

Emergency Department Crowding: High Impact Solutions



Emergency Medicine Practice Committee

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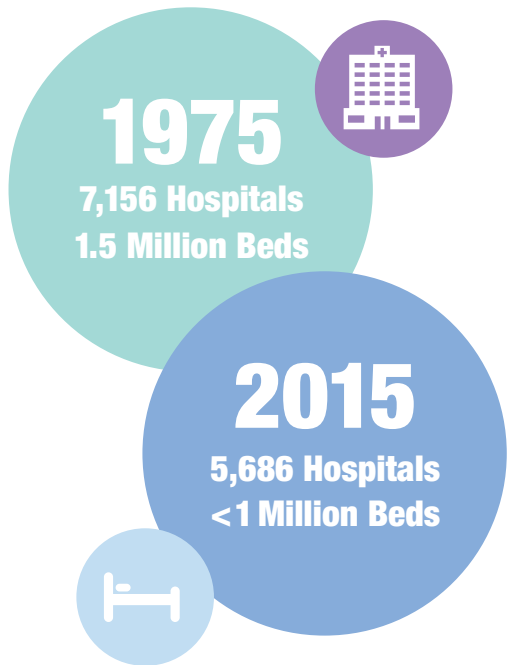
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Introduction



96,000,000 ED Visits in **1995** **136,000,000** ED Visits in **2011**

Emergency departments (ED) represent an essential component of the healthcare system, providing timely access to care for the evaluation, stabilization and treatment of the patient who may be seriously ill or injured. Some rely upon EDs as their primary or sole provider, due to economic constraints or limited access to primary and specialty care. Physicians often refer patients to EDs when their offices are overbooked, or when their patients could benefit from the testing and services provided by EDs, particularly during non-business hours. EDs are often utilized to perform the initial evaluation and processing of patients admitted to the hospital, accounting for nearly half of all hospital admissions.¹ As a safety net for medical care in the United States (US), the ability of EDs to provide timely and efficient care is far too often hampered by lack of capacity due to crowding, and boarding, in particular.

Hospitals flourished during the mid-twentieth century

The Hill-Burton Act of 1947 provided funds for the construction and expansion of community hospitals, and Medicare and Medicaid, established in 1965, provided funding for care of the aged and poor.² By 1975, there were 7,156 hospitals in the US and 1.5 million beds.³ Due to the increasing numbers of hospitals and the advent of expensive new treatments and technologies, inpatient hospital costs grew dramatically, leading the way for price controls. Medicare incorporated a prospective payment system in 1983, paying a preset amount for specific diagnoses in the form of diagnostic related groups. More aggressive forms of cost containment followed, which forced most hospitals to become more efficient, limited inpatient bed capacity, and forced many hospitals to close. By 2015, there were 5,686 hospitals containing less than one million beds, a one-third bed decrease from 1975.⁴ While EDs were declining in number, visits soared, increasing by one-third during the fifteen-year period of 1995 to 2010, when visits increased from 96 million to 130 million⁵ and to 136 million by 2011.⁶

Crowding occurs when the number of patients exceeds treatment space capacity...

It impedes efforts of ED personnel to provide care to patients, stretching resources, delaying treatment and leading to poorer patient outcomes. It also causes patients to leave prior to being evaluated by a physician or other provider, and may lead to ambulance diversion. Due to the unscheduled nature of emergencies, ED crowding will probably never be completely eliminated, but efforts can be made to mitigate boarding of patients and the crowding which boarding creates.

...the ability of EDs to provide timely and efficient care is far too often hampered by lack of capacity

Current State



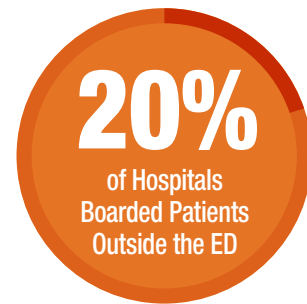
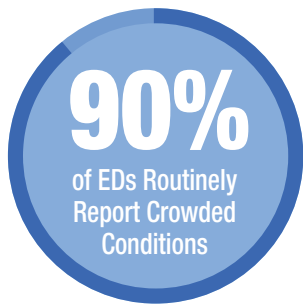
Over 90% of EDs routinely report crowded conditions. Many factors contribute to the problem: hospital closures; diminished hospital capacity via inpatient bed contraction; growing numbers of both uninsured patients and Medicaid patients (via Affordable Care Act exchanges), most of whom have limited or no access to unscheduled care; and decreased reimbursement to hospitals.

Crowding creates operational inefficiency in the ED, and has particularly concerning consequences on critically ill patients

ED crowding is a symptom of a hospital's operating at- or over-capacity, curtailing its ability to absorb the ED workload.⁷ Intrinsic ED issues are dwarfed by hospital-wide flow disruptions. In the early 2000s, studies showed that ED crowding correlated with bottlenecks in hospital flow, and specifically identified ED boarding of inpatients as a primary contributor to crowding. Crowding creates operational inefficiency in the ED, and has particularly concerning consequences on critically ill patients,⁸ where compliance with sepsis bundles has been adversely affected.⁹ It has been associated with delay (or failure) to administer antibiotics in community acquired pneumonia,¹⁰ poor analgesia management in patients with severe pain,¹¹ increased medical errors, and increased in-hospital mortality.^{12,13} Mortality appears to increase in association with the duration of ED boarding.¹⁴ ED boarding increases length of stay (LOS) for all patients,¹⁵ leading to decreased staff and patient satisfaction. The experience of boarding in ED hallways leads to lower satisfaction scores for ED care, and is predictive of low satisfaction scores for the entire hospital stay.¹⁶



Crowding also decreases access to emergency services, leading to increased walkout and left without being seen (LWBS) rates, and increased ambulance diversion events. Significant opportunity costs ensue as revenue from potential patients is turned away for lack of space or inefficient bed turnover.^{17, 18}



Initial causes of crowding identified included fewer ED beds and growing ED volumes, with an emphasis on “avoidable” ED visits, retrospectively identified as unnecessary or visits for conditions that could, theoretically, be addressed at the primary care/ambulatory care level. Prospectively, it would be difficult to determine which patient presenting with acute chest pain is “avoidable” (e.g. acid reflux or gastritis) versus those with an emergency medical condition (e.g. acute coronary syndrome or cholecystitis). Over the last two decades there have been myriad yet unsuccessful pushes to “keep patients out of the ED” by expanding primary care access. This has resulted in only minor gains, because the ED still affords a unique opportunity for immediate, on-demand access to a full evaluation including laboratory testing and imaging that would otherwise be fragmented within the ambulatory care paradigm. The root cause of ED crowding does not intrinsically reside in the ED; it is a patient-flow problem in need of a hospital-wide solution.

...there has been little progress, perhaps even regression, with efforts to decrease crowding

To facilitate the study of crowding, several ED crowding scales were developed, among them the National Emergency Department Overcrowding Study scale (NEDOCS).¹⁹ The expansion of research on this topic has yielded proxy metrics for crowding including time to provider (TTP), overall ED LOS, and dwell time (duration of boarding in the ED awaiting an inpatient bed).²⁰ Suggested hospital-wide solutions include proactive monitoring of inpatient and ED beds, inpatient units that ‘pull’ ED patients upstairs, and smoothing elective admission and surgeries.

The Centers for Disease Control and Prevention (CDC) National Hospital Ambulatory Medical Care Survey (NHAMCS) highlights that there has been little progress,

perhaps even regression, with efforts to decrease crowding. Despite efforts directed to curtail ED visits, there were over 136 million ED visits in 2011, a significant increase from the 115 million visits in 2005. Over 62% of patients admitted through the ED boarded there for at least two hours.^{21,22} Hospitals have been slow and reluctant to vigorously address boarding and crowding. A recent survey found that inpatient nurses were four times as likely to oppose having patients board in a ward hallway than ED nurses; this opposition held even when asked their preference in the event they themselves were admitted. The majority of hospitals have failed to implement full capacity protocols, even among the most crowded quartile.²³ Despite the admonitions and evidence of harm, hospital administrators have failed to utilize many of the solutions outlined in the literature, prompting the question of whether the interventions must be legislated and regulated to increase compliance.²⁴

Some progress has been made. In 2011 the CDC reported that upwards of 66% of hospitals reported having bed coordinators and nearly 40 percent having a full capacity protocol in place. Twenty percent boarded patients in inpatient hallways and other spaces outside the ED. In January 2014, the Centers for Medicare and Medicaid Services (CMS) issued new core measures to include ED flow, specifically TTP, LWBS and overall LOS for discharged and admitted patients. Core measures now include dwell time, putting hospital flow in focus.

The Joint Commission (TJC) also recently addressed this, establishing an updated “Flow” Standard with 9 elements of performance. The new standards reflect a recognition that while “patient flow problems often manifest in the ED, their origins may be multifactorial and stem from other areas of the hospital.”²⁵ The updated standards acknowledge the risks associated with boarding of patients in the ED and include metrics in this regard.

Decrease Input



Posting wait times

Anecdotal evidence supports the public posting of wait times as a means to distribute flow around a system or geographical area. This can be done online, with billboards, and through smartphone applications or texting, for example. Patients with non-emergent conditions can use this information to make better informed decisions about where they seek care,²⁶ although posted and actual wait times may not correspond in larger EDs.²⁷



ED appointments

Appointment times, or ED reservations, have been suggested as another means to smooth the arrival curve and have patients arrive to the ED at times that resources are available to care for them. Combining historical data with predictive software, EDs can model arrivals, and allow patients with non-emergent complaints to schedule a visit in the future. Conversely, if a surge of patients arrives, future appointments can be blocked off. One survey study in the United Kingdom found that 79% of patients with minor injuries prefer such a reservation system to the current walk-in method.²⁸ In addition to re-distributing arrivals, appointments provide patients with the convenience of waiting at home for their visit, and may also motivate ED staff to meet certain benchmarks to deliver scheduled appointments on time.²⁹

...data from the US showed that patients with non-business hours access to their PCP had 7% fewer ED visits.



Increasing primary care access

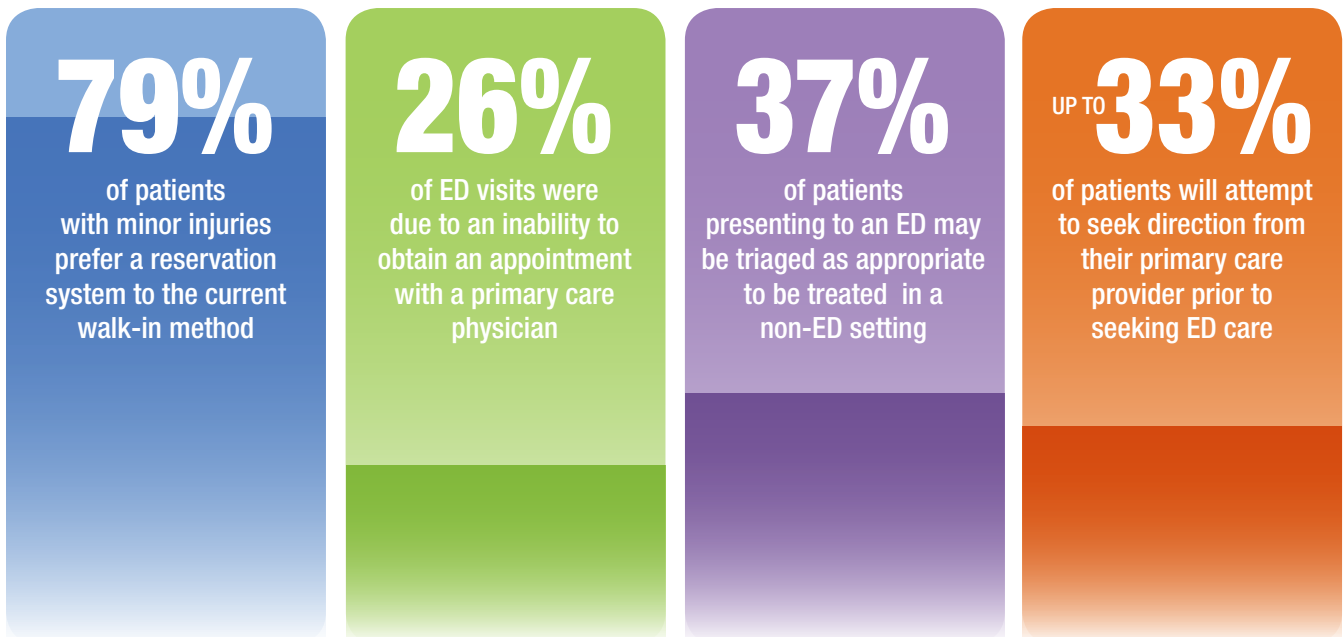
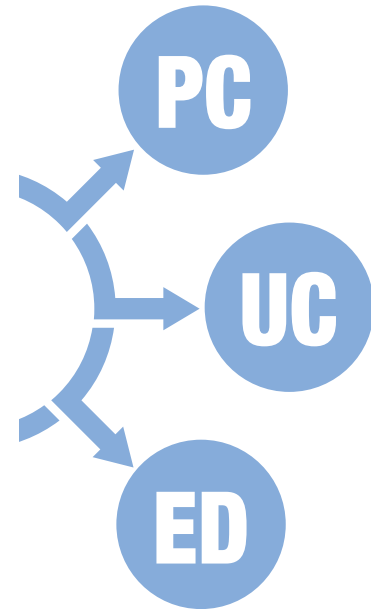
Improving access to primary care has the potential to decrease the influx of patients into the ED. A national study in Britain found that 26% of ED visits were due to an inability to obtain an appointment with a primary care physician,³⁰ and data from the US showed that patients with non-business hours access to their PCP had 7% fewer ED visits.³¹

Triage to non-ED setting

37% of patients presenting to an ED may be triaged as appropriate to be treated in non-ED settings such as urgent care (UC).³² UCs may be a viable alternative for appropriate patients. Subsequent analysis places the potential for patient diversion to UCs and other alternative ambulatory settings at 13.7-27.1% of all ED visits³³ with cost savings to the patient of over \$400 per visit.³⁴

Diversion of lower acuity patients from the ED may result in increased ED acuity and decreased volume. However 5.5% of patients triaged as low acuity will eventually result in acute hospitalization.³² There should be clearly defined transfer protocols to an ED from UC, and good relationships in place with local EDs to minimize the risk to patients who choose UC incorrectly.

In patients who have used ED's in the past, when given the option to self-triage to UC, a 48% reduction in ED utilization within that population would result.³⁵ As the uninsured rate continues to fall in the US patients have increased access to primary care,³⁶ and as many as 33% of patients will attempt to seek direction from their primary care provider prior to seeking ED care.³⁷ However education for providers, as well as patients, must improve as even providers have difficulty agreeing upon what constitutes an appropriate patient for evaluation at UC.³⁸



Improve Throughput



ED physicians and triage nurses can predict which patients will be discharged after a quick triage with over 90% accuracy.

Quick registration

Efforts to streamline front-end operations have led to direct bedding with bedside registration. Traditional patient processing involves a series of queues upon arrival to the ED, including waits for triage, registration, medical screening, and the next available ED bed. Reductions in wait times may be achieved with a transition to parallel, as opposed to sequential, processing. In place of traditional triage, patients are seen simultaneously by a nurse, registration worker, and care provider.

Direct bedding necessitates quick registration, entailing a brief intake of basic patient demographics to permit electronic charting and order entry. Full registration may then be completed at some point during the patient's ED stay.³⁹ With such measures in place, several EDs have reported decreased LWBS rates, wait times, and LOS.⁴⁰⁻⁴⁵

Registration kiosk

One technological advance increasingly used in the ED is the registration kiosk. Mostly used in airports, restaurants, and stores, self-service touch screens may also be used in EDs to register patients.^{39,46}

Provider in triage

The placement of a physician, or advanced practice provider, in triage is another method used to reduce delays in patient care. This triage provider may initiate medical screening exams, testing, and/or management until a bed becomes available in the ED. In addition, low acuity patients may be evaluated, managed and discharged directly from the waiting room. Though this operational change requires both space and funding, it has been shown to reduce LOS and LWBS.⁴⁷⁻⁴⁹

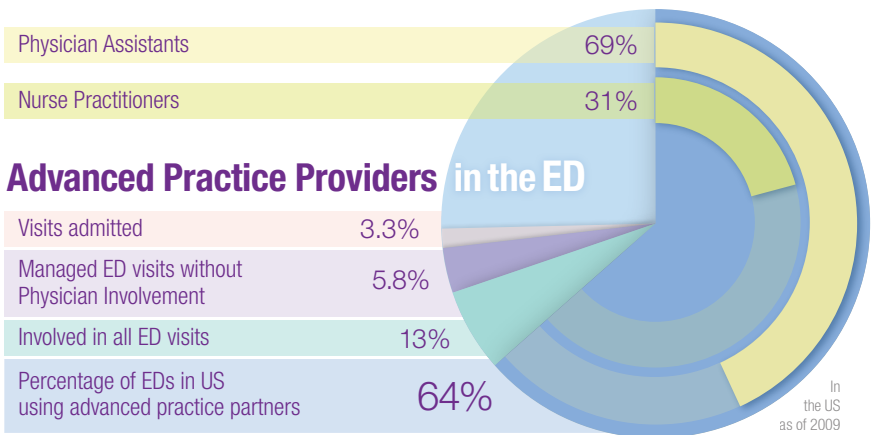
Nurse initiated orders

The use of evidence-based, standardized order sets has been shown to improve timeliness of care and reduce medical errors.^{39,50,51} Initiation of testing in triage is a possible solution for the congested ED, as results are returned earlier in the patient's visit, reducing LOS.⁵² Protocols involving medication administration are reported to improve time to pain medication,^{53,54} time to antibiotics,⁵⁵ and time to thrombolysis in myocardial infarction.⁵⁶

Streaming, split flow, fast track

Streaming, or split flow, is an ED management technique by which patients with different needs are stratified during triage into different treatment protocols. Often, this strategy places specific patients in a different physical area of the ED and assigns a different treatment provider, although different streams can be specified through colors or other indicators besides physical location. Several studies show that split flow decreases LOS, wait time to see a provider and LWBS, and increases patient satisfaction.⁵⁷⁻⁵⁹ Patients can be split by acuity level, need for a bed, need for lab studies, chief complaint, or any other designation.

Fast track is the most common way to split patients, and it uses a differentiation of low or high acuity, often by Emergency Severity Index (ESI) triage level. Levels 4 and 5 belong in a fast track, whereas level 3 patients can be more undifferentiated. Some evidence finds that splitting some ESI 3 into fast track and others into regular flow by how many resources they will require can decrease LOS for discharged patients.⁶⁰ ED physicians and triage nurses can predict which patients will be discharged after a quick triage with over 90% accuracy.⁶¹ Fast track models have the strongest evidence for shortening wait times and LOS, and 10-30% of ED patients typically qualify.⁶²



Nurse practitioners and physician assistants/advanced practice providers

As of 2009, 64% of EDs in the US were using advanced practice providers; 69% are physician assistants and 31% nurse practitioners. In 2009, they were involved in 13% of all ED visits, managed 5.8% of ED visits without physician involvement, and 3.3% of their visits were admitted.⁶³ Their hourly cost is lower than a physician's, making them a cost-effective option to improve throughput.

Rotational assignment

In EDs with multiple providers, rotational patient assignment instead of physician self-assignment showed a decreased median arrival to provider time (39 to 22 minutes), median LOS (232 to 207 minutes), LWBS (0.73% to 0.36%) and complaint ratio (9.0/1000 to 5.4/1000).⁶⁴

Improved turnaround time (TAT) for laboratory and radiology

Laboratory testing TAT can be improved with certain point of care testing (POC). Use of POC blood glucose and urine pregnancy tests are well established in emergency medicine. There are currently many POC testing options available, however, not all are cost effective. POC troponin decreases TAT for patients with chest pain.⁶⁵ Mean LOS decreased by 1.5 hours (8.46 to 7.14) in patients with chest pain and POC D-dimer testing.⁶⁶ Additional examples of tests that could decrease time to disposition include lactate in sepsis patients, and coagulation tests for stroke.⁶⁷

A dedicated radiologist available to read ED studies can decrease delays in results and reduce time for disposition. In one study, extending attending radiologist hours from 8am-5pm to 6:45am-11pm decreased imaging report times by greater than thirty minutes.⁶⁸

Medical scribes

ED providers spend a large amount of time dedicated to documentation, upwards of 22-32% according to several studies.⁶⁹⁻⁷¹ Scribes allow physicians to spend more time directly related to patient care. Although the literature describing improved patient throughput related to scribes is not as robust as those related to patient/provider satisfaction and financial implications, several studies have shown improvement in patients per hour, time to clinician, and time to disposition after implementing scribe programs.⁷²⁻⁷⁶



Electronic health records

Driven by both internal quality improvement initiatives as well as incentives related to the HITECH act ('meaningful use'), a large number of health care systems nationwide have transitioned (or intend to transition) to electronic health records (EHRs) and computerized order entry (COE). When designed and utilized appropriately, this transition may carry several theoretical benefits with regard to patient throughput.⁷⁷ These benefits can include rapid availability of past history and work-ups, standardized discharge information, streamlined medication ordering, and improved discharge communication.⁷⁸⁻⁸¹ As such, some studies have demonstrated a long-term reduction in patient throughput times after the implementation of an EHR. Of note, however, is the initial increase in throughput metrics during EHR implementation for upwards of 7-12 months. Some studies have demonstrated an increase in ordering of tests and treatments with EHR, which may offset associated operational improvements.⁸² Implementation of an EHR and COE as tools to combat ED crowding should be considered carefully.



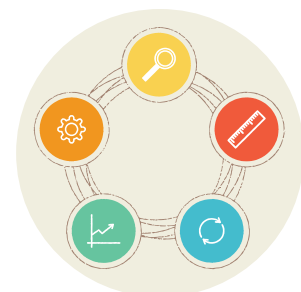
ED expansion

ED expansion as a means to speed patient flow was first suggested in 1984, and reiterated in 2000.⁸³ Without other patient flow modifications, expansion alone also led to decreased patient satisfaction; increased door-to-provider time, LOS and boarding; and either unchanged or increased rates of LWBS.^{84,85} There are mixed effects on ambulance diversion, with some demonstrated improvement and some unchanged.⁸⁶



Care coordinators

Case managers and social workers can be effective in the care of high utilizers, referral to community services, and can assist with discharge planning.⁸⁷ They are helpful in creating strategies to deal with psychiatric patients that frequent EDs.⁸⁸ Care coordinators have shown repeated effectiveness in reducing ED LOS and usage.⁸⁹



Process improvement strategies

Lean, introduced in 1988, derives from the Toyota Production System and is a bundle of methods and tools used to improve the efficiency of a company.^{96,97} It is also a philosophy on how to promote “the endless transformation of waste into value from the customer’s perspective,”⁹⁸ and has five principles: identify value, value stream mapping, create flow, pull, and perfection. Numerous articles have demonstrated improvements in ED healthcare after Lean introduction. Nine suggestions for successful Lean implementation in the ED are: be ready for change, take a human-centered approach, secure expertise, obtain top management support and resource allocation, secure leadership, aim for culture change, adapt Lean to the local level, improve continuously, and learn from previous experiences.⁹⁹ However studies are needed to determine the best implementation process and sustainability,¹⁰⁰ as Lean can increase workload, threaten autonomy and bring about anxiety in employees.⁹⁹

Six Sigma, first introduced at Motorola in 1986, is a quality improvement strategy that uses statistical methods and an infrastructure of leaders to achieve a product/process that is six sigma (99.99966%) free of defects. There are five steps in the Six Sigma process: define, measure, analyze, improve, and control.

There are other quality improvement methodologies, but the combination of Lean and Six Sigma has demonstrated symbiosis.¹⁰¹

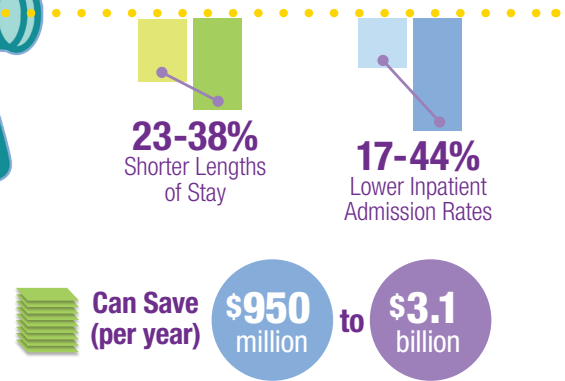
Increased staffing

The study of staffing levels and its effect on crowding is difficult and is affected by several variables.^{90,91} One study showed that a decreased LOS is associated with the addition of a senior resident or attending, while an increased LOS is associated with an extra junior level resident.⁹²

Government mandates on nurse/patient ratios are not evidence-based,⁹³ though it has been shown that patient wait time and total care time were decreased when nurse/patient ratios were in compliance in California.⁹⁴ There is an association of improved patient outcomes with increased nurse staffing, but causation has not been proven.⁹⁵



Independent Protocol-driven Units



Observation units

The rate of disposition from ED to observation unit has tripled from 0.6% in 2001 to 1.87% in 2008.¹⁰² 34.1% of EDs had a dedicated observation unit in 2008, and 56% of them were administered by the ED. Disposition to observation more than doubles in EDs that control their own observation units, from 15% for general observation units to 38% for ED-controlled units.¹⁰³ There are no differences in one year outcomes or costs for chest pain patients placed in observation versus inpatient,¹⁰⁴ and evidence shows that effective, independent protocol-driven units can save \$950 million to \$3.1 billion per year through 23-38% shorter lengths of stay and 17-44% lower inpatient admission rates.^{105,106} 2.1% of patients admitted from the ED stay less than 48 hours and have similar characteristics and diagnoses to patients admitted to observation units, presenting an additional opportunity for time and cost savings.¹⁰³ It is recommended that ED LOS end once admitted to observation in order to accurately measure ED throughput.

Increase Output



Reverse triage

Reverse triage is a military concept where the lowest acuity combatants are treated first so they may return to the battlefield. In the hospital setting the concept is used to create surge capacity by identifying inpatients at lowest risk of adverse outcome if discharged or placed in a lower level of care earlier than would normally be anticipated. Patients who are discharged should have an acceptably low rate of consequential medical events (CMEs), though this rate may be higher than under normal operations. Studies looking at the process estimate a hospital can increase its bed capacity by 10-20% in a matter of hours using reverse triage.¹⁰⁷

Patients are classified into 5 categories of risk, with individual categories being ranked acceptable for discharge/downgrade based on the severity of resource constraints. In pediatric patients the target CME rate for the lowest category is < 2%, which is a CME rate similar to a routine discharge under normal operations. The target CME rate for the next category up was 7%.¹⁰⁸ In studies looking at adults, the acceptable CME rates were approximately double for each category. Higher categories of risk were not considered acceptable for early discharge or downgrade except in exceptional circumstances.

Most studies done on the impact of reverse triage are simulations, where at a predetermined time the population in a hospital is categorized but no patients are actually discharged. Such studies can assess the anticipated volume and timing of discharges but not the safety of the process.

A strategy to actively manage hospital beds has been associated with decreased ED LOS and fewer hours on ambulance diversion

10% TO **20%**

estimated increase in bed capacity in a matter of hours using reverse triage

25%

drop in LOS when inpatient hallway boarding is utilized according to some limited evidence

50%

of patient sent to inpatient hallways to board spend less than 1 hour in the hallway

85%

of surveyed patients preferred inpatient hallway boarding

Inpatient hallway boarding

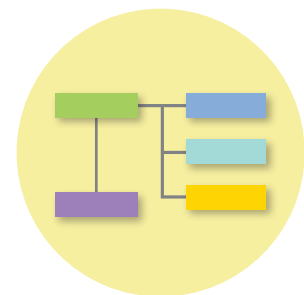
Inpatient hallway boarding describes moving admitted patients from the ED to inpatient hallways until inpatient beds become available, in an effort to improve ED capacity. Patients who are boarded on inpatient hallways are typically a limited class of patients (up to and including telemetry patients but usually excluding stepdown/intermediate care or critical patients) who do not have one of a few exclusion criteria, such as incontinence. The decision to board in hallways may include time, where ED LOS exceeds a set threshold, or volume, where there are an excessive number of ED boarders.

The process is safe and preferred by 85% of surveyed patients.¹⁰⁹ Mortality and ICU transfer rates were less among patients placed in inpatient hallway beds compared to those awaiting standard bed placement.¹¹⁰ 50% of patients sent to inpatient hallways to board end up spending an hour or less in the hallway. Some limited evidence shows up to a 25% drop in ED LOS when inpatient hallway boarding is utilized.¹¹¹



Active bed management

A person acting as a bed czar or bed director can manage all inpatient beds to coordinate and match ED admissions. This person should also facilitate timely transfer from the ED to inpatient beds and can mobilize resources to aid in ED throughput issues. Alternatively there can be a point person in the ED to help navigate admissions during times of high ED boarding. There should be real-time bed census availability so the ED is aware of the number and type of beds available. A strategy to actively manage hospital beds has been associated with decreased ED LOS and fewer hours on ambulance diversion.¹¹²⁻¹¹⁵



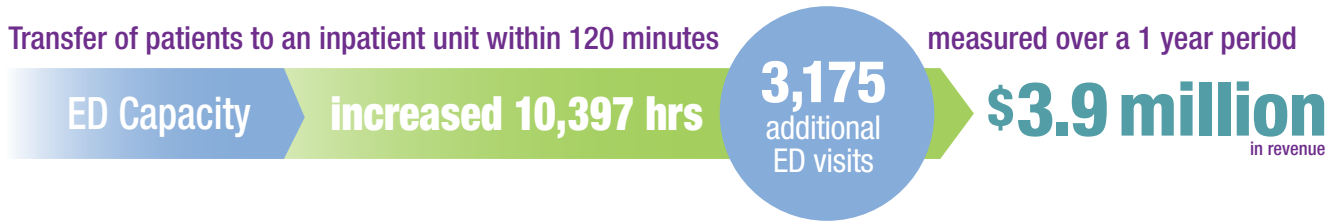
Coordination of elective surgeries

Patients scheduled for elective surgery often require post-operative hospital admission. Elective surgery times should be matched to available inpatient beds by smoothing the schedule to include all days of the week, and to schedule more intensive procedures throughout the week.¹¹⁶



Discharge lounge

A specific space for hospital patients who are awaiting discharge allows inpatient beds to become available sooner.



Modified admission protocols

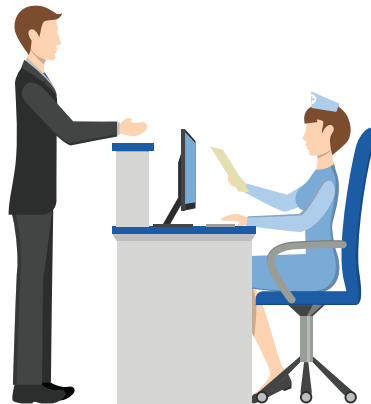
Modification of the admission process to create a more efficient, streamlined process can lead to a reduction in ED LOS and ED boarding times.^{117,118} This may involve establishment of transition orders, allowing patients to be admitted prior to completion of all diagnostic testing and having admitting providers see patients on the floor, rather than in the ED.

A protocol requiring transfer of admitted patients to an inpatient unit within 120 minutes, when measured over a one year period, would have increased ED capacity by 10,397 hours, translating into an additional 3,175 ED visits and revenue of over \$3.9 million.¹⁷ A reduction of ED boarding by one hour would have resulted in almost \$10,000 additional daily revenue in an inner-city teaching facility with over 118,000 visits annually, based on improvements in LWBS and ambulance diversion.¹¹⁹

Early discharges

Computer modeling has shown that shifting peak hospital discharge time one hour earlier cuts ED boarding hours in half, and four hours earlier eliminates ED boarding.^{120,121} When weekend discharges occur at the same rate as during the week, there is a significant improvement in ED boarding and hospital LOS.¹²² While not specific to the ED, similar improvement is demonstrated when surgical schedules are smoothed.¹²³

When daily peak discharge time can be shifted to precede peak admission time, there is a lower peak occupancy in the hospital, a lower overcrowding rate, and lower ED boarding hours. The effect is accentuated with more lead-time between peak discharge and admission.



Role of legislation

ED LOS and boarding times are now part of the CMS pay-for-reporting program. Highlighting the issue may help, however attaching financial incentives or penalties in the future may be needed to drive change. TJC now requires hospitals to address boarding for purposes of accreditation, however their role is quasigovernmental, and their requirements are not necessarily followed by competing accreditation agencies.²⁴



Britain, Australia, Canada and New Zealand have all enacted some form of legislation to reduce boarding. The 2004 “four hour rule” in Britain required that 98% of ED patients had to be out of the ED four hours after their arrival; while controversial, there was an increased percentage of patients meeting this requirement without affecting quality.¹²⁴⁻¹²⁶ Western Australia enacted similar legislation in 2008 and effectively reduced ED crowding and overall mortality. Additional legislation may be required to generate significant and sustained improvements.¹²⁷⁻¹³¹

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