Emergency Department Throughput

Purpose

Emergency department (ED) throughput has become a focus for hospitals across the country. A significant increase in patient volume since 2011, with growth for 2014 and 2015 reported at 4.3%,\(^1\) has contributed to the challenge of patient flow management. Inadequately managed patient flow processes have the potential to negatively impact ED wait times, patient satisfaction scores, and most importantly, the overall quality of patient care. These circumstances and the need for hospitals to report throughput quality measures data in a pay-for-performance healthcare model have prompted organizations to closely review their patient throughput processes.\(^1\)

In recent years, ED leaders across the nation have made great strides in identifying, measuring, and solving throughput issues using evidence-based practice and real-world solutions. This topic brief will review multiple challenges encountered during the care, treatment, and disposition of ED patients, and offer meaningful workflow practice changes and innovative strategies to help improve patient throughput. A historical background of ED throughput, impact of regulations and data, a conceptual throughput model, and best practice recommendations to improve patient flow are presented.

Overview

The traditional role of EDs has been to provide trauma and emergency care for patients in danger of losing life or limb or to stabilize critical illness. A change in this role has evolved over the years as the U.S. population has increased.\(^2\) as patient volume and acuity continue to increase, while the pool of primary care providers is limited.\(^3\) Emergency departments are typically inundated with patients at certain times within a 24-hour period;\(^3\) most EDs will begin to see an increase in volume around 10 am that will continue throughout the day until 11 pm. Difficulty in managing the influx subsequently leads to boarding of patients, which contributes to decreased ED throughput. The ED patient admission rate, estimated at 16% nationally, translates into many ED beds being used by patients waiting for in-house beds to become available.\(^1\) In addition to the frustration of long wait times experienced by ED patients, ED crowding has been associated with the risk of poor health outcomes,\(^4\) which makes the need to decrease ED crowding even more of a priority for hospitals.
Background

Americans choose to be seen in EDs for a variety of reasons: accessibility, perceived time savings, and 24-hour availability of care. A 2003 U.S. Government Accounting Office report concluded that poor management of inpatient capacity and the resulting inability of hospitals to move patients from the ED into inpatient beds was one of the major factors causing ED overcrowding. A separate study reviewing care choices made by the uninsured and lower socioeconomic groups suggested that the ED was chosen because the care was perceived as cheaper, faster, and better than other care options. In addition, EDs were more accessible by public transportation and were preferred by patients over their primary care office. These issues are contributing to ED crowding and result in longer ED wait times, increased ED lengths of stay for admitted patients, and higher rates of patients leaving the ED without being seen.

Another issue related to ED overcrowding is an increase in hospitals diverting ambulances to other hospitals. Emergency department diversion status is most often a result of a mismatch between ED capacity and various facility-wide input, throughput, and output factors including patient surges, patients waiting in the ED for inpatient bed placement, and inpatients not ready or waiting to be discharged. When EDs are overcrowded, arriving ambulances are often asked to wait until an ED bed becomes available, potentially tying up the ambulance crew and their care resources for long periods of time. In urban areas, ambulances are often forced to travel longer distances to less busy EDs if multiple facilities are on ambulance diversion. Admitted patients boarding in the ED are the leading cause of ambulance diversion. Despite a reduction in diversion hours nationally, often the result of mandates by county Emergency Medical Services (EMS) organizations, diversion still exists in some larger cities, causing widespread patient back-ups in other facilities.

Historical Context of ED Overcrowding

EDs are a critical component of the U.S. healthcare system; in some communities, they are the only source of healthcare. EDs serve as the central point for preparation and response to disasters, mass-casualty events, and public health emergencies such as outbreaks of influenza or other communicable diseases. One of the factors that has led to increases in ED visits is overall growth in the demand for ambulatory care. As primary care physicians (PCPs) work with growing patient capacity issues, there is increasing spillover of patients seeking care in EDs. Some patients prefer the convenient, 24-hour accessibility that EDs provide, which lends to this growth. Additionally, ED utilization by uninsured patients has increased, primarily as a result of the 1986 Emergency Medical Treatment and Labor Act, which requires hospitals to provide emergency screening and stabilization services regardless of patients’ ability to pay. Today, hospital EDs are a major source of primary healthcare in the community, treating a broad range of health problems including minor ailments and other non-urgent conditions.

Regulatory Factors

The American College of Emergency Physicians defines overcrowding as existing “when the institutional resources available are insufficient to meet the basic service needs of emergency patients.” As more focus is placed on ED overcrowding, several nonprofit, non-governmental agencies have weighed in on the issue. The Institute of Medicine, a nonprofit, non-governmental organization (NGO), tasked with providing unbiased advice on issues of health and medicine to policy-makers and the public, has established that ED overcrowding is caused by the unsafe practice of holding admitted patients. The Institute for Healthcare Improvement (IHI), another nonprofit NGO, is a leading innovator of healthcare improvement. Through its efforts, IHI has determined that the need for holding admitted patients in the ED is primarily due to poorly executed, hospital-wide throughput processes. Finally, the
National Quality Forum, a nonprofit NGO that measures quality standards to identify initiatives to enhance safer patient care and achieve better outcomes, provided a focus for throughput standards that led to the creation of national regulatory standards.\textsuperscript{13}

In response to these organizations and research data highlighting the negative impact of poor throughput on patient morbidity and mortality, The Joint Commission (TJC)\textsuperscript{14} and Centers for Medicare and Medicaid Services (CMS)\textsuperscript{15} have introduced regulatory standards to encourage healthcare facilities to focus on improving quality of care. CMS went one step further and tied these measures to financial incentives.\textsuperscript{16} The intent of these measures is to focus healthcare facilities on identifying and removing barriers to improving patient quality of care and decreasing the negative impact on morbidity and mortality of factors such as increased lengths of hospital stay and delays in treatment.

In July 2012, TJC updated its standards addressing patient flow through the ED.\textsuperscript{14} The updated standard, LD.04.03.11, was effective January 1, 2013 and specifically addressed hospital leadership’s “use of data and measures to identify, mitigate, and manage issues affecting patient flow throughout the hospital.” By placing responsibility for maintaining this standard with facility leadership, ownership of patient flow is facility-wide and not centered only on the ED. Beginning in 2004, CMS added financial incentives related to reporting on an initial set of ten core quality measures. Over the intervening years, CMS has expanded the processes for quality measure reporting. Several new CMS core quality measures were developed to address ED throughput, focusing on timeliness and effectiveness of ED care delivery. One example is measure OP-20, “Door to diagnostic evaluation by a qualified medical professional,” widely known as “door to provider time.”\textsuperscript{15} Medicare-certified hospitals began reporting data on these measures in October 2013 (FY14).\textsuperscript{15}

Some of the barriers identified in the studies discussed above are within the purview of the ED to manage or eliminate by identifying best practices focused on patient throughput and care quality. However, one of these CMS quality measures—time from decision to admit to ED departure—is a measure of not just ED throughput but also of hospital-wide throughput.\textsuperscript{16} This measure addresses barriers outside of the ED that can impact ED throughput for the admitted patient. It is crucial to have support in addressing this measure from all hospital leaders, including senior leadership, to achieve barrier-free and streamlined processes that move patients out of the ED and to their inpatient locations in a timely fashion.

**Data and Impact**

The phenomenon of ED overcrowding was first identified in the 1990s.\textsuperscript{17} Initially, ED overcrowding was thought to be due to an overabundance of non-urgent visits. To counter this, managed care efforts attempted to prevent patients using emergency services for non-urgent issues. However, ED visits still increased by 14\% from 1992 to 1999. A review of over 30 studies of ED overcrowding from 1990–2002 concluded that non-urgent visits were not the primary cause of ED overcrowding.\textsuperscript{17} Instead, there were multiple reasons for overcrowding that were closely tied to inadequate inpatient capacity, higher severity of illness, and hospital system restructuring.

In a 2002 study conducted by the American Hospital Association, 90\% of large hospitals were found to be operating at or over capacity.\textsuperscript{18} Since then, many governmental and NGO studies have demonstrated that EDs, particularly urban EDs, were routinely operating at or above capacity.\textsuperscript{2,11,19–22} Several studies have suggested that holding inpatients in the ED, commonly referred to as “boarding,” negatively impacts quality of care and increases potential for adverse events. A 2009 American College of Emergency Physicians study highlighted that almost two thirds of
EDs board patients for more than two hours after admit decisions are made.\(^19\) Many other studies have shown that boarding inpatients in the ED has significant impact on ED operations, including loss of flex capacity to treat all incoming ED patients efficiently, longer dwell times for all ED patients, suboptimal care quality and safety of boarded patients, and poor perceptions of quality and care by boarded patients.\(^23\)

Richardson (2006) examined the relationship between ED overcrowding and 10-day mortality using a retrospective stratified cohort analysis of three 48-week periods in a tertiary mixed ED from 2002–2004. Study findings suggested that the relative risk of death for the overcrowded group was 1.34 times greater, equating to an additional 13 deaths a year in the studied ED.\(^24\) In yet another study centered on the adverse patient effects of ED boarding, a retrospective cohort analysis of over 995,000 admissions showed that, for patients admitted on days with high ED overcrowding, there was a 5% greater risk of inpatient death, a 0.8% longer inpatient stay, and a 1% increase in cost per admission.\(^25\)

Another study specifically examined hospital-level performance on ED wait times and visit length.\(^26\) This study showed that almost one third of ED visit-length variability is directly attributed to overall hospital-level factors. So, as hospital occupancy rates rise, the length of ED visits increases. The study concluded that important determinants of hospital variability that impact ED length of stay include inpatient occupancy, transport availability, housekeeping practices, admitting procedures, and prioritization of non-ED admissions. It is clear from the literature that multiple pre-hospital, ED, and overall hospital factors contribute to ED overcrowding.

**Throughput: A Systems Approach**

A conceptual model for throughput was developed by Asplin et al. (2003) and uses a systems approach to help illustrate ED crowding. The three phases of this model include: entry into the ED system (input), administration of elements through the ED patient flow process (throughput), and departure from the ED system (output).\(^27\)

*Input Considerations*

The input phase is one of the most difficult to control, especially due to limited capacity for unscheduled urgent care as well as safety net care for vulnerable populations in the acute healthcare system.\(^27\) Two common methods used to address input are to provide a physician at triage or to bypass triage altogether in favor of the “pull-to-full” method.\(^28\) Another option is to establish triage protocols to promote rapid decision-making upon patient arrival.\(^29\) The START (Supplemented Triage and Rapid Treatment) method\(^29\) requires a clinician greeter who provides screening and determines in less than two minutes whether the patient needs immediate evaluation or if s/he can go through the triage process. Because relatively few patients present to the ED by ambulance, going on diversion has demonstrated limited success in decreasing the volume of patients arriving at the ED.\(^28\)

*Throughput Considerations*

Since the ED can neither control the arrival of patients nor the availability of inpatient beds, the phase where more immediate improvement can be achieved is throughput. Current best practice shows that highly effective methods of addressing the throughput phase include bedside registration, establishing a fast-track space, and developing protocols and order sets to expedite patient care.\(^30\) Creating a specific flexible care area where ambulatory patients can be treated and released can prevent non-urgent care needs from obstructing the patient flow in the main ED.\(^31\) Establishing length-of-stay goals that appropriately reflect the level of urgency and the treatment necessary may
help to improve timeliness of care. Emergency department leaders should consider flexible staffing options such as partnering with local EMS to assist with specific tasks during high-volume times.  

Each facility must know what its state laws allow when considering this option. Matching nurse and physician staffing to the patient demand will allow for maximizing resources during high volume times. Although the use of hallway beds in the ED might be considered a viable means to decrease the door-to-provider times, they should be used with caution as not all facilities may be equipped to provide appropriate care and monitoring for those patients.

Having a designated patient-flow team with a coordinator within the ED can generate improvements to patient flow while providing potential financial benefits by decreasing ambulance diversion and left-without-being-seen rates. Providing visual management tools that highlight turnaround times (length of stay for patients admitted, transferred, and discharged) alongside the department goals may help ED staff see where they are performing well and help them understand areas still in need of improvement. Identifying barriers that prevent achievement of goals and engaging the ED team in development of solutions may also inspire them to improve throughput processes. As throughput is a hospital-wide issue, the next step would be to include other departments in similar exercises to identify barriers and potential solutions.

Developing patient care protocols and order sets for commonly-seen chief complaints will improve the efficiency of care by standardizing treatment delivery and decreasing the wait time before patients receive needed interventions. Using computer simulation programs or simulating in the current space may help to determine which processes would provide the greatest reduction in patient length of stay.

**Output Considerations**

In order for an ED to successfully implement a high-impact solution to output, it needs more than executive support: hospital leadership will need to provide the impetus for change. Before suggesting or implementing change initiatives, however, effective collaboration with ED team members as key stakeholders is necessary. Within the ED, clear standards can be established for the admissions process along with the expected turnaround times from decision-to-admit to the patient’s departure from the ED.

If the ED has the means to communicate its level of surge or overcrowding to the rest of the hospital, and a comprehensive surge response is in place, care providers from other departments can assist in alleviating the overflow by coming to the ED to get their patients or by providing ancillary personnel to assist in patient care. Determining levels of surge and approach to solutions should be a multidisciplinary exercise. When evaluating the importance of putting more emphasis on output, hospital administrations should analyze how boarding patients in the ED may have a negative impact on outcomes by extending inpatient lengths of stay and potentially decreasing financial returns for the hospital.

**Recommendations and Best Practices**

When addressing throughput, many hospitals focus on reducing the demand for emergency care and improving flow within the ED. A more effective approach is to view this problem as a hospital-wide challenge involving all disciplines and units. In 2003, the Robert Wood Johnson foundation initiative, “Urgent Matters Learning Network I”, identified seven factors that are critical to the success of improving patient throughput: recognizing that throughput is a hospital-wide problem, not an ED problem; making transparency an organization value; building multi-disciplinary teams to drive quality improvement; guaranteeing top management support; recruiting a
champion; using formal improvement methods; and committing to rigorous metrics.\textsuperscript{36} Other studies have noted and emphasized similar concepts as being necessary for success.

The aforementioned factors ensure that an organization is vested in the improvement of its throughput and the overall care of the patients it serves. It is important to have the appropriate people on the throughput committee, with decision-makers and key stakeholders that include nursing leaders of outpatient and inpatient areas, as well as physician leadership, registration, and ancillary service leaders. Senior leaders should also participate or sponsor the project to provide accountability.\textsuperscript{23} To fully understand variability, organizations must employ systems thinking, where hospital units are viewed as interdependent compartments within an interrelated system, rather than independent departments existing in isolation.\textsuperscript{39} To improve throughput, ED and inpatient staff need to work together to identify solutions to problems and opportunities for improvement. It can be a significant challenge for hospitals, as inpatient and ED staff may not naturally collaborate on a problem traditionally labeled as an “ED issue.”\textsuperscript{36}

There are strategies that have been shown to improve patient throughput and ensure quality patient care is provided. Some of these strategies begin in the triage area, reducing or eliminating waiting room time. They include:

- **“Pull until full”** – Bypass the triage process when beds are available within the department, decreasing door-to-provider time and freeing up triage staff to provide direct patient care within the department.

- **“Rapid intake process”** – A dedicated area/space used to initiate care, hold patients awaiting diagnostic tests, and discharge patients who do not require a bed, freeing up bed space for higher acuity patients. This may include placing a provider in this area to initiate the care.

- **“Nursing protocols”** - Nursing protocols or order sets reduce overall wait times by initiating treatments and testing prior to the provider seeing the patient. This allows the patient care to be initiated and then continued when the provider sees the patient. All protocols should be discussed and agreed upon by nursing and the emergency medical staff.\textsuperscript{36}

- **“Reserving inpatient beds at triage”** - Studies have shown it is possible to reliably predict the need for admission at the time of triage.

Results of these models can be used to influence desirable bed management behaviors and make resource allocation decisions that improve patient flow between EDs and inpatient units.\textsuperscript{40}

Throughput goes beyond triage; matching demand and capacity is a key factor in maintaining a solid throughput model. Staff (both nursing and provider) should be matched to volume in both the ED and inpatient units.\textsuperscript{36} This allows for smoother transition and adequate caregivers during the peak volume times. Ideally, inpatient staff will be ready to receive and take action soon after the decision to admit is made. However, creating this staff mentality is difficult. Several hospitals described this in terms of a “push” versus a “pull” mentality.\textsuperscript{36}

Boarding time limits have been implemented with good success. When a boarding time limit is established, patients have a maximum waiting time in the ED before going to their destinations. Bed and resource management are an integral part of the throughput and placement process. Having a centralized role for this helps to streamline and
coordinate efforts between areas. Often, an electronic bed board assists in determining the capacity at any given time. Bridge or holding orders allow a patient to be moved from the ED to the inpatient unit more rapidly with basic orders. The orders are not intended to replace the admitting providers, but rather bridge the gap from ED to unit.

**Helpful Resources**

There are a variety of evidence-based resources available to assist hospitals in their process improvement. The resources mentioned below are not an exhaustive list, but are pertinent to ED crowding, throughput, and potential solutions. The list includes an overview of the content and focus areas for each resource.

1) **Emergency Department Crowding: High Impact Solutions**

   This ACEP Emergency Medicine Practice Committee information paper identifies three focus areas to reduce ED crowding: decrease input, improve throughput, and increase output. Recommendations to improve these processes include:
   - Quick registration
   - Use of providers in triage (i.e., nurse practitioners and physician assistants)
   - A split flow or fast track model
   - ED expansion to include observation unit
   - Use of advanced practice providers
   - Use of inpatient hallways for boarding
   - A discharge lounge
   - Facilitate early inpatient discharges

2) **Improving Patient Flow and Reducing Emergency Department Crowding**

   McHugh et al. (2014) (an Agency for Healthcare Research and Quality publication) provides hospitals with a six-step guide on how to improve patient flow and reduce ED crowding.

3) **The Past, Present, and Future of Urgent Matters: Lessons Learned from a Decade of Emergency Department Flow Improvement**

   This document illustrates how hospitals have improved ED flow through identification of three key success factors:
   - Hospital culture change
   - Leadership support
   - Continuous quality improvement

4) **Making the Middle Count: Three Tools to Improve Throughput for a Better Patient Experience**

   This article discusses three components for improving throughput:
   - Operationalizing a results-pending area
   - Operational stakeholder meetings
   - Rounding by ED leaders
5) **Partnering Effectively with Inpatient Leaders for Improved Emergency Department Throughput**

A hospital throughput committee is an essential component in improving ED throughput. To improve ED boarding, the organization needs effective, consistent, hospital-wide collaboration to facilitate timely admissions to inpatient units. The hospital throughput committee uses ongoing monitoring, measurement, and real-time process improvement to enhance ED throughput.

6) **ENA Staffing Guidelines**

Appropriate ED nurse staffing directly influences staff satisfaction, staff retention, and patient outcomes. Using these nurse staffing guidelines, ED managers and administrators can use their departmental data to identify and support an appropriate number of patient care full-time equivalents (FTEs) for the ED.

**Innovative Strategies**

Emergency departments share ongoing innovative strategies to improve ED throughput on these websites:

- [Urgent Matters](#)
- [AHRQ Healthcare Innovations Exchange](#)

**Conclusion**

Throughput is a complicated process that requires collaboration among the ED, inpatient units, and other services. Leadership support is also necessary to help eliminate barriers and challenges. There are many components that can be managed in the ED and hospital-wide to help create a more efficient, timely, and safe process for patient flow. Secondary improvements that can be gained from successful throughput management are staff satisfaction, financial efficiency, and improved quality of care.
Definitions of Terms

Boarding: The process of holding an admitted patient in the ED while waiting for an inpatient bed; an interval measured as the time between the admit decision and departure time stamps.¹ A component of ED crowding in the output phase.²⁷

ED Crowding: When institutional resources available are insufficient to meet the basic service needs of emergency patients, impacting timely patient care.¹⁰ Factors contributing to ED crowding include input, throughput, and output.²⁷

- **Input:** The flow of patients into the emergency department; the most difficult aspect of ED crowding to control. Care categories include emergency care, unscheduled urgent care, and safety net care.²⁷
- **Throughput:** Processes that impact ED flow while patients are in the ED (e.g., triage, staffing, ancillary and specialty services, etc.)²⁷
- **Output:** The patient disposition process once treatment in the ED is complete, for entry back to the community, admission to the hospital, or transfer to another facility.²⁷ Boarding is a component of output.

Throughput (Patient Flow): A hospital-wide process by which patients flow through services, from entry into the hospital system through final disposition.

Authors

ENA 2016 Emergency Department Operations Committee
Catherine Hesse, MSN, RN, NP, Chairperson
Pamela A. Assid, DNP, MSN, RN, CNS, CEN, CPEN, NEA-BC
Paula Jackson, MBA, BSN, RN
Jennifer Schmitz, MSN, RN, EMT-P, CEN, CPEN, FNP-BC
Terry Stigdon, MSN, RN, CPEN

ENA 2016 Board of Directors Liaison
Jeff Solheim, MSN, RN, CEN, CFRN, TCRN, FAEN

ENA Staff Liaison
Catherine Olson, MSN, RN, Director, Institute for Quality, Safety, and Injury Prevention
References


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