Improving Nurse Scheduling in Health Systems Using Lean Principles—How it Can Optimize Costs
The objective of this study is to understand how Lean and Six Sigma can provide the necessary framework to rethink care delivery processes and improve Nurse Scheduling in Health Systems.
Introduction

The basic tenets of Lean and Six Sigma are to lay the groundwork and identify necessary tools to implement the program in any healthcare system. This further helps the system to identify opportunities to incorporate Lean and Six Sigma tools and understand how to get started.

Laying the groundwork generally needs the consideration of variables like:

- **Cost and Quality**: Many programs being put into place today are fundamentally based on the assumption that higher quality ultimately leads to lower costs.

- **Targeting Excess costs**: Organizations with strong continuous improvement programs will be the best prepared to reduce excessive costs.

- **Demand patterns in the industry**: New demands from patients are forcing the redesign of the way care is delivered in nursing practices.

- **Readiness Assessment**: Before embarking on a process improvement program, it is critical to ensure that the necessary infrastructure is in place so that you can make the most of limited resources.

- **Change Continuum**: The culture must be regularly assessed in order to ensure that it is continuing to move up the continuum.

- **Measure and analyze**: Lean and Six Sigma offers additional analytical rigor and provide tools to achieve desired results by effectively managing the areas of opportunity, organizations can realize measurable improvements within the nurse scheduling.

Many organizations are turning to Lean and Six Sigma as tools to address cost and quality simultaneously. They are complementary and often overlapping philosophies that make the patients’ needs the top priority.

**By Definition Lean**

- Considers any activity that does not directly create value for the customer to be a target for improvement or elimination.
- Often known for the principle of “waste reduction.”
- Valued as a tool for cultural change as well as cost reductions.
By Definition Six Sigma

- Targets perfection by identifying the causes of errors and reducing process variation.
- Focused on quality improvement, with cost reduction as a benefit of reaching that goal.
- Establishes a threshold of acceptable performance at the “six sigma” level (i.e., 3.4 defects per million opportunities).

Targeting Excess 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.

<table>
<thead>
<tr>
<th>Areas of concern</th>
<th>Expenditure ($)</th>
<th>Ways of improvement</th>
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<tbody>
<tr>
<td>Unnecessary Services</td>
<td>210 BN</td>
<td>Conduct analysis of variance between providers in order to identify best practices</td>
</tr>
<tr>
<td>Excessive Administrative Costs</td>
<td>190 BN</td>
<td>Streamline processes to minimize unnecessary expenditures</td>
</tr>
<tr>
<td>Inefficiently Delivered Services</td>
<td>130 BN</td>
<td>Optimize processes and establish a Lean culture that focuses on continuous improvement.</td>
</tr>
<tr>
<td>Missed Prevention opportunities</td>
<td>55 BN</td>
<td>Develop and implement standard work and care protocols.</td>
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These areas will be the target of continued governmental and payor pressures. Organizations with strong continuous improvement programs will be the best prepared. According to the Institute of Medicine (IOM)

“Americans would be better served by a more nimble health care system that is consistently reliable and that constantly, systematically, and seamlessly improves.”
Demand patterns in the industry: New demands from patients are forcing the redesign of the way care is delivered in nursing practices. New demand care include:

- **Accessibility:** Nurse schedules with same-day open access and/or extended hours, new delivery model (patient-centered medical home [PCMH] or team model), new patient encounter types (e-visits, e-mail), Stratification of patient panel at the start of the visit to off-load physician schedule.

- **Comprehensive Care:** Dedicated nurse managers or disease management PCMHs, coordination with dentists, pharmacists, and nutritionists 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, telephone calls for patient follow-up.

**Readiness Assessment**

As Lean and Six Sigma are deployed, organizations are having mixed results. There is great potential, but organizations are frequently unprepared, lacking the infrastructure necessary for success. Before embarking on a process improvement program, it is critical to ensure that the necessary infrastructure is in place so that you can make the most of limited resources.

“Readiness Assessment” is one of the groundwork that has to be done to ensure the alignment of Lean and Six Sigma process. And to set up the necessary infrastructure, organizations need to make sure of the fact that they have the following in place:

- Leadership commitment
- Project management
- Nurse alignment
- Project prioritization
- Easy access to reliable data
Change Continuum

Once an improvement program is in place, an organization slowly shifts its culture along the change continuum during the transition to a culture of continuous improvement.

Measure and Analyse

By effectively managing these areas of opportunity, organizations can realize measurable improvements within the physician enterprise.

- **Operational Processes**: Improve scheduling accuracy/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 nursing roles in clinic, Promote team-based accountability for patient experience.

- **Systems**: Develop robust and intelligent systems to adjust staffing based on current and future volumes. Real-time dashboards to help monitor house-wide staffing status and hours per patient-day for optimum labor productivity.

The Hallmark Lean six sigma consultants conduct a thorough analysis of the below components to identify gaps and recommend solutions.

The 3 major components of scheduling a work force are:

| Scheduling process | Scheduling practices | Scheduling technology |
Scheduling Process

Define

This step is to clearly understand and articulate the problem areas in the current scheduling process; clarify actualities and set objectives. The output from this phase includes:

- High-level process maps of current scheduling process: It involves both identifying the holes in the current scheduling process and new requirements needed to make the process more efficient.
- Internal and external contributors affecting the process: Contributors to the process is generally identified by the understaffing and overstaffing in different departments, Standards for information sharing (e.g., patient placement, time and attendance). Definition of critical process outputs (CTQs) and controllable variables: The holes are identified and addressed with the optimization of controllable variables.
- Project targets or goal
- Project boundaries or scope

Measure

This step is to meaningfully institute current baselines as the basis for process improvement. This is a data gathering step, the objective of which is to establish process performance baselines. In this step the team...
• Identify the gap between current and required performance.
• Collect data to create a process performance capability baseline for the project metric.
• Assess the measurement system for adequate accuracy and precision.
• Establish a high level process flow baseline.

The main motive is to understand and identify the critical shift for nurse scheduling and the extra pay incurred during the scheduling. The step helps to analyse the vacancy rate and the frequency of understaffing/overstaffing and likewise the just-in-time approach to fill these holes. All these processes help the health system in allocation of budget in terms of salary spend and overtime premium payments.

Analyze

The purpose of this step is to identify, validate and select root cause for elimination. A number of potential root causes are identified via root cause analysis. A data collection plan is created and data are collected to establish the relative contribution of each root causes to the project metric, Y.

• Listed and prioritized for potential causes of the problem
• Prioritized as key process inputs to pursue in the Improve step
• 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 in the overall process – first to identify the holes to be scheduled, then manually allocate the employees to these holes and update the entire process by entering the details into the scheduling system. The amount of time and energy spent is considerable and the chances of mistakes in the entry and allocation is high. Also we can encounter the strong correlation between the high incentive / OT pay and the high census fluctuation. This is not limited to scheduling errors but also the reconciliation reports made during scheduled and clocked hours leads to high incidental OT.

Improve

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

- Implement process changes.
- Review outcome and CTQ performance in order to understand the impact of changes

The process of improvement helps to address and fix up the problems of extra time spent in allocating of employees and manual entry into the scheduling system. This can be automated now using centralized staffing and efficient system to automatically view all employees available/eligible to fill a hole.
Control

The purpose of this step is to sustain the gains. Monitor the improvements to ensure continued and sustainable success. Create a control plan. Update documents, business process and training records as required. A Control chart/ AI systems can be useful during the Control stage to assess the stability of the improvements over time by serving as a guide to continue monitoring the process and provide a response plan for each of the measures being monitored in case the process becomes unstable.
Scheduling Practices

Scheduling practices focuses on the various policies and rules applicable to workforce staffing and scheduling. Policies deemed necessary under certain circumstances can soon become practices which are manipulated to result in significant spend for the organization. DMAIC enables continuous oversight to avoid such scenarios.

Define

This step is to understand the current policies and practices which influence workforce staffing and scheduling. It will help articulate the intent of the different policies and the actual practices which are followed by employees. Interviews with the nursing, scheduling, and house supervisors will provide “on the ground” understanding of the policies and practices.

<table>
<thead>
<tr>
<th>Major scheduling practices affect the scheduling process</th>
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<tbody>
<tr>
<td>• Employees are booked on call for a regular shift and later work as “call duty”</td>
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<tr>
<td>• Employees do not sign up to work a shift until the shift is deemed as a “critical shift”</td>
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<tr>
<td>• Employees who have indicated availability to work are being booked “on call” even in units where no on call is required</td>
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<tr>
<td>• Employees are mandated to work in other units when the original unit where they are scheduled cancels</td>
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<tr>
<td>• Employees are floated to all units instead of clusters</td>
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<tr>
<td>• Incentive pay/OT logs are manually maintained and monitored after the expense is incurred</td>
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<tr>
<td>• In some cases, casual nurses are not fully utilized – their nurse-patient ratios are lesser than the same for FT/PT in the same department</td>
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<tr>
<td>• There are several cases where specific employees are scheduled for more than 80 hours a week regularly – “stress” was quoted as one of the main reasons for leaving in exit interviews</td>
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Measure

This step is to measure the impact of the different practices on the overall labor spend. Establishing the current impact would help set up the baseline for future improvements. This step would involve significant data gathering and data slicing from payroll to quantify the impact of each staffing policy and practice.
After the scheduling process is in place, we need to measure the best scheduling practices. As in the below exhibit measurement for three different practices were taken- Critical shift, Call Duty and On Call shift. This helps in further steps of analysing and controlling. As measured it can been seen that 47% of the labor spend was done on the overtime shift, 22% on critical shift and the rest 31% done on the call duty shift. Based on these measurements the health system can now plan its resource expenditure with a better scheduling process and practice as well.

| Employees do not sign up to work a shift until the shift is deemed as a “critical shift” | $20 extra per hour |
| Employees are booked on call for a regular shift and later work as "call duty" | Paid $51 per hour |
| Employees who have indicated availability to work are being booked “on call” even in units where no on call is required | $2 per hour |

**Analyze**

The purpose of this step is to analyze the impact of eliminating or modifying existing practices to reflect best practices. Correlation analysis is used to study the inputs (Xs) and outputs (Ys) from modifying the different practices. Scenario analysis is conducted to study the end game resulting from the changes. In addition to hard numbers, the impact on cultural change for employees is also considered during the scenario analysis.

**Improve**

The best practices and policies identified in the previous phases are implemented in this step. Based on the extent of impact, practices may be changed throughout the organization or in a phased manner. Various project management and change management tools are used to implement the new policies. Throughout this step, AI tools are used to monitor the impact of policy changes in both inputs and outputs, especially based on their correlation. For example: reduction in overtime should not lead to increased agency usage. There are various tools to improve the scheduling process as well as the scheduling practices in the health organizations.
Control

As part of this step, controls are implemented for continuous monitoring of policies/practices 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. For e.g.: notifications can be sent to senior management if a department exceeds budgeted limits or has low productivity consistently. Control plans are drafted on actions to be taken for policy deviations and communicated to all employees.

Scheduling Technology

Gap Analysis

Organizations typically view workforce management processes in silos – Human resources oversees recruitment, Nursing controls workforce utilization, and Finance manages compensation. This situation leads to further chaos when each department is looking at different sources of data for decision making. Healthcare organizations should take holistic people-process-technology view to deliver a comprehensive strategic workforce solution. In order to achieve maximum benefits, it is important to standardize workforce processes and compensation models and centralize the resource management system. Hallmark strategy and technology consultants assess the differences between the current and desired performance levels of the healthcare systems’ scheduling applications.
The gap analysis will also help determine how to meet the appropriate technology requirements for scheduling efficiency and scalability.

The following gaps in technology are addressed for scheduling efficiency and scalability:

- Core scheduling completed automatically through artificial intelligence
- 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 report
- Cloud technology for scalability, security, and no hardware investment
- Transparency; horizontal and vertical views of house-wide staffing status
- Predictive modelling of staffing needs for future volumes, seasonal trends, and disaster planning
Key requirements for an efficient scheduling system include:

- Automated schedule creation capability, but with flexibility for managers to make manual adjustments
- Proactive alerts and notifications when schedule results in overtime, premium pay, and/or any policy conflicts
- Centralized view of schedule and open needs; ability to match eligible employees to open needs automatically; data-driven floating across locations and departments
- Scalable easily to any number of locations, departments, skill to meet the organization’s future growth
- User-based custom analytic reporting to facilitate each level of management make data-based actions
- Interoperable with other staffing systems like payroll, Time & Attendance, and HR for comprehensive reporting
Technology – What is Required?

- System should automatically list all employees who “can” fill a need
- Should be easy to track if employee has completed minimum hours and/or weekend requirement as contracted
- Maintain a bench of “available employees” to fill last-minute needs
- System should highlight overtime, if any incurred on booking the employee
- Should be easy to contact employees to confirm availability?
About Hallmark Healthcare Solutions

Hallmark is a global healthcare solutions and information technology firm comprised of nearly 400 employees; with offices located in New Jersey, New York, Michigan, Texas, Dubai and India. As of 2014 we have conducted more than 3620 engagements for more than 1140 clients nationwide. Over the years, we have helped organizations optimize and save millions in labour expenses, improve their efficiency, and achieve fiscal responsibility through our best-in-class software and strategic workforce solutions.

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