

When Overcrowding Paralyzes An Emergency Department

Changing the process and mindset of health care professionals was the key to reducing emergency department overcrowding

Joseph R. Twanmoh, MD, FACEP, Assistant Professor of Emergency Medicine, University of Maryland School of Medicine, Baltimore, Md., Gail P. Cunningham, MD, FACEP, Head, Department of Emergency Medicine, St. Joseph Medical Center, Towson, Md.

ABSTRACT

Emergency department overcrowding is a critical problem nationwide. A survey by the Lewin Group in 2002 found that 90 percent of Level 1 trauma centers and hospitals with more than 300 beds reported being over capacity. Although ED overcrowding has many causes, external factors are most commonly blamed — too many patients, lack of inpatient capacity, inappropriate use of the ED, the Emergency Medical Treatment and Active Labor Act (EMTALA), lack of primary care availability, and lack of access to health care for the uninsured. In this article, we describe a series of changes that were implemented in the ED of a regional medical center. Those changes improved operational efficiency, expedited patient care, and reduced ED overcrowding.

The changes focused on patient input, throughput, and output. In terms of input, we revamped the triage and admission processes. To

improve throughput, we modified the physical layout of the urgent care area to maximize efficiency in staff movement and communications, changed staffing patterns to match anticipated patient volume, and revised our policies regarding exchanges with the radiology staff. To facilitate patient flow out of the ED, we identified the causes of delays in discharges and admissions, instituted the practice of flagging the charts of patients ready for discharge, and implemented admission orders to decrease patient waiting times.

Improving patient throughput increases ED efficiency, and thus capacity, in terms of the number of patients that can be treated over a given time period, and it promotes the cost-effective use of institutional resources. Decreased waiting times should ultimately lead to increased patient satisfaction and better patient care.

INTRODUCTION

In October 2003, St. Joseph's Medical Center, a 391-bed regional medical care facility in northern Baltimore County in Maryland, opened a new emergency department to replace an outdated facility. Annual patient volume had grown to 34,000, so the old 20-bed ED often filled quickly. Consequently, patients experienced long waits to be seen. By June 2003, ambulance diversion averaged 120 hours/month. It seemed clear that a

larger state-of-the-art facility would solve these problems. The new department would have 40 beds, including 10 for fast track and nine observation beds for patients with chest pain of undetermined origin, patients requiring extended workups, and main ED overflow. With an annualized patient-to-bed ratio of just over 1,000, capacity was not expected to be an issue. Generally speaking, EDs begin to saturate their physical plant capacity at 1,500 patients/bed/year.

In June 2003, the medical center launched an initiative to address overall patient throughput and capacity maximization. The new ED opened four months later with great anticipation and the assumption that throughput problems would be solved. Unfortunately, all the symptoms of overcrowding remained. Patients continued to experience long waits, sometimes three to four hours, before being taken to a treatment room. Ambulance diversion continued to be excessive, reaching an all-time high of 287 hours in December 2003. The ED was crippled with "boarders" — patients whose conditions warranted hospital admission but for whom an inpatient bed was not available.

The hospital's patient throughput initiative was a mixed blessing. While it gave the ED a forum to discuss problems over which the department had no control (e.g., availability of housekeeping staff to clean a vacated

Author correspondence:

Joseph R. Twanmoh, MD
Department of Emergency
Medicine
University of Maryland School
of Medicine
110 S. Paca St., 6th floor
Baltimore, MD 21201
Phone: (410) 328-8025
Email: jtwanmoh@smail.
umaryland.edu

unit room, making the “system” aware of an open bed, arranging transport from the ED to the unit), it made the shortcomings of the ED glaringly obvious. For instance, to address the issue of boarders, the hospital shortened inpatient bed cleaning cycle times and opened 16 additional medical-surgical beds in February 2004. The daily average number of boarders dropped after those new beds became available, but other indicators of patient flow did not improve (Table 1). It became clear that we could not continue to blame other departments for all our shortcomings.

Being as objective as possible, we assessed overall ED operations using the Health Care Advisory Board’s “The Clockwork ED” (1999). We identified more than two dozen flow barriers over which we had some control, categorized as follows:

1. Input — affecting flow of patients into the department.
2. Throughput — affecting flow of patients once in the department.
3. Output — affecting flow of patients after the discharge/admit decision was made.

Our strategy was to focus on input

issues first, followed by output issues, and then throughput issues. We would cross boundaries if we identified issues that were straightforward and simple to fix but would not divert significant time and energy from the general plan.

IMPROVING INPUT

The decision to start with input was based on the following rationale:

1. The input process is almost solely under the control of the emergency department.
2. We had clear parameters of measurement.

Table 1 Changes in variables demonstrating improved patient throughput

	2003	2004							
	Dec.	Jan.	Feb.	March	April	May	June	July	Aug
Overall ED									
Volume	3,730	3,395	3,478	3,789	3,544	3,839	3,589	3,625	3,588
Admits	836	690	726	776	718	706	652	699	710
EMS arrival	731	533	602	688	693	699	652	590	600
EMS divert	446	444	340	208	22	27	1.5	1.5	0
LWBS %	1.0	0.5	1.5	1.1	0.4	0.9	1.5	0.17	0.16
LOS all patients (hr)*	5.8	6.1	5.3	5.7	5.1	4.5	3.3		
Main ED									
LOS discharged patients (hr)*	4.12	3.87	4.1	4.2	3.6	4.1	3.1		
LOS admitted patients (hr)*	11.2	13.4	12.9	12.6	10.7	9.5	7.0		
Door to bed (avg. min.)	45	36	40	35	19	17	7	9	5
Percentage door to bed <20 min†		67					96	92	98
Door to MD (avg. hr.)	1.4	1.2	1.4	1.3	1.0	1.0	0.6		
Percentage door to MD <40 min†		34					67	79	82
Urgent care									
Percentage door to bed <30 min							92	94	97
Percentage door to NP <30 min							67	83	76
LOS (avg. hr.)	2.97	2.61	2.76	2.33	2.01	1.76	1.33		
Percentage LOS <90 min†							69	78	73

*Averages for LOS after June 2004 are not available.

† In July 2004, the hospital stopped using averages for performance measurement and switched to percentage of goal; therefore, percentages are not available for the preceding months.

EMS, emergency medical services; LWBS, left without being seen; LOS, length of stay; MD, physician; NP, nurse practitioner.

3. The amount of time spent waiting to see a physician is highly correlated with patient satisfaction (The Clockwork ED, 1999).
4. We believe the waiting time to see a physician is a valid and important criterion of quality of patient care (JCAHO, 2002).
5. Assessment of ED input would demonstrate to hospital administration and the other departments that we were willing to take responsibility for cleaning our own house.

During our operational analysis, we identified an opportunity regarding flow of patients into the department. As in most EDs, our patients do not arrive in linear fashion. The number of arrivals, as well as the number of patients in the department, was lowest in the early morning (3 a.m. to 5 a.m.). Arrivals began to increase at 7 a.m. (usually three to four patients/hour) and reached a plateau of approximately eight patients/hour between 10 a.m. and 11 a.m., continuing at that rate until 10 p.m. or 11 p.m. Beds in the ED would be filled in the early afternoon, usually between 1 p.m. and 3 p.m. However, even when there were empty beds, patients could spend 45 minutes or more in the waiting area as a result of the triage and registration processes. If we could eliminate this bottleneck, we could take advantage of unused ED bed capacity and potentially avoid bed gridlock.

Triage serves a valuable and critical role when ED beds are full but acts as a bottleneck when beds are available. Consequently, we decided to bypass the triage process when beds were available. Instead, patients would be brought directly from the waiting room to a treatment bed. Once in a treatment bed, the patient was assessed by a nurse, who incorporated elements of traditional triage into the primary nursing assessment.

The belief that triage must be performed before the patient is placed in a treatment bed was ingrained in the

nursing staff. To introduce our new concept, we had to get "buy-in" from the nurses. First, we invited all ED nurses and physicians to a retreat. The results of the operational assessment were shared with the group and the concept of bypassing triage was discussed. Once we had consensus, those who attended the retreat became the core group to enact the change (Worthington, 2004).

We had additional staff meetings and set a "go live" date for the new process. The nurse manager spent considerable time in the ED for the first two weeks, reminding nurses of the change. We assigned the charge nurses with the responsibility to enforce the new process. After each shift, the charge nurse ran a report from the tracking system that identified patients who were placed in a treatment bed within established goals (15 minutes for fast track; 20 minutes for the main ED). Barriers to meeting those goals, such as a note stating "all beds filled," would be identified on the shift report, which was reviewed by the ED nursing director daily. By establishing defined goals (e.g., time from registration to bed), the nursing staff had clear parameters by which to measure performance. The daily shift report provided the real-time feedback necessary to create behavioral change.

To streamline the entry of patient information into the hospital computer system, a short-form registration process with only five elements (name, address, date of birth, Social Security number, and chief complaint) was adopted. All other aspects of registration were performed at the bedside, unless no beds were available. In that situation, the registrars completed the registration process while the patient waited for a bed.

Our fast-track area began taking patients directly from the waiting room based on chief complaint and age, rather than waiting for a triage nurse to see the patient first. If the patient's condition was more complicated than initially appreciated,

he/she would be moved to the main ED for more extensive evaluation and treatment.

IMPROVING OUTPUT

Simultaneous with our evaluation of ED input, we evaluated the admission process. Useful data were made available to us by the admitting department, which tracked delays in bed assignments, inpatient discharges, and the acceptance of ED patients by inpatient units.

Within the ED, we identified sources of delays regarding discharges and admissions. We realized that we did not have a process for distinguishing charts for discharge from those for other nursing orders. We began flagging charts for discharge and adding an identifier on the tracking screen to indicate patients ready for discharge. Physicians began discharging patients themselves, where appropriate (e.g., patients who did not have social issues or require additional nursing interventions, such as medications, prior to discharge). Once the patients had signed their discharge instructions, an ED technician could remove an intravenous line. Thirty to forty minutes was saved on some patient encounters, opening beds that much faster for new patients.

During the admission process, a significant number of patients were seen by a house physician, who would write admitting orders and perform a history and physical for the attendings. This could add hours to the patient's ED stay. Frequently, the house physicians were not immediately available, or they could have multiple admissions at the same time. We addressed this problem in two ways.

We implemented transition orders, brief admission orders to cover the patient for the couple of hours on the inpatient unit until the patient could be evaluated by the house physician or the private attending. A number of the emergency physicians were reluctant to write transition orders, be-

lieving this would expose them to increased liability. Therefore, we asked the medical executive committee to pass a rule stating that at the time of admission, attendings had to provide admitting orders to the ED nurses by phone. The net effect trimmed hours off the ED length of stay when an inpatient bed was available.

IMPROVING THROUGHPUT

The first area of focus during the throughput assessment was our fast-track area (urgent care). The dedication of health care providers, support staff, and resources to the fast-track area can greatly improve throughput of nonemergent patients who would otherwise wait while more acute cases are seen. Admissions from urgent care were virtually nonexistent, eliminating the need to review the admission process.

In addition, a much smaller group of health care providers worked in urgent care. This area was staffed by a small core of nurse practitioners: Two nurses worked regularly in urgent care; the rest rotated in from the main ED. (Physicians saw patients in urgent care if requested by the nurse practitioner or if urgent care was excessively backed up with patients.) The size of the group facilitated communication.

Also, urgent care was much less affected by ancillary services such as the laboratory, radiology, and respiratory therapy than the main ED. In a number of respects, urgent care is a microcosm of the ED as whole. Process improvements there could be exported to the main ED.

Originally, urgent care was hindered by with the fact that it really was not a fast track at all. Overbuilt at 10 beds, it did not have sufficient fast-track patient volume to use its capacity efficiently. Furthermore, staffing was based on patient volume, not bed capacity. Staffing consisted of one nurse practitioner, one nurse, and one technician. When the main ED ran out of beds, which occurred fre-

quently, patients would overflow into urgent care. Most of them were not fast-track patients. Therefore, when a true fast-track patient arrived, a bed and the staff might not be available to deliver the desired service.

Our first goal was to instill a sense of staff pride and ownership in urgent care. We already had dedicated nurse practitioners. Next, we identified nurses and technicians who wanted to be regular members of the urgent care team. This core work group met regularly to discuss goals and process improvements.

The next step was to reserve a number of urgent care beds for fast-track patients only. This meant that the main ED would have to deal with patient volume without overflowing into urgent care beds. The urgent care team was made responsible for meeting certain goals, specifically door to bed in ≤ 15 minutes, door to provider in ≤ 30 minutes, and length of stay < 90 minutes. They were to check their performance on each shift and document any barriers to success.

The shift reports were reviewed daily. Identifying fast-track candidates in the waiting area and taking those patients directly to urgent care beds fostered "ownership" of the patients and the fast-track process.

The physical layout of urgent care was not ideal. The unit was long and narrow, with charting areas at one end and patient treatment beds at the other. In the center of the treatment area was a large countertop, designed as an island for charting but now used as a supply storage area. Anyone charting alone in that area was bombarded with questions from patients and families. To improve efficiency, we moved everyone's workstation to this central island. All staff members were now closer to the patients, and no individual staff member would be "ambushed" by patients and families. Additionally, patients and visitors could see the staff at work. This alone reduced the number of questions.

During peak hours, we added an-

other ED technician. One technician focused on getting patients in, and the other focused on getting patients out. By having defined roles, the technicians became more productive and were expected to help each other in times of overload.

During the daytime, radiology was a bottleneck. From 7 a.m. to 7 p.m., radiologists provided preliminary interpretations on all plain films. Turnaround for this process (time from order of the study to receipt of the interpretation) was exceedingly long. Furthermore, the nurse practitioners were unwilling to make dispositions on patients without seeing the films themselves. A number of causes of these delays were identified: Films were sometimes sent back to the film library instead of to urgent care, radiologists were not immediately available to read the films, urgent care studies were placed on the bottom of the pile of films to be read, films were not given to the radiologist to read, the fax machine in radiology or urgent care malfunctioned, reports were sent to the wrong fax machine.

Rather than attempt to fix a broken process, we bypassed the process. We moved to an ED first-look system, in which the films are sent to urgent care before the radiologist reads them. The films are kept with the patient, and both are brought back to the treatment area together. If the nurse practitioner has a question about the film, radiologists are available for consultation. As a result, turnaround time has improved significantly.

Provider hours were adjusted to better match patient volume. Mondays and weekends proved to be generally busier than the rest of the week. The beginning and ending hours of urgent care tended to be low volume. Urgent care originally operated from 10 a.m. to midnight. By shortening the hours to 11 a.m. to 11 p.m., we saved 2 hours of budgeted coverage each day (14 hours/week). We reallocated these hours and added four hours of double coverage on the

weekends and six hours on Mondays without increasing cost or losing urgent care volume, while improving door-to-provider times.

MAIN ED REFORMS

After building momentum in urgent care, we started to tackle flow issues in the main ED. We quickly realized that “bigger” does not mean “more efficient.” The main ED was designed with a single large nurses’ station to serve three physicians, six nurses, three technicians, one charge nurse, one unit secretary, and 27 beds. The charts of patients to be seen were placed in one rack, and all nurses’ orders for those patients were placed in another. The result was physicians having patients scattered all over the department, nurses constantly walking back and forth between the order rack and rooms farthest from the nurses station, and doctors and nurses constantly looking for one another during the shift.

To increase efficiency, we made the ED functionally smaller. We split the main ED into three zones, each having nine beds. Additional nurses’ stations were created in the two new zones, where charts for those zones were kept. Initially, only nurses were assigned to each zone. The improvement in care was so dramatic that, soon thereafter, physicians and mid-level providers were also assigned to these zones, creating functional work teams. Each team consisted of one medical provider (a physician, physician assistant, or nurse practitioner), two nurses, and one technician, responsible for nine beds and any overflow patients in the hallways. The staff members were now closer to their patients and each other. Communication between all parties improved. Nurses and physicians no longer had to walk around the department to look for each other; instead, their paths crossed frequently as they migrated back to the nurses’ station in their zone. Spreading the staff across the department decreased congestion

and noise in the central main nurses’ station. Families were no longer bombarding the lone unit secretary with questions. The department seemed less hectic. Physician productivity improved. Previously, low-producing physicians could “ride the coattails” of more productive physicians. Now, with the teams, the less productive physicians were forced to see more patients, the patients in their zones.

Because the changes in urgent care related to radiology were such a success, we went to an ED first-look process for all plain radiographs. Twenty-four hours per day, plain films were sent to the ED first, whether the radiologist was reading films or not. This kept the films with the patient. When the patient came back from radiology, so did the films.

With the distraction of radiologist plain film interpretation out of the way, we could focus on more important radiology reforms, such as plain film and special study turnaround time. Since we had set performance goals for ourselves, radiology had to agree to its own performance standards for turnaround times. Plain films were to be delivered to the ED within 25 minutes after time of order, noncontrast computed tomography (CT) within 50 minutes, and CT with oral contrast within 2.75 hours. Oral contrast medium for abdominal CT was kept in the ED and given to the patient as soon as the study was ordered, saving 20 to 30 minutes over the previous system, in which a radiology technician administered the oral contrast medium.

One of the critical steps to bed turnover is the decision regarding disposition — admission or discharge. In some cases, test results would come back, but the physician was unaware of their arrival. We implemented a simple, yet effective, means of flagging diagnostic results. Charts for new patients to be seen were placed upright, whereas charts ready for disposition were turned on their side in the physicians’ rack. At a glance, the

physician could see how many patients had to be seen and how many were ready for disposition, increasing efficiency in time allocation.

Monitoring door-to-physician performance prompted us to look more carefully at patient volumes and time of arrival and to adjust physician hours accordingly. We found great variation in daily volume. Saturday, Sunday, and Monday volumes tended to run higher than those of the rest of the week, although patients tended to present earlier on Saturday and Monday and later on Sunday. Contrary to popular belief, the ED did not have more patients in the evening. The average numbers of registered patients on day versus evening shifts were almost equal. Evenings just seemed busier because of the leftover patients from days. Staffing patterns were adjusted accordingly, with more physician/mid-level provider staffing on high-volume days and a physician on-call schedule for unpredicted surges in volume.

Throughout this process, seemingly minor barriers to flow were identified and addressed. The supply and medication inventory was reviewed and adjustments were made. Patients would no longer have to wait for routine medication from the pharmacy. Phone lines were changed so that all lines could be picked up anywhere in the department. Vacuum tube availability and transport issues were addressed. Unit secretaries could not leave the desk without arranging for someone to cover the phones. Individually, these changes are small, but, cumulatively, they added up to significant time savings.

Ambulance diversion was a major problem, peaking in January and February 2004 at over 400 hours/month. By June, that number had dropped to an all-time low of 1.5 hours. In retrospect, two things were responsible for the change: 1) a change among the ED staff regarding patient volume management and 2) overall improvement in patient throughput and flow.

Although ambulance diversion was designed for patient safety, it became a crutch for the ED staff to attempt to control patient volume. Instead of a mechanism of last resort to address ED overcrowding, it became the first trigger pulled when the department became busy. Certain physicians and charge nurses were quicker to put the ED on diversion than others. Although the decision to divert ambulances should be the prerogative of the charge nurse and emergency physician on duty, that system did not work effectively.

We developed objective criteria for ambulance diversion, and placed the decision to divert in the hands of the ED director and department chair. The physician and/or charge nurse on duty had to make their case to the director or department chair. If criteria for diversion were not met, it would not be approved. The staff began to think about alternatives to ambulance diversion and to anticipate overcrowding. On Sept. 19, 2004, the ED had a record volume of 167 patients, 39 percent more than the average daily volume of 120, with zero hours of ambulance diversion from midnight to midnight.

RESULTS

Because improvements in process and flow occurred simultaneously, individual gains are difficult to quantify. In the aggregate, the numbers speak for themselves: ambulance diversion hours are now minimal, patients are placed in treatment beds within minutes after arrival, patients are seen promptly, and the ED is no longer overcrowded.

In August 2004, door-to-provider intervals and length of stay dropped. Reviews revealed a disproportionate use of part-time physician assistants and nurse practitioners in urgent care to cover summer vacations taken by the full-time staff. The performance of the part timers was far below that of the full timers. Part timers did not have the same mindset or priorities as the

full-time staff. Department goals were reviewed with the part-time care providers, so that they too had the opportunity to contribute to the department in terms of receiving, evaluating, and discharging patients quickly.

CONCLUSION

ED overcrowding has been well documented as a national problem. A 2002 survey by the Lewin Group (2002) found that 62 percent of all emergency departments responding described themselves as over capacity. Three of four urban hospitals considered themselves over capacity. The situation at trauma centers and hospitals with more than 300 beds was even worse, with 90 percent over capacity.

However, overcrowding is not just a problem of the ED, but a symptom of lack of institutional capacity — too much demand for existing resources. Those resources can be in the form of physical capacity (e.g., shortage of beds) or functional capacity (e.g., inefficient or unnecessary processes). We found that the solutions were more related to the latter than to the former. Building a new state-of-the-art department did little to relieve the congestion of the emergency department: Changing process and mindset was the key.

The support of senior management was essential to this turnaround. The message was clear: improving ED performance was mission-critical, and all departments needed to assist in whatever way they could. This set the stage for eliminating the “silo mentality” and fostering interdepartmental cooperation. By increasing inpatient bed capacity, administration gained credibility with the ED staff. It sent the message that administration was serious and committed to improving the process.

In general, individuals and groups tend to be myopic about their own shortcomings. In the emergency department, we were quick to point out the shortcomings of the rest of the hospital but slow to take a hard look

in the mirror. Taking ownership and fixing our inefficient processes were critical to establishing credibility with other hospital departments. Getting buy-in from the ED staff was critical; the retreat with the nurses and physicians marked a turning point. Instead of just the department chair and nursing director beating the drum, a critical mass of nurses, nurse practitioners, and physicians became part of the chorus. With this group, we were able to tackle the internal problems of the ED and ask the tough questions: Why do we do it this way? Why do we allow this behavior? What do we expect from ourselves and our coworkers? Before we made demands on other departments, we asked if we had done what we could within our own department to streamline the process. Throughout the transition, communication and leadership were essential. We were blessed to have a strong cadre of clinical coordinators (i.e., the charge nurses) who functioned as the change management agents.

Many people who seek care in emergency departments experience long waits to be evaluated and treated. Such was the case in our ED prior to our changes. We found significant untapped capacity by streamlining processes and changing mindset. We believe that process improvement can be a valuable tool in alleviating, if not eliminating, ED overcrowding.

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