How To Use Lean Principles
To Improve Scheduling in Health Systems
And Reduce Costs While Increasing Value

William Reau and Isaac Ullatil
Principals, Hallmark Health Care Solutions
Introduction: Applying Lean principles to workforce scheduling strips away waste and excess costs to create continuous improvement.

By definition, Lean considers any activity that does not directly create value for the customer to be a target for improvement or elimination. As a result, it’s known for resulting in waste and cost reductions. Six Sigma behaves similarly, but it focuses on quality improvement, with cost reduction as a side-benefit. It works by identifying the causes of errors, reducing process variation, and establishing a threshold of acceptable performance at the “six sigma” level (i.e., 3.4 defects per million opportunities).

Combined, Lean and Six Sigma are complementary and often overlapping philosophies that make the patients’ needs the top priority. They allow health care organizations to take a measured approach further helps the system to identify opportunities to incorporate Lean and Six Sigma principles and understand how to get started.

Laying the groundwork generally needs the consideration of variables like:

1. Cost and Quality;
2. Targeting Excess Costs;
3. Demand Patterns in the Industry;
4. Readiness Assessment;
5. Change Continuum; and

1: Cost and Quality

Many programs today fundamentally assume that higher quality ultimately leads to lower costs, and they turn to Lean and Six Sigma as tools to address both simultaneously.

We start by targeting superfluous costs.

2: Targeting Excess Costs

Organizations with strong continuous improvement programs will be the best prepared to reduce excessive costs.

In September 2012, the Institute of Medicine (IOM) published its findings on waste in the healthcare system, much of which could be addressed through the effective deployment of Lean and/or Six Sigma as a way of doing business.

These areas will be the target of continued governmental and payor pressures, for which organizations with strong continuous improvement programs will be the best prepared.

3: Demand Patterns in the Industry

New demands from patients are forcing health systems to redesign the way care is delivered.
• **Accessibility:** Nurse, physician and other staff schedules that offer same-day open access and/or extended hours and incorporate new delivery models (e.g., patient-centered medical home [PCMH] or team model), new patient encounter types (e-visits, e-mail), etc.

• **Comprehensive Care:** Dedicated managers, specialists, or disease management PCMHs who coordinate with dentists, pharmacists, nutritionists, and others for preventive care.

• **Coordinated Care:** Standards for information sharing (e.g., patient discharge notes, medication reconciliation) and organization-wide standard protocols for patient follow-up.

• **Patient Engagement and Communication:** Patient portals, chat rooms, e-visits, group visits, online scheduling, in-office resource centers, and telephone calls for follow-up.

### 4: Readiness Assessment

As Lean and Six Sigma are deployed, organizations may see mixed results initially. Despite the great potential, organizations are frequently unprepared and lack the infrastructure necessary for success. Before embarking on a process improvement program, organizational leaders must ensure that the necessary infrastructure is in place in order to make the most of limited resources.

This “**Readiness Assessment**” is part of the groundwork that must done to properly align Lean and Six Sigma processes. And to set up the necessary infrastructure, organizations need to verify that they have the following in place:

• Leadership commitment;
• Project management;
• Nurse, physician and other staff alignment;
• Project prioritization; and
• Easy access to reliable data.

### 5: Change Continuum

Once an improvement program is in place, an organization will slowly shift its culture along the change continuum as it transitions to a culture of continuous improvement.

In other words, the culture must be regularly considered to ensure it is continuing to move up the continuum. See Figure 1.

---

**Figure 1. The change continuum.**

### 6: Measurement and Analysis

Lean and Six Sigma protocols offer additional analytical rigor and provide tools to manage the areas of opportunity so that organizations can realize measurable improvements within staff scheduling.

• **Operational Processes:** Improve scheduling accuracy and ownership, balance clinic/staffing schedules to better utilize resources, evaluate clinic building space allocations, and reduce duplicative processes.

• **Care Model:** Identify appropriate staffing models, evaluate staffing levels and licensure mix, clarify expectation of staff roles in clinic, and promote team-based accountability for patient experience.

• **Systems:** Develop robust dashboards with clear targets, optimize electronic health records (HER) to enable daily task management, create ongoing in-clinic training program, and streamline documentation.

• **Revenue Cycle:** Stabilize front-end revenue cycle expectations, optimize charge capture performance, and develop manager training to enhance understanding of health practice drivers.

• **Organizational Enhancement:** Clarify roles and responsibilities, create decision-making forum with physician input, develop infrastructure for process improvement, and evaluate support functions for centralization.

Once the foundation has been laid through these six considerations, the next step is a thorough analysis to identify gaps and recommend solutions. The three major components of this analysis are: scheduling process, scheduling practices and scheduling technology. We’ll start with scheduling process.
Scheduling Process: Clearly understand and articulate problem areas with the current scheduling process and set objectives.

Poor and inconsistent scheduling processes are a major source of excess cost and organization waste. To apply Lean principles here, we take the DMAIC (Define, Measure, Analyze, Improve and Control) approach to enable measurable and ongoing performance improvements.

Step 1: Define

The output from this phase includes:

- High-level process maps of current scheduling process that identify both holes in the current scheduling process and new requirements to make the process more efficient;
- Internal and external contributors affecting the process, generally identified by examining understaffing and overstaffing in different departments, standards for information sharing (e.g., patient discharge notes, medication reconciliation), and organization-wide standard protocols for patient follow-up;
- Definition of critical process outputs (CTQs) and controllable variables that can be optimized in order to identify and address holes;
- Project targets or goal; and
- Project boundaries or scope.

Step 2: Measure

This data-gathering step meaningfully identifies current baselines to establish process performance baselines. In this step, the team will:

- Identify gaps between current and required performance;
- Collect data to create a process performance baseline for the project metric;
- Assess measurement system for accuracy/precision; and
- Establish a high level process flow baseline.

Step 3: Analyze

The purpose of this step is to identify, validate and select problematic root causes for elimination, a number of which can be identified via root cause analysis. A data collection plan is created, and data are collected, to establish the relative contribution of each root cause to the project metric (“Y”). This process is repeated until “valid” root causes can be identified. Of the "validated" root causes, all or some can be:

- Listed and prioritized for potential causes of the problem;
- Prioritized as key process inputs to pursue in Step 4;
- Analyzed how the process inputs (X’s) affect the process outputs (Y’s) (specifically, data is analyzed to understand the magnitude of each root cause to the relevant project metric, often using statistical tests using p-values accompanied by Histograms, Pareto charts, and line plots); and
- Detailed process maps can be created to help pin-point where in the process the root causes reside, and what might be contributing to the occurrence.

For instance, consider the amount that is spent during the overall process as schedulers first identify the holes to be scheduled, then manually allocate the employees to these holes, and finally update the entire process by entering the details into the scheduling system. That process requires a considerable amount of time and energy, and the chances of entry and allocation mistakes are high. Also, we can run into the strong correlation between the high incentive of overtime (OT) pay and the high census fluctuation. This is not limited to scheduling errors but also affects the reconciliation reports made during scheduled and clocked hours, leading to high incidental OT.

Step 4: Improve

The purpose of this step is to identify, test and implement a solution to the problem, whether in part or in whole. It is important to ensure that each solution is targeted at resolving the specific problems identified in the earlier phases. Various project management and planning tools can be used to implement these new processes in order to:

- Implement process changes; and
- Review outcome and CTQ performance in order to understand the impact of changes.
The process of improvement also helps to fix the problem of extra time spent in allocating employees and manually entering them into the scheduling system, a process that can be automated now using centralized staffing and an efficient system to automatically view all employees who are available and eligible to fill a hole.

Step 5: Control

The purpose of this step: sustain the gains. Monitor the improvements to ensure continued, sustainable success and create an ongoing control plan.

Update documents, business process and training records as required; and, to assess the stability of the improvements over time, use a control chart and/or AI systems to continue monitoring the process(es) and provide a response plan for each of the measures being monitored in case the process becomes unstable.

Scheduling Practices: This phase focuses on the various policies and rules that apply to workforce staffing and scheduling.

Unfortunately, policies deemed necessary under specific circumstances can turn into easily manipulated practices that result in significant spend for the organization. The DMAIC approach once again enables continuous oversight to avoid such scenarios.

Step 1: Define

This step is to understand the current policies and practices which influence workforce staffing and scheduling. It will help to articulate the intent of the different policies and the actual practices which are followed by employees (which may be different). Interviews with the scheduling and registration teams will provide “on the ground” understanding of the policies and practices.

Often, this process will uncover major scheduling practices that negatively affect the scheduling process, such as:

- Employees are booked on call for a regular shift and later work as “call duty.”
- Employees do not sign up to work a shift until the shift is deemed “critical.”
- Employees who have indicated availability to work are being booked “on call” even in units where no “on call” is required.
- Employees are mandated to work in other units when the original unit where they are scheduled cancels.
- Incentive pay/OT logs are manually maintained and monitored after the expense is incurred.
- In some cases, casual staff (nurses, physicians) are not fully utilized – their patient ratios are less than for FT/PT workers in the same department.
- Specific employees are scheduled for more than 80 hours a week regularly (note that “stress” is quoted as one of the main reasons for leaving in exit interviews).
Step 2: Measure

After the scheduling process in place, we need to measure the best scheduling practices and identify the impact of different practices on overall labor spend to help establish the baseline for future improvements. This step involves significant data gathering and data slicing from payroll to quantify the impact of each staffing policy and practice.

Consider the exhibit below, showing measurements for three different practices: critical shift, call duty and on call shift. As measured, we see that 47% of the labor spend went to overtime shifts, 22% to critical shifts, and the remaining 31% to call duty shifts. Based on these measurements, the health system can now plan its resource expenditure with a better scheduling process and practice.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees do not sign up to work a shift until</td>
<td>$20 extra per hour</td>
</tr>
<tr>
<td>the shift is deemed as a “critical shift”</td>
<td></td>
</tr>
<tr>
<td>Employees are booked on call for a regular shift</td>
<td>Paid $51 per hour</td>
</tr>
<tr>
<td>and later work as “call duty”</td>
<td></td>
</tr>
<tr>
<td>Employees who have indicated availability to work</td>
<td>$2 per hour</td>
</tr>
<tr>
<td>are being booked “on call” even in units where</td>
<td></td>
</tr>
<tr>
<td>no on call is required</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3. Costs for three different practices.

Step 3: Analyze

Here we analyze the impact of eliminating or modifying existing practices to reflect best practices. Correlation analysis is used to study the inputs (X’s) and outputs (Y’s) from modifying the different practices. Scenario analysis is conducted to study the outcomes resulting from the changes.

In addition to hard numbers, analysis should also consider the impact on cultural change for employees.

Step 4: Improve

Step Four implements the best practices and policies identified in the previous phases. Depending on the extent of impact, practices may be changed throughout the organization or in a phased manner, using various project management and change management tools.

Throughout this step, AI tools monitor the impact of policy changes in both inputs and outputs, with attention paid to emerging correlations. For example, reduction in overtime should not lead to increased agency usage. Various tools can improve the scheduling process, as well as scheduling practices, in the health organizations:

- Goal Deployment/Strategic A3X
- Value Stream Mapping
- Rapid Improvement Events

Step 5: Control

Step Five implements controls for continuous monitoring of policies/practices and their impact on financial spends. Analytic reporting customized for each level of management can provide real-time data for actionable steps. AI systems can also help set up automatic alert notifications when control limits are exceeded, e.g., notifications can be sent to senior management if a department exceeds budgeted limits or has low productivity consistently. Control plans are (1) drafted around actions to be taken in the event of policy deviations and (2) communicated to all employees.
Scheduling Technology: Healthcare groups should take a holistic people-process-technology view in order to deliver a comprehensive strategic workforce solution.

Organizations typically view workforce management processes in silos: for instance, human resources oversees recruitment, nursing controls nurse workforce utilization, and finance manages compensation. But such silos can lead to chaos when each department is looking at different data sources for decision-making. Maximum benefits require standardized workforce processes and compensation models as well as a centralized resource management system. Strategy and technology consultants can assess the differences between the current and desired performance levels of the healthcare systems’ scheduling applications.

This gap analysis will also help determine how to meet the appropriate technology requirements for scheduling efficiency and scalability. Critical technology gaps to address include:

- Core scheduling completed automatically through AI;
- Automatic open needs creation and adjustment for proactive right-sizing;
- Real-time labor productivity monitoring based on census and schedule;
- Customizable reporting, including Hours Per Patient Day;
- Cloud tech for scalability, security, and no new hardware;
- Transparency, with horizontal and vertical views of house-wide staffing; and
- Predictive modelling of staffing needs for future volumes, seasonal trends, and disaster planning.

Conclusion

Lean and Six Sigma principles can dramatically improve worker experience, removes dis-satisfiers, right-size the workforce, and offers more layers of staff support to flex up and down as patients demand, all while decreasing overall labor costs and improving patient outcomes.

The multi-phased approach described in this paper will take your organization down a journey of discovery, starting with an in-depth analysis of existing processes and actual practices that will enlighten stakeholders on the realities of waste and inefficiency in their organization and open the door to a new beginning for sustainable workforce optimization.

About Hallmark Healthcare Solutions

We are a people, process, technology consulting firm blending Strategy and Technology. Our sustainable results are customized and derived from years of input while working with global healthcare leaders. We laser focus on your organization’s needs; working with you to develop effective and efficient strategies. Sharing of these challenges and successes around organizational need are the essential components hospitals require to create exemplary outcomes. We provide consulting services and implement software to execute strategy and guarantee results. The need for a larger resource pool, analytic software, real time information and the ability to better manage/communicate with staff around workforce needs is paramount to continued success. Hallmark is here to assist.

Visit www.hallmarkhealthcareit.com or email info@hallmarkhealthcareit.com

3000 Atrium Way Ste 299
Mt Laurel NJ 08054

(856) 231 5340