Hardwiring hospital-wide flow to drive sustainable competitive performance

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Abstract Healthcare leadership requires the ability to become a high-quality, low-cost provider by doing more with less in an increasingly capacity-constrained environment. One of the most powerful tools to accomplish this is hardwiring hospital-wide flow. Flow is adding value to, and reducing or eliminating waste in, processes, services or behaviours, by increasing benefits, decreasing burdens — or both — as patients move through the service transitions and queues of healthcare. Applied as a discipline, flow assures that the right resources are provided to the right patient in the right environment for the right reasons at the right time — every time. The tools of patient flow include the disciplines of

demand-capacity management, identifying and eliminating bottlenecks and constraints, intelligent and strategic bed management, and applying the science of service operations. Accelerating flow into, through and out of the hospital should be applied from the emergency department, through hospital-wide flow, as well as in surgery and anaesthesia. Doing so provides substantial financial and operational results.

KEYWORDS: patient flow, lean, value, waste, demand-capacity management

INTRODUCTION: DEFINING FLOW IN HEALTHCARE

It is often noted that healthcare is in the middle of cataclysmic change. Doing more with less in an increasingly capacity-constrained environment is not only a feature of high-performing healthcare systems, but also a necessity for survival. And yet, as accurate as that insight is, change is always 'cataclysmic' to those who are 'being changed'. Changing their workplace, their resources, the metrics by which success is measured, and the very processes constituting their daily work makes for turbulent times for everyone who works in healthcare. Simply stated, change is never easy, particularly in a service-oriented business with measurable scientific outcomes. Add the need to 'do more with less', as the Institute for Healthcare noted in defining patient flow,[1] and it can make for a harsh prescription for those actually providing bedside care, as well as for those who lead and manage such care, unless the right tools are available. One of those tools is the ability to hardwire hospital-wide flow.

Becoming high-quality, low-cost providers of care is a constant challenge for all healthcare leaders and managers. In fact, the dissonance between healthcare workers' perception of the resources available to them and the metrics expected of them is one of the primary causes of burnout.[2] Simply stated: 'The way we are working . . . is not working'.

Those who are familiar with the work of Dr Paul Batalden would not be surprised by this. In one of the least understood but most widely quoted statements, Dr Batalden summarised healthcare's current dilemma (adapting the thoughts of Arthur Jones[3]): 'Every system is perfectly designed to get precisely the results it gets'.

Are your current results, metrics, turnover rates, patient experience scores, patient safety markers, clinical guideline compliance, etc where you want them to be? If so, you have a great system that may be 'perfectly designed' to get those results. But for most of us there is a substantial 'delta' between where we are and where we want to be on performance and the strategic deployment of the resources requisite to obtain that performance. If we are in that category, Batalden's fundamental insight is that the very nature and fabric of the system itself (not just the components of the system) must change if we expect different results. And the sad fact is that too few healthcare leaders and managers are ready to completely change the nature and fabric of the processes by which care is provided to get the better results to which we all aspire.

One reason for that dilemma is that we feel that healthcare is extremely complicated. Indeed, no less a leader than Peter Drucker noted, 'The hospital is altogether the most complex human organization ever devised'.[4] (Sadly, Drucker did not live long enough for us to gain the full focus of his insights on healthcare, as this quote came only 3 years before he died.) And, while he is clearly correct, consider this: we have had the opportunity on several occasions to observe US Navy and Marine aircraft operations off

the flight decks of nuclear aircraft carriers. The dizzying array of personnel and aircraft movements is complex, sometimes confusing, and captivating. But closer examination shows that it is subject to detailed, highly consistent processes, provided by a cascade of people with disparate levels and types of education and training, yet all of this results in predictably safe and efficient flight. (In their original work on high-reliability organisations, Weick and Sutcliffe referenced both naval aircraft operations and emergency departments.[5]) Perhaps healthcare is not so unique when it comes to the complexity of operations provided by those with widely varying educational backgrounds.

Nevertheless, another reason that facing cataclysmic change in healthcare is difficult is that many organisations have not embraced a full understanding of one of the best tools to change systems in a practical way — the science, art and business of patient flow. Healthcare may define flow as 'adding value and eliminating waste to processes, services, or behaviours by increasing benefits, decreasing burdens (or both) when applied to the movement of our patients through our service transitions and queues'.[6] Defining flow as adding value and eliminating waste indicates that ours is a lean definition of flow, relying as it does on value and waste as important components. Indeed, our organisation is one with a deep commitment to lean concepts, but formal lean training is not necessary to use this practical definition of flow.

'Value' in healthcare, however, requires a more practical definition than the one traditionally given it — one that can be used by bedside clinicians to make decisions based on their assessment of value. In most formulations, value is defined as a ratio of outcomes divided by the cost to attain those outcomes (Value = Outcomes/Cost). The literature on defining healthcare outcomes is increasingly helpful in setting metrics around desired states, although it is still very much in evolution. 'Cost' is still a troublesome and vague concept to most clinicians — it works on the macroeconomic level of healthcare, but offers less utility for most clinicians. For example, what is the cost of obtaining an MRI scan for a patient? When we have asked physicians and nurses that question the responses varied from 'I don't know — I never thought about that' to 'several thousand dollars'. The latter answer, however, is not really the cost of one additional magnetic resonance imaging (MRI) scan; it is the charge, including both the facility fee and the professional fee component. The actual marginal cost of an MRI, once the scanner has been purchased and is operational and the radiologist is there to interpret it, is substantially lower than most appreciate. Unless we can reliably determine true costs versus charges, any formulation of value as being a ratio of outcomes divided by costs is incomplete and misleading.

For that reason, we define value in the flow equation as a ratio of benefits received versus the burdens endured in the process of receiving those benefits, because that drives value to the bedside in a way clinicians can not only understand, but upon which they can have a substantial impact, as Figure 1 shows.

Defining flow in this way helps leaders, managers and bedside clinicians understand that they are 'flow detectives', in search of ways to increase value, while also identifying

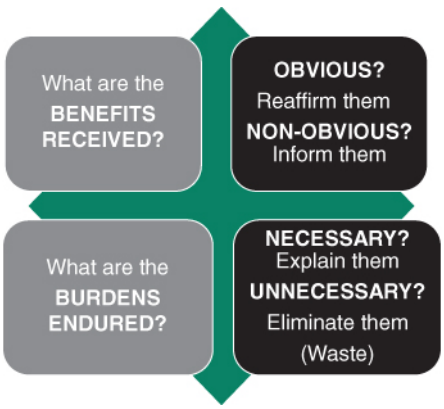

Figure 1: Value is defined as a ratio of 'benefits received' versus the 'burdens endured' in patient care
Source: Authors.

and eliminating waste. Our experience is that empowering staff to add value and cut waste results in a much broader and enthusiastic acceptance of flow, as opposed to saying, 'Listen, you're going to have to do more with less'.

Using this practical definition of value and waste helps the team understand that there are six 'Rights' comprising effective flow:

1. The right resources for . . .
2. The right patient in the . . .
3. The right environment (bed) for . . .
4. The right reasons (evidence-based) at . . .
5. The right time (flow metrics) . . .
6. Every time (reliability and consistency).

WHY IMPROVE FLOW?

Nietzsche noted that 'He who has a strong enough "Why" can bear almost any "How"'.[7] That is true in healthcare as well as life, writ large. Communicating the reasons for moving to flow-based processes requires, at a minimum, two fundamental insights that must be communicated to those involved in change efforts. First, changing systems and processes requires the input of those actually providing the service — their voice must be heard at every stage of the redesign. As the saying goes, 'If they're not with you on the take-off, they won't be with you on the landing'. Flow initiatives that do not include the active input of the staff simply will not work in either the short or the long term. If people feel they have been the authors of redesigning processes and systems, however, they are far more enthusiastic. Most people do not mind change, they mind being changed.

Nietzsche's wisdom is the second insight. The best 'Why' in healthcare combines better patient care with the ability to make our jobs easier.[8] Intrinsic motivation is a far better catalyst for change than extrinsic drivers.

Certainly, the team needs to understand the realities of our changing healthcare environment, particularly as we move from volume-based to value-based reimbursement systems, and it is the job of leaders and managers to make that clear. But it is also important that staff realise, as we noted at the outset, that the way we are working is not working all that well — for us as well as the patients.

Start with the refreshing insight that we can choose to change systems, processes and behaviours in ways that are better for the patients and ourselves. And then share the data from our and others' experience that flow has many additional benefits:

- Improved financial return by increasing capacity
- Shortened time intervals by eliminating waste
- Identification and removal of bottlenecks
- Improved patient and clinician experience
- Increased safety by reducing non-value-added variation
- Improved clinical outcomes and reliability
- Reduced costs by decreasing non-value-added steps
- Easier jobs for us

Our experience is that making the case for flow should certainly include the business case for flow (Figure 2), but it should also be made clear that it creates additional capacity while making the job easier for those who directly care for patients.

IMPORTANT FLOW TOOLS AND INSIGHTS

Demand-capacity management

In our capacity-constrained environment, where we must 'do more with less', healthcare leaders and managers must utilise the concept of demand-capacity management (DCM), which focuses on five essential questions:

- Who is coming?
- When are they coming?
- What are they going to need?
- Will we have it?
- What will we do if we do not?

The answers to each of these questions should be based not on opinion or personal experience, but on data dashboards, rigorously collected and analysed over time. 'Who is coming?' gives the answer to how many patients should reasonably be expected to arrive at each clinical unit or entity, based on historical data and trends. 'When' tells the team the times of day and days of the week that these patients should be expected. 'What' tells us their specific acuity needs, again based on historical data. For example, if a hospital's cardiothoracic surgeons all have their 'block time' on Mondays and Tuesdays, the ICUs can reliably predict their staffing needs will be high from Monday afternoon until at least Wednesday. Those acuity needs can be 'smoothed' if the surgery is scheduled differently, as we will discuss later. 'Will we have it?' is a recognition that using data to predict capacity is a fundamental skill requisite for success in healthcare. At times, we will simply not have sufficient capacity. Examples include patients boarding (ie waiting in corridors for an inpatient bed for more than 1 hour) in the emergency department (ED), closing beds because of nursing shortages, inadequate behavioural health resources and long delays for outpatient appointments. Finally, 'What will we do if we do not?' recognises that if we know that demand will exceed capacity, it is important to develop contingency or surge plans for the demand-capacity mismatch, or

ER Patients	Results
40,000 ED visits x 1 hr reduction in length of stay	40,000 hours of added capacity/year
40,000 Hours of added capacity/year 2 hours per ED visit	20,000 potential new visits/year
20,000 new ED visits x US$150/visit in physician revenue	US$3,000,000 new revenue for the group
20,000 new ED visits @ US$500/visit for the hospital	US$10,000,000 new revenue per year for the hospital
New hospital admissions at US$3,000–US$7500 per admission	1 more admission per day (365) X US$3,000–US$7500/ patient admission =US$1,095,00–US$2,737,500/year
	(AHRQ — only 6.2% of admissions through the ED are uninsured)

Figure 2: The business case for flow — a case study

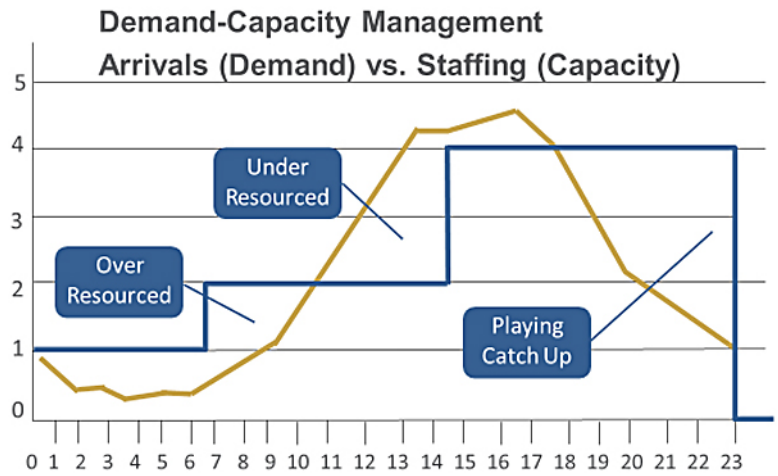

Figure 3: Demand-capacity management

our patients will face delays and potential poor outcomes and safety issues.

Figure 3 shows graphically what many clinicians have experienced: understaffing produces under-resourced units that will eventually have to 'play catch-up' with patient arrivals and acuity.

These basic (but often ignored) insights should be augmented by the use of IT systems that can not only graphically illustrate these concepts, but also guide efforts to change staffing to adjust for DCM mismatches.

As Figure 4 shows, using DCM tools can result in shifting, rather than increasing, staffing to more appropriately meet demand issues. Our physician group uses this proprietary tool in our client hospitals and has found it to be a valuable tool in 'doing more with less'. Sophisticated IT departments should be able to develop similar DCM tools.

'Pull' versus 'push' systems

Understanding the difference between a classic 'push' system, seen in most hospitals, and a 'pull' system is an important aspect of hardwiring flow. Most hospitals have functioned in a 'push' system, where the unit wanting to transfer or admit a patient has the responsibility to push as hard as possible to overcome resistance and obstacles to efficient patient movement into their next phase of care. This is in sharp contradistinction to a 'pull' system, which is designed to motivate the entire inpatient team to proactively 'pull' patients onto the unit they serve whenever they have capacity. This is an important flow insight, since it relies on an understanding of the role of the intelligent use of healthcare's most important resource: the hospital bed (see following).

How can you tell if your hospital is a 'push' versus a 'pull' system? One of the best diagnostics is to visit units and listen to the words and watch the actions of the staff.

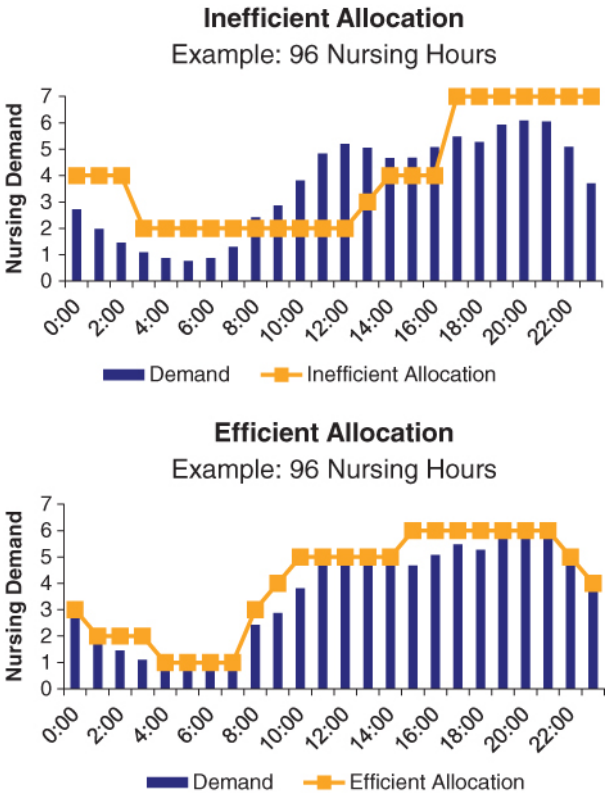

Figure 4: Using demand-capacity tools to improve staffing for flow

'Push' systems language

- 'Do you have a bed?'
- 'Can you take a patient?'
- 'We have six boarders — can you help us?'
- 'We're on rounds — we can't talk right now.'
- 'This is not a good time for us to take a patient.'

'Pull' systems language

- 'I looked at the bed board and saw you have ten boarders in the ED. We can take two, one now and one in 20 minutes.'
- 'What can we do to help?'
- 'We won't have an ICU bed for another hour, but I'll send a nurse down now to help out.'
- 'We're on rounds, but I'll have a nurse break out to take a report and get that patient up here ASAP.'
- 'We have three beds open in Cardiac Short Stay. Do you have any ED patients who are likely to be coming to us, because we can take them now?'

Leaders who are committed to flow should ensure that the culture of the hospital and each of its units is based on a 'pull' ('We have capacity — give us patients') versus a 'push' philosophy ('What do I have to do to get someone to take a patient?').

Theory of constraints and bottlenecks

One of the most fundamental concepts in chemistry is that of the 'rate-limiting step', which is the phase of a chemical reaction that occurs most slowly and therefore limits the speed of the reaction as a whole. Similarly, bottlenecks and constraints exist throughout healthcare as rate-limiting steps to flow. It is up to us as leaders to identify and eliminate them. The following are fundamental aspects:

- Constraints limit performance.
- Focusing on elimination of constraints improves performance.
- In healthcare, capacity cannot be stored . . . but it can be intelligently managed.
- An hour lost at the bottleneck is an hour lost to the whole system.
- An hour saved at a non-bottleneck is of no benefit for the system or the patient.

A simple definition is that a constraint or bottleneck is anything that significantly limits the performance of an organisation or process in moving towards its goal. They fall into two different categories: a weakness in the system or a scarce resource. A physician or lab technician who performs a certain service may be the only one available to do so, for example, and so can easily become a constraint on the system.

The Theory of Constraints is a management philosophy that focuses an organisation's scarce resources on improving the performance of the true constraints — the 'bottleneck' — for fluid flow of products or services. Goldratt[9] uses a chain analysis: a focus on 'chain strength' that strengthens the weakest link in the chain (ie the constraint). Bottlenecks, especially in the healthcare arena, can be fluid, and the journey of a patient into, through and out of the hospital is actually a journey through a network of queues, each with its own set of constraints or bottlenecks. Here are succinct definitions to distinguish between bottlenecks and non-bottlenecks:

- A bottleneck is any resource whose capacity (ability to serve) is equal to or less than the demand placed upon it.
- A non-bottleneck is any resource whose capacity is greater than the demand placed upon it.
- The capacity of the system is thus the capacity of the bottleneck: the slowest process or resource ('rate-limiting') in the service chain governs throughput. Remember that patient care comprises a network of queues and service transitions. A related implication is that

you can reduce the time spent at the non-bottleneck, but not reduce the time spent within the overall system.

The following five sequential steps are a proposed approach to help concentrate improvement efforts to eliminate bottlenecks and constraints and answer these questions: 'What needs to change?', 'What should we change to?', and 'How can we cause the change?'

1. **Identify the System Bottleneck/ Constraint**

   The key here is to identify the part of the system that constitutes the 'weakest link'. Start by looking at the processes that have the highest utilisation and those that take the longest time to complete. If you are unsure which these are, draw a Value Stream Map to help identify the bottleneck.

   - Constraints can be rooms, staff, processes or policy (place, people, performance, policy . . .)

2. **Exploit the Constraint**

   'Exploit' means making every effort to improve the capability in a process before adding new resources or making expensive changes. This is accomplished by reducing variation and eliminating waste in the process.

3. **Subordinate Everything Else**

   A manager should focus most of his or her efforts on improving the bottleneck. Remember, improving a non-bottleneck is a mirage.

   - Align every other part of the system to support the constraints even if this reduces the efficiency of non-constraint resources: standard work, support, process buffers . . .

4. **Elevate the Constraint**

   If we are unable to eliminate the constraint by means of steps 2 and 3, then we must consider adding resources (acquiring more of this resource so that it is no longer a constraint) or reinventing the process. If not, this constraint will continue to limit system performance.

5. **Go Back to Step 1, but Beware of 'Inertia'**

   Managing constraints is an iterative process because once you 'break' the bottleneck/constraint, another step in the process will become the new bottleneck/ constraint and so on. 'Inertia' refers to the fact that process changes at one step often affect another step. The challenge is to never get complacent and to recognise that improving any system is a rewarding, continuous process.

Who is the 'most valuable player' of the hospital?

It is a provocative question. Is it the doctors? The nurses? The essential services support staff (lab, imaging, bed board, Environmental Services)? Of course, someone might appropriately say, 'It's the entire team!' While that insight is accurate, we have a slightly different answer. It turns out that the 'Who' is a 'What'. Consider the example of the highly successful restaurant chain, The Cheesecake Factory.[10] How are they able to deliver high-quality, attractive meals of the right quantity and quality that customers literally wait for hours to eat there? There are a number of important answers to that question, but one of the most critical, which lies at the heart of their ability to serve customers, is . . . the table. The faster they are able to 'turn tables' (consistent with delivering quality food and service), the more customers they can accommodate and the more revenue they generate.

What is the healthcare analogy? 'Table turns' in healthcare are dependent upon . . . beds — the most valuable player (MVP) of our system. But in a system where 'doing more with less' is a necessity, it is not just the number of beds that is important, but the intelligent use and deployment of those beds to add value and reduce waste. Here are some simple examples. The ability

to deliver effective 'bed turns' is dependent on many factors, some seemingly beyond our control, but others quite amenable to modulation. First, at the heart of the effort is a fundamental understanding that, for most hospitals and healthcare systems, the bed is a potential 'bottleneck' or constraint on the ability to provide care. For example, hospital boarders in the ED waiting for a bed is a clear constraint and bottleneck affecting patient experience, outcomes and safety. It is perhaps our most capacity-constrained resource (we seemingly cannot build them fast enough, and the transition to value-based as opposed to volume-based reimbursement will change the fundamental fabric of reimbursement).

That drives us to better and more intelligent, indeed strategic, use of beds. Many hospitals have recognised this and developed 'Everyone Out by 11.00am' programmes to facilitate early discharges to create additional capacity for incoming patients, whether from the ED, operating rooms (ORs), ICUs or transfers.[11] Some of these have been highly successful and others much less so, for reasons we have discussed elsewhere.

The science of service operations: Hardwiring tactics

Patient flow requires a disciplined approach to hardwiring tactics through these five steps:

1. Use the demand-capacity questions to gain a fundamental and widely shared understanding of patient demand and healthcare capacity to meet those demands.
2. Commit to the right staffing mix, the right staff and the right numbers of staff to meet expected demands.
3. Make sure patient intake (eg triage in the ED) enhances flow by adding value and eliminating waste ('triage is a process, not a place').
4. Develop a consistent and reliable system to segment patient flow into value streams designed to meet patients' needs.
   - Keep vertical patients vertical and moving.
   - Vertical patients value speed; horizontal ones value real estate (beds).
5. Match service delivery options to incoming patient streams.
   - Remove all work that does not add value.
   - 'Fast track' is a verb, not a noun.
   - Ensure that physicians, nurses and advanced practice providers (APPs) work at the top of their licensed skills.

ACCELERATING FLOW INTO, THROUGH AND OUT OF THE HOSPITAL

Hospital-wide flow

Figure 5 lists the best strategies for ensuring that input to the hospital admission process is guided by flow principles, each of which is discussed briefly.

Early decision to admit

Data from the Emergency Department Benchmarking Alliance (EDBA), which represent over 40 per cent of all ED visits, show that of the total number of ED visits, between 12 and 35 per cent will be admitted to the hospital, with the higher levels occurring in high-volume EDs and trauma centres. But even in lower volume EDs, ED admissions contribute between 60 and 80 per cent of total hospital admissions, indicating that they are an important source of potential flow improvements.[12]

Hospital-Wide Flow

- Early Decision to Admit — 'In or Out?'
- Early Request for a Bed — Be a Bed Ahead
- EBM Bed Selection (Electrocardiogram or Point of Care Troponin)
- Rapid Admission Process
- Express Admitting Units
- ICU Fast Tracking
- Adopt — a — Border
- Real — Time Demand-Capacity Management

Figure 5: Strategies for hospital-wide flow

In most cases, an experienced emergency physician-nurse team knows within minutes after the initial assessment whether a patient will need admission. And yet, instead of calling immediately for inpatient bed placement and the admitting physician team, most ED teams are forced to wait until lab and imaging studies are completed prior to making those calls. This is a classic example of sequential, instead of parallel, processing and is an enemy of smooth flow ('because we've always done it that way!'). To be sure, diagnostic testing is sometimes necessary to determine the type of bed (observation, floor, telemetry, etc). Yet with the majority of patients, diagnostic testing and the patients' progression confirm rather than determine the need for admission.

Simply stated, delaying admission until every lab and X-ray is back is an unrealistic expectation in hospitals committed to patient flow. Yet early consultation is often resisted, usually because it is perceived as disruptive to the flow of the admitting team, for example, 'We're on rounds — we can't be bothered with more patients'. If, however, there is no resistance to change, there is probably no meaningful change involved. In this case, expect some resistance from the inpatient units, since saying, 'No' or 'Not now' is infinitely easier than disrupting rounds or the normal work flow to say, 'Yes, we'll take that patient now'. This is a classic example of the difference between a 'push' system and a 'pull' system.

Fundamentally, 'Early Decision to Admit' is another example of the 'Rights' we discussed previously: right resources, right patient, right bed, right reasons, right time, every time.

Intelligent bed management

As important as it is to obtain a bed for a patient in the most timely manner possible, it is also important to select the 'right' bed for your patients. This is an example of segmenting patients into the 'right' value stream for their clinical demands. Intelligent bed management uses both real-time and historical data to determine where the patients' needs can best be met, given the current capacity. It should be guided by a written agreement between both nurses and physicians and should include important factors such as telemetry, isolation, vasoactive drip and other resources. There are both process goals and outcomes goals to such a programme:

Process goals

- Adding accuracy
- Improving cooperation and teamwork
- Reducing variation

Outcomes goals

- Efficiently and effectively placing the patient in the right nursing unit, capable of the right skills, with the right staffing ('Best-Fit')
- Facilitating the acceptance of the patient by that nursing unit ('Pull versus Push')

Of course, there are caveats to intelligent bed management, including the fact that admitting physician preferences will need to be taken into consideration (at least until that preference can be managed by value/waste discussions). In addition, it requires a multidisciplinary team to develop, implement and improve the system, and an agreement negotiated in the spirit of diplomacy in the best interests of the patient.

Express admitting units and ED holding areas

For hospitals whose data predictably show delays in bed placement (usually those with more than ten hospital boarders per day), one strategy is the creation of Express Admitting Units (EAUs), also known as ED holding areas. We recommend the term Express Admitting Units, both because it more accurately describes its purpose and because the term 'holding area' has a negative connotation, for patients and staff alike.

The purpose of an EAU is to decompress the boarder burden before the number of boarders starts to grow to 'gridlock'. It is not intended to replace the work done in the ED, but rather to place stable patients who will be admitted in a pleasant area with a dedicated purpose, where their laboratory, imaging and clinical progress allows for a determination of precise bed placement. Patients should have time-limited transition orders in place, most of which can be predetermined and agreed to by the ED and admitting physicians, based on the most common clinical problems admitted to the unit.

These units can be located anywhere within the hospital, but the most efficient ones are physically contiguous to the ED. Most EAUs range from 5 to 15 beds, depending on the number of hospital boarders, based on flow data. Some very large hospitals with substantial boarding issues, however, have units as large as 25 to 30 beds.

The following are essential components of streamlined EAU operations: EAU nurses must be relentless in their pursuit of admitting orders from the inpatient team, fast tracking the preliminary diagnostic and treatment plan, 'bird-dogging' laboratory and imaging results, and informing the admitting teams when they are complete.

EAUs can be a very effective flow strategy for hospitals that have a consistent boarder burden but in which inpatient bed expansion is impossible. Both patient and staff satisfaction are typically high in these units, and inpatient length of stay is usually lower by 0.5–1 day.

Transition orders

As patients transition from ED to inpatient care, one important issue is the gap in responsibility and the orders that will guide the patients' care. Transition orders (also known as 'GAP', bridge or holding orders) can significantly decrease time to admission and ED length of stay for these patients, while freeing up ED beds for arriving patients. To be clear, transition orders are not admitting orders, but simply allow for a transition of care from the ED to the inpatient team, giving that team a specified amount of time to further evaluate the patient and develop a treatment strategy and a set of orders reflective of that strategy. They are time-limited orders for stable patients that permit them to be safely moved to an inpatient bed or EAU. They should make clear that the admitting team is responsible for actual admission orders and that they should be informed of status updates and laboratory, imaging and other results.

In the past, considerable resistance arose from some emergency physicians with concerns about the possibility of increased medicolegal liability in writing such orders. Both the American College of Emergency Physicians (ACEP) and the American Academy of Emergency Medicine (AAEM), however, have developed position statements supporting transition orders, if carefully and thoughtfully developed. Our closed-claims experience from a large emergency physician group is that there is actually more medicolegal risk from boarding patients in the ED than in writing time-limited, focused transition orders.

Adopt-a-Boarder and full capacity protocols

At some hospitals with persistent and recalcitrant hospital boarding issues, up to 10–20 patients may wait 12–24 hours in ED hallways for inpatient bed placement. Data from several different centres show that these patients have worse outcomes, increased length of stay, increased patient safety issues and poor patient experience scores. In response to these issues, two institutions independently developed solutions to this problem. The logic driving these innovations was that, instead of having ten (or more) patients waiting in the hallways in the ED, why not place one patient each in ten different inpatient units, diffusing the boarder burden across multiple areas of the hospital.

At Inova Fairfax Medical Campus (IFMC) and at Stony Brook in New York these

policies were put in place, although other similar programmes have been developed at Duke, William Beaumont and UCLA medical centres. The results have been predictably positive:

- Admitted ED patients very much preferred the inpatient hallway to the ED hallway.
- Adopted boarders felt they got more personal attention and better care in the inpatient hallways than in the ED.
- Nearly all patients stated that they were happy to be closer to their inpatient bed.
- Studies from Stony Brook and Inova hospitals, and UCLA, showed that the Adopt-a-Boarder programme accelerated bed turnover.
- Many patients who were destined for an inpatient hallway bed instead went straight to their inpatient rooms, because beds were cleaned in a fraction of the normal time, probably in response to pressure from the inpatient nurses and their leadership for environmental services to assist in getting the patients out of the hallways.

Further discussion of this programme, including examples of the policies and protocols, can be found at http://www.hospitalovercrowding.com// or the Commonwealth of Massachusetts' Code Help programme at http://www.mass.gov/eohhs/gov/departments/dph/programs/hcq/healthcare-quality/health-care-facilities/hospitals/code-help-plans.html.

ICU fast tracking

ICU patients in the ED consume significant amounts of nursing and physician resources and divert monitoring and care from other patients in the ED. There is also a correlation with the duration of time an ICU patient remains in the ED and subsequent mortality, especially for ED stays longer than 6 hours.[13] This can be a common problem causing delays and poor outcomes, since up to 5–10 per cent of ED patients are admitted to the ICU. For these and other reasons, several proactive hospitals and their ICU and ED leadership have developed the concept of 'ICU Fast Tracking', which recognises that certain ED patients will undoubtedly be admitted to the ICU and deploys appropriate resources to provide for their needs.

A policy is jointly developed, with ICU and ED input, whereby patients to be admitted to the ICU who experience delays (set to a specified time limit, often 30 minutes) will have resources deployed to the ED to care for them. The policy indicates that a 'Critical Care Alert' can be called for patients meeting the following inclusion criteria:

- Sepsis/sepsis syndrome
- Acute respiratory failure requiring mechanical ventilation
- Resuscitation post-arrest
- Unstable haemodynamics requiring vasopressor intervention
- Intracranial haemorrhage with evolving neurological deficits or airway compromise

Patients meeting these criteria will have a Critical Care Alert called at the time they are recognised to meet inclusion criteria, which drives the following protocol:

- A 30-minute response time (from notification to arrival in ED) is required from the patient's physician or the intensivist.
- Critical Care Unit will respond within 30 minutes of notification with both a bed assignment and a team for transporting the patient to Critical Care.
- All immediate diagnostic radiology needs should be completed prior to transport.
- The patient's ED nurse will accompany the team to the Critical Care Unit to give a bedside report.

Such a policy and protocol predictably results in safer, more timely care and, in many cases, decreased length of stay for ICU patients.

Flow, surgery and anaesthesia

Our friend and colleague, Dr Eugene Litvak, has written eloquently and persuasively that surgical smoothing is one, if not the primary, key to success in improving patient flow, both for surgical and non-surgical patients. The following section is a summary of those concepts.[14]

The OR has a significant impact on the flow of patients through the hospital.[15] The peaks and valleys typically seen in the elective surgery schedule drive corresponding patterns in inpatient census. During the peak days, usually early in the week, these electively scheduled patients fill the inpatient units so that when urgent or emergent patients come to the ED, these specialty beds are not available. These fluctuations in the OR volume and resulting variability in the inpatient census also make it very difficult to have predictable scheduling for nurses and physicians. Smoothing the flow of elective admissions and ensuring that separate and adequate capacity is available to meet the demand for beds for urgent and emergent patients result in smoother patient flow patterns, with smaller ranges between high and low volume, and opens capacity in both the OR and the inpatient areas of the hospital.

The block schedule in the OR is typically based on utilisation by surgeons and their preferences. Rarely is the schedule based on what happens in the inpatient units of the hospital. Smoothing the elective schedule incorporates the inpatient units into the OR scheduling process by adjusting the block schedule based not only on utilisation but also on where the patient should go postoperatively. These thoughts should help guide the process:

- There must be give and take by both the hospital and the surgeons in order to make smoothing work. In some cases, surgeons must be willing to change the days of the week or hours that they work. In order to facilitate this, it is imperative that the data around patient placement, patient satisfaction, nursing overtime and physician office issues be provided to surgeons being asked to change.
- Results from smoothing the flow of elective admissions and thereby reducing peaks and valleys are compelling. Reducing this fluctuation opens more functional capacity in the OR and inpatient units.
- Further more, with smoothing based on the destination unit of the patient, fewer patients are placed off-service, which leads to a reduction in length of stay. An additional benefit is that placing patients in the appropriate bed and unit improves both patient and physician satisfaction.

Figure 6 summarises many of these concepts into strategies to smooth surgical flow.

Emergency department flow

Much of the original work on patient flow came from the ED, where processes were ripe for improvement.[16] We have written and lectured extensively on this topic, but a brief summary of these improvements is presented here.[17] EDs (and healthcare systems generically) can be viewed as a series of 'inputs, throughputs and outputs'.

Figure 7 summarises effective flow strategies for each of these phases.

The 'output' strategies have been discussed earlier in more detail, but a brief summary of the other strategies follows. On 'input', value is added by getting the patient and the care givers (particularly the doctor) together as quickly as possible. Triage bypass/bedside triage does that by taking patients directly to the ED treatment area during hours in which beds are available, considerably improving patient-to-bed and bed-to-provider flow metrics. When all beds are full, the triage nurses are empowered

Fundamental Change Concepts for Surgical Smoothing

- Dedicate a room for unscheduled surgeries
- Develop and enforce scheduling procedures
- Place cases with unpredictable length in a separate room or at the end of the day
- Stagger surgery start times
- Standardize room set – up and prepare commonly used drugs, equipment, supplies, etc ahead of time
- Use historical data to establish surgical schedules (ie case length)
- Complete all pre-op work before start time
- Synchronise case start time to an agree upon point in time (eg incision time)
- Designate 'on-call staff' to help alleviate unexpected high demand situations
- Use an RN perioperative facilitator to streamline and manage the room transition process
- Use admission/discharge criteria to ensure appropriate post-op patient placement
- Use an OR room cleaning team and turnaround strategy

Figure 6: Fundamental change concepts for surgical smoothing

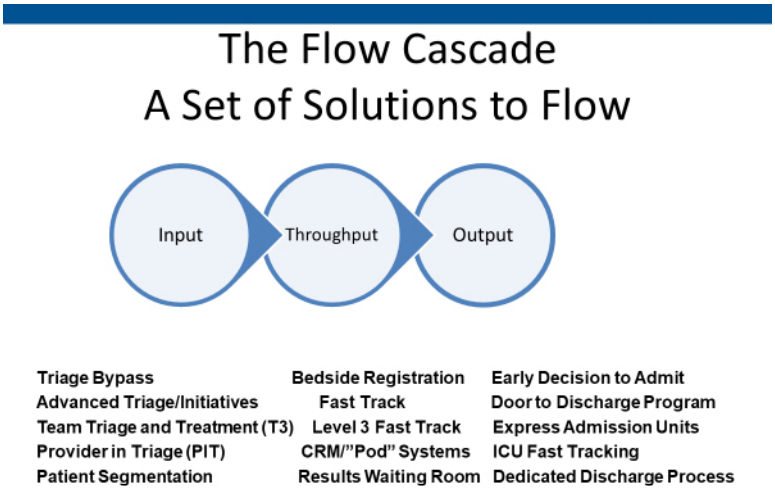

Figure 7: Flow strategies throughout the phases of input, throughput and output

through written physician standing orders to begin simple treatments and diagnostic testing ('Advanced Triage and Initiatives'). For EDs where hospital boarders cause long periods of delay for ED beds, a Team Triage and Treatment programme puts an emergency physician (or an APP) along with a nurse, technician and registrar in the triage area to initiate (and sometimes complete) treatment. First used at IFMC, this programme has shown dramatic results across patient flow, safety, core measure compliance and patient experience scores.[18]

In the 'throughput' phase, segmenting patient flow into Fast Tracks, SuperTracks and Emergency Severity Index (ESI) Level 3 Fast Tracks has improved flow and patient experience. Use of 'Results Waiting Rooms' and 'Standing EDs' is an example of treating the ED bed as the 'MVP of the ED' by having patients occupy beds only as long as it adds value, after which they can wait in a designated area, thereby making the bed available for other patients.

CONCLUSION

The disciplines of hardwiring hospital-wide flow allow healthcare systems to deliver high-quality, low-cost care by adding value and eliminating waste. It is an example of being able to do more with less, while involving clinicians in the work of improving processes to not only make patients' lives better, but also

to simultaneously make our lives easier. It is an essential tool for all healthcare leaders. Equally important, these skills of necessity improve the cohesiveness of healthcare teams working together for the betterment of the patient, since improving flow always involves cross-functional work across boundaries.

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