Institute for Healthcare Improvement

Achieving Hospital-wide Patient Flow (Second Edition)

The Right Care, in the Right Place, at the Right Time

White Paper
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Authors

Patricia A. Rutherford, RN, MS, Vice President, IHI

Alex Anderson, Research Associate, Innovation, IHI

Uma R. Kotagal, MBBS, MSc, Executive Leader, Population and Community Health, Cincinnati Children's Hospital Medical Center; IHI Senior Fellow

Katharine Luther, RN, MPM, Director of Quality (retired), UTHealth McGovern Medical School; Faculty, IHI

Lloyd P. Provost, MS, Statistician and Senior Improvement Advisor, Associates in Process Improvement

Frederick C. Ryckman, MD, Emeritus Professor of Surgery and Transplantation, Senior Vice President for Medical Operations (retired), Cincinnati Children's Hospital Medical Center

Jane Taylor, EdD, Improvement Advisor, IHI

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Institute for Healthcare Improvement

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Preface to Second Edition

The 2017 IHI White Paper was the culmination of approximately two decades of IHI's research, innovation, and learning about hospital-wide patient flow. This 2020 update of the white paper builds on IHI's hospital-wide patient flow framework and includes ongoing learning gleaned from participants in the IHI Hospital Flow Professional Development Programs, sessions presented at US and international IHI Forums, direct work with various hospitals and health system leaders, and the experience of hospitals in regions dramatically impacted by the surge of COVID-19 patients.

Foreword

My visits with hospital leaders around the world make it clear that patient flow in hospitals is a large, and growing, challenge to providing high-quality care. Waits and delays are not only disrespectful to patients, they are potentially harmful. The failure to see the additional burden we're putting on patients that need our care can keep us locked into inaccurate and potentially paralyzing ways of thinking about flow. Our inability to more effectively design and manage care processes also wears on clinicians and staff — decreasing their efficiency and productivity, contributing to burnout, and decreasing job satisfaction.

In 2020, ensuring timely patient care in the right location with the right clinical team amidst the COVID-19 pandemic has never been more important. The pandemic crisis has the potential to lead us to lasting innovations to improve patient flow in hospitals as well as in care settings beyond the hospital walls.

This updated version of IHI's 2017 white paper includes new learning and insights that have informed adaptations to the hospital-wide patient flow framework. The paper shares strategies, promising change ideas, and resources to help leaders and improvement teams take on the challenge of achieving hospital-wide patient flow. An extraordinary team at IHI has continually researched this topic, tested and refined theories, and assembled key resources to help health care organizations improve flow, no matter where they are on this important journey.

Maureen Bisognano
President Emerita and Senior Fellow
Institute for Healthcare Improvement

Executive Summary

While health care systems are making progress toward more value-based, person-centric care practices, most hospitals are experiencing significant operational and financial stress. Costs continue to escalate, while reimbursements are waning. In 2020, hospitals throughout the US and the world have been impacted by the COVID-19 pandemic, resulting in hospitals experiencing dramatic increases in costs and simultaneous decreases in revenue.

Even though there is an oversupply of hospital beds in the US, emergency department and inpatient bed capacity fail to meet daily patient demand in many hospitals, particularly in large academic medical centers.[1] In some regions, ensuring adequate nurse staffing may be of paramount importance for safely caring for hospitalized patients. Hospitals throughout the world are experiencing similar bed capacity and staffing shortages to meet regular patient demand for acute care.

Diversions, long waits, and delays in the emergency department (ED) are a hospital-wide issue, not solely an ED operations issue. Delays are often the result of ED beds being occupied by patients waiting for admission to the hospital. Larger hospital-wide issues include mismatches in bed and staff capacity and demand for various clinical services; inefficient processes for transferring patients among units and for discharging patients; long waits for transferring patients to skilled nursing and long-term care settings; and patients with mental health conditions occupying hospital beds due to inadequate mental health facilities in the community. Lack of inpatient capacity also results in delayed or canceled surgical procedures, patients being "boarded" in the post-anesthesia care unit, and patients being cared for in "off-service" units. Disparities in timely access to and progression of care for underserved patient populations is an additional issue that must be understood and addressed.

Throughout the world, the COVID-19 pandemic has exacerbated the need for hospitals to rapidly expand their capacity and capability to meet the needs of acutely ill individuals needing to be hospitalized. Dramatic expansion of emergency departments, acute care, and critical care units to meet the anticipated needs of COVID-19 positive patients has been essential to provide safe and effective care for patients in crisis. Hospitals of all sizes and in varied locations have faced unique challenges in ensuring the necessary space, supplies, equipment, and staffing to care for this patient population.

Failing to achieve hospital-wide patient flow — the right care, in the right place, at the right time — puts patients at risk for suboptimal care and potential harm. It also increases the burden on clinicians and hospital staff and can accelerate burnout. Yet, while many understand the problem, they often lack the comprehensive strategies to address it. Optimizing hospital flow, and ultimately improving outcomes and the experience of care for patients, requires an appreciation of the hospital as an interconnected, interdependent *system* of care. It also requires strong leadership; in fact, the role of executive leaders is critical for success. The executive oversight team committed to achieving system-wide flow must prioritize four things: carefully craft and communicate a long-term aim and its rationale; put in place structures to execute on system-wide improvement, shifting the focus from localized initiatives to hospital-wide results; be ready to resolve the tough dilemmas and surges in patient demand on a timely basis; and focus on a few important initiatives to demonstrate organizational capability, then expand the scope to hospital-wide flow initiatives.

This white paper — the culmination of two decades of the Institute for Healthcare Improvement's research, innovation, and learning about hospital-wide patient flow — guides leaders and quality improvement teams through an in-depth examination of a systems view of patient flow, theories for improvement, and high-leverage strategies and interventions to improve hospital-wide patient flow. IHI's recommended approach is based on these principles:

- A **system-wide approach to patient flow**, with a few "simple rules" — design principles that guide system-wide improvement — to govern complex systems;
- A **hospital-wide learning system** that utilizes the science of improvement to understand and prioritize solutions to reduce flow failures and flow delays;
- The **integration of various approaches** (e.g., quality improvement, Lean management, operational engineering, complex systems analysis, operations research) to achieve hospital-wide patient flow;
- The **utilization of advanced data analytics** to reduce artificial variation in elective surgical scheduling, forecast patient demand patterns, and match capacity and demand in routine operations; and
- A **focus on reducing demand** — with change ideas to reduce hospital utilization by relocating care to less costly and, in many cases, higher-quality care — **and on shaping demand** by expanding operating room scheduling system capabilities to predict and plan for patients who need intensive care and care in other inpatient units.

Background

Achieving hospital-wide patient flow, and ultimately improving outcomes and the experience of care for patients, requires an appreciation for the entire system of care. A hospital is an interconnected, interdependent system; improvements in one department affect the operations of other departments. In a 2003 white paper, the Institute for Healthcare Improvement (IHI) explained, "Understanding patient flow requires looking at the entire hospital system of care, not just in isolated units. Reducing variation in flow has been shown to improve overall patient flow. Providing patients with timely access to appropriate care is an essential element of high-quality care, because *when* care is provided is often as important as *what* care is provided."[2]

Complex theories and approaches to improving flow that have matured in other industries and academic disciplines have been adapted to the context of health care systems.[3] Some examples from other industries include Lean manufacturing and the Toyota Production System, operational management, and the use of advanced data analytics. The pioneering efforts of Eugene Litvak and his colleagues described the importance of developing systems to address variation in scheduling of elective surgical procedures, and to separate the flows of planned surgical cases from unexpected or emergent cases.[4] Both methodologies have demonstrated a significant impact on hospital flow.[5,6] While eliminating artificial variability in elective surgical scheduling has been shown to make dramatic improvements in patient flow, cultural barriers have thwarted widespread adoption of this method. Other efforts have focused on administrative oversight systems, primarily matching available staffing and bed capacity to demand for patient care.

Following on the work of the IMPACT Flow Community (2004 to 2009), IHI continued to collaborate with expert faculty to promote specific strategies to improve hospital flow. Real-time demand capacity (RTDC) management, a method piloted at the University of Pittsburgh Medical

Center,[7] aims to improve hospital-wide patient flow through better prediction and planning each day, identifying capacity and demand mismatches, and initiating specific improvement projects to address obstacles to efficient patient flow.

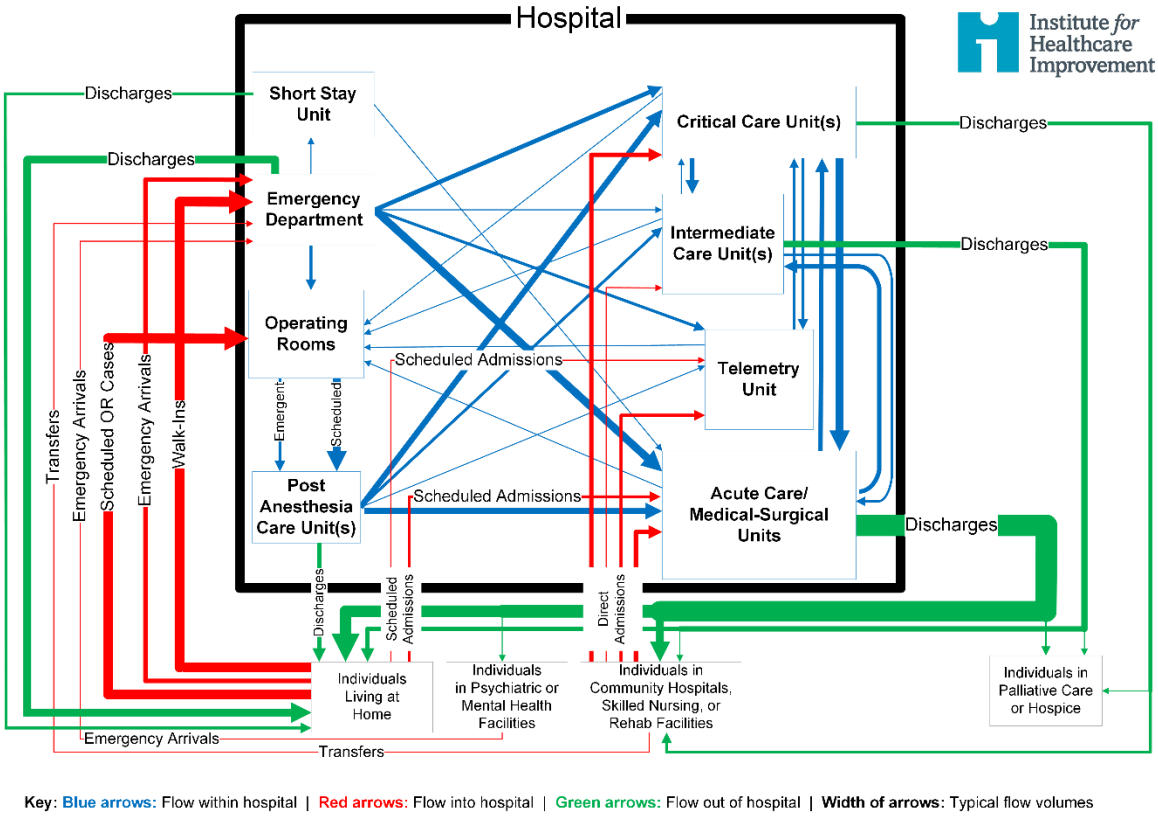
In 2014, IHI's Innovation team intensified its focus on learning about persistent challenges and breakthrough strategies to achieve hospital-wide patient flow. These efforts include extensive literature reviews, expert interviews with leading hospital administrators and point-of-care staff, site visits to exemplar organizations, and development of training opportunities to spread this learning. The 2017 IHI White Paper was the culmination of approximately two decades of IHI's research, innovation, and learning about hospital-wide patient flow. This 2020 update of the white paper builds on IHI's hospital-wide patient flow framework and includes ongoing learning gleaned from participants in the IHI Hospital Flow Professional Development Programs, sessions presented at US and international IHI Forums, direct work with various hospitals and health systems leaders, and the experience of hospitals in regions dramatically impacted by the surge of COVID-19 patients.

A Systems View of Hospital-wide Patient Flow

Making meaningful and sustainable changes to hospital operations, including patient flow, requires recognizing the interdependent nature of every facet of the hospital. Understanding hospital-wide patient flow requires looking at the whole system of care, not just individual patient care units or subgroups of patients. A system is an interdependent group of items, people, or processes working together toward a common purpose.[8,9] Systems thinking means viewing the organization as dynamic, adaptive to the needs of patients, and comprising interdependent people, departments, equipment, facilities, processes, and products, all working toward a common purpose. Optimization of a system requires orchestrating the efforts of all components of the system toward achieving the stated purpose.[10]

To appreciate this interdependence, a conceptual diagram or "system map" helps to visualize the key components of the system and the important linkages among them. Figure 1 is a system map of patient flow in a typical hospital, depicting the interactions within the hospital and beyond it. Within the largest "Hospital" box in the figure, the smaller boxes represent typical hospital units, and the blue arrows show the flow of patients among these units. The figure also depicts care settings outside of the hospital, with red arrows showing the flow of patients into the hospital and green arrows showing flow out of the hospital to these settings. The width of the arrows indicates typical flow volume; the wider the arrow, the greater the volume. Figure 1 clearly illustrates that hospital patient flow is a complex, interdependent system: changes to flow in one unit affect many other parts of the system and with different time lags. See Appendix A for a full-page version of Figure 1.

Figure 1. System Map: Patient Flow in the Hospital



Some key systems principles can be observed in this system map:

- **If each part of a system, considered separately, is made to operate as efficiently as possible, the performance of the system as a whole will be suboptimized.**[11] Improvements on one unit could create problems, even chaos, in another part of the hospital. For example, when EDs improve efficiency and increase throughput, there is a need to accelerate the transfer of patients from the ED to inpatient units. However, if inpatient beds are unavailable when needed, patients are often placed in hallways and on "off-service" units. So, improving flow must be orchestrated at the system (hospital) level. This principle suggests that understanding flow throughout the hospital requires measures at the organization, department, and unit levels (discussed in more detail later in the paper). A system map helps identify the processes in each unit and the impact that changes in one unit may have on other areas of the system.[12]
- **There are two types of changes in a system: first-order and second-order changes.**[13] First-order changes (e.g., problem solving, staffing allocations, bed availability) are needed to keep the system running day-to-day at the current level of performance. Second-order changes (e.g., improvement projects, capital projects) are required to move to new levels of performance.
- **Every system has a current constraint or bottleneck.** Identifying the major constraints in the system and then developing changes to address or remove them will have the greatest impact on the performance of the system.[14]

- **Understanding variation is key to achieving optimum flow.** Common cause variation is the natural or expected variation inherent in a process. Special cause variation arises because of specific circumstances that are not inherent in the process.[15] Displaying flow measures using Shewhart charts enables teams to distinguish between special cause and common cause variation. When a system is stable (i.e., only has common cause variation), organizations can then use queuing theory to plan for balancing capacity and demand.[16]
- **Every system is perfectly designed to get the results it gets.**[17] If we want better results, we need to change the system.

Use of Simple Rules in Complex Systems

In conjunction with the specific quality improvement strategies described in this paper, the adoption of a few "simple rules" can catalyze a systems view throughout the organization to guide decision making and action. Research on complex systems has found that some simple rules can lead to high levels of system performance.[18]

The behavior of a flock of birds in flight is an example of this phenomenon. Flocking behavior is controlled by three simple rules: 1) separation: avoid crowding neighbors; 2) alignment: steer toward the average heading of neighbors; and 3) cohesion: steer toward the average position of neighbors. With these three simple rules, the flock moves in a harmonious way, creating complex motion and interaction that would otherwise be extremely difficult to achieve.

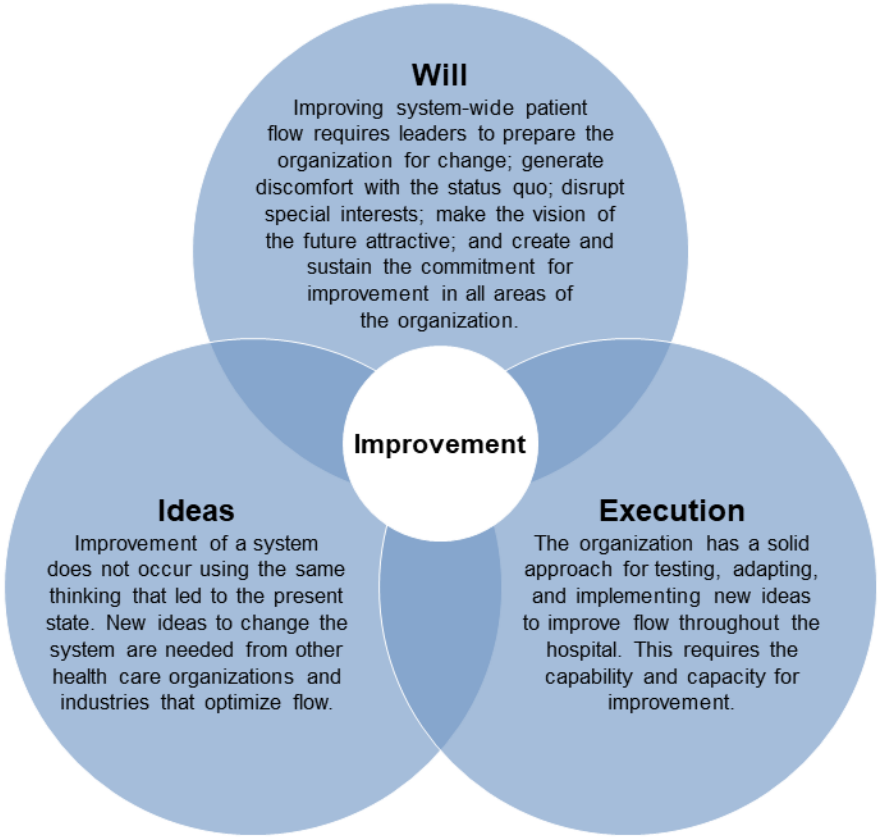
Are there simple rules to optimize hospital-wide patient flow? Such rules should provide guidance and a vision for clinicians and staff, but they should not be prescriptive solutions. We recommend the adoption of the following three simple rules to provide a focus for achieving hospital-wide patient flow:

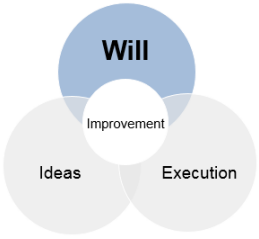
1. **Right Care, Right Place:** Patients are placed on the appropriate clinical unit with the clinical team that has disease- or condition-specific expertise.
2. **Right Time:** There are no delays greater than two hours in patient progression from one hospital unit or clinical area to another, based on medical readiness criteria. For example, patients should be transferred within two hours from the ED to an inpatient unit, within one hour from a post-acute care unit to a surgical unit, and discharged to home or community care within two hours.
3. **Available Capacity:** Ensure each unit or clinical area has some capacity at the beginning of each day. For example, a unit should have one or two beds available and staffed at 7:00 AM based on patient demand patterns.

These simple rules are not intended for judgment or accountability. Rather, they can form the basis for a hospital-wide flow philosophy that unites all staff and departments in a common purpose. They can provide the basis for daily flow huddles to manage safe and timely patient progression throughout the hospital. Most importantly, the simple rules can form the basis for learning and improvement through quality improvement methodologies. Measuring each rule provides data for learning about flow issues throughout the hospital (see discussion of recommended measures in the Execution section). Using these measures, the executive leadership team can create a hospital-wide learning system to understand failures to achieve these simple rules and focus improvement efforts on mitigating the failures.

IHI's three essential elements for any system-level improvement — Will, Ideas, and Execution (see Figure 2) — provide a strategic framework for achieving hospital-wide patient flow.[19] According to this framework, the improvement of any system requires the *will* to improve the system, *ideas* about how to make the system perform better, and a plan to make it real — *execution*. We use these three elements as the overall structure for the sections that follow.

Figure 2. System-Level Improvement Requires Will, Ideas, and Execution





Building Will for Improving Hospital-wide Patient Flow

Taking a system-level approach to improving hospital flow requires building will throughout the organization, from the highest levels of leadership to point-of-care managers and staff. This section presents six strategies for building will:

- Make Delivering the Right Care, in the Right Place, at the Right Time a Strategic Priority
- Leverage Hospital-wide Patient Flow Initiatives to Improve Patient Safety, Patient Experience, and Clinician/Staff Satisfaction
- Align Medical Staff and Hospital Executives to Achieve Improved Flow
- Adopt Value-Based Care Models to Support Improved Flow
- Demonstrate That Improved Flow Has a Positive Return on Investment
- Connect the Work of Departments and Units to Hospital-wide Flow Strategies

Make Delivering the Right Care, in the Right Place, at the Right Time a Strategic Priority

Focusing on system-wide hospital flow is about much more than productivity or efficiency. The operational challenges inherent in our highly complex health care systems often mean that patients do not receive the right care, in the right place, at the right time. This leads to suboptimal care and is certainly wasteful; it is also potentially harmful to patients.

When viewed from the perspective of a system-wide approach to improving flow, suboptimal care experiences are clear examples of waste and potential harm. Yet, our health care systems and the existing incentives often create conditions for this type of care to exist. As Don Berwick, IHI President Emeritus and Senior Fellow, notes: "Flow is every bit as consequential for the health of our systems and the well-being of our patients" and deserves the same strategic prioritization as safety.[20] Without addressing flow as a strategic priority, clinicians and hospital staff are left to fix flow failures on an ad-hoc, reactive basis — repeatedly addressing the same problems and flow failures without addressing recurring system constraints and inefficiencies.[21]

Achieving system-wide hospital flow requires strong leadership; in fact, the role of executive leaders is critical for success. The executive oversight team for this work must first carefully craft and communicate a long-term aim and its rationale. The roles of the executive team are further discussed in the Execution section.

Leverage Hospital-wide Patient Flow Initiatives to Improve Patient Safety, Patient Experience, and Clinician/Staff Satisfaction

After making flow a strategic priority, communication will be required so that all staff understand that this effort is more than a productivity or efficiency initiative. Harm as a result of poor patient flow manifests itself in many ways — an anxious ED patient waiting in pain to be admitted to a hospital bed that is unavailable; delays in initiating treatments or procedures for an acutely ill patient because of waiting times for transfer to the appropriate service or hospital unit; a patient, boarded in a medical-surgical bed instead of an intensive care unit (ICU) or specialty unit bed due to overcrowding, receiving less than optimal care because of the respective skills sets of each unit's care teams.

Staff throughout the organization must have a shared understanding of why hospital-wide flow is a priority. Communicating its importance can be accomplished in several ways, including through sharing journal articles, presentations, stories, and data. Some examples in the literature to help make the case are described below.

- Chalfin and colleagues[22] reported a cross-sectional analytical study of 120 adult ICUs from approximately 90 hospitals across the United States that evaluated the impact of emergency department boarding on outcomes for critically ill patients from 2000 to 2003. They focused on length of stay and mortality of these patients in two cohorts: those with no delay (less than 6 hours) and those with a greater than 6-hour delay, with corresponding ICU mortality of 8.4 percent and 10.7 percent respectively. In-hospital mortality was 17.4 percent for the delayed cohort and 12.9 percent for those with less than 6-hour delay. Length of stay was also longer for the delayed patients. Their conclusion: delay in transfer from the emergency department led to increased mortality and length of stay.

- McIsaac and colleagues[23] studied the association between delay of emergency surgery and in-hospital mortality, length of stay, and costs at the Ottawa Hospital in 2012 to 2014. Their study included 15,160 non-cardiac emergency surgery patients. They defined an acceptable delay for each of the five urgency categories. The delays ranged from 45 minutes for Category A patients and delays of up to 24 hours for Category E patients. Based on these criteria, 2,820 patients (18.6 percent) experienced a delay. Mortality increased from 3.2 percent for patients without delays to 4.9 percent for patients with delays (a 53 percent increase in mortality). Each delayed patient also had increased length of stay of 2.6 days and increased costs of $3,335.
- In 2013, Cincinnati Children's Hospital Medical Center was managing more than 100 bone marrow transplants per year as well as their hematology/oncology patients in the 56-bed Cancer & Blood Diseases Institute (CBDI). In the last half of 2013, average daily census increased from an historic median of 55 patients to 75 patients per day and the number of active Phase 1 oncology treatment patients increased from less than 10 to more than 30. The number of patient days with CBDI patients in off-service units went from 50 in 2010 to more than 350 in 2014. What was the impact on safety? The bloodstream infection (BSI) rate from 2011 through the first half 2013 was stable at 0.6 BSI per 1,000 line-days. During the next year, the average rate increased to about 2.0 BSI per 1,000 line-days, with four months above 3.0. The connection from flow failures (off-service patients) to bloodstream infections was clear.[24] Bed capacity on the CBDI unit quickly increased from 56 to 80 beds in 2014.

To build will for the hospital-wide flow initiative, hospital leaders can share examples like these from other organizations as well as study and share the effect of waits and delays in their own hospital systems.

Align Medical Staff and Hospital Executives to Achieve Improved Flow

The relationship between senior leaders, who set organizational priorities, and medical staff and other care providers, who implement changes at the point of care, is integral to the success of a system-wide effort to improve flow. Some hospitals use financial incentives for improved performance. However, a more promising approach is for hospital executives, physicians, and care providers to implement strategies to overcome barriers and adopt changes to improve hospital-wide patient flow. For example, Virginia Mason Hospital and Medical Center has a compact with physicians and other care providers that outlines what each party can expect from the other. The compact creates space for honest conversations and setting expectations about strategic priorities and approaches to achieve Virginia Mason's mission.[25] The incentive for improvement stems from involving the people who will be most affected by the changes. Honest discussions, with clear data analysis, about the needs of both the organization and clinicians surfaces barriers to desired performance and creates a path forward to real improvement.

A well-crafted aim statement and a shared vision for achieving hospital-wide patient flow is critically important, but these may not be adequate to mitigate the influence of special interests (e.g., those of surgeons, ED physicians, hospitalists) that are not oriented to the needs of the whole organization. Hospital executives need the authority to mitigate the influences of special interests in order to align efforts to achieve new levels of performance for hospital-wide patient flow.

Adopt Value-Based Care Models to Support Improved Flow

As hospitals move toward more integration across the system of care, or toward value-based care models like accountable care organizations (ACOs), there are increased incentives to deliver the right care, in the right place, at the right time. Timely access to care providers and community services, a proactive approach to care management and coordination, and collaborations among health care providers across the continuum of care to best meet the needs of patient populations often reduce patients' need for acute care services and hospitalizations.

For example, when patients rely on emergency departments for low-acuity visits, high-cost resources are used inefficiently and inappropriately, and continuity of care across providers becomes more difficult. ACOs or other value-based models of care are in a unique position to work with patients to ensure they receive care in the most appropriate setting based on their health needs. Full implementation of this type of system of care requires a dramatic improvement in providing patients with timely access to providers, particularly for patients with chronic illnesses; extended clinic hours; open slots for urgent care visits; phone contact with care providers for clinical advice and guidance; access to medications and refills; and contact between ED physicians and clinic staff to ensure adequate and timely outpatient follow-up for those who do seek care in the ED. In a two-year study comparing patients who joined an ACO between 2012 and 2013 with patients in traditional health system models, the ACO patients visited EDs 3.6 percent less often than their non-ACO counterparts and were less likely to utilize the ED for conditions that could be better treated in outpatient settings.[26]

Demonstrate That Improved Flow Has a Positive Return on Investment

Realizing a return on investment (ROI) for flow improvements will vary based on hospitals' current occupancy, their payment models, and other local contexts. The selection and timing of specific flow improvement initiatives should take all of these into consideration. In both value-based and fee-for-service payment systems, a positive ROI on improving flow is attainable. In predominantly fee-for-service environments, the three major drivers for increasing ROI are eliminating diversions, reducing variation, and improving efficiencies, leading to increased capacity and throughput. Cost savings in value-based payment models are realized by reducing the following: patient length of stay; complications; and avoidable ED visits, hospitalizations, and readmissions. In both payment models, reducing waits and delays will lead to improved patient satisfaction scores, which will likely lead to increased patient loyalty and market share.

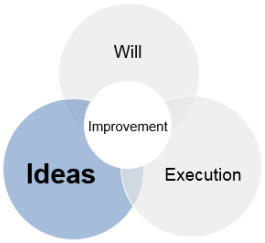
Reducing the artificial variation created by scheduling elective surgeries can have a very good return on investment. Cincinnati Children's Hospital Medical Center developed a scheduling system for elective surgeries and balanced the downstream ICU impact. They also planned for the predictable emergency surgeries from the emergency department. The reduction in variation resulted in increased capacity equivalent to a $100 million, 100-bed expansion and increased revenue since they could care for more patients.[27,28]

While average hospital occupancy rates in the US stay close to 65 percent, due to significant fluctuations in demand (i.e., predictable increases in patient demand related to seasonal events) hospitals often find themselves at or above 100 percent occupancy. Occupancy rates in other countries generally average higher (e.g., the UK hospital occupancy rate is about 84 percent). With a system-wide approach to improving flow, hospitals can more effectively manage these fluctuations and thereby reduce costs and retain more revenue within the hospital system.[29]

Connect the Work of Departments and Units to Hospital-wide Flow Strategies

Implementing and sustaining improvements in hospital-wide flow requires alignment, cooperation, and coordination between hospital units and departments. Without effective executive oversight and collaboration, teams operate in isolation from one another and the aggregated impact of their efforts is limited and sometimes even counterproductive. In many cases, this isolation leads to duplicative work, rework, or work that runs counter to overall goals to improve hospital-wide patient flow.

Before embarking on a coordinated, system-wide approach to improving flow, leaders need to recognize the work already undertaken by various teams, celebrating and highlighting their successes, while also acknowledging the systemic nature of ongoing flow challenges. Hospital leaders must present a vision of flow as a system-wide issue with cross-departmental improvement opportunities, so that every team and every individual understands the connection between their work and overall improvement for the hospital. To facilitate this, it helps to create a unified system of measures used throughout the hospital, including all units and clinical services such as operating rooms. These measures are then rolled up to the hospital level and shared with all staff on a monthly basis (see Execution section). Visual displays of data and improvements related to the work (e.g., patients waiting in the ED, admissions and discharges pending, critical test backlog) allow for real-time situational awareness for all caregivers. This helps create an environment in which each team has a direct line of sight to the overall efforts of the organization to improve flow, which increases buy-in to the effort.[30]



High-Leverage Change Ideas for Improving Hospital-wide Patient Flow

To reduce delays and waiting times and improve patient flow throughout the hospital, there are three key approaches for optimizing the system: shape or reduce demand, match capacity and demand, and redesign the system.[31] Below is an overview of the three approaches.

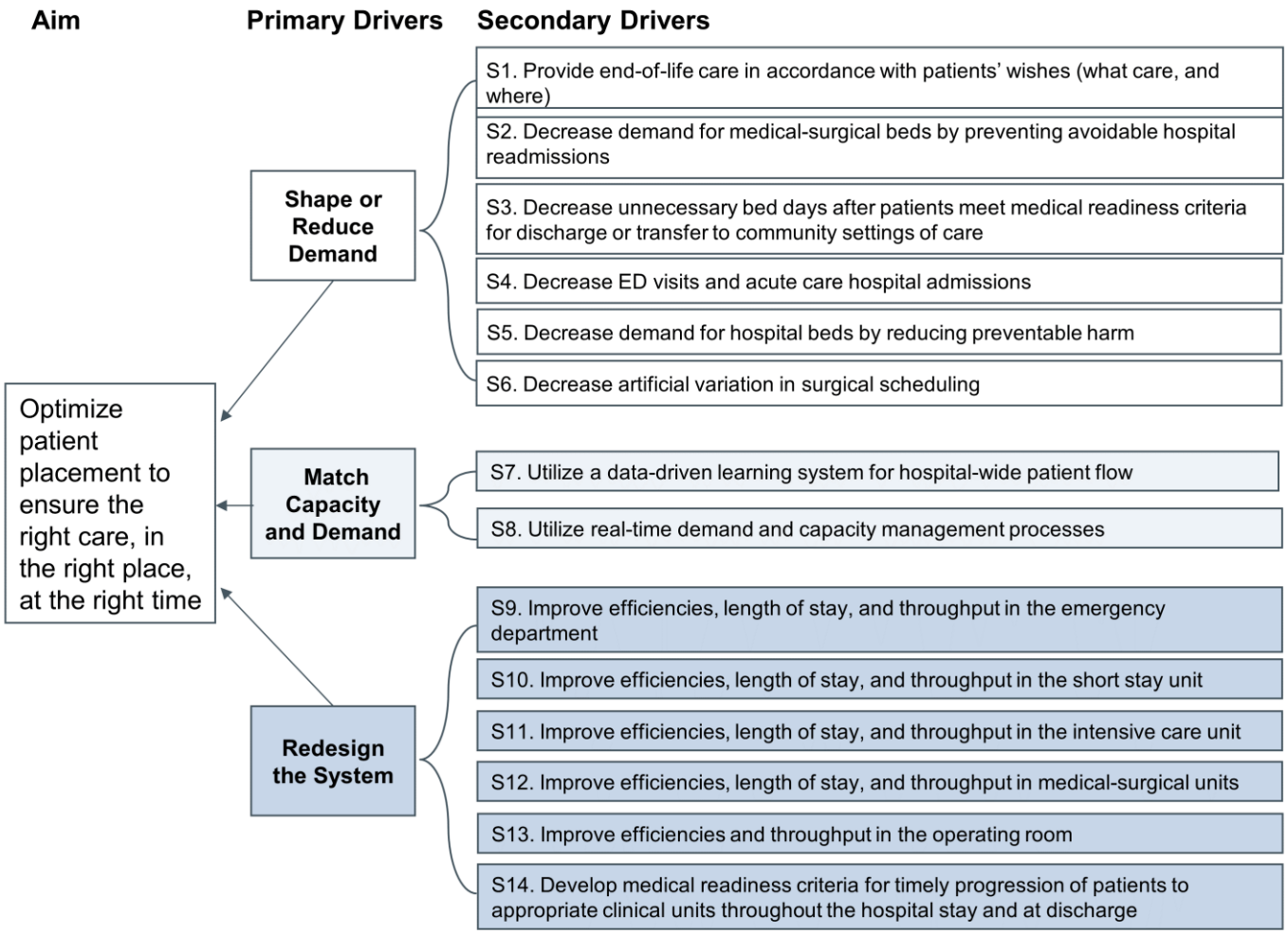
- **Shape or Reduce Demand:** Instead of adding capacity to hospital departments or units to meet patient demand, waits and delays in patient flow throughout a hospital stay can be reduced by shaping or reducing demand. Examples include:
    - Reduce patient demand due to ineffective or defective care (e.g., reduce hospital-acquired conditions, such as infections, to reduce avoidable bed days);
    - Provide needed care outside the hospital (e.g., extend hours in primary care, provide palliative care for patients with advanced illness in accordance with their wishes); and
    - Smooth or level-load elective clinical services (e.g., smooth elective surgical schedules, eliminating artificial peaks and valleys in patient demand for post-operative care in various ICUs and patient care units).
- **Match Capacity and Demand:** Both demand for care and capacity to deliver care can vary by month, day, shift, and hour. Often, changes can be made to better align system capacity with demand. Some examples of matching capacity and demand include:

  - Add or reduce capacity to meet month-to-month variation in patient demand (e.g., create seasonal "swing" units to add or reduce bed capacity during anticipated surges or declines in seasonal demand);
  - In unanticipated events (e.g., natural disasters, public health emergencies, epidemics or pandemics) activate incident command centers to coordinate efforts to create bed capacity, increase staffing, and secure needed equipment and supplies; and
  - Schedule or adapt capacity to meet day-to-day or hour-to-hour variation in demand (e.g., use data analysis to determine patterns of patient demand and create staffing patterns for ED physicians and nurses to match the demand).

- **Redesign the System:** Creating efficiencies throughout the system can increase capacity without adding resources. Redesign efforts involve changing processes, redesigning work for constrained resources (e.g., units and staffing), managing constraints, doing tasks in parallel, eliminating steps, and synchronizing tasks. Examples of redesigning the system include:
  - Do tasks in parallel: Implement a process for direct rooming and bedside registrations in the ED;
  - Change processes to create efficiencies: Discharge patients when they meet medical readiness criteria, thereby reducing discharge delays; and
  - Redesign work for constrained resources: Create separate process flows for distinct types of patient demand; for example, use separately designated OR suites for elective surgical cases and emergent surgeries based on patient demand patterns, thereby increasing throughput and reducing OR delays.

The driver diagram in Figure 3 depicts (from left to right): the desired outcomes for achieving hospital-wide patient flow; the three primary drivers for improving flow; and the secondary drivers for each primary driver (denoted by the letter "S" in the figure and text below). See Appendix B for a full-page view of Figure 3 and for individual driver diagrams for the three primary drivers. See Appendix C for detailed descriptions of the specific change ideas for each secondary driver.

Figure 3. Driver Diagram for Achieving Hospital-wide Patient Flow



Shape or Reduce Demand

Match Capacity and Demand

Redesign the System

Shape or Reduce Demand

Achieving hospital-wide patient flow cannot be solved within the hospital walls alone. To improve overall flow of patients throughout the hospital, hospital leaders need to work in partnership with primary care practices, urgent care centers, specialty practices, mental health services, community-based care services, skilled nursing facilities, and nursing homes and other long-term care facilities. Decreasing overutilization of hospital services and relocating care to lower-intensity sites of care, while improving outcomes, is one high-leverage strategy for improving value by providing the right care, in the right place, at the right time. The third simple rule in IHI's approach for improving hospital-wide patient flow provides a vision for clinicians and staff engaged in reducing or shaping patient demand — Available Capacity: Ensure each unit or clinical area has some capacity for new patients at the beginning of each day. (See Use of Simple Rules in Complex Systems section above.)

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S1. Provide end-of-life care in accordance with patients' wishes (what care, and where).

Most patients in ICUs receive intensive expert clinical care to stabilize or reverse acute conditions, and when they are clinically ready patients are transferred to other care units within the hospital. However, between 15 and 20 percent of all deaths in the United States occur in the ICU.[32] Some patients choose to exhaust all available medical efforts to extend life and these patients may eventually die in the ICU. Others with advanced illnesses prefer to avoid acute care hospitalizations and intensive care treatments, even at the risk of a shorter life. Patients should engage in proactive planning for advanced illness care in collaboration with clinical teams in primary and specialty care, and/or with hospitalist teams. Frequently, care provided in ICUs could be provided in other settings that are better aligned with the patient's wishes — at home, in a palliative care unit, or in hospice.[33] Each individual's care should be aligned with his or her values and goals for care at the end of life, and in some cases advanced illness care planning may reduce unwanted hospitalizations.[34,35,36]

Specific Change Ideas:

- C1.1 Reliably identify patients' end-of-life care wishes and proactively create and execute advanced illness care plans.
- C1.2 Develop hospital-based and community-based palliative care programs.

S2. Decrease demand for medical-surgical beds by preventing avoidable hospital readmissions.

Potentially preventable rehospitalizations are prevalent and costly events that are burdensome for patients and their families and frustrating for providers, often putting a strain on hospital resources.[37] In most cases, hospitalization is necessary and appropriate. However, a substantial fraction of all hospitalizations are patients returning to the hospital soon after their previous inpatient stay. Preventable readmissions also offer a lens to view patients' experiences of care at a critical time of vulnerability. Many patients return to the hospital for treatment of acute exacerbations of chronic conditions or because of a poor recovery after leaving the hospital.[38] Evidence suggests that the rate of avoidable readmissions can be reduced by improving core discharge planning and transition processes out of the hospital; improving transitions and care coordination at the interfaces between care settings; and enhancing coaching, education, and support for patient self-management.[39,40]

In recent years, avoidable readmissions came under the scrutiny of US policymakers as an opportunity to improve care while reducing health care spending.[41] Efforts supported by the Centers for Medicare & Medicaid Services and mandated by the Affordable Care Act showed early progress in reducing readmissions that has since slowed down.[42] Care is fragmented and patients are caught in episodic care processes driven by the incentives of fee-for-service reimbursement rather than receiving integrated, coordinated care. US health care policy and payment changes, in addition to coordinated care improvement efforts, have resulted in reductions in the 30-day readmission rate by as much as 40 percent to 85 percent for certain patient populations.[43] Additionally, evidence shows that reductions in 30-day readmissions also have a small, but statistically correlated reduction in 30-day mortality after discharge.[44] Notable care transition interventions include the Care Transitions Model,[45] Bridging Nursing Support/Transitional Care Model,[46] Project RED,[47] Project BOOST,[48] GRACE Model,[49] and the STate Action on Avoidable Rehospitalizations initiative.[50]

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Redesign the System

Specific Change Idea:

- C2.1 Improve transitions and post-hospital care to reduce readmissions for high-risk populations.

S3. Decrease unnecessary bed days after patients meet medical readiness criteria for discharge or transfer to community settings of care.

In the US, patients with prolonged hospitalizations consume 14 percent to 15 percent of all hospital days despite representing only 2 percent of hospitalizations. These hospitalizations confer more than $20 billion of financial burden to the health care system annually. Large academic hospitals, increasingly the providers of care for these patients, should consider investing in strategies to expedite discharge for patients who are medically ready to reduce prolonged length of stay and the associated costs.[51]

Most acute care hospitals focus on length of stay (LOS) outliers as a proxy for identifying unnecessary bed days in hospitals. LOS outliers may be defined by number of days in the hospital (with some exclusions) or by LOS for patients whose hospital stays extend beyond the normal expected range for their diagnosis-related group (DRG). While the terminology and operational definitions vary (e.g., alternative level of care, long-stay patients, stranded patients), most acute care hospitals have been collecting data on unnecessary bed days, including the type of care and community-based services that are needed after acute care hospitalizations.[52]

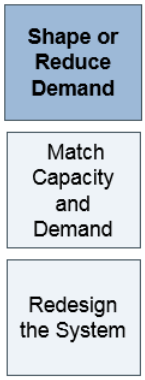
Identifying focused opportunities and successful strategies for reducing prolonged hospitalizations and unnecessary bed days for patients who have received necessary hospital care and are medically ready for discharge or transfer to a community-based care facility is a crucial step in providing the right care, in the right place, at the right time. Doing so will reduce the overutilization of hospital beds and costs of care while also providing additional bed capacity to improve patient progression throughout the hospital stay.[53]

Specific Change Ideas:

- C3.1 Improve efficiencies in hospital care and planning for transitions to other care settings.
- C3.2 Ensure capacity and capability of needed services in the community following hospital discharge.
- C3.3 Develop partnerships with payers to ensure payment for needed services.

S4. Decrease ED visits and acute care hospital admissions.

Hospital emergency departments serve as the most accessible health care site for individuals with emergent health care needs. For urgent medical needs, the ED is the most appropriate place to receive care. However, many visits to the ED are for low-acuity, non-urgent care needs. While it is difficult to determine the rate of non-urgent ED visits, estimates range between 8 percent and 62 percent, with an average of 37 percent.[54] Individuals rely on the ED for non-emergent conditions for many reasons: lack of or delayed access to primary care, specialty care, or mental health care; lack of familiarity with other options for care; availability of care 24 hours a day, 7 days a week; and belief that the ED provides the best care. Minimizing low-acuity visits to the ED by implementing comprehensive health care system strategies to provide care and community services for individuals' low-acuity health care needs is an effective patient-centered strategy — improving the quality and continuity of care while also decreasing unnecessary ED use.



Reliance on EDs and hospitals for acute care needs is on the rise across all patient populations. Overuse in these settings disrupts system-wide flow by creating unnecessary demand for emergency and hospital services. This overuse is especially important for patients with complex medical care and social needs,[55] for whom preventing ED visits and acute care hospital admissions requires a proactive approach to care management and coordination. Also, hospitals and community-based care settings can engage in proactive management for patient populations that are underserved and for those who have difficulty accessing primary care and mental health services. This requires strengthened partnerships between the various care access points in a community. Care settings should identify overlapping patient populations and their needs, understand how each care team serves these patient populations, develop shared goals, and work together to best meet the populations' needs by designing a plan of action to deliver higher-quality, better coordinated care.[56,57,58]

Specific Change Ideas:

- C4.1 Use enhanced care management and coordination of services for patient populations with complex medical care and social needs.
- C4.2 Provide home-based primary care for high-risk populations.
- C4.3 Relocate low-acuity care in the ED to primary care, mental health settings, and community-based services.

S5. Decrease demand for hospital beds by reducing preventable harm.

Preventable harm in health care is a health crisis requiring a coordinated response from policymakers, stakeholders, community members, and care providers.[59] The Centers for Disease Control and Prevention lists unintentional medical errors as the third leading cause of death in the United States.[60] Preventable harm — including medication errors, diagnostic errors, hospital-acquired conditions, and central line infections — is responsible for additional medical treatment and extended hospital stays for one in 18 Canadian hospital patients.[61]

Hospital-acquired conditions (HACs), complications and harm that are a result of medical care in the hospital, are avoidable through reliable implementation of evidenced-based care practices. The Centers for Medicare & Medicaid Services (CMS) identified several preventable HACs for which CMS will not reimburse treatments and additional days in the hospital.[62] The impact of HACs on patients and hospital resources is significant. Older adults contracting healthcare-associated bloodstream infections (BSI), for example, experience a 48 percent higher mortality rate, 44 percent longer length of stay, and 46 percent higher cost compared to patients who avoid BSI.[63] Value-based payment programs penalize or withhold incentive payments if hospitals fail to prevent avoidable harm, increasing the financial incentive to reduce HACs and other harms.[64,65]

Specific Change Idea:

- C5.1 Decrease complications and harm, and subsequent increases in hospital lengths of stay, resulting from errors and hospital-acquired conditions.

S6. Decrease artificial variation in surgical scheduling.

The Institute for Healthcare Optimization (IHO) has developed an approach to identify, classify, and quantify different types of variability in patient flow, followed by smoothing of artificial variability. The main goal of managing flow variability is to increase patient throughput, decrease patient waiting times, reduce cost of care, and maintain or improve safety and quality.[66] The IHO Variability Methodology has a three-phase approach. Phase one focuses on balancing resources

and flow of time-sensitive emergent/urgent and elective/scheduled surgical cases. Phase two focuses on smoothing elective/scheduled patient flow (with scheduled surgical cases having the biggest impact on variation in patient demand on inpatient units). The main goals of this phase are to improve quality and safety of care, decrease competition between scheduled and unscheduled flow on inpatient units, and enhance elective surgical and/or medical throughput, depending on the hospital's priorities. Phase three focuses on correctly sizing inpatient units to improve quality, safety, and throughput to better match capacity with demand on medical units, alleviate medical unit bottlenecks, and improve appropriate patient placement.

Specific Change Idea:

- C6.1 Redesign elective surgical schedules to create a predictable flow of patients to downstream ICUs and inpatient units.

Shape or Reduce Demand

Match Capacity and Demand

Redesign the System

Match Capacity and Demand

To reduce waits and delays in patient progression throughout the hospital, hospital operations leaders must continuously assess the status of capacity and patient demand and remedy mismatches through effective strategies. Both demand for patient care services and hospital capacity can vary by month, day, shift, and hour. Hospitals must employ complex short-term and long-term system-wide strategies to align capacity with patient demand patterns. A hallmark of success is the achievement of the first simple rule in IHI's approach for improving hospital-wide patient flow — Right Care, Right Place: Patients are placed on the appropriate clinical unit with the clinical team that has disease- or condition-specific expertise. (See Use of Simple Rules in Complex Systems section above.)

S7. Utilize a data-driven learning system for hospital-wide patient flow.

A learning system in a hospital or health care system aligns science, data analytics, and culture for continuous improvement and innovation.[67] The Institute of Medicine emphasizes the role of the electronic health record and the use of operations data for research and improvement as foundational for such a system. Patient-centered care and evidence-based medicine are built on this data foundation. Care is supported with links to the community, care continuity, and optimized hospital operations (flow). A supportive leadership environment is required, with transparency and aligned incentives. A productive learning system includes active use of multiple methods of learning: recognition and investigation of special causes using Shewhart charts; study of informative cases (e.g., documenting a specific patient's journey); observational studies of relationships between factors and responses (including epidemiology); natural experiments (including learning from planned and unplanned changes that occur in hospitals); and planned experiments (including randomized controlled trials and factorial designs).[68]

These methods are incorporated into improvement strategies, including demand and capacity management using queuing theory, reducing variation, waste reduction, and simulation modeling. These approaches form the basis of suggested strategies to improve system-wide hospital operations and patient progression throughout stages of care in the hospital.[69,70]

The use of advanced data analytics and simulation is essential for the system-wide flow improvement oversight team to assess and manage demand and capacity at the hospital-wide level and in all hospital departments and inpatient units. The aim of demand and capacity management is to predict patient demand by time of day, day of the week, and season of the year, and to design hospital operations with sufficient capacity (i.e., hospital facility space and staffing) to meet that

demand. Accurate forecasts of patient demand enable leaders to make strategic decisions regarding physical facilities and staffing. Units can be sized with the flexibility to ensure that capacity exists to meet patient demand.

Specific Change Ideas:

- C7.1 Forecast seasonal variations and changes in demand patterns to proactively plan for predicted volume.
- C7.2 Assess the number of beds and staffing needed for each service to make plans to accommodate patient volume for each service.

S8. Utilize real-time demand and capacity management processes.

Many hospitals lack the processes and structures to admit or transfer patients without delays to inpatient units throughout the hospital. Managing hospital flow is a day-to-day activity; however, this effort should be coupled with a learning system that skillfully identifies problems and develops prevention strategies to avoid future problems. The real-time demand capacity (RTDC) management approach, which is based on management principles and queuing and constraint theory, has been implemented successfully in a variety of health care organizations.[71] RTDC represents a promising approach to improve hospital-wide patient flow and can be integrated into current bed management processes. RTDC comprises four steps that are undertaken in the hospital each day: 1) predict capacity at the unit level; 2) predict demand at the unit level; 3) develop a plan to match capacity and demand at the unit level; and 4) evaluate the results of the plans to identify barriers to patient flow that can be the focus of targeted improvement projects.[72] In addition to RTDC, flexible staffing models and capacity planning to accommodate surges in patient volume are necessary to provide agility in matching capacity and demand.[73]

Specific Change Ideas:

- C8.1 Use hospital-wide patient flow planning huddles and real-time demand and capacity problem solving.
- C8.2 Use flexible staffing models for clinicians and staff to meet daily and hourly variations in patient volume in each unit.
- C8.3 Use early recognition of high census and "surge" protocols to expedite plans for accommodating unplanned increases in patient volume.
- C8.4 Activate incident command centers to coordinate efforts to create bed capacity, increase staffing, and secure needed equipment and supplies during natural disasters, public emergencies, and epidemics or pandemics.

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Match Capacity and Demand

Redesign the System

Redesign the System

Demand for hospital beds often exceeds capacity, leading to delays in patient admissions and transfers between inpatient units, and cancellations of elective surgical procedures. Effective strategies must be in place for efficient use of existing bed capacity. There are numerous opportunities to improve efficiencies in care for hospitalized patients — while maintaining steadfast attention to providing safe, patient-centric, value-added hospital care — and arranging needed follow-up care after patients are discharged.

To achieve efficiencies and increase value in hospital care, hospital operations leaders must employ Lean principles, constraint management, and quality improvement strategies throughout the

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hospital.[74,75] Length of stay (LOS) for hospital patients is a well-accepted indicator of hospital efficiency, a key driver of hospital costs, and affects capacity within hospitals. Shorter hospital stays are often more standardized (and more patient centered), enabling beds to be available more quickly and thus more patients to receive timely care.

Understanding and managing constraints and bottlenecks and continuously reducing waste from processes within ORs, EDs, short stay units (SSUs), ICUs, and medical-surgical units are key approaches to decrease inefficiencies, reduce LOS in key clinical units, and improve patient flow. These improvements are essential for optimal clinical operations and are aligned with the third simple rule in IHI's approach for improving hospital-wide patient flow — Available Capacity: Ensure each unit or clinical area has some capacity at the beginning of each day. (See Use of Simple Rules in Complex Systems section above.)

S9. Improve efficiencies, length of stay, and throughput in the emergency department.

The demand for emergency department (ED) services has steadily increased, while capacity in most hospitals is severely stressed. Thus, hospital EDs are often plagued with long waits and delays. ED overcrowding contributes to poor care, frustrated patients, increased cost, potential harm, and stress for both patients and staff. Creating more efficient care processes through the application of Lean principles, constraint management, and quality improvement methodologies has dramatically improved ED outcomes and experiences for patients and staff.

Some successful strategies for improving ED flow and decreasing ED length of stay include bedside registration; focusing on triage as a process, not a location, and including physicians, physician assistants, or nurse practitioners in the triage process; patient segmentation by acuity level; rapid diagnosis and treatment for patients with low-acuity issues; early decision to admit patients; and cooperative arrangements between ED physicians and hospitalists. In addition to these interventions, staff configurations to meet predicted ED patient volume is a critical step for matching capacity to demand.[76,77]

Specific Change Ideas:

- C9.1 Separate ED flows based on acuity of patients.
- C9.2 Eliminate or streamline triage in the ED.
- C9.3 Implement efficiency changes in the ED to decrease length of stay (discharged and admitted patients).

S10. Improve efficiencies, length of stay, and throughput in the short stay unit.

In the US, observation services are generally a well-defined set of specific, clinically appropriate services that include ongoing short-term treatment and assessments to help clinicians decide if patients need further treatment in the hospital or if they can be discharged. There are a number of approaches for treating patients designated as "observation status." Patients managed in a dedicated, protocol-driven observation (or short stay) unit get timely diagnostic testing; have shorter lengths of stay and lower overall care costs; and have positive experiences of care.[78] Hospitals outside of the US similarly designate a short stay unit (SSU) as a location for patients with clinical conditions that generally require brief hospital stays.[79] By providing an alternative to hospital admissions, observation (or short stay) units allow hospitals to reserve beds on medical and surgical units for patients needing treatment for acute care needs.

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Specific Change Ideas:

- C10.1 Provide protocol-driven care in the SSU.
- C10.2 Utilize well-defined criteria for placing patients in one short stay location.
- C10.3 Establish dedicated clinicians and staff for the SSU.

S11. Improve efficiencies, length of stay, and throughput in the intensive care unit.

Length of stay in the intensive care unit (ICU) accounts for the highest costs in hospitals and poses the greatest risk for hospital-acquired conditions. In addition, bottlenecks in ICUs have a negative impact on patient flow, and delays in placing patients in appropriate ICUs may result in suboptimal care. Strategies to optimize the ICU length of stay include four key areas: 1) preventing complications; 2) enhancing interdisciplinary communication and planning; 3) ensuring downstream bed availability by coordinating ICU transfers and floor discharges using prediction, visual management, and twice-daily hospital-wide huddles; and 4) compassionate end-of-life care planning.[80]

Bundles and protocols in the ICU must be clearly understood by the entire care team and reliably implemented for optimal management of critical care processes — fluid stabilization and resuscitation, ventilator weaning, early mobilization and delirium prevention, and "zero" complications (e.g., ventilator-associated pneumonias [VAPs], catheter-related bloodstream infections [CR-BSIs], catheter-associated urinary tract infections [CA-UTIs], surgical site infections [SSIs], deep venous thrombosis [DVT]).[81,82] Each of these, when mismanaged, adds days and costs to ICU stays. In the complex hospital environment, care teams need a standard set of operating principles, clear, agreed-upon plans for each patient, and a designated process to continuously work together to identify barriers and solve problems.[83,84]

Specific Change Ideas:

- C11.1 Provide protocol-driven care (e.g., weaning, ambulation) and stabilization in the ICU.
- C11.2 Ensure timely palliative care consults in the ICU.
- C11.3 Identify and eliminate delays (e.g., consults, procedures) in the ICU.
- C11.4 Implement daily huddles and interdisciplinary planning in the ICU.

S12. Improve efficiencies, length of stay, and throughput in medical-surgical units.

Most medical-surgical unit care teams are facing increased demand due to shorter lengths of stay, an aging population, increased patient complexity and acuity, inefficient care processes, and challenges with discharging patients with the "appropriate care" in a timely fashion. These discharge delays often create bottlenecks that negatively impact patient flow throughout the hospital. Some changes that have increased efficiencies and eliminated waste on medical-surgical units include decentralizing clinical workstations, redesigning admission and discharge processes, geographic assignments for hospitalists, bedside rounding, improving interprofessional communication, and care planning with patients and family members.[85,86]

Specific Change Ideas:

- C12.1 Use case management and care management for patient populations with complex care and social needs in medical-surgical units.

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- C12.2 Use advance planning and cooperative agreements for transfers of patients from medical-surgical units to community providers of care.
- C12.3 Standardize interdisciplinary rounds in medical-surgical units and effectively engage patients and family caregivers in rounds.
- C12.4 Identify and eliminate delays (e.g., consults, procedures) in medical-surgical units.

S13. Improve efficiencies and throughput in the operating room.

In many hospitals, operating room (OR) capacity is at a premium. Maximizing efficiencies in OR suites is essential to ensure that patients have timely access to needed surgical procedures, both scheduled and emergency cases. With respect to hospital operations, ORs are a resource-intensive and costly department and also a major source of revenue. Thus, increasing OR workflow efficiencies and throughput is an essential strategy for maintaining economically viable hospital operations. Lean management strategies can be readily applied to increase OR throughput and service capacity.

Increasing throughput and removing waste and inefficiencies requires attention to a wide array of variables, including scheduling OR cases, staff allocation, equipment availability, preparation and induction of patients, adherence to start times, performance of surgery, recovery from anesthesia, and preparation of the OR for the next patient.[87,88] In addition to OR efficiency improvements, separating elective and non-elective surgical cases has resulted in waiting time reductions for urgent and emergent surgical cases, increases in OR throughput, decreases in staff overtime, and decreases in delays for elective surgeries. Thus, the use of the variability methodology to manage a hospital's surgical services has demonstrated improvement in operational performance and the safety and quality of care.[89,90]

Specific Change Ideas:

- C13.1 Separate flows for scheduled and emergency OR cases.
- C13.2 Implement efficiency changes to improve OR throughput.

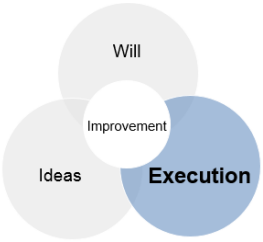
S14. Develop medical readiness criteria for timely progression of patients to appropriate clinical units throughout the hospital stay and at discharge.

Timely progression of patients to the appropriate clinical areas and units throughout hospitalizations is the second simple rule in IHI's approach for improving hospital-wide patient flow. (See Use of Simple Rules in Complex Systems section above.) Based on clinical status, patients are transitioned to the appropriate location of care (e.g., from the ED to a telemetry unit, from a surgical unit to the OR, from a medical unit to the ICU, from a medical or surgical unit to a long-term care facility).

Clinical leaders need to develop medical readiness criteria for timely progression of patients to appropriate clinical units throughout the hospital stay and at discharge. Additionally, leaders need to mutually agree on the ideal timeframe for patient progression after medical readiness criteria have been met. While this concept is straightforward, hospital-wide implementation is complex.[91] Flow delays occur when patients are held in a clinical site or unit for an inappropriate length of time, resulting in inconvenient waiting times, potential safety risks, and treatment delays. Measurement of delays in flow can help leaders and improvement teams assess progress in achieving hospital-wide patient flow.

Specific Change Ideas:

- C14.1 Use medical readiness criteria to facilitate timely patient progression to appropriate clinical units.
- C14.2 Use proactive discharge planning focused on patient medical readiness criteria for discharge.
- C14.3 Improve efficiencies and coordination of discharge processes.



Execution Strategies to Achieve Hospital-wide Patient Flow

The key to execution is to plan and deploy a hospital-wide patient flow strategy. No single initiative or set of unaligned projects is enough to produce system-level results.[92] See Appendix D for additional guidance on creating an action plan to get started with efforts to improve hospital-wide patient flow, or to enhance your organization's current initiatives. The following section presents four key execution strategies to achieve hospital-wide patient flow:

- Provide Oversight of System-Level Performance
- Use Hospital-wide Flow Measures to Guide Learning and Improvement to Achieve Results
- Create a System for Achieving Breakthrough Performance Improvement
- Build Quality Improvement Capability at All Levels of the Organization

Provide Oversight of System-Level Performance

System-level improvement requires executive leaders to prioritize intended work and set expectations regarding resource allocation, operations, and results. Strong, effective, and persistent executive oversight creates coherence between improvement projects across individual departments and teams.[93] The necessary operational and cultural changes to achieve sustainable improvements in hospital-wide patient flow require dedicated executive leadership.

- **Declare the importance of hospital-wide patient flow.** In many hospitals, isolated teams attempt to address patient flow without leadership support at the highest level. Only the executive leadership team has the authority to establish system-wide change. Executive leaders must understand the challenges of patient flow throughout the system; articulate why improving flow is important to the hospital's operations and core mission, as well as safety and quality. Leaders support and guide efforts to make system-wide improvements. Every team member, from executive leaders to point-of-care staff, must understand the importance of flow to deliver high-quality care.
- **Demonstrate an understanding of the realities of flow challenges in the hospital.** Effective executive leaders understand the challenges and opportunities facing their hospital systems. This requires firsthand learning about flow bottlenecks and constraints by spending time in the various hospital departments and units. Formal executive walkarounds enhance senior leaders' working knowledge of hospital-wide, unit-level, and departmental operations, including types and frequency of patient flow and census challenges.

- **Convene an executive oversight team for system-wide flow improvement.** This team should include many, if not all, of the following individuals: executive team representatives; heads of major departments across the hospital such as surgery, medicine, and nursing; staffing and resourcing leaders; data and operations analysts; and quality improvement specialists. Conduct a diagnostic self-assessment of flow operations. Do you have the organizational will for this work? Have you created a flow strategy that your flow team can execute? Can you implement changes articulated in the driver diagrams? Do your teams have the efficacy to execute the flow strategy?

  Refer to Appendices A, B, and D to guide a self-assessment. Create a flow map similar to Figure 1 and begin collecting monthly data for the recommended system-wide flow measures listed in Table 1. Discuss learning and findings with flow team members. Use your self-assessment to set priorities. Gaining insights into how special interests and siloed operations suboptimize flow is a critical step to understand challenges that must be addressed to achieve hospital-wide patient flow.

- **Establish a strategy for hospital-wide patient flow.** Initially, the executive oversight team establishes the strategy for flow improvement based on the self-assessment and the hospital's focus. The strategy enables the organization to focus leadership's attention and prioritize work in the first year, benefitting flow teams by providing strong direction and enabling them to maintain energy.

- **Revise the hospital-wide flow strategy at least annually.** With knowledge of the biggest opportunities for improvement gleaned from the self-assessment, and assessment of specific interventions that will likely lead to improvement, focus on two or three high-leverage secondary drivers.

- **Ensure learning and oversight to optimize hospital-wide flow.** The executive oversight team needs to create a hospital-wide learning system to understand hospital-wide flow constraints and bottlenecks and develop approaches to mitigate them. The oversight team meets regularly to review flow improvement project progress and monitor hospital-wide flow measures (described below) to assess whether patient flow is improving. Tracking and utilizing data on key flow measures throughout the hospital helps senior leaders and unit-level teams better understand areas where patient flow is, or is not, working well. Based on these results, executive leaders can help correct course or make important decisions to redirect or reinforce efforts. The executive oversight team is accountable to the organization for ongoing learning and progress of the hospital-wide patient flow strategy.

Hospital Example: Oversight of System-Level Performance

Executive leaders at Cincinnati Children's Hospital Medical Center used the approach described above to convene an oversight team focused on improving system-wide flow. The team included executive leaders, department leaders, operations specialists, and data analysts. The oversight team identified "entire system delay" as their primary system-level measure of patient flow, which aggregated all delays of admission, transfer, and discharge across all departments into one easily understood number.

Executive leaders ensured that hospital departments had protected time to undertake improvement and invested in developing staff quality improvement skills. To ensure the success of flow improvement efforts, executive leaders meet regularly with the oversight team, which provides a forum for identifying and addressing barriers and challenges in a timely manner. Through their James M. Anderson Center for Health System Excellence, the hospital has built improvement capability and an operations infrastructure to support this learning system, enabling them to operate at a greater than 90 percent bed occupancy rate overall.[94]

Hospital Example: Oversight of System-Level Performance

Long Island Jewish Medical Center, part of Northwell Health, designed a learning system to inform whether and how changes were affecting flow failures, delays, and bed capacity. They formed a Hospital Throughput Committee with senior leader sponsorship. Clinical, ancillary, and support departments collaborated for flow improvements. First, the committee looked at flow failures. Were patients cared for in the right place and at the right time? This led to reallocating some units to accommodate demand for patients with similar conditions and staff training to provide patient care by the most appropriate staff. Next, the hospital tracked flow failures and flow delays by unit and used seven questions for every patient during interdisciplinary rounds.

The team displayed data for flow failures and bed capacity using run charts. Data was stratified by unit, enabling the team to learn about reasons for flow failures and focus improvement efforts on the eight most common failures. As a result of their efforts, heart failure length of stay decreased, flow failures reduced dramatically, and ED holds over 24 hours were nearly eliminated. The Case Management and Social Work roles were also redesigned on three pilot units, resulting in reduced length of stay and increased capacity by eight beds. When completely rolled out to the hospital, capacity of 24+ beds will be created through efficiency gains. The Hospital Throughput Committee continues to meet and prioritize goals based on learning from system-wide measures and initiatives to improve patient flow.

Use Hospital-wide Flow Measures to Guide Learning and Improvement to Achieve Results

Hospital-wide and unit-level measures for patient flow help hospitals monitor overall system performance. Table 1 lists twelve recommended hospital-wide flow measures. See Appendix E for operational definitions for these measures.

Table 1. Recommended Hospital-wide Patient Flow Measures

Number of flow failures (right care, right place, defined by each unit/service)
Percentage of patient days with flow delays (right time, defined by each unit/service)
Percentage available capacity (percentage of units with at least one available bed at 7 AM)
Occupancy rate (monthly, day of week)
Number or percentage of readmissions within 30 days after discharge
Patient experience (patient satisfaction measures related to waits and delays)
Clinician and staff satisfaction related to workload
Number or percentage of healthcare-acquired conditions (e.g., falls with injury, ventilator-associated pneumonias)
Number or percentage of unnecessary bed days (by month, by unit/service)
Average length of stay (all inpatient units)
Number of decedents spending more than 7 days in the ICU in the last 6 months of life
Number of ED visits and hospital admissions

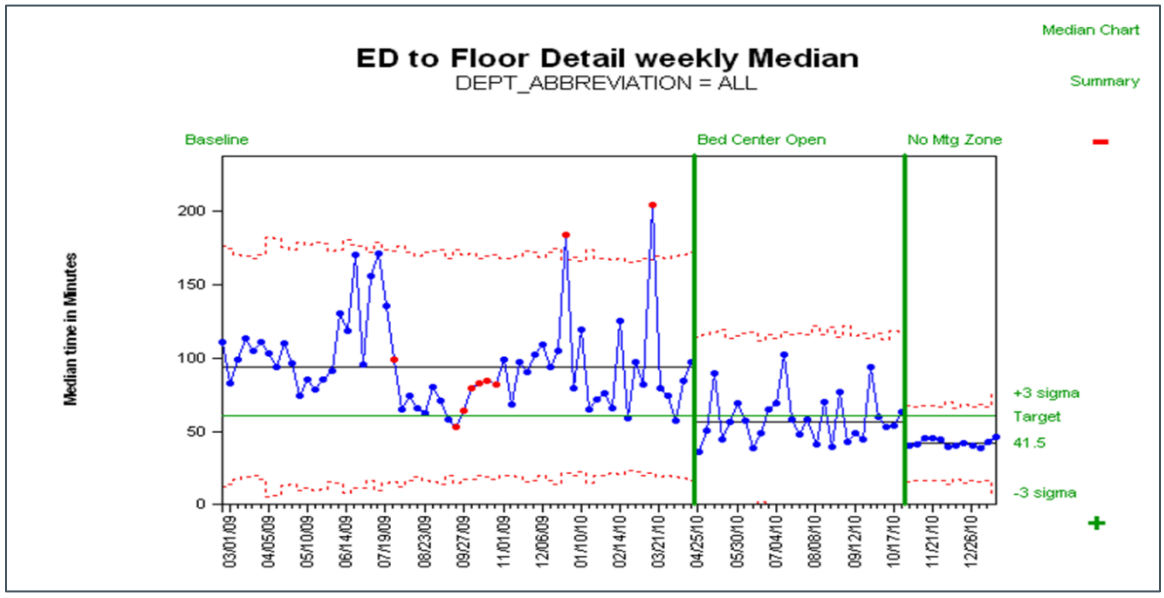
These measures help hospital leaders monitor and learn about overall system performance for hospital-wide patient flow. Measurement data informs improvement efforts and real-time flow management.

- **Planning for Improvement:** Understanding the performance of an organization at all levels requires the use of multiple measures. No single measure is adequate to inform the performance of a complex system, including hospital-wide flow. Below we discuss the use of a dashboard of the twelve hospital-wide flow measures.
- **Measurement for Improvement:** Measurement and feedback are used to identify flow problems, establish baseline performance, inform and guide the progress of improvement projects, and select and test changes for improvement. Evaluating current performance through continuous monitoring of system-level measures is the key strategy to identify flow problems. This quality control function should be a part of daily operations. When performance gaps are detected in flow measures, operations can react to close these gaps (e.g., through daily flow huddles, real-time capacity and demand analysis). With ongoing monitoring of system-level flow measures, the executive oversight team can also initiate improvement projects with the objective of improving overall hospital-wide patient flow.

  Measurement is also used to inform and guide improvement projects at the department and unit levels. At the beginning of a project, the team establishes process, outcome, and balancing measures to support the improvement aim. Measurement is part of Plan-Do-Study-Act (PDSA) cycles to develop, test, and implement changes. Measures used in these small tests of change are typically specific process measures related to the change(s) being tested in the PDSA cycle; sometimes they are the project outcome measures stratified for the scope of the PDSA cycle. The team reports data for measures graphically on time series charts.
- **Real-Time Flow Management:** Information technology makes it possible to measure flow (capacity and demand) on a real-time basis and take actions based on these measures to maintain flow. (See additional discussion in the strategies associated with real-time capacity and demand management.)

Since flow is a dynamic concept, the presentation and analysis of flow measure data should incorporate the use of time series charts, graphical displays of data plotted over time, in the form of run charts and Shewhart control charts (a statistical tool used to distinguish between common cause and special cause variation in a measure).[95] Figure 4 is an example of a Shewhart control chart for an ED flow measure (time from decision to admit to transfer from the ED to the inpatient unit).

Figure 4. Example Shewhart Control Chart from Kaiser Permanente South Sacramento Medical Center

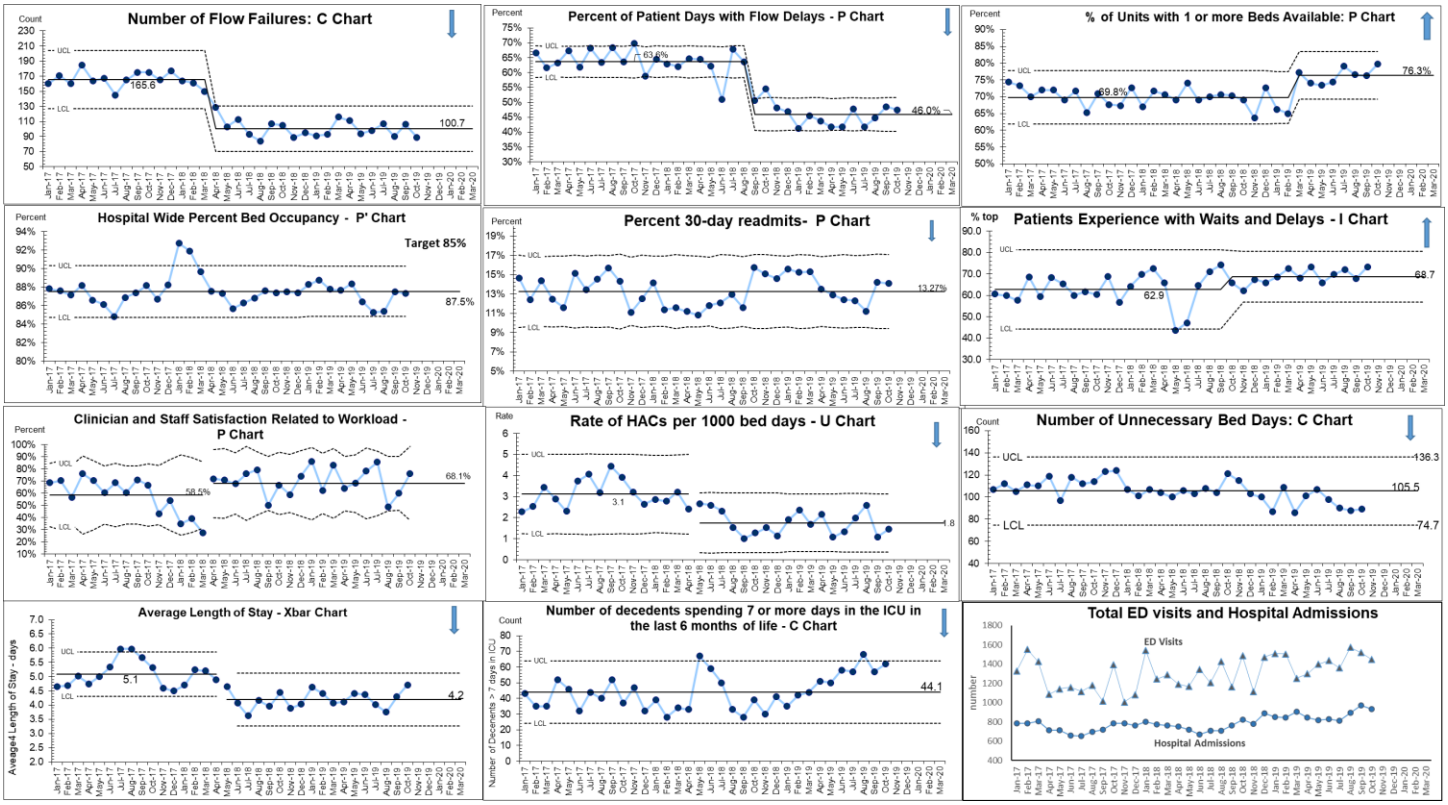


Some organizations present their dashboard of flow measures using a color-coded system: red (problems), yellow (warning), green (okay).[96] The focus on colors to indicate current flow performance can be useful for hospital operations, where the purpose is quick decision making and action; however, it can be distracting and misleading when the focus is learning and understanding the system-wide impacts. Strategic decisions are best made by learning how the system performs more broadly rather than based on a single point in time. Color-coded displays may lead to making judgments relative to a dashboard goal without providing a basis for making improvements toward that goal. Acting on a single point in time based on either meeting, nearly meeting, or not meeting a goal can lead to faulty action since the decision is informed only by a single data point rather than on the pattern or trend of data. Valuable information about the system's performance is hidden when the color-coded style of dashboard is used.[97]

Flow is dynamic and complex; data for each measure should be tracked on an appropriate time series chart (run chart or Shewhart control chart). Displaying time series charts for all measures on the same page presents a "dashboard" view of the performance of the entire system,[98] enabling teams to explore the interdependencies of the measures and understand the impact (both intended and unintended) of improvement initiatives.[99,100]

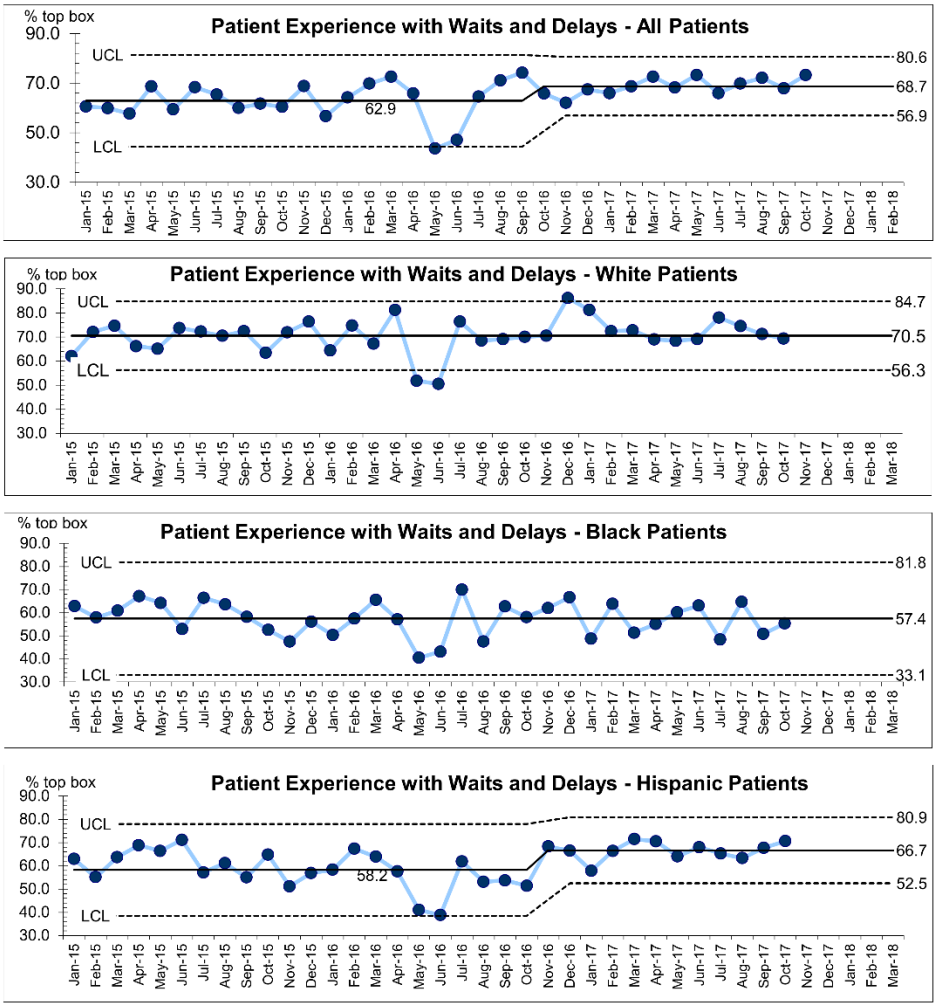
Figure 5 shows an example of the dashboard format for the twelve hospital-wide patient flow measures listed in Table 1. The dashboard format helps leaders more accurately assess the impact of changes to the system, identify system interrelationships, appreciate both dynamic (i.e., change over time) and detail complexity, and predict future performance of each measure.

Figure 5. Dashboard of Time Series Charts for Twelve Hospital-wide Patient Flow Measures



Stratifying these flow measures is also useful for exploring issues such as health equity. Figure 6 shows examples of stratification by racial groups on Shewhart control charts for the hospital-level patient experience measure.

Figure 6. Incorporating Learning about Health Equity from Stratified Data



Create a System for Achieving Breakthrough Performance Improvement

Execution is the action component of the Will-Ideas-Execution framework presented in the IHI White Paper on this topic and includes the four components described below.[101] Aligned improvement projects based on a shared hospital-wide flow strategy will help produce system-level results. The execution strategy described here aims to produce system-level results in hospital-wide patient flow.

- **Develop a portfolio of improvement projects aligned with the hospital-wide flow strategy.** Identify improvement projects that support the specific goals of the strategy. Project teams (usually cross-functional and interdepartmental) lead the day-to-day improvement projects using an improvement methodology to guide their work — establishing a project aim and measures, and identifying and testing changes on a small scale before implementing them more widely to reduce the risks of unintended consequences and to learn whether promising change ideas produce the predicted results. Scale-up of improvements can occur after successful implementation in pilot areas.[102] Figure 7 describes a comprehensive

portfolio of projects in key clinical hospital areas. Select specific change ideas depicted in the driver diagram in Figure 3 (and described in more detail in Appendices B and C).

Figure 7. Example of a Comprehensive Portfolio of Flow Improvement Projects

	Shape Demand	Match Capacity and Demand	Redesign the System
	Aims: Reduce avoidable hospitalizations and unnecessary bed days; reduce low-acuity ED visits; reduce day-of-week census variation	Aims: Reduce delays in moving patients to appropriate units; ensure patients are admitted to the appropriate unit; ensure adequate staffing	Aims: Reduce bed days; reduce length of stay; reduce waits and delays
Hospital-Level (Macro)	• Provide end-of-life care in accordance with patients' wishes • Reduce readmissions for patients with complex needs • Reduce hospital-acquired conditions	• Data-driven learning system for hospital-wide patient flow • Real-time capacity and demand management • Early recognition of high census and surge planning	• Construct single rooms • Implement seasonal "swing" units/beds • Improve service line optimization for populations (e.g., frail elders, SNF residents, stroke patients, homeless individuals)
Short Stay Unit	• Utilize case managers to facilitate discharges to home • Arrange home care and timely follow-up care	• Improve predictions of admissions and discharges	• Create a separate unit for short stay patients
Emergency Department	• Provide end-of-life care in accordance with patients' wishes • Utilize case managers to facilitate discharges to home • Arrange home care and timely follow-up care • Relocate patients with low-acuity needs to community-based care settings	• Improve predictions of admissions for various units • Create staffing plans to meet predicted patient volume	• Implement ED efficiency changes to decrease length of stay (for patients being discharged and patients being admitted) • Separate flows in the ED
Intensive Care Unit	• Provide end-of-life care in accordance with patients' wishes • Decrease complications and harm	• Improve real-time capacity and demand predictions • Create staffing plans to meet predicted patient volume	• Decrease length of stay (timely consults and procedures; aggressive weaning and ambulation protocols)
Medical-Surgical Unit	• Provide end-of-life care in accordance with patients' wishes • Decrease complications and harm • Reduce avoidable readmissions • Create cooperative agreements with rehab facilities, SNFs, and nursing homes	• Improve real-time capacity and demand predictions • Create staffing plans to meet predicted patient volume	• Decrease length of stay for patients with complex medical care and social needs • Discharge patients that meet medical readiness criteria
Operating Room	• Decrease artificial variation in surgical scheduling	• Improve predictions for transfers to various units • Create staffing plans to meet predicted patient volume	• Implement OR efficiency changes to improve throughput • Separate flows for scheduled and emergency OR cases

Reference Appendix D for a health care system example of how to align teams to support a system-wide patient flow strategy.

- **Provide the appropriate project resources needed to achieve the hospital-wide flow strategy.** System-wide flow improvement projects demand significant resources and time. The intensity of resources committed affect the pace of progress. Improvement project teams need an executive sponsor to connect project teams to organizational strategy, coordinate the efforts with other projects, ensure resource support, and assist with removing barriers. Teams need one or more technical experts, persons who know the clinical subject matter intimately and who understand the processes of care. In addition to allocating time and resources for improvement team members, organizations must also make it a priority to allocate organizational resources to the portfolio of projects:
    - Capital for projects, such as information technology, construction, or new equipment;
    - Designated information technology services to support the needs of projects;

  - Other support services such as finance or human resources, as required; and
  - Dedicated data or operations analysts and quality improvement specialists assigned to assist teams. These analysts and improvement specialists can also serve as expediters for the hospital-wide flow improvement efforts by sharing knowledge among the various improvement teams.

- **Establish an oversight and learning system for the portfolio of improvement projects to increase the likelihood of success.** As part of the hospital's system-wide strategic plan, organizations need a process for executive review of flow improvement projects. Both monthly and quarterly, executive sponsors review their flow teams' progress with the executive team responsible for executing the hospital's overall strategic plan and associated improvement initiatives. Reviews function as high-level problem-solving sessions, with an unwavering commitment to make the projects and the teams successful.
- **Empower teams to make improvements and remove barriers.** Executive leaders empower flow improvement teams by prioritizing and providing clarity for new work. Improving hospital-wide flow requires innovation in both local teams and cross-departmental teams. This may require de-prioritizing other improvement projects. As teams map the current processes, they will identify existing barriers to patient flow (e.g., delays that are tied to old processes, "the way we've always done it here"). Executive leaders must empower teams to address these impediments and provide support to help teams eliminate barriers.

Build Quality Improvement Capability at All Levels of the Organization

Deploying resources to a portfolio of flow improvement projects requires leaders, managers, clinicians, and staff with skills in quality improvement. For individual projects, select project leaders from candidates who have training in using quality improvement methods and interest in improving system-wide flow.

The executive oversight team will have to negotiate with line managers to enable their time to work on the projects, as this work will require considerable time. Although the high levels of staffing initially required by the improvement projects (discussed above) may seem excessive or unaffordable, these projects are vital to the organization and expected to result in a substantial return on investment. The pace of the improvement projects is a deliberate choice ("how much, by when") and the resources must support that choice.

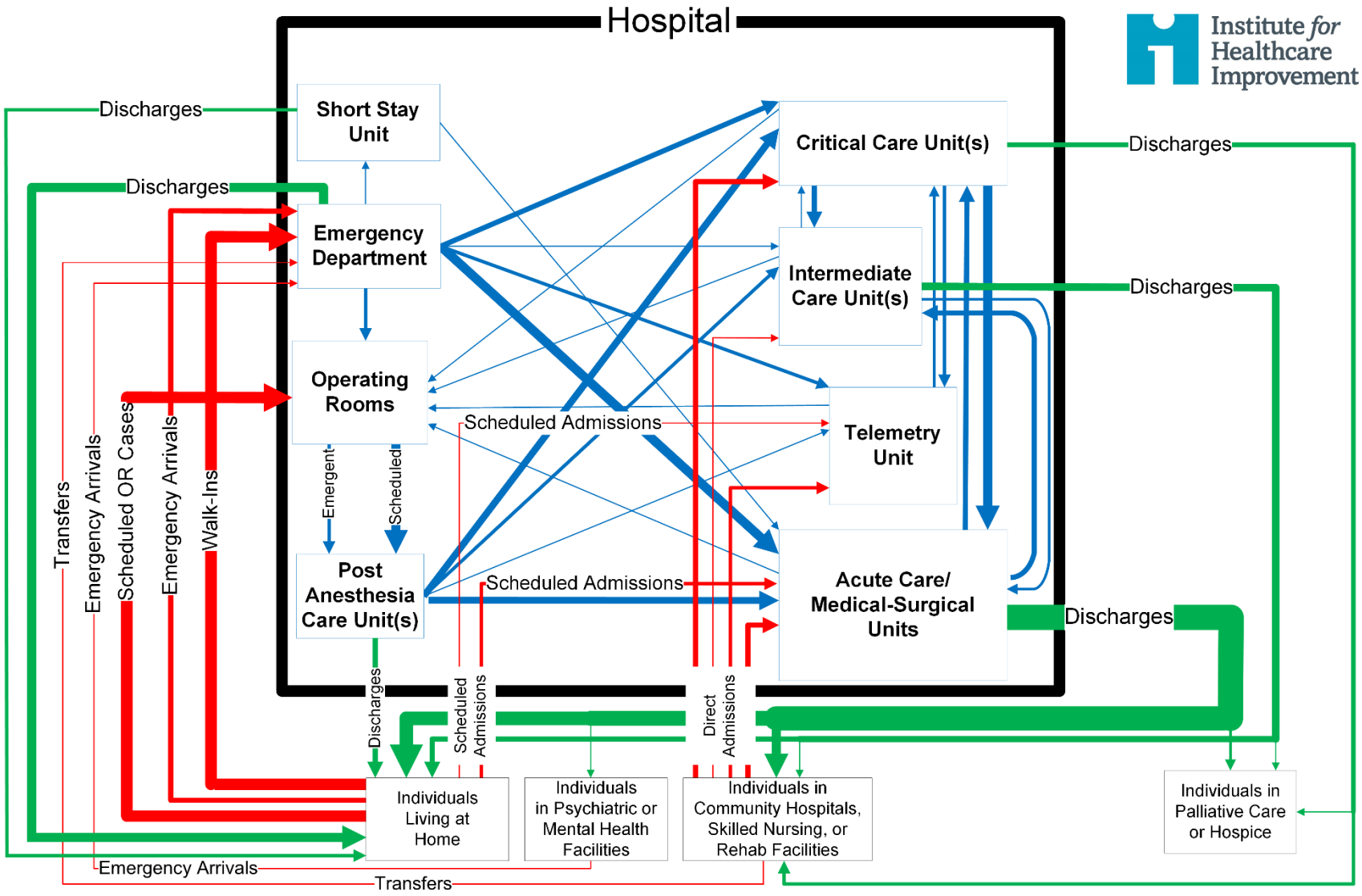
For many organizations, the issue is not how much of someone's time to allocate to a project, but rather finding and developing people in the organization who are capable of leading a project or overseeing a portfolio of projects. Organizations that successfully execute projects create development plans for individuals within the organization to become improvement team leaders, including some or all the following: increasing responsibility for larger and more complex projects; attending seminars and other formal improvement training; participating in multi-organization improvement efforts; making presentations at conferences; and writing papers for publication in peer-reviewed journals.

Training and development of improvement project leaders should take an experiential learning approach that applies improvement skills and knowledge to real projects. The organization needs to have a common framework for improvement such as the Model for Improvement in order to leverage a shared approach to training and training materials across all departments and projects.[103]

Conclusion

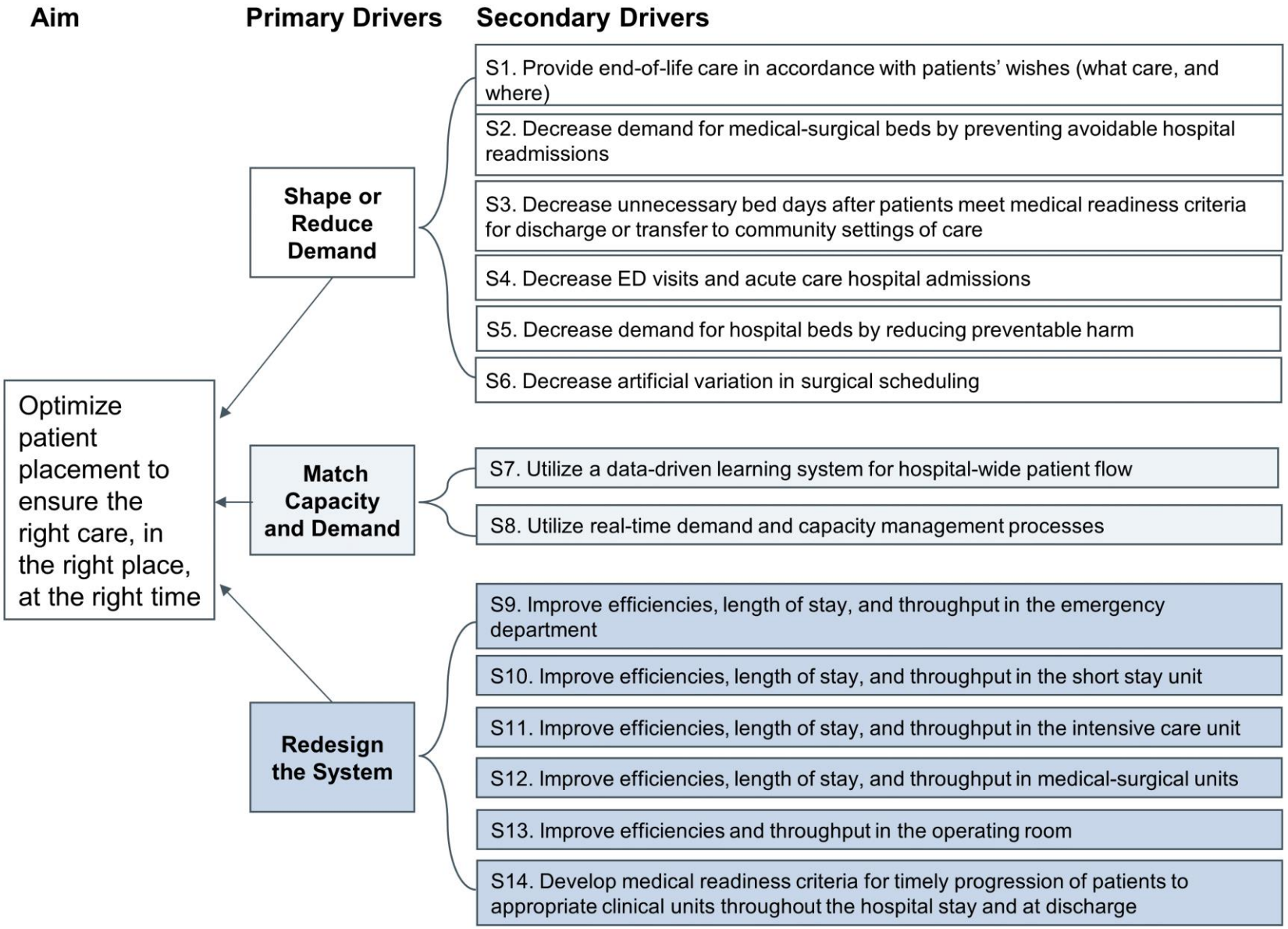
Current efforts to improve patient flow in most hospitals are well intended, but are often characterized by the pursuit of siloed and sometimes conflicting priorities within the organization. This white paper aims to serve as a guide for hospital leaders and quality improvement teams seeking to adopt comprehensive, system-wide strategies to improve hospital-wide patient flow. Reliable delivery of the right care, in the right place, at the right time is an essential priority for achieving the very best outcomes for all patients.

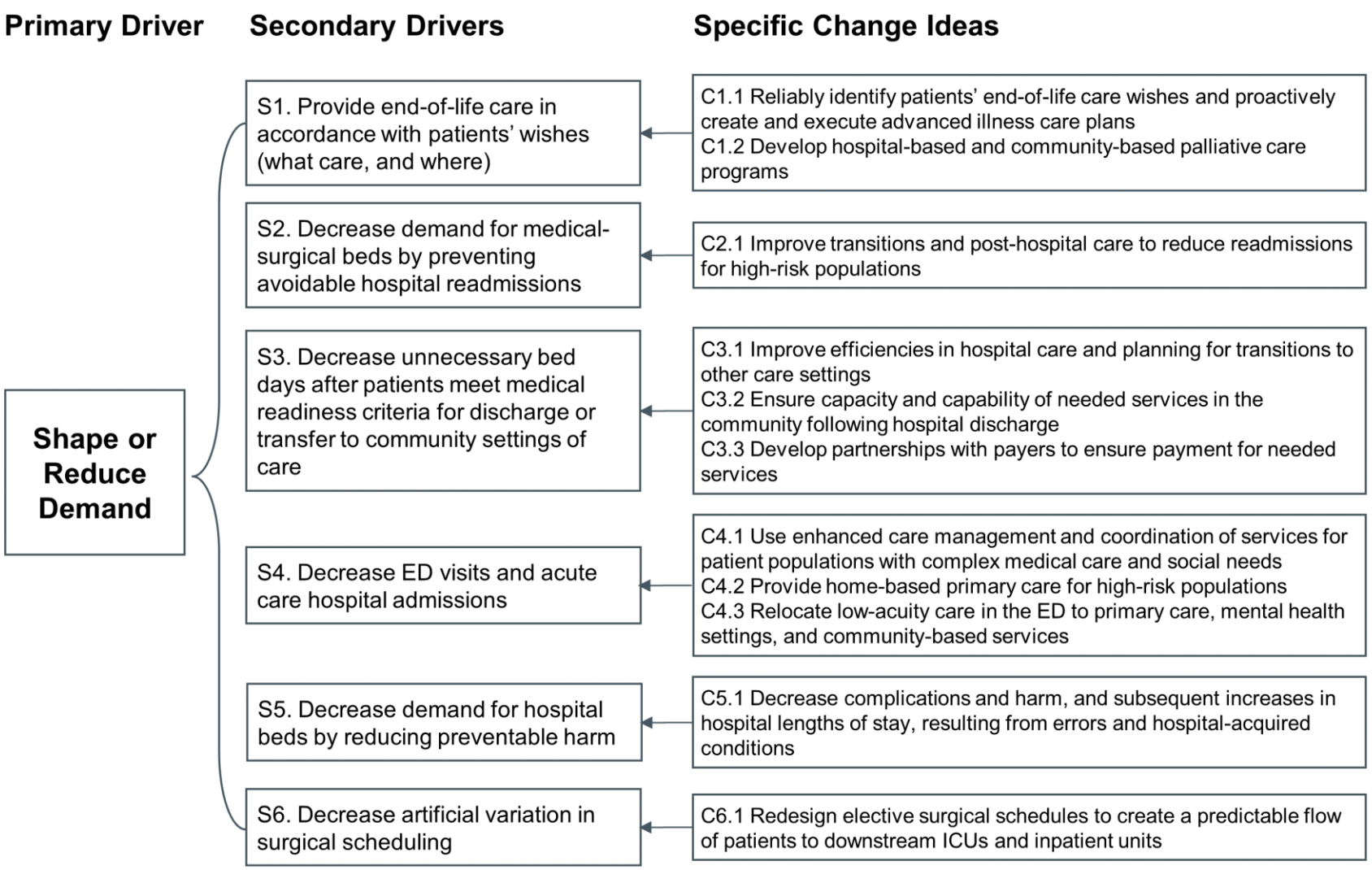
Appendix A: System Map: Patient Flow in the Hospital

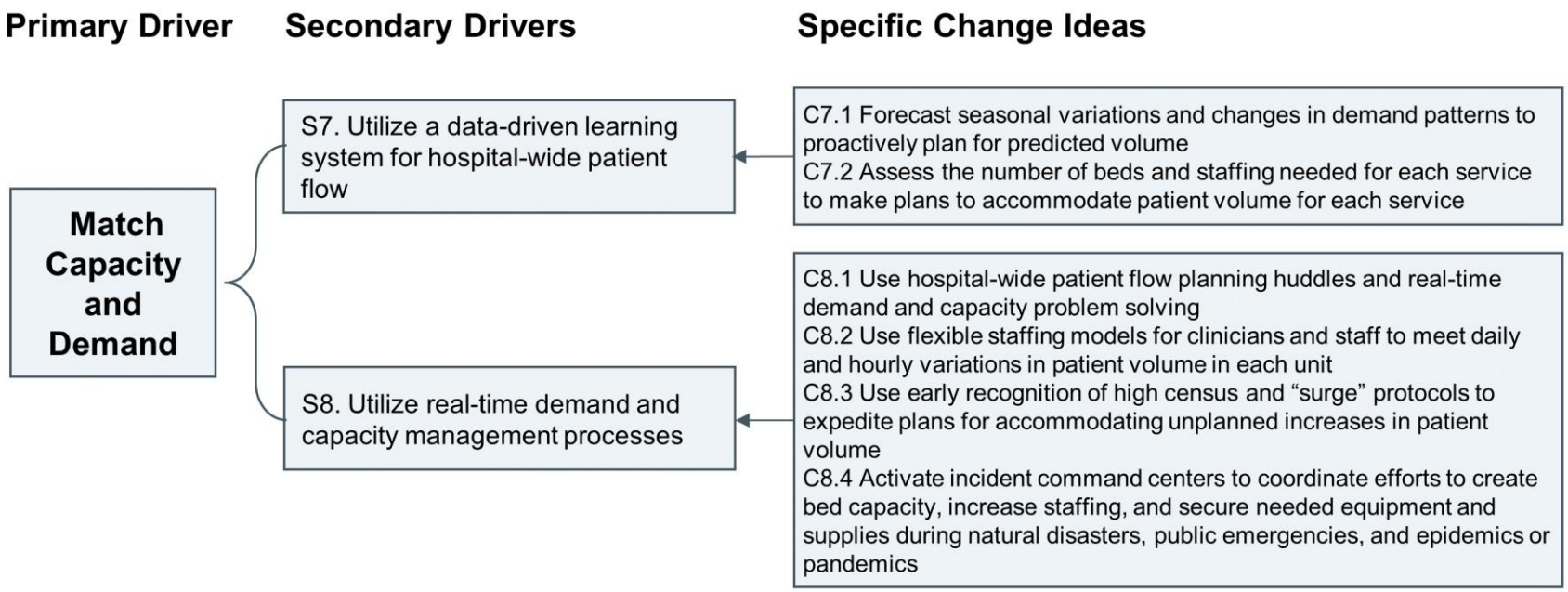


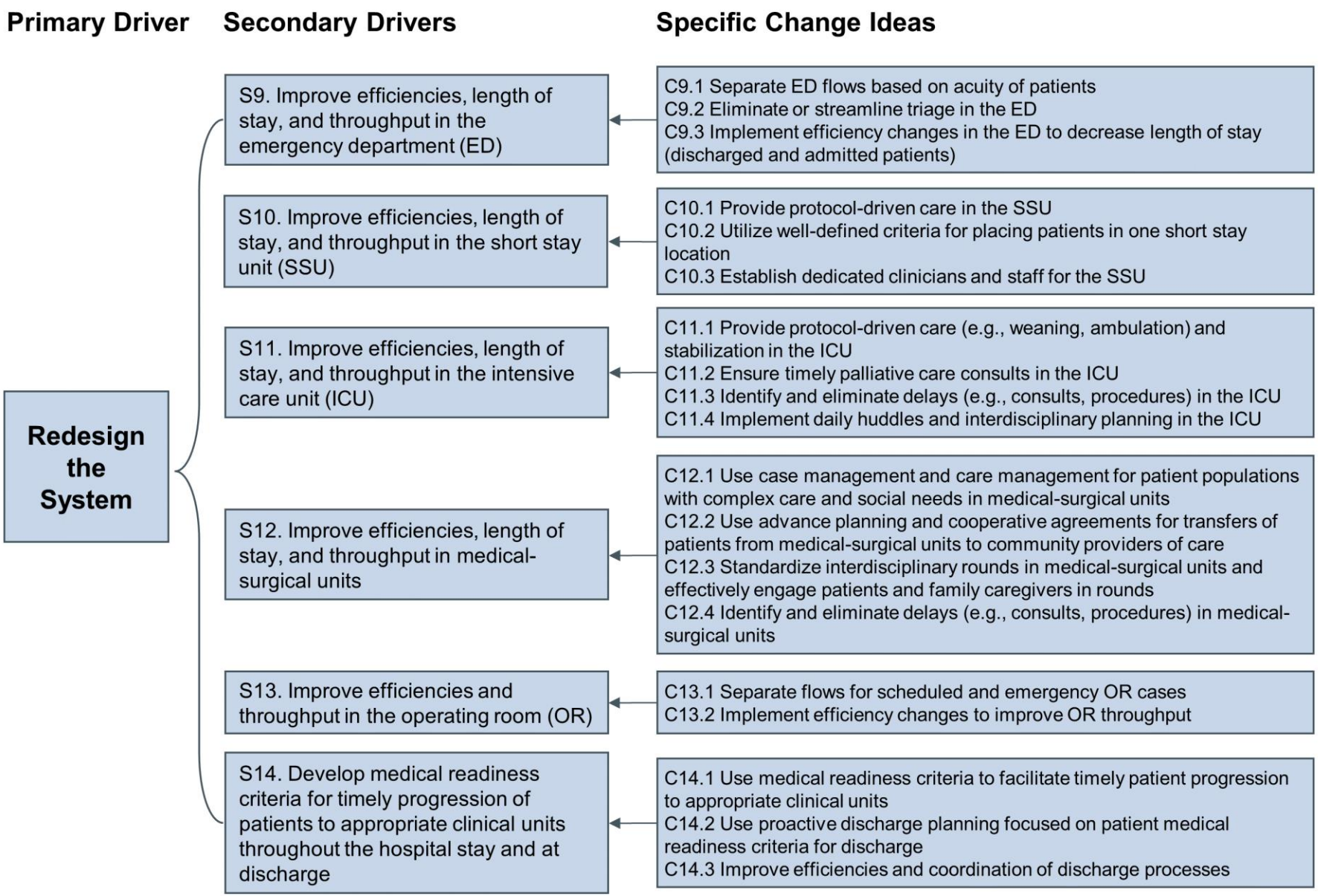
Key: Blue arrows: Flow within hospital | Red arrows: Flow into hospital | Green arrows: Flow out of hospital | **Width of arrows:** Typical flow volumes

Appendix B: Driver Diagrams for Achieving Hospital-wide Patient Flow




Primary Driver
Secondary Drivers
Specific Change Ideas
Shape or Reduce Demand
S1. Provide end-of-life care in accordance with patients' wishes (what care, and where)
C1.1 Reliably identify patients' end-of-life care wishes and proactively create and execute advanced illness care plans
C1.2 Develop hospital-based and community-based palliative care programs
S2. Decrease demand for medical-surgical beds by preventing avoidable hospital readmissions
C2.1 Improve transitions and post-hospital care to reduce readmissions for high-risk populations
S3. Decrease unnecessary bed days after patients meet medical readiness criteria for discharge or transfer to community settings of care
C3.1 Improve efficiencies in hospital care and planning for transitions to other care settings
C3.2 Ensure capacity and capability of needed services in the community following hospital discharge
C3.3 Develop partnerships with payers to ensure payment for needed services
S4. Decrease ED visits and acute care hospital admissions
C4.1 Use enhanced care management and coordination of services for patient populations with complex medical care and social needs
C4.2 Provide home-based primary care for high-risk populations
C4.3 Relocate low-acuity care in the ED to primary care, mental health settings, and community-based services
S5. Decrease demand for hospital beds by reducing preventable harm
C5.1 Decrease complications and harm, and subsequent increases in hospital lengths of stay, resulting from errors and hospital-acquired conditions
S6. Decrease artificial variation in surgical scheduling
C6.1 Redesign elective surgical schedules to create a predictable flow of patients to downstream ICUs and inpatient units


Primary Driver
Secondary Drivers
Specific Change Ideas
Match Capacity and Demand
S7. Utilize a data-driven learning system for hospital-wide patient flow
S8. Utilize real-time demand and capacity management processes
C7.1 Forecast seasonal variations and changes in demand patterns to proactively plan for predicted volume
C7.2 Assess the number of beds and staffing needed for each service to make plans to accommodate patient volume for each service
C8.1 Use hospital-wide patient flow planning huddles and real-time demand and capacity problem solving
C8.2 Use flexible staffing models for clinicians and staff to meet daily and hourly variations in patient volume in each unit
C8.3 Use early recognition of high census and "surge" protocols to expedite plans for accommodating unplanned increases in patient volume
C8.4 Activate incident command centers to coordinate efforts to create bed capacity, increase staffing, and secure needed equipment and supplies during natural disasters, public emergencies, and epidemics or pandemics


Primary Driver
Secondary Drivers
Specific Change Ideas
Redesign the System
S9. Improve efficiencies, length of stay, and throughput in the emergency department (ED)
C9.1 Separate ED flows based on acuity of patients
C9.2 Eliminate or streamline triage in the ED
C9.3 Implement efficiency changes in the ED to decrease length of stay (discharged and admitted patients)
S10. Improve efficiencies, length of stay, and throughput in the short stay unit (SSU)
C10.1 Provide protocol-driven care in the SSU
C10.2 Utilize well-defined criteria for placing patients in one short stay location
C10.3 Establish dedicated clinicians and staff for the SSU
S11. Improve efficiencies, length of stay, and throughput in the intensive care unit (ICU)
C11.1 Provide protocol-driven care (e.g., weaning, ambulation) and stabilization in the ICU
C11.2 Ensure timely palliative care consults in the ICU
C11.3 Identify and eliminate delays (e.g., consults, procedures) in the ICU
C11.4 Implement daily huddles and interdisciplinary planning in the ICU
S12. Improve efficiencies, length of stay, and throughput in medical-surgical units
C12.1 Use case management and care management for patient populations with complex care and social needs in medical-surgical units
C12.2 Use advance planning and cooperative agreements for transfers of patients from medical-surgical units to community providers of care
C12.3 Standardize interdisciplinary rounds in medical-surgical units and effectively engage patients and family caregivers in rounds
C12.4 Identify and eliminate delays (e.g., consults, procedures) in medical-surgical units
S13. Improve efficiencies and throughput in the operating room (OR)
C13.1 Separate flows for scheduled and emergency OR cases
C13.2 Implement efficiency changes to improve OR throughput
S14. Develop medical readiness criteria for timely progression of patients to appropriate clinical units throughout the hospital stay and at discharge
C14.1 Use medical readiness criteria to facilitate timely patient progression to appropriate clinical units
C14.2 Use proactive discharge planning focused on patient medical readiness criteria for discharge
C14.3 Improve efficiencies and coordination of discharge processes

Appendix C: Specific Change Ideas for Improving Hospital-wide Patient Flow

The specific change ideas (denoted by the letter "C" in this Appendix) are organized first by the three key approaches (primary drivers) for improving hospital-wide patient flow (i.e., shape or reduce demand, match capacity and demand, and redesign the system), and then by the secondary drivers (denoted by the letter "S") for each of these approaches described in the "High-Leverage Change Ideas for Improving Hospital-wide Patient Flow" section in the body of the white paper. (See also the driver diagrams in Appendix B.)

Shape or Reduce Demand

S1. Provide end-of-life care in accordance with patients' wishes (what care, where).

- **C1.1 Reliably identify patients' end-of-life care wishes and proactively create and execute advanced illness care plans.**

  Because the course of advanced illnesses is often unpredictable, it is important for individuals to plan ahead. Proactive planning is especially important when risk of exacerbation of symptoms and clinical decline are more apparent in patients with serious illness or older age. In these populations, failure to conduct appropriate advance care planning could result in unwanted treatments and potential harm. Identifying and honoring patients' end-of-life care wishes is essential for providing person-centered care. Physicians and care team members need to engage with patients and family members in shared decision-making discussions by clarifying the medical prognosis, initiating end-of-life care discussions, identifying end-of-life care goals, and developing a comprehensive plan of care.[104]

- **C1.2 Develop hospital-based and community-based palliative care programs.**

  Hospital-based palliative care consultation programs result in less time spent in the intensive care unit, with a lower likelihood of dying in the ICU and a higher chance of receiving a referral for hospice care.[105,106] Palliative care programs improve quality of care outcomes, especially for pain and depression. And, through goal setting and matching patient needs with the most appropriate care services, palliative care programs help patients avoid unnecessary emergency department visits and hospital stays.[107] Community-based palliative care programs — which include home care, hospice, and collaborative partnerships with various care service agencies and providers in the community — provide similar services while meeting the desire of patients to be in their own community or home. Community-based options meet the needs of patients who may not qualify for other care settings.[108,109]

S2. Decrease demand for medical-surgical beds by preventing avoidable hospital readmissions.

- **C2.1 Improve transitions and post-hospital care to reduce readmissions for high-risk populations.**

  Improving care transitions for high-risk patients after an acute care hospitalization is a key strategy for reducing avoidable readmissions. Discharge preparations include a comprehensive assessment of discharge needs; enhanced patient and family caregiver education using the Teach-Back method;[110] improved medication management; timely and complete communication between inpatient clinicians and care teams in the community;

follow-up care arranged prior to discharge; and appropriate referrals to home- and community-based care services.[111] High-risk patients may need additional support and care for a period of time after hospital discharge. The University of Pennsylvania Transitional Care Model, for example, provides care to high-cost elderly patients by connecting advanced practice nurses, patients, and their caregivers to better manage care, coordinate follow-up care, and provide regular home visits and telemedicine. These efforts resulted in a 36 percent decrease in readmissions and 39 percent decrease in costs for the patient population.[112] The Care Transitions Model developed at the University of Colorado utilizes "transition coaches" to encourage and support patients and family caregivers to take an active role in managing their health care needs at home.[113]

S3. Decrease unnecessary bed days after patients meet medical readiness criteria for discharge or transfer to community settings of care.

- **C3.1 Improve efficiencies in hospital care and planning for transitions to other care settings.**

  Reducing unnecessary acute care bed days for patients with complex medical and social needs requires a comprehensive approach that includes collaboration among engaged clinicians across the continuum of care, who also partner with patients and family members. This comprehensive care coordination is essential for establishing agreed-upon care priorities to meet the unique needs of these patients. Patients with complex social needs usually constitute a high proportion of patients with lengthy hospital stays, where supports for care in the community are insufficient. This "pain point" for many hospitals may accelerate the development of cross-continuum partnerships and health system planning to address the unmet needs of specific populations. In some hospitals complex care rounds have emerged as an effective strategy for in-depth planning and coordination to meet the unique post-discharge medical and social needs of this population.[114]

- **C3.2 Ensure capacity and capability of needed services in the community following hospital discharge.**

  Using analytics to understand and manage variations in LOS, with special attention to LOS outliers, is also an effective strategy to uncover root causes of excessive hospital utilization. Patients with complex medical and social needs usually constitute a high proportion of patients with lengthy hospital stays.[115] In addition, individuals seeking emergent care treatment experience predictably longer LOS than those seeking elective care.[116] In some cases, there are lengthy delays for patients awaiting transfer to another care facility in the community, insufficient home health care and community services, and an increasing number of patients who need care in scarce inpatient psychiatric and mental health facilities. Identifying focused opportunities for improving the overall LOS for patients with complex needs is the crucial step in developing an integrated care system for this population.[117,118,119]

  Exemplary models to meet the complex care and social needs of patients at home include the Visiting Nurse Service of New York, transforming home health care and measurably improving outcomes[120]; Buurtzorg "neighborhood care" in the Netherlands led by self-governing nurse teams[121]; the Better Care Playbook, curated examples of promising approaches to improve care for people with complex health and social needs[122]; Hospital at Home® provides hospital-level care in a patient's home as a full substitute for acute hospital care[123]; and the use of telepsychiatry to avoid unnecessary hospitalizations.[124]

- **C3.3 Develop partnerships with payers to ensure payment for needed services.**

  Some unnecessary bed days result from the lack of payment for post-acute care services such as rehabilitation facilities, home care services or equipment, and long-term care. Countries with universal health coverage have incentives for hospitals to partner with community-based care providers to provide more value-based care in home settings and in community facilities. In the US, health care systems are taking several approaches to resolve some of the current payment issues such as paying for a few home care visits, needed equipment, adaptations to homes to make them accessible to individuals with disabilities, and providing temporary housing for individuals experiencing homelessness. For example, New York State health care reform initiatives have focused on addressing the social determinants of health (e.g., housing, food security, jobs, education). Partnerships and genuine collaboration between health care organizations and community-based organizations are essential to establish lasting solutions.[125] More sustainable solutions will likely emerge as hospitals and health systems adopt value-based payment models and form community partnerships to advance population health initiatives.

S4. Decrease ED visits and acute care hospital admissions.

- **C4.1 Use enhanced care management and coordination of services for patient populations with complex medical care and social needs.**

  Understanding the risks facing a given population and coordinating care around the needs of those individuals can lead to better care in appropriate care settings.[126] A common approach for providing care to individuals and managing populations involves team-based care delivery and management.[127] Care management can improve outcomes and reduce costs, although at first it may take time to realize the benefits as care teams and patients adjust to working together in new ways. Successful care management requires a reliable process for identifying appropriate patients in the population and a high-performing care team — including specially trained registered nurses and care managers with smaller patient loads — working in person with patients.[128]

- **C4.2 Provide home-based primary care for high-risk populations.**

  Home-based primary care provides comprehensive, interdisciplinary primary care in the homes of patients with complex medical, social, and behavioral health needs.[129] Common home-based primary care models involve primary care providers, nurse practitioners, physician assistants, physical therapists, social workers, and other care providers delivering coordinated care in a patient's home. A typical scope of care involves management of long-term chronic conditions, preventative care, and environmental assessments.[130] Home-based primary care approaches focus on preventing hospitalizations by bringing the care to the patient, with the larger goal of meeting the patient's care and health goals rather than exclusively assessing and treating the clinical condition.[131] A standard model for home-based primary care does not currently exist. Rather, individual health systems are developing their own approaches based on their patient populations' needs and the local context. Moderate evidence suggests that home-based primary care reduces hospitalizations and hospital bed days, and some evidence shows decreases in ED and specialty care utilization and cost reductions.[132,133,134,135]

- **C4.3 Relocate low-acuity care in the ED to primary care, mental health settings, and community-based services.**

  A promising approach to reduce low-acuity visits to emergency departments involves expanding access to primary care providers. Convenience is one cited reason for visiting the

ED, beating out perceived quality of care and financial concerns.[136] By expanding primary care access, health care systems can effectively meet the needs of people utilizing the ED for convenience. Extended primary care resulted in a 26 percent decrease in ED visits in Manchester, England.[137] Similarly, in the US, patients reporting difficulty accessing primary care after-hours are 24 percent more likely to visit the ED and 38 percent more likely to experience a hospitalization.[138] In addition to expanding primary care hours, engaging individuals with chronic conditions in primary care group visits reduced ED utilization compared to a similar population without group visits.[139] The use of telemedicine, email, and text messaging also expands primary care provider accessibility and capacity to meet patient needs outside of typical office hours.[140,141] In 2020, the coronavirus pandemic has accelerated widespread adoption of telehealth services.[142]

Individuals with mental health conditions are more likely to seek care in the ED and be admitted to the hospital than individuals seeking care for physical illness.[143] Community-wide approaches to address mental health needs provide opportunities to alleviate the burden of suboptimal ED utilization, while also providing higher-quality, patient-centered care. Opportunities for improvement include collaboration across agencies (including EDs, hospitals, law enforcement, and community-based care services), utilizing mental health specialists and care coordinators in the ED and the community, taking advantage of telehealth options, and investing in community-wide support systems to address mental health needs.[144]

Paramedics and emergency medical technicians (EMTs) are the first responders to emergency calls in the home and community. Traditionally, paramedics and EMTs focused on providing immediate care to individuals while transporting them to the ED or hospital. Many situations that paramedics and EMTs respond to do not require transport to the ED, with as many as 52 percent of emergency ambulance calls involving patients with non-serious problems.[145] A growing number of health care systems are employing the services of community paramedics and EMTs to triage and treat individuals in the home. The House Calls program at Northwell Health in New York dispatches a paramedic team, often arriving in SUVs and not ambulances, to treat patients in their home.[146] Video conferencing or other telecommunications with emergency physicians or specialists can enhance the care that community paramedics provide in the individual's home.[147] The Houston Fire Department in Texas relies on an Emergency Telehealth and Navigation system that employs mobile technology, community-based paramedicine, and local medical partnerships to connect low-acuity patients to the appropriate care.[148]

S5. Decrease demand for hospital beds by reducing preventable harm.

- **C5.1 Decrease complications and harm, and subsequent increases in hospital lengths of stay, resulting from errors and hospital-acquired conditions.**

  Care teams in hospitals can significantly reduce the occurrence of preventable harm in the hospital. These harms include hospital-acquired conditions (HACs), which often lead to complications and unintentional patient harm in the form of hospital-acquired pressure ulcers, catheter-associated urinary tract infections, surgical site infections, and patient falls with harm, among others. Harm can also appear in the form of unnecessary waits, underdiagnosed and inadequately treated pain, as well as boarding and being admitted to the wrong ward. HACs increase length of stay by seven to nine days and cost patients $40,000 more on average.[149] There are many recommended practices for preventing common HACs, including hand hygiene, environmental cleanliness, clear directives from leadership, effective use of personal protective equipment, delivering evidence-based care, appropriate use of

antibiotics and medications, respiratory hygiene and cough etiquette, and others. Reliable implementation of these evidence-based practices is the challenge.[150]

S6. Decrease artificial variation in surgical scheduling.

- **C6.1 Redesign elective surgical schedules to create a predictable flow of patients to downstream ICUs and inpatient units.**

  Phase two of the IHO Variability Methodology presents a compelling case for how elective surgery scheduling not only affects operating room operations, but also has an enormous impact on downstream inpatient units (particularly ICUs and inpatient units for surgical patients). In most hospitals, surgeons electively schedule surgical cases unevenly throughout the week. This uneven scheduling is often a significant contributor to hospital-wide flow problems, such as "ED boarding" and the inability to place patients on the preferred clinical units. Strategies for "smoothing" the flow of elective surgical patients throughout the week decrease artificial variability and can create more predictable flows of patients from the OR to ICUs and inpatient units; decrease the competition between unscheduled (e.g., ED) and elective admissions; increase patient placement in appropriate units; and help to achieve more predictable and optimal nurse staffing on units.[151,152]

Match Capacity and Demand

S7. Utilize a data-driven learning system for hospital-wide patient flow.

- **C7.1 Forecast seasonal variations and changes in demand patterns to proactively plan for predicted volume.**

  The use of advanced data analytics coupled with the expert knowledge of doctors and other clinicians to understand variation patterns (and in some cases to provide information about the expansion of specific hospital services) provides useful information for mathematical modeling and simulations of patient demand patterns. Demand forecasting provides relevant information for identifying needed actions in advance and expanding the options available to solve operational problems before they occur. It is not only critically important to predict demand for the hospital, but also to predict demand for separate hospital services (e.g., OR procedures, ED services, intensive care, care on specific medical-surgical inpatient units). Demand forecasting is the first critical step to inform bed capacity planning. The second equally crucial step in bed capacity planning is to ensure that there is adequate staffing to meet the needs of patients on each hospital service and inpatient unit. One of the best ways to optimize staffing utilization and related costs is to forecast demand far enough in advance in order to sufficiently match staff to meet anticipated patient demand without incurring last-minute expenses such as overtime or supplemental staffing.[153,154]

- **C7.2 Assess the number of beds and staffing needed for each service to make plans to accommodate patient volume for each service.**

  Accurate forecasting of patient demand by season, month, day of the week, and time of day enables leaders to make strategic decisions regarding the resources needed to provide hospital services to the number and type of patients requiring such services. Capacity is determined by physical facilities (e.g., ED cubicles, operating rooms, procedure unit rooms, ICU beds, inpatient beds) and human resources (e.g., doctors, nurses, technicians, other clinical and support staff). Ideally, after eliminating artificial variability in surgical scheduling and understanding how best to manage the variability of random patient demand, "correctly sizing" hospital service space and inpatient units improves the timeliness of admissions and transfers, enables higher reliability in patient placement in appropriate care settings, and

improves space utilization. Equipped with accurate demand forecasts, hospital leaders can reconfigure units and redeploy staff during predicted low-census periods, and units with seasonal occupancy can be closed and repurposed.[155,156]

S8. Utilize real-time demand and capacity management processes.

- **C8.1 Use hospital-wide patient flow planning huddles and real-time demand and capacity problem solving.**

  Most hospitals have some form of bed management system, with daily bed huddles or patient flow meetings to make plans for ensuring real-time patient flow. Bed management huddles usually include administrative decision makers, bed managers, staffing coordinators, and representatives from the ED, OR, ICU, and all inpatients units. The goal is to develop a proactive plan focused on the specific actions needed to create enough capacity to meet the patient care needs that day. These hospital-wide flow administrative meetings need to address predictions for admissions and discharges, synchronization of admissions, and discharges and transfers; specific capacity challenges; and potential solutions for capacity and demand mismatches throughout the hospital.

  Advanced data analytics for hospital-wide operations and command centers in some large health care systems with several hospitals are emerging to provide real-time decision support tools for optimizing hospital-wide or system-wide patient flow, and for expediting patient progression and transfers among multiple hospital settings in large systems. Real-time demand capacity (RTDC) management also includes the identification of constraints and bottlenecks that repeatedly thwart efforts to reduce waits and delays in hospital operations and thereby suboptimize patient flow. Teams accountable for hospital operations and patient flow should study these barriers at the specific unit or departmental level to identify root causes of repetitive capacity and demand mismatches. Leaders at the hospital level should collaborate with unit and departmental leaders to generate and test potential solutions to alleviate recurring constraints and bottlenecks.[157,158,159]

- **C8.2 Use flexible staffing models for clinicians and staff to meet daily and hourly variations in patient volume in each unit.**

  Predictive analytics can be used to inform long-term nurse staffing plans and budgets to meet average patient volume, but fluctuations in patient demand require additional strategies to adjust near-term staffing patterns to meet day-to-day and shift-to-shift variations in patient volume. Providing adequate nursing time per patient in the context of acuity and census variability is, first and foremost, a patient-centric strategy to ensure patient safety and the best possible care and outcomes.[160,161] Increasing daily staffing to levels that can accommodate peak periods of patient demand, should they occur, is cost prohibitive and inefficient for most hospitals. Thus, most hospitals are intentionally staffing for below-peak demand levels and either tolerating periods of increased nursing workload or establishing flexible staffing strategies to provide coverage during peaks.[162] Advanced data analytic models hold promise for capturing real-time data on patient demand, available beds, and nurse staffing for each clinical unit. Even a three- to five-day view into future demand and resource requirements gives leaders more time to consider a variety of options for workforce and bed placement optimization.

  Taking a flexible approach to hospital resources, including physicians and other medical staff as well as department rooms and resources, shows promise for reducing wait times for elective treatment without negatively impacting wait times for emergencies. Moreover, overall system performance is improved with flexible staffing and resource use as measured by wait times.[163,164]

- **C8.3 Use early recognition of high census and "surge" protocols to expedite plans for accommodating unplanned increases in patient volume.**

  There is real value for hospitals to adopt practices to regularly respond to non-emergent, unplanned surges in patient volume. "Patient flow requires daily diligence and attention. It should not be something focused on only on busy days, but should be managed each day. By taking a proactive approach to patient flow, the number of days your hospital will be bottlenecked can be reduced."[165]

  A visual management system specifying hospital-wide census levels for review during bed huddles or for ongoing surveillance within hospital command centers is becoming routine in most hospitals. High census protocols to expedite plans for accommodating unplanned increases in patient volume include expediting discharges, expediting admissions from the ED, and managing variation in elective surgical schedules.[166] Specific levels of census, expected admissions, and patient acuity are generally coded as green (business as usual), yellow (additional awareness and interventions required), or red (immediate action needed). Some best practices for surge planning include defining the roles and responsibilities for personnel at each level of the hospital census, establishing clear lines of authority for decision making, and post-escalation debriefs for learning and evaluation to identify proactive strategies for the future.

- **C8.4 Activate incident command centers to coordinate efforts to create bed capacity, increase staffing and secure needed equipment and supplies during natural disasters, public emergencies, and epidemics or pandemics.**

  Incident command centers are one way to co-locate experts to manage all aspects of patient flow and care when an organization is faced with an unexpected challenging environment, whether due to weather (e.g., hurricane, tornado, earthquake, fire), violence (e.g., Boston Marathon bombing), or a localized epidemic or widespread pandemic. There are several common attributes to incident command centers. Co-location of experts includes physician and nurse leaders, staff in operational departments, IT and data analysts, and community resources to allow for quick analysis of information and critical decision making. Data analysis and display is readily available and operations management and predictive modeling techniques are employed to predict real-time and future resource and/or staffing needs. Leadership teams in incident command centers often evolve as the crisis changes over time.[167]

  Incident command centers are staffed 24/7 throughout the emergency response timeframe and often include oversight of functions such as EMS and Rescue Transport, patient placement and triage, ICU bed and operating room access and management, deployment of community resources (e.g., food, water, supplies), and staged recovery steps. As observed during the COVID-19 pandemic, one vital function of a command center is tracking, securing, and distributing critical personal protective equipment, other equipment, and supplies. The command center also manages staffing for all aspects of care and redistributes staff as needed.

  Although incident command centers were initially created as limited engagements to meet the needs of a disaster or transient surge of individuals needing acute medical care, in more recent years many medical centers have broadened the concept to manage everyday work. This same concept of bringing the right experts together with advanced data management capability and predictive modeling has been used by hospitals to manage the daily challenges of efficient patient flow. Using a command center as the hub for all patient flow activities, decision making, staffing, and patient placement has enabled hospitals and health systems to improve access, reduce ED waiting time, reduce waiting time after surgery, and decrease

length of stay. Although several large companies offer command center IT and other technologies (e.g., artificial intelligence), the concepts are easily translated to smaller hospitals and health systems through a reorganization of routine operations and patient flow activities with similar results.[168]

Redesign the System

S9. Improve efficiencies, length of stay, and throughput in the emergency department.

- **C9.1 Separate ED flows based on acuity of patients.**

  Improve ED efficiencies by using Emergency Severity Index (ESI) criteria to assess patients for low-, medium-, and high-acuity care. Conduct an in-depth analysis of these three patient cohorts, including the number of patients your hospital regularly treats, arrival patterns, admissions and discharges, and major bottlenecks in each patient cohort flow. Care processes with clear responsibilities and assignments for a dedicated care team are designed to meet the specific needs of each cohort of patients.[169]

  FastTrack models of care for ESI levels 4 and 5 have become one of the most effective interventions to decrease length of stay and increase ED capacity. In some instances, most low-acuity patients are assigned to a comfortable chair where all activities and care (e.g., registration, insurance verification, lab tests, exams, treatment) are provided in one location. Patients are quickly seen, diagnosed, and treated efficiently, with most patients being discharged to home.

- **C9.2 Eliminate or streamline triage in the ED.**

  Triage is a clinical process, not a location. Many clinical leaders in the ED have implemented a rapid triage process and scaled down the list of triage questions to include those that determine the severity of illness using the evidence-based ESI assessment. This assessment can be done in a variety of locations. After triage, patients are assigned to a specific cohort care team to smooth workflow. By expediting triage processes and creating a more efficient system for treating lower-acuity patients in the ED, many hospitals have significantly decreased ED waiting times and patients leaving without being seen (LWBS) rates.[170]

- **C9.3 Implement efficiency changes in the ED to decrease length of stay (discharged and admitted patients).**

  Many EDs have not yet adopted the increasing number of effective interventions to reduce ED crowding: matching staffing patterns to meet the anticipated volume of patients (e.g., seasonal and daily variation, arrival patterns during the day), bedside registration, expedited triage processes, and RFID tracking of patients.[171]

  Numerous hospital EDs have redesigned front-end, middle, and back-end processes to gain efficiencies and improve patient flow. The goal for the triage process is "pull to full" — pull patients out of the waiting room, quickly assess their ESI status, and move patients into rooms or spaces for the appropriate level of care. Efficient flow in the middle stage of ED care requires rapid turnaround times for labs and radiology exams and timely consults by specialists. Frequent team huddles to discuss patient status can help coordinate and expedite care. Priorities for back-end processes include expediting discharges, establishing follow-up care and appointments, securing home care supports, and working with hospital leaders to improve hospital-wide flow to enable timely admission of patients from the ED.[172]

S10. Improve efficiencies, length of stay, and throughput in the short stay unit.

- **C10.1 Provide protocol-driven care in the SSU.**

  Clinician leaders in short stay units establish standardized diagnostic and treatment pathways for well-defined patient populations. To decrease the need for consults, treatment pathways and protocols are developed in collaboration with specialists (e.g., cardiology, neurology, infectious disease). This approach results in efficient diagnostic assessments and relatively straightforward treatment regimens. Appropriate monitoring of patient symptoms, review of diagnostic testing and laboratory tests, and assessment of patient responses to medications and treatments enables the clinical team to determine whether a patient requires further treatment in the hospital or can be discharged to home.[173]

- **C10.2 Utilize well-defined criteria for placing patients in one short stay location.**

  Well-defined inclusion and exclusion criteria are used to determine appropriate placement of patients in short stay or observation units. Common diagnoses or presenting symptoms such as chest pain, asthma exacerbation, pneumonia, cellulitis, and congestive heart failure exacerbation are often cared for in SSUs. Unit-specific standardized assessments, diagnostic tests, interventions, and criteria for either discharge or admission to the hospital are established.[174]

- **C10.3 Establish dedicated clinicians and staff for the SSU.**

  Standardized approaches to care are customized for each commonly seen clinical condition and outline well-defined roles and responsibilities for physicians, physician assistants, nurse practitioners, nurses, pharmacists, case managers, and other care team members. Efficiencies are gained by having a dedicated physician group and clinical team in the same location. Designated SSU leaders are responsible for clinical care and patient outcomes, and accountable for performance improvement and monitoring key metrics to assess outcomes.[175]

S11. Improve efficiencies, length of stay, and throughput in the intensive care unit.

- **C11.1 Provide protocol-driven care (e.g., weaning, ambulation) and stabilization in the ICU.**

  Almost all aspects of ICU care are improved by evidence-based, protocol-driven care. Multiple studies show that when appropriate protocols are flawlessly executed, both hospital-acquired conditions (e.g., VAP, CA-UTI, CR-BSI, DVT, SSI) and length of stay decrease.[176,177,178] Procedural steps (e.g., ventilator weaning, blood product administration, chemotherapy) decrease variability and complications. As a first step, develop evidence-based protocols before implementing efforts to improve efficiency. Efficient delivery of a flawed protocol does not improve safety or prevent complications.

- **C11.2 Ensure timely palliative care consults in the ICU.**

  Palliative care discussions in the ICU are often delayed until all other medical options have been exhausted. Engaging palliative care experts earlier in the care process improves efficiency in care delivery and is more likely to respect patient and family wishes for end-of-life care. Early identification of patients who are at "high risk for death" triggers early palliative care consultation. Approaches to ICU palliative care consults that are leading to early success include selecting trigger criteria and a care model, forming guidelines, and developing evaluation criteria. Early identification of advance directives, code status, goals of care, and patient and family expectations can lead to proactive patient and family consultations with ICU and palliative care staff.[179,180,181]

- **C11.3 Identify and eliminate delays (e.g., consults, procedures) in the ICU.**

  One of the most efficient ways to improve access and patient flow is to decrease or eliminate unnecessary waits and delays in care during hospitalization (e.g., for consults, operative or interventional procedures, or routine services when inadequate staffing hampers access). Clear expectations for consult turnover are required from medical and hospital leaders, along with appropriate monitoring. Procedural areas can use operations management tools to analyze elective and emergency needs and adjust elective scheduling to best meet the needs of the entire system. Strategic use of designated operating and procedural room time which is set aside from other elective procedures improves access for predictable needs (e.g., endoscopy, feeding tube and tracheostomy placements). Use of IHI's waste identification tool has helped systems identify these needs.[182] Discrete event simulation models can help accurately predict resource allocation.[183]

- **C11.4 Implement daily huddles and interdisciplinary planning in the ICU.**

  Daily huddles throughout the organization foster better and more efficient care. Daily interdisciplinary rounding on patient care units facilitates decision making and execution on plans of care. Include critical consultants in the initial discussion to avoid conflicting plans and discussions with patients and families. Unit-level huddles conducted multiple times each day improve care coordination and predictive planning of patient flow and transition to the next level of care. The results of unit-level huddles roll up to hospital-wide huddles to provide a forum for improved staffing and patient transfers as well as a methodology for predicting future concerns and needs. Hospital-wide huddles enable proactive intervention by medical and hospital leaders to avoid last-minute emergencies whenever possible.[184]

S12. Improve efficiencies, length of stay, and throughput in medical-surgical units.

- **C12.1 Use case management and care management for patient populations with complex care and social needs in medical-surgical units.**

  Patients with complex medical care and social needs frequently require hospitalization for an acute episode or deteriorating clinical condition. These patients have challenges that may include exacerbation of multiple chronic conditions, often accompanied by cognitive impairments, behavioral health issues, and a variety of unmet social needs. Underserved populations that historically have been adversely affected by discrimination or exclusion also require special attention to their complex needs. Individuals with complex medical and social needs require comprehensive and coordinated efforts to ensure that post-hospitalization care and supports are in place before hospital discharge.

  Reducing hospital length of stay and safely discharging patients with complex needs requires a comprehensive approach that includes collaboration among clinicians across the care continuum and partnering with patients and family caregivers to establish agreed-upon care priorities to meet the unique needs of these patients. Care and case management have emerged as effective strategies for managing the longitudinal care of patients with complex needs, coordinating and evaluating care providers and services to meet the wide-ranging needs of these patients.[185,186] Case managers, working closely with social workers and other members of the interdisciplinary care team, help ensure that patients and family members are actively participating in the hospital discharge plan.[187]

- **C12.2 Use advance planning and cooperative agreements for transfers of patients from medical-surgical units to community providers of care.**

  Meeting the comprehensive needs of this population through effective partnerships with community providers is essential for achieving optimal outcomes during the hospital stay.

Another important dimension of care is developing comprehensive plans to meet patients' ongoing medical care and social needs after hospital discharge. Coordination of services for patients with complex needs requires proactive planning, case management, and interdisciplinary collaboration to prevent long hospital stays and unnecessary bed days after the patient is medically ready to transition from the acute care hospital to home or a community care setting.[188,189,190]

Cooperative agreements between hospitals and care providers in the community (e.g., home care services, community supports, post-acute care facilities) help create smooth transitions by clarifying clinical conditions, defining roles and responsibilities, and streamlining typically cumbersome information-sharing processes. By working closely with community care providers, hospital teams can help these providers anticipate the capacity and capabilities needed for timely patient transfers to post-acute care following hospitalization.[191,192]

- **C12.3 Standardize interdisciplinary rounds in medical-surgical units and effectively engage patients and family caregivers in rounds.**

  While most organizations have some form of multidisciplinary rounds, the efficacy and effectiveness can be variable. Rounds should be carefully scripted and managed to maximize decision making, incorporate patient and family needs, and minimize caregiver time. This includes defining distinct roles, ready access to appropriate clinical information, and tight time management. Focus daily ward rounds on moving and downgrading patients and discharge planning with clear transition plans.[193] In most situations, patients with complex needs should be managed in a separate format or rounds, with all interdisciplinary team members from across the care continuum participating to overcome challenges and meet the comprehensive needs of these patients.[194,195]

- **C12.4 Identify and eliminate delays (e.g., consults, procedures) in medical-surgical units.**

  Multiple factors can delay a patient's progression throughout their hospital stay, including a myriad of "waiting for…" scenarios (e.g., waiting for specialist consults, test results, procedures, diagnostic tests, home care assessments, equipment delivery). While seemingly minor irritants, these delays can add up quickly and may result in increased hospital days for patients. Identification and elimination of the waits and delays can result in more efficient and timely care for patients. A simple form for tracking delays can be used during care or multidisciplinary rounds to tabulate patient volume and the length of time for specific waits and delays in care. Once identified, process improvement methods can be employed to eliminate waste and unnecessary handoffs to lessen or eliminate delays in care processes.[196]

S13. Improve efficiencies and throughput in the operating room.

- **C13.1 Separate flows for scheduled and emergency OR cases.**

  Maximizing efficiencies in OR suites is essential to ensure that patients have timely access to both scheduled elective surgery and urgent or emergent surgical procedures. ORs must manage these two competing and often conflicting streams of care. Although efficient management of these two streams increases OR throughput and access, the most compelling reason to separate these flows is improved safety. Delays in instituting care for urgent or emergent OR cases may lead to increased risk of progressive disease, complications, and poor outcomes.[197]

  Assigning operating rooms that have designated nursing and anesthesia staff ensures urgent cases have timely access to needed surgical services. In many hospitals, urgent add-on cases are only undertaken when elective surgery has been completed, or emergent cases are

interposed into the elective surgery schedule. This practice leads to either delayed urgent access or displacement of elective cases to later in the day when appropriately skilled nursing and anesthesia teams may not be available. Neither situation leads to the right care, right time, or right team.[198,199] Separating elective and non-elective surgical cases has resulted in waiting time reductions for urgent and emergent surgical cases, increases in OR throughput, decreases in staff overtime, and decreases in delays for elective surgical procedures.[200,201] Using simulation modeling and prediction enables OR teams to allocate the appropriate resources to address the variable urgent needs of different health systems.

- **C13.2 Implement efficiency changes to improve OR throughput.**

  Increasing OR workflow efficiencies and throughput is an essential strategy for providing timely, safe patient care and for maintaining economically viable hospital operations. The first step is to identify key processes for perioperative clinical care (including the pre-operative, surgical procedures, and post-operative phases of care). Best practices that result in better outcomes in key OR processes should be adapted and adopted — for example, include team-based surgical safety timeouts with checklists and critical handoffs from the OR to post-anesthesia care team members. When best practices don't exist, use Lean methodologies to improve the efficiency of key processes.[202]

  Inefficient and potentially dangerous situations occur in ORs when staffing is driven by convenience rather than by ensuring that staff have the needed procedural, skill-based competencies. Ensuring that highly competent team members are present during all stages of perioperative care vastly improves both patient safety and efficiency.

S14. Develop medical readiness criteria for timely progression of patients to appropriate clinical units throughout the hospital stay and at discharge.

- **C14.1 Use medical readiness criteria to facilitate timely patient progression to appropriate clinical units.**

  To facilitate timely progression to the appropriate units, clinical leaders need to mutually agree on the ideal timeframe for patient progression after medical readiness criteria have been met. For example, nurse-driven protocols for telemetry expedite patient progression to a general medical unit or discharge to home. Delays in patient progression also occur when patients are held in higher intensity clinical areas rather than transferred to a lower level of care when medically ready (e.g., patients held in the ICU for longer periods of time).[203,204,205]

- **C14.2 Use proactive discharge planning focused on patient medical readiness criteria for discharge.**

  Bed capacity management is a critical issue facing hospitals and inefficient discharges impact patient flow throughout the hospital. Lack of standardized discharge criteria contributes to unpredictable discharge timing and lengthy delays. Establishing medical readiness criteria for discharge on admission to medical-surgical units has been shown to drive efficient planning, coordination, and enhanced communication among care team members and with patients and their family members.[206]

- **C14.3 Improve efficiencies and coordination of discharge processes.**

  Discharging patients from the hospital is a complex process with numerous challenges. Some common steps and care processes that impact timely patient discharge include early comprehensive assessment of discharge needs; completion of diagnostic testing and reporting of test results; coordination and decision making among physicians, nurses, other care team providers, and patients and their family members; preparation of patients and family

members for the next phase of care in the patient's home or other community care setting; arrangement of home health equipment and services; securing the availability of transportation for patients returning to home; and arranging for transfer to community settings of care (e.g., skilled nursing facility, mental health treatment facility, rehabilitation center). While patients' clinical conditions, plans of care, and personal situations vary greatly, numerous activities must be coordinated and completed before patients can be safely discharged to home or the next care setting.[207] Daily multidisciplinary huddles and established criteria for medical readiness for discharge have been effective strategies for proactively assessing and planning for patients' discharge needs.[208]

When patients require placement in a variety of community-based care settings and mental health facilities after acute care hospital stays, advance planning and coordination are required to prevent any unneeded additional days in the hospital.[209] One strategy for facilitating timely care transitions is to develop strong partnerships with post-acute care providers — in nursing, rehabilitation, subacute care, and mental health treatment facilities.[210]

Appendix D: Creating an Action Plan for Improving Hospital-wide Patient Flow

It may be helpful for organizations to use the steps described below to create an action plan for improving or enhancing hospital-wide patient flow.

1. **Complete a diagnostic self-assessment of your current hospital-wide patient flow performance.**
    - Review current performance and the results of any quality improvement projects to improve hospital flow. Use the drivers noted in the driver diagrams in Appendix B to identify additional areas for improvement. Which departments or units achieved desired results? Where are your biggest opportunities for improvement?
    - Review the list of recommended hospital-wide flow measures in Appendix E. Which specific measures are you tracking? Based on your selected measures, what does current performance look like at the hospital-wide and unit levels? How are you learning from these measures? What additional measures do you need (e.g., number of "off-service" patients by service) to accurately depict hospital-wide performance? Have you stratified hospital-wide measures for equity insights or areas for improvement?
2. **Create an action plan to focus improvement efforts on three to five high-level strategies to improve hospital-wide patient flow.**
    - Review the secondary drivers (see Appendix B driver diagrams and the High-Leverage Change Ideas section), in addition to the specific change ideas in Appendix C, to identify the specific interventions that are most likely to have a significant strategic impact on improving patient flow in your hospital.
    - Initially, focus on two to three high-leverage strategies based on knowledge of your biggest opportunities for improvement from the diagnostic assessment, and your assessment of specific interventions that will likely lead to hospital-wide improvement. Since flow is complex and dynamic, periodically review these strategic priorities to make adjustments as needed.
    - Develop or charter a portfolio of flow improvement projects aligned with your organizational focus and strategy. Select high-leverage change ideas to test (see the High-Leverage Change Ideas section). Commit the necessary resources to reliably implement these changes (see the Execution Strategies section). Develop an executive review process to assess the progress of improvement projects toward achieving the desired results.
    - As desired results are achieved in selected areas, expand the work to focus on additional high-leverage change ideas to create a reliable system of hospital-wide patient flow.

Example: Refocusing Efforts to Improve Hospital-wide Patient Flow at UW Health

UW Health in Madison, Wisconsin, implemented the diagnostic assessment and action-planning approach described above to accelerate their efforts to achieve desired outcomes for hospital-wide patient flow. This example describes some of the organization's work to improve flow.

UW Health is an integrated health system affiliated with the University of Wisconsin–Madison. Each year, more than 600,000 patients throughout the Upper Midwest receive care from a team of more than 1,400 physicians and 16,500 staff. The health system includes six hospitals and 80 outpatient sites.

Over the past several years, leaders at UW Health recognized that their University Hospital was operating at higher capacity than in prior years. As utilized capacity exceeded 85 percent, hospital executives recognized that this would drastically impact operations and delay patients throughout the system. Hospital leaders became increasingly concerned about patient safety, care quality, patient experience, and lost revenue as a result of these capacity and operations issues. Regular delays and waits for admissions resulted in patients leaving UW Health to seek care at other hospitals and health systems.

Refocusing Flow Improvement Priorities

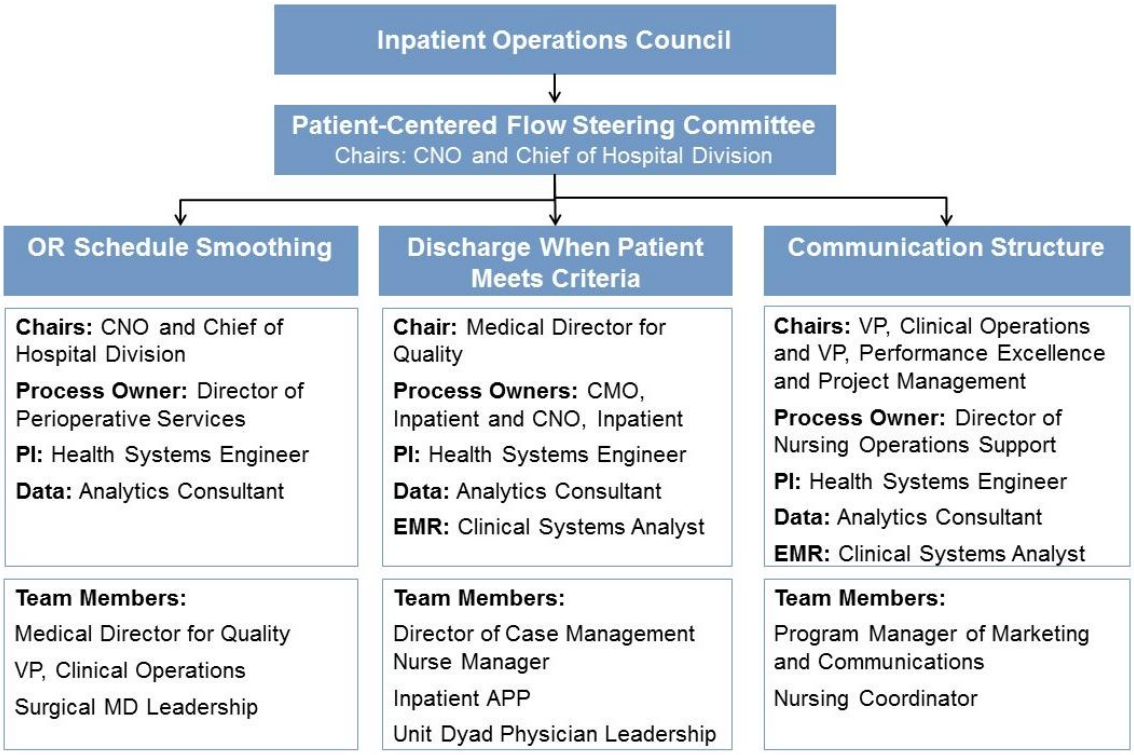
In October 2015, UW Health leaders convened a hospital flow steering committee to better understand the health system's current performance. The flow steering committee identified various "pain points" and chartered 16 improvement projects, providing oversight for the project teams. While individual projects achieved some positive results, system-wide improvements in patient flow were unrealized.

In November 2016, the director of nursing and operations support, the health systems engineer, the medical director of quality, the vice president of clinical operations, and the senior health systems engineer attended IHI's Hospital Flow Professional Development Program. They learned two important concepts: "exnovation" (eliminating the things that do not yield desired results) and "flow failures."

With these learnings and with the support of the flow steering committee, the number of flow improvement projects was reduced from 16 to three, based on strategic priorities aligned with the three primary drivers: shape or reduce demand; match capacity and demand; and redesign the system. The three flow improvement projects focused on smoothing elective surgery scheduling, improving the inpatient discharge process, and implementing bed huddles with updated hospital-wide flow communication and problem solving.

Figure 8 shows the organizational chart for UW Health's three flow improvement projects. The Inpatient Operations Council oversees the progress of all projects, working directly with the Patient-Centered Flow Steering Committee. Each improvement project team reports to the steering committee, which is staffed by a chair, process owners, a quality system improver, and a data analyst.

Figure 8. UW Health Organizational Chart for Flow Improvement Projects



Project progress is tracked through a patient-centered scorecard that is populated with data from UW Health's electronic health record. The flow steering committee reviews the scorecard every other week, including data on the following measures: occupancy rates, patients turned away, holds in the ED and PACU, discharge before noon, and average unit capacity. Measures are tracked, noting when changes were implemented to help assess the effectiveness of the changes.

In addition to ensuring accountability through the flow steering committee, UW Health's executive leadership team also invested in leadership development and quality improvement skills for clinical team leaders. The charge nurse role expanded to include more professional development opportunities and leadership responsibilities for patient flow on the unit (and included financial compensation for the additional responsibilities). Each quarter, these nurse leaders participate in training sessions to enhance their quality improvement and leadership skills to improve clinical operations.

Since November 2016, the focus on three priority flow improvement projects and on making the operational and cultural shifts to improve hospital-wide patient flow have achieved promising results. Overall system census continues to increase, but hold and wait times are not increasing. There is a decrease in patients being turned away. As progress is made in the three priority areas, the executive team plans to expand efforts to include other high-leverage changes to continuously improve hospital-wide patient flow.

Appendix E: Operational Definitions for Recommended Hospital-wide Flow Measures

Measurement is essential to understand patient flow throughout the overall hospital system. Listed below are the operational definitions for the twelve recommended hospital-wide flow measures.

Hospital-wide Measure	Definition	Data Collection Method	Numerator	Denominator
Number of flow failures	Flow failures occur when patients are placed in an incorrect location to receive ideal care	Data collection by unit during huddles, daily report, or from EHR	Total number of patient days with flow failures	N/A
Percentage of patient days with flow delays	Failure to achieve flow in the right time period, defined by each service or unit (e.g., greater than 2-hour delay after medically ready for discharge)	Data collection by unit or during huddles; may be able to program EHR to automatically flag this information Note: A patient may have multiple delays	Total number of delays hospital-wide for the month	Total patient days during month
Percentage available capacity	Percentage of units with at least one available bed at 7 AM (cumulative daily count)	Daily data collection by unit (or during huddles)	Total number of units with capacity	Total number of units
Occupancy rate	Usage of all available beds in the hospital (staffed beds, not total licensed beds)	Record on midnight census	Total number of inpatient days for the month x 100	Total number of available beds x number of days in the month
Readmissions within 30 days after discharge (number or percentage)	A patient who has been discharged from a hospital (does not have to be your hospital) is readmitted to your hospital within 30 days	Discharge and admission records Look back 30 days (or 7 days, if preferred) to count patients discharged during the previous month (or week) and readmitted in the current month (or week)	Total number of patients readmitted within 30 days of discharge	Total number of patients discharged during the previous month
Patient experience	Patient satisfaction survey scores on the most relevant question(s) related to waits and delays	Average rating for relevant question(s) from total number of surveys received	Total of ratings for relevant questions received during the month	Total number of surveys received during the month
Clinician and staff satisfaction related to workload	Average rating by clinicians and staff on surveys related to workload	National Database of Nursing Quality Indicators (NDNQI) nursing surveys, physician surveys, or other internal surveys conducted during the month	Total ratings on surveys completed during the month	Total number of surveys completed during the month
Healthcare-acquired conditions (HACs) (number or percentage)	Any undesirable situation or condition that affects a patient during their hospital stay (e.g., falls with injury, ventilator-associated pneumonias)	Collect monthly from safety reporting system using CMS 14 categories of undesirable conditions	Total number of HACs	Total number of patient days (use for percentage)

Hospital-wide Measure	Definition	Data Collection Method	Numerator	Denominator
Unnecessary bed days (number or percentage)	Days a patient remains in the hospital after meeting medical readiness criteria for hospital discharge or transfer	Counted when daily census is calculated Three methods: 1. From EHR (use same data elements as flow delay) 2. From case manager daily reports 3. From unit discharge records	Total number of days after medically ready for discharge for all patients remaining in the unit at least 1 day	Total number of patient days in the month (use for percentage)
Average length of stay	Average number of days in the hospital for patients discharged during the month	Department/unit records or EHR	Total patient days in the hospital during the month	Total number of patients discharged during the month
Total number of decedents spending 7 or more days in the ICU in the last 6 months of life	Total number of patients who died within 6 months of an ICU stay with a duration of 7 or more days in the ICU	EHR search (site of admission and date search required to encompass last 6 months)	Total number of patients with 7 or more days in the ICU in the last six months of life	N/A
Total number of ED presentations and hospital admissions	Total ED presentations for the month plus total hospital admissions for the month	EHR or department/unit records	Total number of ED presentations and hospital admissions for the month (plot both numbers on the same run chart)	N/A

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