds typically don’t become available until the evening because the bulk of discharges occur in the late afternoon.57 When boarded in the ED, patients may receive their urgent treatments such as antibiotics for sepsis, but other tests, consults, and case management and social services, generally await the following day. By moving admitted patients to the floor earlier in the day, these services are initiated a day earlier and can contribute to a shortened LOS. This endeavor must be of sufficient magnitude to have significant impact. The obstacles to early discharge are multifactorial and require collaboration, planning, and communication.58–61 Success is difficult to achieve without a clear goal driven by strong leadership.

**CASE STUDY**

Discharging Patients Earlier in the Day at New York University Langone Medical Center

Faced with an increase in both patient volume and acuity, New York University Langone Medical Center (NYULMC) was challenged to increase capacity without building any additional beds. The key metric that sparked our early discharge initiative was the following: Patients who arrived from the ED to the floor after 1:00 p.m. stayed 0.6 days longer in the hospital than the same patients who arrived from the ED before 1:00 p.m. So more than half a day in LOS was added to the hospitalization if patients could not get up to the floor to start their treatment. The reason why it was so hard to get patients up to the floor was that the existing patients were not being discharged in a timely way. In fact, for all of 2011, the percentage of patients discharged before noon on the general medicine teams was in the single digits. The Discharge Before Noon Challenge was born.
The Challenge team learned quickly that the reasons why patients were being discharged late in the day were multiple. Some patients wanted to stay for lunch (or even dinner), others needed a ride home, others didn’t know they were even being discharged, or they wanted to speak with key members of the team or were confused about their medication. Providers were waiting for final labs tests and procedures or were waiting for a call back from consultants. It was immediately recognized that the entire medical team was not always on the same page, and the patient was lost in the middle.

On March 5, 2012, we launched the Discharge Before Noon (DBN) Challenge on the general medicine floors of our academic, tertiary care urban hospital. For the first time ever, we assembled every health care worker (from Dr. Robert Grossman, our Dean and CEO, chief of medicine, hospitalists, house staff, nurse practitioners (NPs), nurses, nurses’ aides, unit clerks, transporters, pharmacists, care managers, social workers, administrators, patient experience representatives, housekeeping, to physical therapists). Clinical leaders explained the WHY behind this initiative. And the WHY centered around patient care. An early discharge allowed for patients to get settled at home with their aides and durable medical equipment, assured that they could get their medicines. If there were questions, the team would still be available to answer. For those patients being discharged to a subacute facility, an early discharge would allow for verbal handoff communication between providers. We also explained that an early discharge helped the next patient to get the proper care and avoid extended waits in the ED. We stressed that, first and foremost, every discharge must be a safe discharge and that a discharge on a Thursday evening is preferred to a discharge on a Friday morning.

Central to the success of this initiative were the following: role clarification, systems-based changes, and reward recognition.

**Role Clarification**

We created a checklist to ensure that every member of the health care team understood and was accountable for specific duties related to discharge, see Table 8-1, right. It was the house staff/NPs’ responsibility to write all prescriptions and complete most of the discharge summary the day before the expected discharge date so that only minor edits would be needed on the day of discharge. It became the care managers’ responsibility to enter all the patients who were expected to leave the following day into a central HIPPA–secured website so that all multiple areas of the institution would know who is expected to leave and how to prioritize tests needed for discharge. The hospitalists were responsible for escalating if there were delays in procedures or consultation. The social worker was responsible for ensuring that appropriate transportation was arranged, and the nurse was responsible for providing patient education/teaching as well as completing a discharge summary.

**Systems-Based Changes**

**Geographic Wards**

To streamline communication, especially between the physicians and the nursing staff, we instituted geographic wards. Prior to this model, teams would care for patients on as many as six different units. As a result, there was disjointed communication among the team. Many times, the nurses would not know which team was in charge of their patients. It was difficult for teams to get to know the nursing staff on so many units. With the institution of

**TABLE 8-1**

<table>
<thead>
<tr>
<th>Discharge Task</th>
<th>Responsible Team Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD discharge summary and medication reconciliation</td>
<td>Resident or NP</td>
</tr>
<tr>
<td>Discharge order</td>
<td>Resident or NP</td>
</tr>
<tr>
<td>Prescription(s)</td>
<td>Resident or NP</td>
</tr>
<tr>
<td>Communicate discharge date and time to patient/family</td>
<td>Resident, Hospitalist, NP, or Patient Education Nurse</td>
</tr>
<tr>
<td>RN discharge summary</td>
<td>Nurse</td>
</tr>
<tr>
<td>Patient belongings/clothing</td>
<td>Nurse</td>
</tr>
<tr>
<td>Patient education/teaching</td>
<td>Nurse</td>
</tr>
<tr>
<td>Final labs/tests</td>
<td>Nurse</td>
</tr>
<tr>
<td>Assess Foley catheter need and remove</td>
<td>Nurse, Transportation, Social Worker, and Care Manager</td>
</tr>
<tr>
<td>At-home services (HHA/HA/private hire)</td>
<td>Social Worker and Care Manager</td>
</tr>
<tr>
<td>Equipment/supplies (DME, O2, ostomy supplies)</td>
<td>Social Worker and Care Manager</td>
</tr>
</tbody>
</table>

** NOTE:** Abbreviations: DME, durable medical equipment; HA, home attendant; HHA, home health aide; MD, medical doctor; NP, nurse practitioner; O2, oxygen; RN, registered nurse.
geographic wards, every patient on a specific team was confined to a separate unit. As a result, the team never left the unit. Nurses and physicians started to learn each others’ names, and face-to-face communication skyrocketed. In fact, we measured the number of phone calls received by house staff after the institution of geographic wards. The number dropped 75%.

**At-the-Bedside Walking Interdisciplinary Rounds**

The institution of geographic wards allowed the teams to enhance interdisciplinary rounds. Prior to this change, the team met at the back of a nurses’ station to discuss discharge planning. Nursing was less engaged, as most of the patients discussed were not on the unit. Communication was not structured. Importantly, the patient was not involved. After we switched to geographic wards, we conducted rounds at the bedside, with the patient literally at the center of the hospitalist attending, the charge nurse, the social worker, the care manager, and the resident. We structured the rounds to discuss what we dubbed “The Four Questions,” using the following script:

**Question 1: Why is the patient admitted?**
Mr. Jones, you were admitted for pneumonia that did not respond to oral antibiotics.

**Question 2: Why is the patient still admitted?**
Mr. Jones, you are still here because you are receiving IV antibiotics and supplemental oxygen.

**Question 3: What has to happen for the patient to leave the hospital?**
Mr. Jones, you will leave the hospital when we can convert you to oral antibiotics and you no longer need supplemental oxygen.

**Question 4: When and where will the patient be discharged, SAFELY?**
You will go home tomorrow before noon with services.

This format allows for patients and their families to be on the same page with discharge planning.

**DBN LISTSERV®**

We created a Discharge Before Noon (DBN) LISTSERV® to allow key departments within the entire medical center to understand who might be discharged and to prioritize what studies needed to be accomplished to do so. Care managers input every patient who is anticipated to be discharged the following day into a listerv. More than 400 key staff receive an automated e-mail listing the patients who are expected to be discharged. The e-mails are sent twice daily—one in the late afternoon (5:00 P.M.) and again in the early morning (7:00 A.M.). Overnight nurse managers update the list to inform the team of clinical changes (for example, a patient who spiked a fever overnight would be taken off the DBN list). If a patient was expected to be discharged pending a PICC (peripherally inserted central catheter) line, the PICC line team would know to prioritize this patient.

**TeamSTEPPS® Training**

To ensure that every member of the team was able to call out and escalate patient safety concerns, we trained more than 90 key members of the medicine team (hospitalists, nurses, care managers, social workers, trainees, and NPs) in basic TeamSTEPPS methods. TeamSTEPPS (Team Strategies and Tools to Enhance Performance and Patient Safety) is a curriculum developed jointly by the Department of Defense and the Agency for Healthcare Research and Quality and has been proven to save lives. We trained all participants on “CUSS” (I am CONCERNED, I am UNCOMFORTABLE, STOP the line, and this is a SAFETY issue), “SBAR” (Situation, Background, Assessment, Recommendation), check back, and IPASS (Illness, Patient summary, Action list, Situation, Synthesis) sign-out strategies. Postsurvey data from all the participants showed an increase in comfort level with escalating concerns.

**Dean’s Dashboard**

In order to make progress transparent and timely, clinical leaders were given access to the early discharge data in the “Dean’s Dashboard.” This is a secured, online, institution-based tool that allows users immediate access to multiple different metrics, including discharge before noon rate. Because the discharge before noon rate is updated every day, unit leaders, service chiefs, and department chairs can monitor progress and make changes as needed.

**Morning Safety Huddle**

The institution of geographic wards also allowed for a morning safety huddle, held at 9:00 A.M. on each unit for
about 15 minutes. Attended by the unit medical director, the unit nurse manager, the hospitalists, residents/NPs, floor nurses, care managers, social workers, physical therapists, nutritionists, and pharmacy, the entire unit will quickly review which patients are expected to leave before noon, which patients are expected to leave later in the day, and a myriad of patient safety concerns, including which patients have Foley catheters or central lines, who is in pain, who is a fall risk, who is refusing venous thromboembolism (VTE) prophylaxis.

**Leadership**

*Alignment with the C-Suite*

It was imperative for Medicine service leadership, including the director of the hospitalist program, to be completely aligned with the C-Suite in carrying out the DBN initiative. This culture change, led successfully and quickly by the Medicine service, gave the hospitalist program in particular the “institutional currency” to expand the program on multiple fronts.

*Unit-Based Dyads*

The importance of unit dyad leadership cannot be underemphasized. The medical director and nurse unit manager set the tone for the unit. They perform mini-RCAs (root cause analyses) on patients who “fail” to achieve a discharge before noon and feed back their findings to the appropriate members of the team. They perform a brief unit orientation for new house staff to ensure that the expectations around early discharge are set at the beginning of each rotation.

*Reward Recognition*

To hardwire success during the initial stages of the DBN initiative, Administration offered a modest reward program on a monthly basis. The reward program was activated when there was an average of five discharges before noon achieved on the entire 17th floor. This included a pizza party for the day and night staff and a random drawing of small-denomination gift certificates. Even more importantly, senior administration, including Dean Robert Grossman, personally thanked the staff on the floor for their efforts.

**Results**

Within three months of starting the DBN initiative in March 2012, the DBN rates increased from 5% to 30%. This rate has been sustained and increased to 42% over the past five years. Originally, there had been concern that this increase in DBN rate would lead to an increase in Observed to Expected Length of Stay (O:E LOS), as providers might opt to keep a patient for an extra day to ensure an early discharge the next day. This did not bear out. In fact, the O:E LOS decreased from 1.06 to 0.96 during the early part of the initiative and has further decreased to 0.93.

Another concern was that the readmission rate would increase, as patients might be discharged prematurely. Again, this did not bear out. Readmission rate was unchanged at 16% for the past five years. We had postulated that HCAHPs (Hospital Consumer Assessment of Healthcare Providers and Systems) scores, particularly around discharge planning and communication with nurses and doctors would have improved with the above interventions. They did not. Further investigation is needed to more fully understand the drivers of patient satisfaction. Our discharge before noon initiative resulted in improved patient flow throughout the hospital. The median time for ED patients to arrive on the floor moved from 5:00 P.M. to 4:00 P.M.65 This was a critical hour that allowed for more patients to be worked up by the primary team, as opposed to the night float residents.

**Sustainability and Portability**

Soon after the Discharge Before Noon initiative started on the Medicine service in 2012, it successfully expanded institutionwide. Our institutionwide discharge before noon rate is currently at 42%. We have shown that with careful planning and no additional resources, and with a careful eye on safety, we can improve early discharge.

In addition, we demonstrated that our DBN initiative is highly portable to other institutions. Our newly acquired Brooklyn hospital, NYU Lutheran, achieved similar success in DBN rates by using many of the above systems-based changes.
CRITICAL ACTION 3
Increase the Number of Patients Discharged on Weekends

The final source of variability comes from the reduced number of discharges on weekends, a significant driver for discharge delay.\(^6\) The volume of discharges on weekends is almost 50% of the number of weekday discharges, resulting in a lost opportunity to enhance capacity in anticipation of the following week. In an analysis of the New York Statewide Planning and Research Cooperative System (SPARCS) data, the average LOS for a surgical patient discharged on a Saturday was approximately 3 days shorter than a patient discharged on a Monday; for medical patients, LOS differs by 1.22 days. Increasing weekend discharges can substantially reduce ED boarding and congestion.\(^6\)

There are a number of potential obstacles to weekend discharge. Hospital services are often reduced on weekends, resulting in patients remaining in the hospital for tests only available on weekdays. This contributes to diagnostic services being overwhelmed at the beginning of the week due to the queue that developed during the previous 2–3 days. Although many nursing and rehabilitation facilities will accept patients on weekends, anticipatory planning during the week is necessary to ensure that the patient is ready for transfer. On weekends, inpatients may be covered by physicians not intimately familiar with their medical issues, so patients sit in limbo until their usual treating physician returns. There may be many other issues unique to a particular institution. Although there may be a number of obstacles to weekend discharge, institutions that have focused on increasing weekend discharges have experienced dramatic improvement in overall bed capacity, decreased ED boarding, and overall shorter hospital LOS. Weekend discharge can be safely accomplished.\(^6\)

CASE STUDY
Increasing the Number of Patients Discharged on Weekends at Montefiore Medical Center

Increasing weekend discharges can have a dramatic impact on capacity. Montefiore Medical Center embarked on a process to better understand levels of services available on weekends to see whether or not identifying patients who could safely be discharged could create additional capacity. This process began with acute care leadership from many different disciplines (physical therapy, echo, social work, among others) spending many weekends on site to identify the opportunities for improvement. Many different areas of focus were reviewed, and the interdisciplinary team of leaders decided to implement several immediate changes. The changes included the following:

1. Have throughput managers on site who would lead weekend rounds and own the discharge process.
2. Create a single discharge list so that all members of the team were working on one comprehensive list.
3. Provide enhanced physical therapy services and an ongoing review of all ancillary services to determine whether other enhancements were required, and always ask the question, “Why not today?”

This weekend review continued for approximately six months before the interdisciplinary leadership team felt comfortable that real progress was being made and that many of the implemented changes led to tangible results. The process continued with the team assembling every Monday morning for a quick debrief on the weekend’s activities, lessons learned, and actions that were required to be taken to improve efforts going forward. These changes resulted in an approximate 50% increase in weekend discharges, which subsequently created significant inpatient capacity during the week.

Montefiore Medical Center operates at near 100% capacity year round. These significant weekend changes contributed substantially to our ability to care for more patients and more complicated cases, and to meet the needs of the population that we serve. Four years later, the process continues with very similar success.
Prior to an institutional focus to increase weekend discharges, on average, 30 admitted patients boarded daily in the ED because of lack of capacity on the inpatient services. A year after implementing the program to increase weekend discharges, boarding virtually disappeared in the ED. Capacity improved to the point that a 30-bed inpatient unit was closed. There was an associated decreased LOS and a very substantial financial gain to the institution from this program.

What is the cost of providing necessary services on weekends to enhance weekend discharges? The total work is the same, so if more testing is done on weekends, then less testing is necessary during the week. Similar to elective smoothing, by smoothing the demand across the entire week, a redistribution of staff toward weekend coverage may be necessary, but there should not be a need for increased resources overall (unless overall resources were inadequate to begin with). Having services available on weekends provides a downstream benefit to other patients not yet ready for discharge. By getting their tests completed at an earlier point in their admission, patients may potentially have a shorter length stay. If there is no change in total volume of patients, then, by having a favorable impact on LOS, there are fewer patients in the hospital at any given time. Where there is a need for additional resources, the cost should be more than offset by the improved capacity and shortened LOS.

**CRITICAL ACTION 4**

**Have a Full Capacity Action Plan**

Regardless of interventions to improve capacity, there will be times when capacity is exhausted. The economics of health care discourage excess capacity. It is costly and wasteful. As such, institutions must run at close to capacity. Even with the implementation of elective smoothing, early discharge, and enhanced weekend discharges to maximize capacity, because of minor variations in flow, or because of major outbreaks, institutions should plan for times when the number of admitted patients exceeds the number of available inpatient beds. In many hospitals, when this occurs, admitted patients board in the ED, with grave consequences as outlined above.

The primary and most studied practice to address capacity failure is the full capacity protocol. In times of boarding and crowding, a selection of boarded patients will be distributed from the ED to inpatient units already at capacity, to offset the burden experienced by the ED and to improve the care and safety of the patients. In such circumstances, the institution is asking each regular inpatient unit to expand their complement of patients by one to two patients, typically. These patients are placed in hallways, solaria, conference rooms, or other available space, depending on availability. Note that the choice is not between a room and a hallway; it is between a hallway in the ED and a hallway on a floor. Because the sickest patients cannot be placed in these settings, the ED continues to board, at minimum, all ICU and ICU step-down patients.

One institution’s four-year experience with 2,042 patients placed on inpatient units in hallways using their full capacity protocol (FCP) supported the safety of this practice. Innes et al. demonstrated improved throughput in spite of an increased volume with the use of the FCP.

Boarded patients are dissatisfied patients. A study from the University of Pennsylvania correlated an inverse relationship between overall patient satisfaction and overcrowding. In a survey study, Garson, et al. also demonstrated a strong patient preference for being on the inpatient service rather than boarding in the ED. When asked, parents prefer to have their children boarded on the inpatient unit rather than in the ED. A study from Stony Brook University documented that close to 90% of patients who actually experienced placement in both ED and inpatient corridors preferred the inpatient hallway rather than remaining in the ED.

Institutions may resist implementation of the FCP due to political reasons, or in anticipation of staff objections. Interestingly, inpatient nurses who have previously worked in the ED are strongly supportive of the practice compared with nurses who have had no prior ED experience. Whatever processes an institution chooses, patient safety must be paramount. The default of allowing admissions to accumulate in the ED is demonstrably unsafe, by
every measure from satisfaction to survival. During these circumstances, the institution must ask, “How can we best care for all of our patients?”78 The FCP demands that staff throughout the institution extend their efforts a small amount, rather than leaving a large burden in one place. Even with the most effective FCP, the sickest patients boarding in the ED, not suitable for hallway placement, will remain in the ED.

Overall, implementation of an FCP has been shown to decrease waits and boarding, to improve throughput, and to shorten LOS.79,80 Innes, et al. demonstrated systemwide improvements in a 15-hospital system with the institution of the FCP.72

Distributing patients in this manner has the following benefits78:

1. Improved capacity in the ED to see incoming patients with potentially serious illness
2. Enhanced number of nursing hours per patient
3. Patient placement in an area with the proper nursing and physician expertise
4. Patient placement in a quiet area
5. Patient placement in an area to access a normal inpatient bed more quickly
6. Decreased overall LOS for the patient (by approximately one day)
7. Decreased workload for ED nurses by a large amount, with only a small increase in the workload for the individual unit nurse because the workload is distributed over a larger network of inpatient beds

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**CASE STUDY**

**Having an Institutional Plan to Address Full Capacity at Stony Brook University Hospital**

Prior to 2001 the ED at Stony Brook University Hospital had initiated multiple process improvements, including bedside registration, creation of a fast track, and patients moved directly from triage into the clinical space, regardless of bed availability. In such cases, patients would be placed in a room for initial evaluation, IV, and labs, and would then be moved out of the room for the next patient, unless clinical circumstances made this unsafe. These changes resulted in decreasing door-to-doctor time from a median of 90 minutes to 12 minutes. However, when inpatient units began to fill to capacity, a growing problem with ED boarding of admitted patients occurred, undermining flow improvements and creating dangerous delays in patient evaluation and care.

In 2001, in the face of steadily increased boarding of admitted patients, and in response to a statewide directive from the New York State Department of Health, Stony Brook undertook the development of a full capacity protocol to ameliorate boarding in the ED. Representatives from administration, inpatient nursing, and ED staff met to determine what should be done, when, and by whom.

Discussions centered on patient safety, and began with the premise that both the ED and inpatient units were at full capacity, with no further available beds. Was it safer for the patient to be one of many in the ED, blocking evaluation of new patients? Data from Stony Brook demonstrated a clear correlation between boarding time, overall LOS, and mortality.81 How did this compare safety-wise with moving a patient to an already full inpatient unit? There was a wealth of data on hazards of ED boarding, but little experience with inpatient boarding.

An FCP was developed. When the ED was boarding admitted patients and ED patients now had to wait to be seen because of lack of space, the institution’s chief medical offer, as the neutral party, would be contacted to make the decision regarding activation of the FCP. When the protocol was activated, appropriate patients were selected for placement on the inpatient units. Exclusions included patients needing high-flow O2, patients needing ICU– or step-down–level care, patients at immediate risk of seizures, and patients with open wounds/secretions/diarrhea. Because of the availability of wireless telemetry, patients needing telemetry were included.

Up to two patients were placed on each 30-bed inpatient unit, increasing the total number of patients from 30 to 32. With nine units eligible, as many as 18 boarded patients could be redistributed to the inpatient units, thus freeing up needed ED resources for incoming patients. Each inpatient unit worked with the fire marshal to ensure that placement was consistent with existing fire safety codes. The ED continued to board the most critically ill patients (roughly 50% of all boarders). The FCP would continue until the boarding problem was resolved.
In evaluating these issues, the following questions were asked:

1. Where will the patient get the most nursing care, as measured in hours per day, assuming normal ED and inpatient staffing? There was an improvement in nursing hours per patient of approximately 4 hours per day by boarding the patient on the inpatient unit. Even if the inpatient unit was one nurse short, the patient still was better off by about 3 nursing hours per day.

2. Where will the patient get more rapid access to a normal inpatient bed? In Stony Brook’s experience with the first 1,000 patients, 25% got into a room immediately, 25% waited for up to an hour, and 50% waited an average of 8 hours before a room became available.

3. In which location would the patient have the proper expertise at the bedside (both nursing and physician)? There was a consensus that, for instance, an oncology patient would be better cared for by an oncology nurse and an oncology physician on the oncology unit. Similar logic applied across all units.

4. If patients are moved to inpatient hallways, how many should each unit take? To initiate the program, a maximum of 2 patients were allowed per unit. Given the degree of boarding at the time of implementation, this number was sufficient.

5. When is the FCP to be initiated? When the ED is full, with some beds occupied by boarded admitted patients, and has no room available to see incoming patients.

6. How will this practice impact patient satisfaction? Overall institutional patient satisfaction scores were unchanged. A formal published study from this institution found that close to 90% of patients preferred placement on the inpatient unit to the ED hallway.

7. How will FCP impact LOS? Internal results of a case control study demonstrated a 0.8 day decrease in overall inpatient LOS for those patients who were moved to the inpatient unit.

When a patient was placed in a hallway, he or she was provided a privacy screen, a wireless call bell, and, if needed, wireless telemetry. A bathroom was also identified for the patient to use. A portable monitor/defibrillator and portable suction equipment should be available on all units, if not already present.

Compared with other interventions to address capacity, this is among the simplest. A patient moves from an ED hallway to an inpatient hallway. As of 2010, 45% of hospitals had a full capacity protocol, with some 24% placing patients in hallways.

Several comments are of note. The FCP is instituted, not to help the ED per se, but to help the patient. In times of overcapacity, one must ask, not what is safe, but what is safest, for all the patients. The overall institutional answer to this question may well be different than the answer from an individual patient care unit. This is not a question of hallway versus room; if rooms were available, the FCP would not be activated. It is a question of ED hallway versus inpatient hallway. Distributing the load over a large area was safer than leaving the problem concentrated in one.

At Stony Brook, the hallways have been used to place patients. Other institutions may choose the use of an exam room, conference room, or solarium as an alternative. However, there are several advantages of using a hallway. First, no additional staffing is required. Second, when a room is made available, the patient can immediately access it. Third, the patient is immediately accessible to the staff.

Over time, many of the patients previously placed in hallways (with, for example, chest pain, syncope, TIA) are now seen, evaluated, and often discharged from the ED. These patients no longer make up a significant pool of patients available for safe hallway placement. Should acuity levels or infection control issues limit the placement of such patients, then consideration should be given to placing those awaiting discharge out in the hallway so that an emergency patient can be moved immediately to the inpatient unit and into a room.

When bed availability is tight, patients may be placed in an off-service bed. With the FCP, one can ask whether the patient is better served being in a room on the wrong service or in a hallway on the proper service. In the absence of any clear evidence one way or the other, this should be framed by what the clinician believes to be in the best interests of the patient. A cardiac patient may be better served in the hallway of a cardiac unit than in a room on the orthopedic service.
In summary, the safety of this practice has been established, particularly when compared with inaction. Overall LOS is reduced. Patients prefer placement in an inpatient hallway rather than the ED. It reduces waiting time for patients arriving at the ED with undifferentiated and potentially serious illness. This does not eliminate boarding in the ED, but does somewhat reduce the total number of patients being boarded, as can be seen from the case study. It also serves to alert the inpatient units that the institution is at capacity, and all efforts must be made to create capacity.

Target the Right Intervention to a Sufficient Degree

Many institutions have gone to great length to address the problem of lack of capacity, but with little impact on the overall problem. This is in large part due to focusing on multiple steps in the process of patient care that do not directly address the driving forces that limit capacity. Processes that hasten the admission process accomplish little if there is no bed for the patient. The key is to focus on the drivers creating the bottleneck. In the case of inpatient capacity issues, this is largely driven by variability in admissions and discharges. Without addressing this variability, one cannot fix the problem with capacity. However, once there is capacity, then these other processes can have an important impact on flow. As one bottleneck is improved, other smaller bottlenecks will need to be addressed.

In addition to targeting the right intervention, it must achieve sufficient scale to make a difference. For instance, increasing early discharges by a small number, or a small increase in weekend discharges, will have insufficient impact on capacity.

References


Optimizing Patient Flow: Advanced Strategies for Managing Variability to Enhance Access, Quality, and Safety offers readers innovative techniques for maximizing patient flow and improving operations management while providing clear examples of successful implementation. This all-new book can help health care organizations to reduce and manage variability, thereby increasing the reliability of systems and processes and improving health care quality and safety.

Litvak makes the case for the importance of patient flow and its effect on quality, safety, and the bottom line. Joining Litvak are hospital CEOs, doctors, patient safety advocates, researchers, and other influential stakeholders. The foreword and prologue provide additional arguments for improving patient flow—that it can indeed be a matter of life and death. Hospital CEOs share their experiences and challenges in improving patient flow. Researchers present the “nuts and bolts” of the mechanics of patient flow, and real-life case studies from around the world illustrate how improved patient flow affects, for example, hospital emergency departments, telemetry bed utilization, and post-acute care. The case studies move beyond the hospital setting and consider health care system flow as well.

Key Topics include:
- Identifying, measuring, reducing, and managing variability
- Smoothing and optimizing the patient admissions process, surgical flow, and operating room use
- Capacity planning and queue management strategies
- Assessing the quantitative impact of patient flow issues on patients and staff
- Standardizing patient admission, transfer, and discharge

In short, this book will convince you of the need to optimize patient flow—and explain how.

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