

## Using LEAN to Improve a Segment of Emergency Department Flow.

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## Using LEAN to Improve a Segment of Emergency Department Flow

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*Emergency department (ED) overcrowding is an organizational concern. This article describes how Toyota LEAN methods were used as a performance improvement framework to address ED overcrowding. This initiative also impacted “bolus of patients” or “batching” concerns, which occur when inpatient units receive an influx of patients from EDs and other areas at the same time. In addition to decreased incidence of overcrowding, the organization realized increased interprofessional collaboration.*

Emergency departments (EDs) continue to experience overcrowding, defined by the American College of Emergency Physicians as “institutional resources available are insufficient to meet the basic service needs of emergency patients.”<sup>1(p7)</sup> Emergency department overcrowding is often a symptom of hospital capacity and process flow opportunities. It is a complex problem, and designing the solution is not simple; it requires attention to structure and process improvements associated with both the ED and inpatient areas.

This project, detailing a performance improvement (PI) initiative at a Magnet®-designated community hospital, was unique because it also impacted “bolus of patients” or “batching” concerns, most commonly occurring when inpatient units receive an influx of patients from EDs and other areas simultaneously. This influx of patients and the related intensity of admission activities contribute to the receptivity of the receiving staff to accept patients as well as to patient safety. Impacting this related process was not an intended goal, but patient influx outside the ED was positively af-

ected through action items of the project team.

### About the Project

A conceptual model, Input-Throughput-Output, has been suggested to enhance understanding of the causes of ED crowding.<sup>2</sup> The model helps to explain the complexity by putting patient flow into compartmentalized portions. Input addresses the ED segment from patient arrival to decision to admit to the hospital. Throughput relates to the time from decision to admit to the time an admission order is written by the admitting provider. Output is the time between the admission order and arrival on the inpatient unit.

This initiative focused on a segment of output, specifically, the time from when an inpatient bed is clean and ready to patient arrival in that bed. Drivers that prompted selection of this efficiency opportunity included frustration by patients, families, and staff regarding delays in process flow in the absence of barriers, such as dirty bed, and overcrowding in the ED, and quantitative data reflect average times of less than 60 minutes for the identified

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**Table 1.** *Analysis, Interventions, and Actions*

Analysis	Interventions	Actions
Missing information needed by patient logistics (PL) staff	Improve turnaround of bed assignments in PL.	Education to ED registration staff, reinforcing the impact of obtaining and correctly entering demographic information to proceed with bed assignment
ED electronic medical record not always crossing into inpatient queue	Improve handover communication.	ED record obtained by inpatient unit clerical personnel, printed, and handed to receiving RN before patient arrival.
Bolus (multiple patients at same time) of patients received by 1 RN because unit staffing assignments are unknown to PL	Decrease batching of patient assignments.	Education to inpatient unit clerical personnel regarding use of electronic bed board “bed ahead” feature, which allows bed placement assignment and prioritization
Inpatient discharge beds not immediately cleaned and/or communicated as vacant and ready when staff other than transport personnel discharge the patient		Process change hardwired to have all discharged patients transported by transport personnel
ED and inpatient RNs either knowingly or unknowingly slowing down patient movement, ie, ED RN not calling for transport when the bed was clean and ready; inpatient RN not notifying the unit clerical staff that the previous patient has been discharged; or not regularly checking electronic bed for “green” visual cue	Improve flow from ED to inpatient bed.	Transfer responsibility for patient movement into a clean and ready bed from RN to receiving unit clerical staff Education to clerical staff to enter transport request for patients as soon as bed is clean and ready
Capabilities of electronic bed board reports not fully used	Design and implement accountability tools	Variety of reports built, disseminated in timely manner, and accountability maintained, ie, pull times listed in minutes by day of the week, as well as in time intervals Daily metric boards designed and placed in public viewing areas, prompting friendly competition and means for senior leaders to recognize outcomes during leadership rounding Success replicated on other units (Table 2) Incentivize stakeholders through aligned goals tied to merit compensation

output segment. The original goal of the project was to reduce this latter time under 50 minutes.

The setting for the project is a 34-bed ED in a 174-bed hospital, 1 of 4 acute care facilities in a health-care network. The hospital is an accredited Chest Pain Center by the

Society of Cardiovascular Patient Care and a Joint Commission Certified Stroke Center.

In 2008, the organization adopted the Toyota LEAN methodology<sup>3</sup> as a framework for PI. In keeping with a key construct of LEAN,<sup>3</sup> this project’s team included

staff who were directly involved in doing the work—direct care nurses, patient care clerical staff, physicians, patient logistics staff, data analysts, and other interprofessional staff as well as managers and support staff. From project onset, it was recognized that solutions needed to

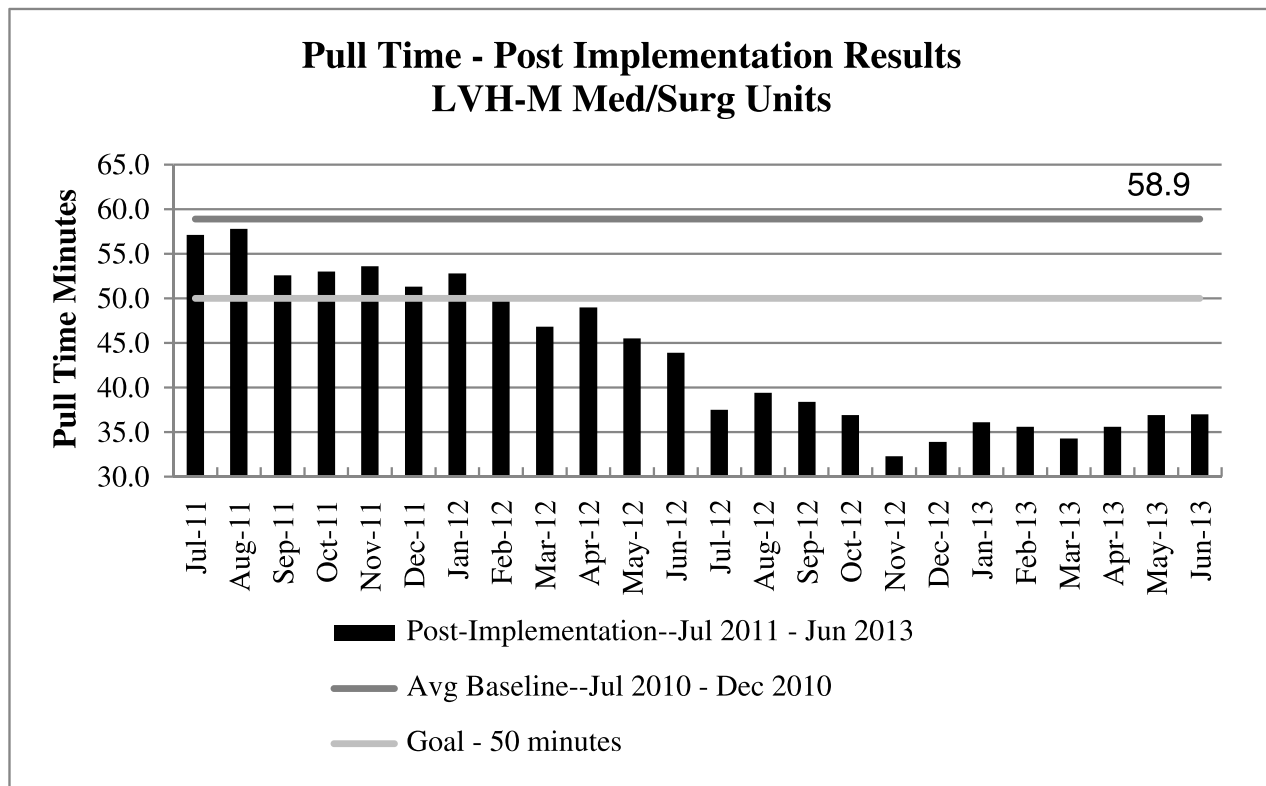


Figure 1. Medical-surgical pull times (postimplementation).

be focused throughout the inpatient continuum of care; thus, frontline team members represented the ED, medical-surgical, low-level, and critical care units. The team was led by the nurse administrator responsible for the ED and medical-surgical units and was supported by an internal organizational LEAN coach. The project was planned and completed in 2 months, with implementation initiated immediately after the team’s recommendations were finalized. Six months later, the process was housewide.

### Current Conditions

Team members began their efforts using a lean tool called an “A3.” This name refers to a project management tool with defined steps to include in a PI effort (see Document,

Supplemental Digital Content 1, <http://links.lww.com/JONA/A317>). Through the team process, the A3 guided the dialogue and analysis.<sup>3</sup>

To assess the current conditions, the 2nd step in the A3 (See Document, Supplemental Digital Content 1, <http://links.lww.com/JONA/A317>), Toyota LEAN methodology encourages “going to the *gemba*.” *Gemba* is a Japanese term for “actual place,” the setting where work takes place. The project work group members went to the *gemba* and recorded what they saw, the current state, within the A3. Compared with the ideal state, the current state gap analysis revealed the following:

- delays in bed assignments;
- delayed and closed-loop communication handoffs, jeopardizing patient safety;

- limited use by medical-surgical staff of an available electronic mechanism to prioritize bed assignments; and
- untimely transport requests.

These delays and process problems led to a longer than necessary “pull time”—defined in this project as “the time from patient assignment to a clean, ready inpatient bed to the time the patient occupies the bed.” In reality, the system was more like “push,” that is, movement of the patient at time of staff convenience, rather than an efficient pull system. The average baseline pull time was 58.9 minutes in the medical-surgical areas. This is an acceptable benchmark among EDs; however, a more in-depth analysis revealed a long “tail” of pull times of greater than 60 minutes. For example, pull times

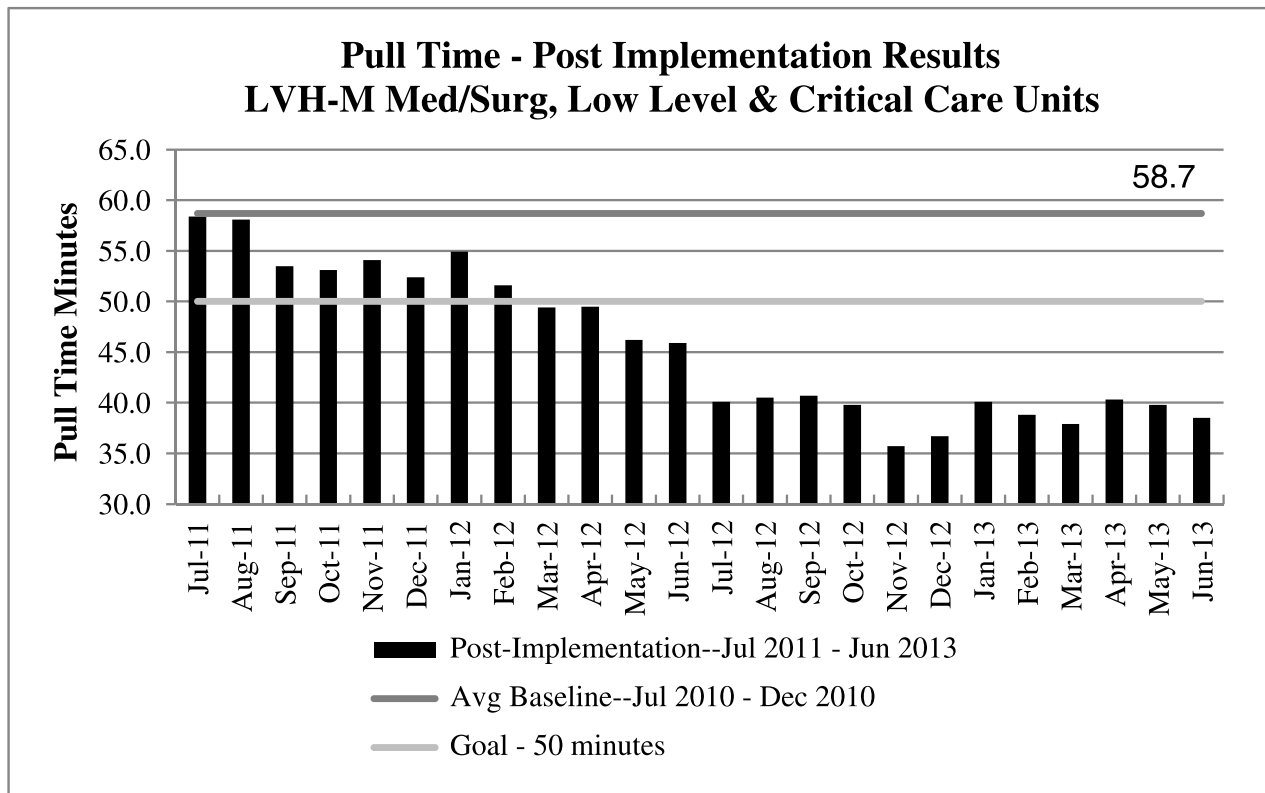


Figure 2. Medical-surgical, low level, and critical care pull times (postimplementation).

could be less than 30 minutes but were balanced with times greater than 90 minutes. These more lengthy times influenced negative perceptions about delays by staff and patients, contributing to exaggerated stories and misperceptions. In summary, going to the *gemba* reinforced the validity and promoted more in-depth understanding of the necessity to move patients out of the ED to accommodate the burgeoning ED population and improve the patient experience.

### Project Goal

The goal identified and documented in the A3 (See Document, Supplemental Digital Content 1, <http://links.lww.com/JONA/A317>) was as follows: “The time from when an ED

inpatient admission order is written through patient arrival to an assigned inpatient bed is <50 minutes, inclusive of standard, required hand-off communication.”

### Analysis, Interventions, and Plans

Details associated with specific actions taken are described in Table 1.

### Results

Quantitative outcomes include continuous significant decreases in ED “admission hold” for the medical-surgical units. Before implementation of project countermeasures and associated actions, from July 2010 through December 2010, pull times

in the medical-surgical units averaged 58.9 minutes. Postimplementation averages in May and June 2013 were 36.9 and 36.7 minutes, respectively (Figure 1, also, see Document, Supplemental Digital Content 2, which details postimplementation medical-surgical pull times <http://links.lww.com/JONA/A363>). After success in the medical-surgical units, plans and actions were spread to the low-level monitored and critical care units. Despite added challenges, such as an ED registered nurse (RN) needing to accompany patients to these units, there has been a continuous decrease in pull times, with the most recent monthly averages, in May and June 2013, being 39.8 and 38.3 minutes, respectively, for the medical-surgical, low-level, and critical care units combined (Figure 2).



**Table 2. Patient Care Unit Pull Time Metrics**

Occupied Unit	Key Metric	10/24/12	10/25/12	10/26/12	10/27/12	10/28/12	10/29/12	10/30/12	Total
6TM	No. admissions	4	3	2	2	6	2	2	21
	Average pull time, min	18.6	38.9	46.1	43.4	25.0	28.2	34.6	30.8
	% Pull time ≤20 min	75.0	0.0	0.0	0.0	33.3	0.0	0.0	23.8
	% Pull time >20 and ≤40 min	25.0	66.7	0.0	50.0	66.7	100.0	50.0	52.4
	% Pull time >40 and ≤60 min	0.0	33.3	100.0	50.0	0.0	0.0	50.0	23.8
% Pull time >60 and ≤60 min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
7TM	No. admissions	6	3	4	6	9	3	3	34
	Average pull time, min	28.7	30.8	33.7	41.0	39.4	26.3	35.0	34.8
	% Pull time ≤20 min	33.3	0.0	0.0	0.0	11.1	33.3	33.3	14.7
	% Pull time >20 and ≤40 min	50.0	66.7	100.0	33.3	33.3	66.7	33.3	50.0
	% Pull time >40 and ≤60 min	16.7	33.3	0.0	66.7	55.6	0.0	0.0	32.4
% Pull time >60 and ≤90 min	0.0	0.0	0.0	0.0	0.0	0.0	33.3	2.9	
% Pull time >90 min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

What did this mean for our patients? They waited to be transported to their clean and ready bed nearly 20 minutes less than before the Move on Green initiative. What did this mean for our community? Approximately 14 additional ED bed hours per day was provided, which supported multipronged efforts to successfully reduce ambulance diversion hours.

Qualitatively, medical-surgical nurses report an improved sense of control over workload owing to the ability to prioritize transfers and thus reduce “batching.” In addition, staff throughout the care continuum relates improved relationships and teamwork to managers during leadership rounds to the gemba.

Finally, patients have also spoken. The ED Press Ganey “overall” patient satisfaction score has been in the low 90s and near or above the 90th percentile since “go live” of this initiative. This compares to preimplementation overall scores ranging from the 60s through low 80s and percentiles ranging from the 40th through 80th.

### Implications for Nurse Executives and Administrators

Lessons learned from this initiative for nurse leaders to consider are as follows: (1) The use of LEAN methodology works; (2) daily metrics and goal alignment enhance PI; (3) friendly competition is good and can support the morale of the team during a project; and (4) successful projects can be adapted to other areas of the organization.

The strategies discussed in this article are pragmatic and illustrate interprofessional collaboration informed by data. This project was successful, in part, because multiple disciplines and departments were involved. The elements of this project



can be readily adapted within other organizations to enhance ED throughput and related outcomes, including staff and patient satisfaction and patient safety. The process used in the ED project has since been applied to bed placement in other areas of the organization and is resulting in

tracking of process elements and improved patient flow (Table 2).

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