

COMMENTARY

Emergency Department Crowding: The Canary in the Health Care System

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DOI: 10.1056/CAT.21.0217

Emergency department crowding is a sentinel indicator of health system functioning. While often dismissed as mere inconvenience for patients, impact of ED crowding on avoidable patient morbidity and mortality is well documented but remains largely underappreciated. The physical and moral harm experienced by ED staff is also substantial. Often seen as a local ED problem, the cause of ED crowding is misaligned health care economics that pressures hospitals to maintain inefficient high inpatient census levels, often preferencing high-margin patients. The resultant back-up of admissions in the ED concentrates patient safety risks there. Few efforts (even well-meaning ones) address the economically driven root causes of ED crowding, i.e., the need to achieve minimal financial hospital margins. The key to a sustainable solution is to realign health care financing to allow hospitals to keep inpatient capacity below a critical threshold of 90%; beyond that, hospital throughput dynamics will inevitably lead to ED crowding.

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Emergency department (ED) crowding is a widespread problem and a source of patient harm. While such crowding may be inaccurately considered a problem of ED operations and inefficiency, in truth, ED status is the sentinel canary in the coal mine — reflective of not just individual department performance or even individual hospital performance, but of health system dysfunction throughout the United States. Emergency medicine provides the optimal setting to efficiently evaluate unscheduled, acute undifferentiated and decompensated conditions. Available 24-7, its smooth functioning is paramount to providing this essential service, and its efficient operation is dependent not just on department staff and managers, but on factors outside the control of the ED.

Just prior to the Covid-19 pandemic, ED visits had risen more than 60% since 1997 to about 146 million,¹ with nearly 46 visits per 100 persons in 2016. Although ED census has not fully returned to previous levels following a significant decrease in patient volumes during the first wave,² the Covid-19 pandemic has only further intensified factors associated with crowding and increased overall ED patient lengths of stay.³ The normalization of ED crowding by hospitals as a tolerable dysfunction had resulted in patient endangerment during “normal” times, and has contributed to capacity failure and affected the ability to meet the challenges of public health emergencies.

Even prior to the Covid-19 pandemic, greater than 90% of U.S. EDs found themselves stressed beyond the breaking point at least some of the time.⁴ Many remain overwhelmed daily. ED crowding — defined as the “need for emergency services exceed[ing] available resources for patient care in the ED, hospital, or both”⁵ — is the persistent norm. The impact of ED crowding on morbidity, mortality, medical error, staff burnout, and excessive cost is well documented but remains largely underappreciated.^{6,7} Large tertiary academic medical centers (AMCs) and safety-net hospitals are particularly affected.⁸ Crowding is further exacerbated in the current and post-Covid-19 environment as hospitals are eager to reestablish full inpatient services while highly restrictive but necessary infection controls remain in place, limiting hospital and ED functions. While EDs are the first point of health care entry for most SARS-CoV-2-infected victims, the pandemic has further highlighted that severely crowded EDs are considerably challenged to respond effectively and safely during crises.

The commonly accepted framework explaining ED crowding focuses on ED *input, throughput, and output* inefficiencies.⁹ Unfortunately, this framework and its traditionally targeted solutions, however helpful, often fall short as they do not address the primary and root causes of ED crowding.

We assert that the largely unrecognized cause of ED crowding and its negative impacts on patients are due to misaligned health care economics and financial pressures on hospitals. These impacts are further accentuated by financial pressures that hospitals are currently experiencing in the wake of Covid-19. The rapid pursuit to “return to normal” or even “exceed normal” operations to redress delayed procedures and treatments place accentuated burdens on the ED due to resultant crowding. Remarkably, discussion of the economic roots that lead to crowding is largely vacant in the crowding literature. Yet, many hospitals are servile to financial drivers that virtually ensure frequent hospital and ED crowding.

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The “return to normal” is further driven by both a need to stem revenue losses and by a fear of losing revenue-producing market share to other health systems. In addition, there is considerable pent-up demand for needed health care delayed by or avoided during the pandemic. Positive hospital financial performance often requires sustained high inpatient occupancy. Concurrently,

hospital and professional fee reimbursement generally incentivize elective admissions, transfers, and surgeries over emergency admissions.^{4,10} Prolonged boarding (more than 2 hours) of ED-sourced admitted patients in the ED effectively reduces ED capacity and capability. Unfortunately, the realities of normalizing hospital operations while retaining the necessary infection-control space constraints have amplified crowding impact on the ED. Misaligned health system financing effectively concentrates patient safety risk in the ED and contributes to health care inequity.

In this paper, we examine the root causes of ED crowding, describe the harmful impacts, review the current status of solutions, and suggest regulatory and institutional-level actions required to effectively overcome ED crowding and its deleterious consequences.

ED Crowding and Harmful Effects

ED crowding is not an issue of inconvenience. There is incontrovertible evidence that ED crowding leads to significant patient harm,⁶ including morbidity and mortality related to consequential delays of treatment for both high- and low-acuity patients,^{11,12} ambulance diversion,¹³ increased adverse events,¹⁴ and preventable error.¹⁵ Acutely ill ED patients requiring urgent intervention leave without being seen (LWBS) due to prolonged waits.^{16,17} Outcomes are worse for patients with prolonged boarding in the ED, which results in longer inpatient stays and higher costs of care.¹⁸⁻²⁰ ED crowding has also been associated with more patients being classified as higher acuity and increased hospital admissions, further exacerbating the problem.²¹ ED crowding leads to increased violence toward staff, high clinician and nursing staff turnover, decreased provider productivity, increased staff distraction resulting in human error, and consequent legal action.^{22,23} Crowding is a key contributor to high ED physician burnout, approaching 75%.²⁴ Finally, patient experience is poor — regardless of quality of care — when patients are forced to remain in the ED waiting room in various states of discomfort.²⁵

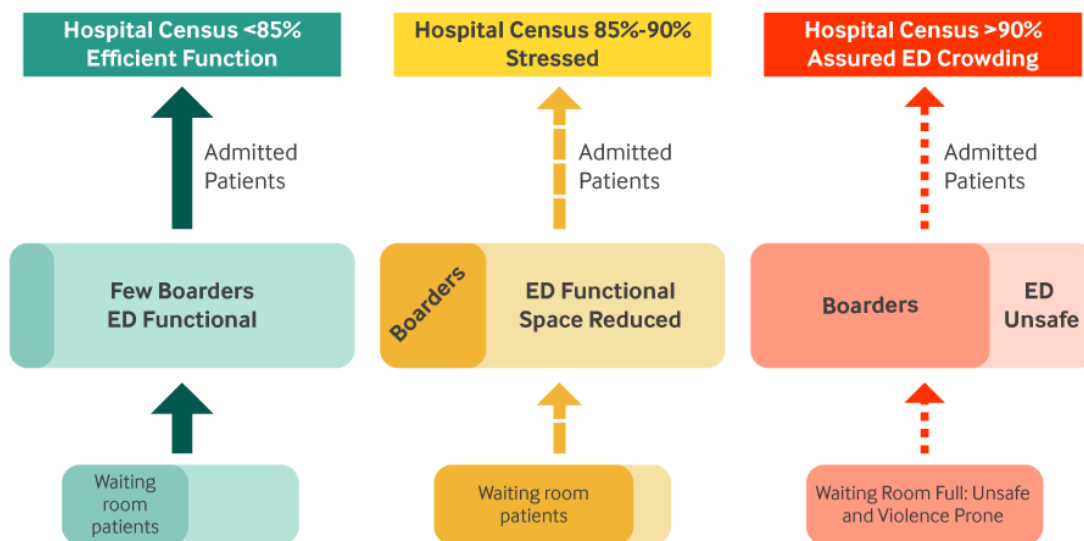
Despite the accumulation of evidence of patient harm and significant national media attention,⁷ progress in mitigating ED crowding and its pernicious effects on patient outcomes has been slow.²⁶ In fact, crowding continues to worsen.^{27,28} Data from the Association of Academic Chairs of Emergency Medicine (AACEM) hospitals reveal that the proportion of ED patient boarding ≥ 8 hours rose nearly 130% (from 7.0% to 16.0%), from academic years 2012 to 2019. Also, instances of boarding ≥ 24 hours doubled from 0.78% in AY18 to 1.45% in AY19 and climbed to 1.64% in AY20. [The academic years conclude at the end of June in the year stated.] In many settings, although ED boarding of inpatients remained an issue and perhaps worsened,³ during the height of Covid-19, many of us experienced a brief period of relief from ED crowding because ED patient volumes plunged, allowing longer admission holds in the ED.²⁹ As of August 2021, ED volumes have returned or increased from pre-Covid-19 levels. In a recent survey in which nearly 60% of the 106 AACEM academic department members responded, 83% indicated that boarding was worse, with one-third of all respondents reporting it was “much worse.” In fact, traditionally, one-third of ED admitted patients in AACEM-member hospitals board ≥ 4 hours. Many EDs board significant numbers of patients well over 24 hours with considerable frequency — some even on a daily basis — an unconscionable occurrence.

Covid-19 infection control practices have added further safety concerns, particularly as hospital and ED volumes are restored. Efficiency of strained resources is further diminished as admissions to specific inpatient units for Covid-19 and non-Covid-19 patients reduce functional capacity. Likewise, the ED is functionally decreased in size by restrictions or resistance to hallway bed utilization or chair stations in inpatient settings. To comply with infection control concerns, access to visitors/family members who can help with histories is restricted or delayed. Elaborate but necessary protocols for infection prevention — including imaging processes, room disinfection, donning and doffing of personal protective equipment, and the involvement of *safety officers* — all delay care and further reduce efficiency, which contributes to crowding as ED room turnover is significantly decreased (Figure 1).

FIGURE 1

Impact of Boarding Admitted Patients on Emergency Department Function

When census is <85%, hospitals typically can function efficiently (green). Hospitals become stressed as census increases beyond 85% and admissions from the ED begin to accumulate from prolonged boarding (yellow) filling the ED to capacity. Most hospitals cannot overcome inefficiencies when hospital census is above 90% (red). The ED becomes overwhelmed and backed up, filling the waiting room and delaying care for those patients leading to increased risk of patient harm.



Source: The authors, based in part on internal Association of Academic Chairs of Emergency Medicine (AACEM) members' data, and informed by Forster AJ, Stiell I, Wells G, Lee AJ, van Walraven C. The effect of hospital occupancy on emergency department length of stay and patient disposition. *Acad Emerg Med.* 2003;10(2):127-133. <https://onlinelibrary.wiley.com/doi/epdf/10.1197/aemj.10.2.127>.

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Causes of Crowding and Why ED Crowding Persists

While crowding is a global problem, in the United States (which spends on average twice as much on health care as other developed countries³⁰) crowding is readily traced to health care structure and economics.

Health System Incentive Structure

Health care financing forces many hospitals to structure operations that ensure the inevitability of both hospital and ED crowding.⁴ ED crowding arises from admitted patients *boarding* in the ED, rendering these beds as unavailable for other ED patients awaiting evaluation and management. Boarding is defined as time from admission decision until the patient leaves the ED.⁵ Excessive ED boarding results from *access block*, i.e., the inability to access appropriate hospital beds within a reasonable time. Access block itself occurs due to high inpatient occupancy rates, whether related to overwhelming service demand, inefficient patient flow processes, or both. Boarding patients effectively reduce ED size and function. In some settings, it is not uncommon to experience functional decreases in ED capacity of 50% or more due to boarding for a substantial portion of the day.

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Between 2005 and 2017, there were about 1,000 hospital mergers and acquisitions affecting nearly 50% of acute care hospitals in the United States.³¹ Health system consolidation driven by market-share motivations and “financial survival” particularly affects inpatient capacity in major AMCs. Highly complex patients are referred/transferred to the tertiary/quaternary center institution of the consolidated health system entity.

Budget requirements or misaligned financial incentives compel hospitals to set inpatient census goals at levels that predictably result in ED access block. Crowding will occur when hospital occupancy exceeds 85%–90%. Our experience finds that in most institutions, ED gridlock is assured when inpatient occupancy exceeds 90%.³²

The 2007 Institute of Medicine report particularly stressed that financial disincentives are an impediment to addressing ED crowding because financial drivers force inequitable queuing of ED admissions in many hospitals.⁴ ED patients are considered to generate less revenue, even among the insured,^{4,10} and are thus often not prioritized as they are thought of as financially less desirable.³³ Thus, ED admissions vie for hospital beds with patients considered more financially rewarding, such as elective admissions, some transfers, and patients undergoing major procedures/surgeries. Indeed, in some hospitals, patients often board in the ED despite open beds held for specialty patients or in anticipation of other financially desirable elective admissions or transfers.⁴

For example, surgical beds are generally high revenue generators. Occupying such beds with patients not requiring a major procedure is considered financially imprudent.²⁶

This practice looms larger as hospitals try to accommodate as many surgeries and procedures as possible to fulfill demand and financial pressures. ED-admitted patients who would be appropriately destined for surgical beds are instead diverted to general medical services. This practice puts great pressure on medical services' census, and thus amplifies ED crowding. Even in hospitals with equitable first-come, first-served bed allocation, elective-patient and procedure bed assignments may occur well before ED admissions peak. The failure to accommodate ED admissions in an equitable manner is inexplicitly short-sighted. Apart from the patient safety issues highlighted earlier, medical admissions from the ED fuel further procedure/surgeries, referrals, and lead to other financially rewarding health care services. Thus, the contribution margin of the ED can be considerable.³⁴ Of note, more than 50% of hospital admissions originate from the ED, and the greatest growth of hospital admissions has been among emergency patients.³⁵

Insufficient Health Care Capacity

Lack of capacity in the U.S. health system also promotes ED crowding. ED visits in the last 2 decades have strongly outpaced population growth.³¹ However, during this time frame, admissions rose 21% while acute care hospitals and staffed beds decreased by 7% and 11%, respectively. Total EDs have decreased, and inpatient bed capacity has decreased by 27%, to 2.41 from 3.32 per 1,000 population.³¹

To fulfill their multiple missions, many tertiary care and AMC hospitals experience insatiable demand for specialty services, need to comply with EMTALA (Emergency Medicine Treatment and Labor Act)³⁶ requirements to accept complex referred patients, and often have local community obligations, as well as resident and fellow training-related volume requirements. In such hospitals, census can be well over 100% at any given point in time (i.e., more patients slated for admission than actual staffed beds). Where this occurs, adjusting hospital financing and redistributing service beds will not dampen high occupancy. Hospitals are largely restricted to weekday daytime operations. This creates a functional capacity mismatch with the ED that operates 24-7 and thus requires resources to accommodate a predictable flow of patients and admissions. Much of the resource requirements are during the evening and weekends, and less so during traditional weekday work hours. Although smoothing of admissions and surgeries over the full week has been shown to be very effective at reducing crowding,^{37,38} this practice is largely avoided. In the experience of some of us, we find it has been tried but strongly resisted by the surgeons and other proceduralist. Indeed, despite some hospitals investing millions of dollars to mitigate crowding, and developing “command centers” that attend to inefficiencies, boarding today has actually worsened.²⁸ Demand for services in many hospitals, particularly AMCs, is so high that improvements are rapidly overcome.

Capacity in other venues of health care is also severely wanting. Lack of availability of post-discharge facility beds leads to long-term hospital occupancy.³⁹ Inpatient units experience eroding functional capacity as patients await placement in post-discharge health care settings (rehabilitation centers, skilled nursing facilities, or nursing homes).

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Compounding the capacity challenges, the United States is experiencing a nursing shortage — including highly skilled ICU and ED nurses — that has reached crisis levels in some jurisdictions.⁴⁰ Reasons for staff shortages are complex and not only budget-related. Covid-19 has had its own impact on staffing generally, and accentuated nursing shortages. Regardless, unstaffed inpatient beds decrease capacity, further debilitating ED flow and efficiency.

Functional outpatient capacity is also wanting. Outpatient health care availability also largely exists on a weekday daytime model, which impedes access for many patients who work or have childcare responsibilities during those hours.⁴¹ Patients seek ED care because alternatives are difficult due to factors such as general lack of outpatient services, inadequate primary care capacity, unavailability of after-hours care, and lengthy waits for primary and specialty care appointments.⁶ These impediments lead to poor control of chronic illness, which, in turn, lead to increased likelihood of decompensated illness presenting to EDs, further increasing admission pressures. While various outpatient services, including telehealth visits, may have been increased due to Covid-19, a considerable proportion of ED visits occur outside the time frame that such venues are available.⁴¹ These obstacles persist and will continue post-Covid-19 despite augmentation of alternate outpatient modalities during the height of Covid-19. Although telehealth visits increased considerably during the pandemic and are likely to endure, this modality is not an easy option for lower socioeconomic groups or the elderly, and some in rural settings who are less likely to readily participate in this modality due to technology issues.⁴² In addition, insurers are already levying co-pays. Based on the recent survey of AACEM members, high-acuity patients and patients requiring admission, i.e., those most responsible for ED crowding, remain largely the same as pre-Covid-19 levels.

As many as one in four people are affected by behavioral health disorders, a leading cause of disability worldwide. Despite the extent of this public health problem, stigma against mental illness has resulted in prioritization of physical illness over mental illness.⁴³ The profound lack of both inpatient and outpatient psychiatric and substance use services, and the labyrinthine processes for psychiatric services driven by byzantine insurance coverage, have placed extraordinary pressure on EDs. Further, inpatient psychiatric beds have decreased.⁴⁴ Thus, the ED has become the default location for evaluation and placement of acutely decompensated psychiatric patients. Between 2006 and 2014, ED visits for mental health or substance use disorders rose 44%, from 14.1 to 20.3 visits overall per 1,000 population.⁴⁵ Suicidal ideation, which generally requires extensive evaluation, has increased more than 400%, from 43,800 first-listed ED diagnoses in 2006 to 225,600 in 2014.⁴⁵ Patients with overdoses increased considerably during the pandemic, to a mean of 14,959 ED visits in 2020 compared to 12,891 during a similar 41-week period in 2019.⁴⁶

Data show that behavioral health patients are disproportionately affected by boarding.⁴⁷ Thus, it is common to have patients with acute psychiatric issues stay in the ED for 3 to 5 days or more, while trying to find an accepting inpatient facility. Issues related to placement of psychiatric patients during the pandemic extended ED boarding of upwards of 10 days and even more in some of our facilities. The discriminatory lack of mental health care resources including inpatient beds renders patients with psychiatric conditions the most common victims of ED boarding. While most non-respiratory-related visits decreased dramatically at the height of Covid-19 surge, mental and substance use disorders remained the same.²

Hospital-based inpatient psychiatry units caring for the sickest, least stable patients have become revolving doors. In our experience, these hospital-based units are nearly always full. Due to intense pressure to take the next qualifying admission, (which often comes from the ED) inpatient psychiatric services practice a form of *reverse triage*. Inpatients who are barely stabilized are discharged, often back into their original unstable environment, to be able to care for a patient in the ED who is less stable and thus at higher risk.

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Finally, failure to address end-of-life care and lack of awareness or availability of hospice/palliative care options constrains inpatient and ICU capacity.

Failure of Regulatory Agencies, Payers, and Legislative Bodies

The vision of The Joint Commission (TJC) is that “all people always experience the safest, highest quality, best-value health care across all settings.”⁴⁸ The TJC’s *Standard LD.04.03.11, EP 6* sets a 4-hour time frame as a “reasonable goal” for boarding. However, TJC did not want to establish a requirement that “in some cases” was not within institutional control and states that the recommended 4-hour time frame for boarding is not a requirement for accreditation and is not scored.⁴⁹ Even though the unenforced guideline was arrived at by TJC, in part, through stakeholder consensus, the 4-hour time frame remains controversial; the emergency medicine community had vociferously advocated for a maximum boarding time of 2 hours. TJC acknowledged that a 2-hour time frame represented the second-highest number of responses in the feedback it received at the time (December 2011 to January 2012) — for both medical and behavioral patients.⁴⁹ We continue to assert that 2 hours or less should be the standard for ED boarding.

Misunderstanding of the Issue

The widely adopted framework categorizing causes of ED crowding detracts from the ability to appreciate the fundamental health system conditions that lie at the root. The accepted paradigm

Table 1. Causes of ED Crowding

Cause	Comment
Health System Level	
Financial structure promotes hospital crowding	Hospitals must keep inpatient capacity beyond ability to maintain efficient operations
Decreased national inpatient capacity	Inpatient capacity per 1,000 population has dramatically decreased year over year since 1975; 37% of 1975 capacity ^{11,12}
Lack of primary care capacity	Broader access would decrease ED visits and hospitalizations from acute deterioration of chronic disease
Lack of national/local capacity for: Skilled nursing facilities Rehabilitation Respite	Inpatient beds occupied waiting for placement leading to hospital crowding
Lack of access Psychiatric services (inpatient and outpatient) Addiction services (inpatient and outpatient)	Patients can board in ED for days awaiting placement
Lack of access related to underinsurance	Results in preventable ED visits and hospital admissions from deteriorating chronic conditions
Hospital Factors	
Lack of leadership alignment and priority	Lack of priority and urgency at all levels of hospital administrations and services undermines likelihood of success of any intended solution
Hospitals not structured to meet 24-7 operational demand	Operations are intensive during standard business hours, resulting in a mismatch with inpatient capacity needs throughout the week
Lack of primary and after-hours care options	Limits patient access; leads to potential deterioration of acute and chronic conditions leading to increased ED visits and hospitalizations
Lack of inpatient nursing, (especially related to Covid-19)	Forces closing of licensed inpatient beds, further decreasing hospital functional capacity
Crisis fatigue	Frequent ED crowding is a tolerated reality and solutions are outside of routine normal operations
Infection control impact on space and patient dwell time	Covid-19 regulations required major limitations of ED space, patient flow, closing of hallway beds, etc.
ED Input Factors	
ED volume	Surges in volume occur, particularly the day following weekends and holidays
Lack of schedule flexibility of PCPs	Inability of PCPs to see patients in timely manner results in possibly unnecessary ED visits
Preference to send patient to ED for workups	Both PCPs and specialists send patients to ED as imaging, laboratory ancillaries, and consults are readily available within a few hours, compared to delays of days or weeks
Preference to send "elective" admissions to ED for processing	Clinicians don't want patients waiting in "admitting" area until bed becomes available. Much of the work that takes days in a hospital is accomplished prior to admission in ED. Some insurers will not cover "elective" admissions but will cover "emergency" admissions.
ED Throughput Issues	
Increased patient complexity	Requires increased time and resources
Increased availability of time-intensive technology	Increased use of imaging (ultrasound, CT, and MRI) increases patient evaluation time
Teaching mission	AMCs are traditionally inefficient due to real-time teaching. This assertion is not uniformly accepted.
Laboratory, radiology, consultant delays	Inefficiencies in these areas delay decisions
ED nursing shortage and turnover	Burnout is high among ED nurses. Shortage results in bed closure or inefficiencies. Turnover requires much in-servicing of less-experienced nurses.
EMR time demand	EMR documentation requirements have paradoxical negative impact on physician and nurse efficiency
Multiple simultaneous provider distractions	e.g., EKG reads, referral calls, non-beneficial abnormal lab calls, etc.

ED Output Factors	
Access block	High hospital census or operational inefficiency prevents bed availability
Inefficient transfer process from ED to inpatient unit	e.g., inpatient nurses may not take report at key times of the day or when they are busy
House staff training needs	Timing on length of teaching and rounds blocks admission availability
Time of inpatient discharges	Inpatient discharges often occur very late in the day/early evening; by then, the ED is backed up
Inpatient bed informal set-asides (blocking)	Some services “save” available beds for specific types of patients
Failure to address end-of-life care	Patients with truly futile conditions linger in ICUs and other inpatient beds

T1. Centers for Disease Control and Protection. National Center for Health Statistics. Hospitals, beds, and occupancy rates, by type of ownership and size of hospital: United States, selected years 1975–2015. Accessed August 12, 2021. <https://www.cdc.gov/nchs/data/abus/2017/089.pdf>. T2. American Hospital Association. ARCHIVED: Fast Facts on U.S. Hospitals, 2019. Accessed August 12, 2021. <https://www.aha.org/statistics/2020-01-07-archived-fast-facts-us-hospitals-2019>. Abbreviations: AMC = Academic medical center, PCP = Primary care physician. Source: The authors

classifies ED crowding causes as *Input*, *Throughput*, and *Output* factors (Table 1).⁹ Solutions targeting these categories may be somewhat helpful, but are mostly tangential to the elemental systemic and largely economically driven issues.

To appreciate the misunderstanding associated with this issue, consider these points:

First, the very term *ED crowding* suggests the problem lies with ED management, inadequate ED size, staffing issues, or staff and provider competency. While some of these may be factors in a few institutions, the main cause of crowding is inpatient access block.

Second is the misperception that many ED patients do not really need acute services and could be cared for in other settings. It is a strongly held tenet that the patient should define whether an emergency exists, and not apply retrospective criteria as to whether an emergency, indeed, existed. For example, many patients present to the ED with chest pain. Most do not have an acute time-sensitive condition. However, neither the patient nor the treating team can ascertain whether the chest pain represented a serious condition until it has been seriously evaluated. While some patients with limited access to health care use the ED for all medical conditions, this is usually for multiple reasons. One of these is that, indeed, alternate, readily available sites are often lacking⁶ and in response, many EDs have formed effective and efficient programs for lower-acuity patients with dedicated space not appropriate for sicker patients and a dedicated staff suited for such patients. In any case, focusing attention on ways to decrease lower-acuity ED visits diverts administrative energy from addressing the real issue — excessive boarding functionally decreases ED size (Figure 1). It is important to underscore that diverting low-acuity patients to alternate sites does not decrease admission demand⁵⁰ or impact boarding.⁵¹

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Third, it is assumed — wrongly — that patients who LWBS (i.e., have been triaged but left before detailed evaluation) have trivial conditions. In fact, a large number of such patients require immediate attention, with 13%–18% returning within 1 week and 5%–11% requiring admission or emergency surgery⁵²⁻⁵⁴ and having bad outcomes.⁵⁵

Finally, prolonged ED waits and boarding are often viewed as an inconvenience but not a harm.⁵⁶⁻⁵⁸ It is challenging to identify or quantify the contribution that crowding or delay in emergency care might have had on any given patient. For example, certain time-sensitive actions are standard of care for patients with sepsis. However, patients deteriorating in the waiting room would not have time-sensitive metrics started until sepsis is clinically considered. Hence, poor outcomes resulting from crowding-associated delays in care remains inapparent and likely underestimated. Consider that in most of our institutions, the root cause analysis (RCA) process for determining source of errors rarely considers, but rather routinely elides, ED crowding as a contributing cause, let alone a major cause. Even when recognized, the RCA process rarely leads to addressing crowding through any particular recommendation.

ED Crowding: The Tragedy of the Commons

The *Tragedy of the Commons* plays out in the ED.⁵⁹ The ED is often considered a shared resource, where agents acting according to their own self-interest behave contrary to the common good. The ED is considered by many clinicians to be a “common” resource, where their patients can receive rapid evaluations, stat lab results, same-visit consults, and full workups.

In many of our institutions there is a sense that risk of harm is better concentrated in the ED than distributed throughout the hospital. As each service/unit is responsible for their safety profiles, there is no alignment of interest to distribute — and thus overall decrease — risk across the system. The result is a perverse form of geographic risk-pooling in the ED, which is perhaps the most hectic environment in the hospital. Further, there is increasing reliance on the ED for extensive patient workups and specialty consultation that historically occurred in the inpatient or outpatient setting.⁷

There has been a profound shift of management and evaluation activity that historically occurred on inpatient services following ED admission. It is true that the ED is a “stat” environment where many consultations, rapid lab and radiology turnaround, and social work interactions occur in short order. This preference for ED-based workups and full stabilization has over-burdened the ED and resulted in significantly increased active bed dwell times.

While elective admissions were largely absent during the initial wave of the Covid-19 pandemic, it is our common experience that when elective patients cannot be readily directly admitted due to lack of available beds (i.e., due to hospital crowding), many physicians will often send their patients to the ED for admission processing anyway, contributing to ED boarding. Similarly, because resources in the ED appear readily available and are comparatively efficient, there can be a preference by some providers to send patients to the ED expecting a speedy detailed evaluation that could have been scheduled for an outpatient setting.

Solutions to ED Crowding

We are not aware of any examples of EDs in the United States that have relieved ED crowding without highly visible involvement of institution leaders at the topmost leadership level.²⁶ Even with such high-level oversight, efforts are hard to maintain, as required actions often run counter to financial realities and local culture of maintaining inefficient inpatient census, and inpatient and ancillary services cannot readily absorb the incremental burdens many of the solutions impose. For example, frequent canceling of elective procedures, denying acute transfer referrals, frequent operationalization of surge plans, disruptions to teaching programs, expectations of higher efficiency of ancillary and support services without financial investment, and imposition of other priorities among institutional leaders often impairs the best intentions. Thus, operational maintenance of anti-boarding measures readily fatigue or are difficult to implement in the first place.⁶⁰ However, we aver that many of the pragmatic solutions discussed below — such as surgical schedule smoothing and earlier-in-the-day and weekend discharges — would allow more patients per bed per year, recovering of LWBS or seen-and-left (SAL) patients with their associated incremental revenue to cover the costs of implementation of a comprehensive solution program.

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That said, there are practical solutions that offer considerable relief if implemented. Because ED crowding is largely an issue of inpatient capacity and its management, the mainstay of successful initiatives relies on definitively addressing this problem. However, there are several means of improving ED efficiency as well.

Proposed solutions to ED crowding have been implemented with varying degree of impact. Those particularly impactful are noted as such in Table 2.^{6,61}

Although potentially difficult to achieve without health care reform, a key metric is for each hospital to establish its optimal census threshold. The effective target is likely 85%–87%. Inpatient occupancy is typically calculated as “heads in beds.” It is important that the occupancy be calculated correctly. Occupancy calculated at midnight, which may coincide with a nadir, can be misleading if average hourly occupancy is, in fact, much higher. It can also be misleading if it includes obstetric beds, as turnover on that service can be high. Hospitals prone to crowding from high occupancy may have census of greater than 100%, when there are more people admitted than available inpatient beds. Finally, occupancy may vary considerably on various services, but is typically a problem on medical floors, psychiatry, and ICUs. Solutions can thus be targeted census issues on key services and implemented through operational change or efficiency to reach an occupancy goal that is calculated as a meaningful and accurate metric.

Table 2. Traditionally Offered Solutions to ED Crowding

Traditional Responses (Tactics)	Comment
ED Input	
Establish UCC nearby	No impact on boarding , unlikely to affect underinsured or ED volumes
Triage low-acuity patients out	No impact on boarding , need alternate venue; EMTALA
Extend primary care hours/availability	Helpful , may incur costs; may enhance control of chronic disease and thus avoid admissions
Ambulance diversion	Not helpful , hurts patients, may needlessly lose revenue
ED Throughput	
Physician/provider at triage	No impact on boarding , decreases ED LOS for discharged patients; decreases LWBS; may identify higher-acuity patients earlier but waits for treatment thereafter persist; unnecessary testing may occur due to restricted physical exam of the patient
Bedside registration	A best practice. Minimal to no impact on boarding. Streamlines operations — may decrease ED LOS for discharged patients
Creation of fast tracks	No impact on boarding , some additional costs
Improving ancillary turnaround times	No impact on boarding , decreases LOS of non-admitted patients, may lead to shorter decision time
Increased ED staffing	No impact on boarding , helpful for overall LOS if initially understaffed; there is a limit due to space constraints; may assist with admitting patients, leaving appropriate numbers of nursing available for undifferentiated new patients Case managers are helpful with facilitating some follow-up admissions, thus avoiding admission
Increasing ED size (redesign, more beds)	Not helpful , costly, may make boarding worse by increasing the number and duration of boarded patients
Increasing ED size (adding hallway beds)	No impact on boarding , costly staff addition or stressed staffing ratios, privacy issues. Except for rare exigencies, hallway beds are not appropriate in any location, including ED and inpatient units.
Inpatient unit to manage ED boarding patients	No impact on boarding , may make it worse
Availability of after-care clinics with evening hours within 48 hours of ED discharge	Very helpful in preventing some admissions; allows for safe ED discharges and known early follow-up
Discharge nursing calls	Possibly helpful. Allows for checking on patients for specific indications and helping with follow-up care, etc. Allows for more safe ED discharges knowing follow-up nurse will call. Abandoned in some centers as costly, time-consuming; low yield as many patients cannot be reached.
Discharge lounges	Possibly helpful if done properly; requires increased staffing, and handoffs to staff unfamiliar with patient
Output (Hospital-Based Solutions)	
Availability of inpatient ancillary services off-hours (evenings and weekends)	Helpful ; when 7 days a week to place patients, secure outpatient services, and decrease inpatient LOS
Hospital operations 24-7; smoothing elective admissions and surgeries	High impact. Hospitals can no longer run 4.5 days a week with increasing LOS; procedures and consults must be available throughout the entire week, not front-loaded to early in the week.
Opening unstaffed beds	Very helpful ; functionally increases inpatient capacity. Increased costs may be offset by increased revenue in some settings.
Redistributing inpatient service beds (e.g., from surgery to medicine)	Very helpful when high capacity, otherwise prevents cohorting patients, as was necessary during Covid-19 surges
Temporary boarding on inpatient hallways	Proven effective ; patient preferred; decreases both ED and inpatient LOS. Having teams see patients needing beds often helps with expediting discharges and cleaning services; may be impractical during pandemic infection control measures.
Admitting service (MD, nurses, or both), provide care for the admitted patient in the ED	No impact on boarding ; ED remains functionally undersized. Helps free up ED staff. Improved care for boarded patients while in the ED and by virtue of receiving in-patient care as soon as admitted in ED; may avoid increase in hospital LOS often associated with boarded patients
Stop elective surgeries/procedures and transfers	Minimally helpful as generally implemented after crowding occurs; may lose revenue; possible patient safety risk from delayed care.
Bed czar with authority	Helpful ; more efficient, dispassionate, agnostic bed allocation. Was useful during Covid-19 surges.

Output (Hospital-Based Solutions)	
Align inpatient discharges to admission demand	High impact; a best practice, usually requires earlier inpatient discharge, may require incremental resources; requires academic centers to delay teaching and focus on discharges early
After-care appointments made within 48 hours of discharge	Helpful; allows for earlier discharges with someone checking on patient, medications, and response to therapies upon discharge

Abbreviations: EMTALA = Emergency Medicine Treatment and Labor Act, LOS = Length of stay, LWBS = left without being seen, SOC = standard of care, UCC = Urgent care center. Source: The authors

Although we next sequentially discuss *ED Input*, *Throughput*, and *Hospital-Based* solutions, it should be noted that many ED-based solutions do significantly improve ED operations and patient flow within the ED, but most do not address boarding and crowding. Thus, meaningful solutions are at the institutional level.

ED Input Solutions

Most input solutions are aimed at keeping patients out of the ED and creating or extending other venues of care. Most of these are of limited value with respect to boarding or crowding. Of these, we judge availability of primary care and extended primary care hours to be most effective for two reasons. First, availability of appropriate and timely primary care follow-up can avoid hospital admission. Second, availability of primary care improves health maintenance and decreases likelihood of deterioration of both acute and chronic conditions into emergencies.

Several previously tested and proffered solutions have been found to have limited to no impact. For example, keeping low-acuity patients out of the ED does little to alleviate boarding or crowding. It is true that the practice of triaging patients (usually underinsured) out of the ED when it is determined they do not have an emergency has been found to be achievable without adverse effects. However, it is generally unpopular with both patients and even providers. This practice has largely been abandoned. The effort to determine if an emergency exists requires considerable effort and time in its own right, even for seeming low-acuity complaints. Thus, many EDs have created “fast tracks” or rapid evaluation programs. While effective for decreasing ED length of stay (LOS) to some extent, such programs have no impact on boarding.⁵¹

Keeping low-acuity patients out of the ED by establishing nearby urgent care centers (UCCs) has also been shown not to be effective in reducing ED crowding. UCCs may offer options for insured patients, but do not uniformly decrease ED volumes⁶² and in the experience of many of us, may lead to an increase. Again, care of low-acuity patients does not impact boarding. Another strategy, ambulance diversion, is not only ineffective,⁶³ but promotes patient harm from delayed care, denying the patient the benefit of care from providers knowledgeable about their condition, and delays availability of the ambulance for the next patient.^{64,65} It also disturbs institutional goodwill relations with emergency medical services (EMS). Diversion may also preclude an important source of revenue.⁶⁶ The only positive aspect of ambulance diversion is that its announcement broadly within the hospital can be used as a marker of crisis conditions in the ED and to trigger appropriate surge actions discussed below.

“

It should be noted that many ED-based solutions do significantly improve ED operations and patient flow within the ED, but most do not address boarding and crowding. Thus, meaningful solutions are at the institutional level."

Distinct from individual hospitals placing themselves on ambulance diversion is a new voluntary 5-year payment model by the Centers for Medicare & Medicaid Services (CMS): [Emergency Triage, Treat, and Transport ET₃](#) for Medicare fee-for-service beneficiaries calling 911. In this model, CMS will pay participants to transport to an alternative destination partner, including primary care offices, UCCs, or even community mental health centers. In and of itself, ideally, only low-acuity patients would be transported to other settings and, thus, no significant impact on ED crowding from boarding is expected. Indeed, we have apprehension about Medicare patients being sent by ambulance to nonemergency care settings given the occult medical vulnerabilities of such patients and the high rates of needed hospital admission associated with ambulance transports.

ED Throughput Solutions

Throughput solutions concern themselves with ED operations efficiency. The literature indicates that a comprehensive approach does shorten ED dwell times for admitted patients and decreases inpatient mortality.⁶ Operational efficiencies include early physician involvement or physician at triage, creation of fast tracks/flexible care areas, improving ancillary turnaround times, implementing parallel operations such as bedside registration, and putting in place standing nurse-initiated protocols not requiring physician orders.

Some operational changes may improve efficiencies but have little impact on boarding or ED crowding per se. Improving front-end operations — particularly physician involvement in triage — appears to be effective in reducing ED LOS for at least discharged patients, but often leads to unnecessary testing that increase health care costs. Impact on ED-admitted patients is variable depending on local customs, as admission services often request additional workup to that initiated during the *up-front* process. Placing physicians or other licensed providers at triage invariably improves LWBS and patient safety. However, improving LWBS by this manner merely squeezes the balloon, as previous LWBS patients are now screened, but ultimately asked to wait in the waiting room until a bed in the ED becomes available. Many of these patients leave from the waiting room and now have a new designation, *seen and left* (SAL).

Maintaining ED morale among nursing is paramount. Burnout and poor morale lead to nurse callouts, often leaving holes in the schedule and forcing nurses to become inefficient and overextended or further decreasing the functional size of the department by needing to close ED beds. Thus, more sick patients wait in the waiting room. Institutions should particularly pay attention to ED nursing staffing and value those with seniority by offering more flexible staffing models and other retention strategies. A sense of daily hopelessness often leads to a high rate of callouts.

Many EDs have increased functional ED capacity by designating ED hallway space (despite the serious privacy and HIPAA issues that creates). There is no other setting in health care where placing patients in public hallways is considered routinely acceptable. Some institutions have invested in expanding ED size and thus staff. However, there is minimal to no impact on LWBS, and this practice may actually increase boarding, as inpatient inefficiencies remain unaddressed and urgency to move ED admitted patients to the wards is relieved.^{67,68} We believe the increased finances required to expand ED coverage is just as well put to improving hospital efficiencies. Finally, some institutions have instituted inpatient unit management of ED boarded patients. While minimal decrease in inpatient stay has been observed, there is either no impact or worsening boarding.²⁰ This practice has little value if the nurses in the ED remain the dedicated patient care resource. This practice, however, may provide improved safety if the inpatient team (RN and MD) fully manage these patients.

Hospital Solutions to Relieve Access Block (Output)

Output solutions are largely outside the control of the ED and are unlikely to be implemented without institutional senior leadership's visible engagement.⁶ Operational changes to consider include: expansion of functional hospital capacity, making inpatient ancillary services available 24-7 (i.e., including off-hours), smoothing surgical schedules, centralizing bed control with authority (bed czar), establishing electronic dashboards, addressing nursing (ED-to-inpatient) handoff-report "lock-outs," synchronizing inpatient discharge with admission demand, implementing strategies to decrease inpatient length of stay, placing ED-admitted patients in inpatient hallways, and implementing TJC 4-hour boarding standards. Several of these are particularly helpful.

One effective solution that is often resisted is that of moving ED boarding patients to inpatient hallways. This practice has been shown to not only decrease ED length of stay, but also to decrease inpatient LOS by a day without any adverse outcomes.^{6,69} Further, patients preferred to board on inpatient hallways to staying in the ED.^{70,71}

Smoothing of the surgical schedule throughout the entire week has been shown to have a major impact on crowding and overall hospital operations.^{37,38} Hospitals often start each week with a heavy surgical schedule, straining if not outright overloading capacity. Surgical volumes typically trail off as the end of the traditional workweek approaches, resulting in hospitals being above capacity during the week and below capacity on weekends.



Maintaining ED morale among nursing is paramount. Burnout and poor morale lead to nurse callouts, often leaving holes in the schedule and forcing nurses to become inefficient and overextended or further decreasing the functional size of the department by needing to close ED beds."

Table 3. Core Solutions and Key Actions Addressing ED Crowding

Core (Root) Solutions	Comment
ED crowding must be acknowledged as a serious patient safety issue by medical leadership, regulators, payers, and legislators.	Crowding is not an inconvenience
Health care financing should realign reimbursements that currently promote ED boarding. Payers and health care finance regulators should ensure that reimbursement considerations avoid forcing high hospital occupancy.	Absolute requirement
Regulators must address the inpatient and post-discharge facility capacity issues.	To alleviate discharge block
Addressing crowding must become a top institutional priority with visible, committed leadership and aligned incentives.	All personnel must experience the urgency and commitment of institutional leadership
Enforceable preemptive surge plans must be generated and actuated.	Surges are predictable. Implementing surge plans after crisis stage is reached has minimal short-term impact.
Key Actions	Comment
Regulators, payers, and legislatures should establish actionable expectations, including publicly reported quality markers for hospitals regarding allowable ED boarding.	Lack of consequences may reduce urgency.
TJC and other regulators should develop and enforce clear and consistent rules regarding ED crowding.	Lack of meaningful regulations and enforcement leads to complacency.
When severe ED crowding does occur and boarding is the major cause, response should be similar to a disaster response.	Severe ED crowding is essentially a disaster in terms of ED function. Altered standards of care should be invoked to promote overall optimal patient safety.
Crowding is predictable. Institutions should develop enforceable preemptive crowding surge plans.	Many existing surge capacity plans lack leadership commitment and are not enforced; surges are predictable. Implementing surge plans after crisis stage is reached has minimal short-term impact.
Hospitals should budget inpatient occupancy <85%.	Efficiency breaks down and boarding is all but assured beyond this threshold, regardless of other measures.
While less than 2 hours of boarding should be the benchmark, adherence to 4 hours for 90% of admitted patients should be the minimum universal standard for all institutions.	The standard metric should not be the median or mean. A large proportion of patients should meet the standard.

Abbreviations: TJC = The Joint Commission. Source: The authors

Another effective operational change is to better match inpatient discharges with ED demand.³⁸ Inpatient discharges often occur significantly later in the day, sometimes deep into the evening. By then there is considerable pent-up demand for admission beds from the ED, and the ED is long overwhelmed. In many institutions, patients are not readily discharged on weekends and backup extends well into the first part of the week. Developing health care partnership with skilled nursing facilities, rehabilitation, respite, etc., can facilitate weekend discharges.

Augmenting support services, such as lab turnaround, inpatient room turnaround (cleaning of rooms), and the availability of social work, physical therapy, and occupational therapy evaluation on weekends would allow more rapid turnover of inpatient beds.

Many hospitals trigger action plans when severe ED crowding occurs (e.g., cancelling elective admissions and surgeries, and preventing transfers).⁶⁷ Impact is delayed and then only moderately effective if surge plans are only implemented after the fact. Additionally, in our experience, even when triggered, most of these plans are not well executed or monitored. Indeed, crowding occurs so frequently there is crisis fatigue; the authority and responsibility for implementation of surge plans is often lacking, and the plans are not proactive or preemptive.⁴ Daily ED and hospital patient demands are highly predictable events.^{41,72} Preemptive institutional actions should trigger whenever early warnings indicate imminent crowding.

We believe that when significant crowding does occur, (despite preemptive procedures) appropriate actions should be seen in the same ethical paradigm as a disaster response.⁷³ During times of severe crowding, alternate standards of care could be considered to allow early inpatient and ED discharges to occur.^{73,74} This concept is termed *reverse triage*.⁷⁵ The ethical tenet underlying this concept is discussed in detail elsewhere,⁷⁶ but rests on the principle of the greatest good for the greatest number. This solution is either rarely discussed or only in passing. From both an ethical and risk perspective, all patients in the system (in beds and needing inpatient beds) are evaluated in terms of who most needs the resource. Such action is intended to lower the overall patient harm risk in the institution by creating capacity for higher-risk patients in the whole system. In the age of artificial intelligence and machine learning, one can imagine that in the future each patient (inpatient and ED) would have a prediction risk score (for preventable bad outcome) and need for key resources that is continuously updated to better allocate inpatient beds and identify patients at low risk of bad outcome for an earlier discharge. This concept is already integrated into routine practice. Machine learning has been shown to be superior to conventional triage in identifying patients with time-sensitive conditions on presentation to the ED.⁷⁷

Core Solutions, Key Actions

In the previous sections we discussed the merits of practical, actionable solutions that institutions can implement. In this final section we emphasize the importance of key principles, many of which may take considerable time to bring about (Table 3).

Here are five essential elements to take on overcrowding in the ED:

1. *ED crowding must be acknowledged as the serious problem to patient safety* that it is — and not the “inconvenience” it is perceived to be.
2. Most important, there are no known examples of successful amelioration of ED crowding in any institution without *significant visible buy-in and action directed from senior-most institutional leadership*. This commitment must be continuously evident with incentives of management at all levels throughout the institution and aligned to resolve this most important patient safety concern.
3. Many institutions operate on razor-thin margins. *Health care financing must realign reimbursement from current practices* that outright promotes ED boarding.
4. *Regulators such as TJC and CMS must clearly address the impact of crowding on patient safety, its potentiation of violence, and its implications for staff well-being*; likewise, the Accreditation Council for Graduate Medical Education should consider the impact of crowding on training and trainee well-being within their credentialing criteria of institutions. The regulations should include clear metrics and associated penalties/consequences.
5. Crowding is predictive and, accordingly, *enforceable preemptive surge plans must be generated and actuated*. When crowding does occur, it must be considered in the same light as a disaster with the same deliberate moral response.

Looking Ahead

ED crowding with its attendant patient safety risks remains a significant problem in many U.S. hospitals, particularly AMCs. The Covid-19 pandemic has intensified ED crowding due to necessary infection control processes alongside the pace of normalization of hospital operations, itself driven by the need to respond to pent-up demand for health care, delayed by the pandemic. ED crowding is predictably inevitable when inpatient census is sustained at unworkable levels. Hospital crowding itself is related to financial drivers that require very high inpatient census and financially incentivized preferential queuing of revenue-generating patients over admissions from the ED. Shortages in health system capacity in primary care, after-hours outpatient services, specialty referrals, and lack of post-acute care facilities, all contribute to hospital crowding.⁶

Even in the absence of pandemic-related constraints, unless the health system is reformed and health care/hospital financing leaders address the capacity pressures that are resulting in high hospital census, then ED crowding and its attendant patient safety risks cannot be successfully alleviated. Addressing ED crowding must be considered a moral imperative.²⁶

Like the ailing canary in the coal mine, ED crowding is a symptom of health care system dysfunction. The canary's condition is critical. Without action, patients will continue to be at a heightened risk of harm. Time for real action is now.

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Disclosures: Gabor D. Kelen, Richard Wolfe, Angela M. Mills, Deborah Diercks, Susan Stern, Michael C. Wadman, and Peter E. Sokolove have nothing to disclose.

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