Using Lean, Six Sigma to Improve Surgical Services
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How many times have we heard that it’s easy to apply Lean and Six Sigma techniques to hospital processes, and specifically to surgical services? Well, in reality it is - if you take into account a few critical essential steps in your planning process. This article focuses on a few lessons learned from one of our recent engagements, and provides you with some quick guidelines to drive significant, sustainable change to your own Surgical Services Process.

**Step 1 – What’s the Problem?** Is the problem financial? Is it productivity? Is it OR utilization? Many projects fail because the problem was not defined correctly, or was too broad in scope. In our case the surgeons were complaining about block schedule utilization. Based on that charge we decided to investigate some of the sources that could negatively impact the block schedule.

We first decided to look along the Value Stream for potential sources of issues – brainstorming by walking around. In addition, we looked at both ‘upstream’ and ‘downstream’ departments. During our investigation we talked to (a) Pre-Surgical Test, (b) Same Day Admit, (c) OR, (d) PACU and (e) Discharge. We also talked to the CNO and the CFO – key executives that we knew would be the executive sponsors of the project.

The CNO identified staff productivity and expense as a primary concern, and had already instituted a ‘flex time’ process so staff could leave early if the OR was not busy. This also helped reduce hospital expenses.

The CFO was concerned with OR utilization – are we seeing enough patients every day and maximizing our opportunity for revenue?

We therefore had three specific problem areas to look at:

1. Block Schedule Utilization – Surgeon
2. Staff Productivity – CNO
3. OR Utilization / Revenue - CFO

**Step 2 - Define Success.** We had to define a clear goal that we would be able to measure and compare the “before” and “after” performance. The goal also had to be one that would satisfy our three different executive sponsors: the Surgeon, the CNO and the CFO. But how could we do that? The surgeons wanted to maximize the number of patients within the Block Schedule, the CNO was interested in expense reduction, and the CFO was interested in increasing revenue of the hospital.

The team looked at our initial value stream to identify potential parts of the process that we could both improve AND positively impact our executive sponsors. We spent a good deal of time breaking down the ‘wheels out to wheels in’ process by OR room, by day of the week, and by surgical specialty before we determined our final definition of success:
“Reduce the Turn-Around-Time” (TAT) for the OR.

We hypothesized that by reducing TAT, staff scheduling would be more predictable for the CNO. We also thought that if we could reduce the variation associated with the TAT metrics, the variation reduction could make the Block Schedule more predictable for the surgeons and, therefore, they could see more patients. Last, if the surgeon was seeing more patients we determined that that would improve the utilization of the OR, satisfying the CFO. It looked like a Win-Win-Win.

**Step 3. Stake Holder Analysis:** A stake holder analysis is often skipped. Is it really necessary? Even I don’t always give it the credit it’s due. In a manufacturing setting, the stake holder is already known – and the metrics to measure performance are clear. Well, to improve TAT in an OR, a stake holder analysis is a critical step. Without it, the project would have failed! Remember that one critically important part of the analysis is to identify the people that can make or break your project. You must determine how THEY benefit from your completing the project successfully.

To improve setup time in the OR, we determined that the following were stake holders:

<table>
<thead>
<tr>
<th>Function</th>
<th>Concerns</th>
<th>Opportunity by Improving TAT and Reducing Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgeon</td>
<td>“Wheels In” gets more off schedule as the day progresses, Variation in “Wheels In” time, Need more Block Time to see Patients, Waiting for Anesthesiologist</td>
<td>Improved On time “Wheels In”, Reduced Variation in “Wheels In” time, Better utilization of existing Block Time</td>
</tr>
<tr>
<td>CFO</td>
<td>More Patients come to hospital, Patient Loyalty and Satisfaction</td>
<td>OR Utilization, Additional Hospital Revenue</td>
</tr>
<tr>
<td>CNO</td>
<td>Minimizing Staff Expense, Clinical Results, Clinical Outcomes, Quality</td>
<td>More Predictable Schedule will increase Staff Productivity</td>
</tr>
<tr>
<td>Anesthesiologist</td>
<td>Time spent in Same Day Admit, OR, and PACU, ‘Wheels in’ time not predictable.</td>
<td>On time “Wheels In” allows much better scheduling, Can see more Patients</td>
</tr>
<tr>
<td>OR Director</td>
<td>Keeping Surgeons happy, Maximizing Utilization of Block Schedule, Expense Management, Clinical Outcomes</td>
<td>On time “Wheels In” helps Surgeons and Staff Productivity, Improved Working Atmosphere</td>
</tr>
<tr>
<td>SPD</td>
<td>Incorrect / Lengthy Preference cards, Predictable Schedule</td>
<td>Improved Productivity by Balancing Staff to Requirements</td>
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</tbody>
</table>
We also knew that any solution we proposed should have the agreement of the above stakeholders.

**Step 4. Create The Value Map.** Factors affecting OR setup could occur all along the Value Map. We therefore documented the processes in the following areas:

1. **Pre-surgical Test.** Pre-surgical Test analysis included understanding the activities at a surgeon’s office for the approval process, communication with the hospital for testing requirements and Block Scheduling input.
2. **Same Day Admit (SDA)** gave us the opportunity to look at and review the chart process and the outputs from Pre-Surgical Test. Were charts complete and were they on time? We also reviewed the registration process for patients.
3. **Operating Room (OR).** The OR, and specifically the TAT metric, allowed us to look at the intersection of many of the upstream processes. Sources of delay can come from several sources. For example, in some instances the patient didn’t arrive on time because the chart wasn’t complete. In other cases, the EPD did not correctly fill in the preference chart. Other examples included Anesthesiologists attending to other patients, and porters not finishing the cleaning of the room on time.
4. **PACU.** We looked at the PACU because our initial discussions identified the fact that sometimes patients could not be moved from the OR due to lack of beds. The PACU had no beds since a small percentage of the patients were scheduled to go back to the floor, but the floor was not ready, and so on.
5. **Discharge.** Was discharge paperwork complete? Was staffing available to process the paperwork? Was the system available?

The Value Map analysis provided us a much better understanding of the processes and potential areas to measure improvements.

**Step 5: Create the Measurement System.** The measurement system must be capable of capturing the current state and also show the improvements resulting from the project. We focused on capturing the TAT data from the system as well as personal observations. We analyzed many variables including:

- Wheels Out – Wheels In
- Actual Anesthesia Start – Incision Start
- Scheduled Start Time vs. Actual Start Time
- Scheduled Complete Time vs. Actual Complete Time

We also analyzed the above data based on day of week, anesthesiologist, surgeon, staffing, type of surgery, type of anesthesia and other demographic data.
As a result, we now had an excellent picture of the average TAT and the amount of variation. We now knew and could clearly see the root causes of why everyone was complaining about the process.

**Step 6. Improve TAT.** Initial implementation recommendations captured opportunities to increase OR utilization by almost 25%. Profitability of the key stake holders would also be improved. Based on the recommendations, the team then prioritized the improvement activities, and noted that many of the changes were ‘just do it’ changes that could be immediately implemented. One notable piece of information also emerged during the analysis process: one surgeon was almost ALWAYS on time and exhibited very low variation on start times. Although not discussed in this article, the leadership style of the surgeon was a primary factor for helping to achieve outstanding operational performance.

**Step 7. Track Results.** The team developed a way to track TAT and variation on an ongoing basis. The results are visible, and the team continues to improve OR and Block Schedule utilization.

**Lessons Learned.** While every project and implementation is different, a few of the key observations from this particular project include:

- Improving surgeons’ revenue stream (though better Block Schedule utilization) could negatively impact the anesthesiologist. In some cases more anesthesiologists were needed to cover increased OR activity (and, therefore, an individual anesthesiologist may see fewer patients)
- To improve TAT the hospital may have to increase staffing. However, this added expense should be offset by additional patients and better utilization. You must look at the whole picture.
- Patient satisfaction appeared to improve with improved chart quality and pre-surgical processes (but was not measured as part of this effort).
- With the significant changes in healthcare coming, many aspects of the revenue/reimbursement side of the equation is in the government’s hands. However, we MUST continue to focus on productivity and clinical outcome improvements – things we CAN control - to maintain a viable hospital operation.

**Conclusions:** In this case, our implementation was mostly, but not completely, successful. Some improvements were implemented quickly. But the lack of alignment of some of the key stake holders hurt the speed of implementation of other opportunities. Additional work by the executive staff would be needed, including the reviewing of contractual obligations with the providers of services to the hospital. In spite of these setbacks, the use of Lean and Six Sigma tools to analyze surgical processes were generally recognized to be effective. If you follow the steps shown above, you should be able to achieve significant process improvement success.

What about sustainability? As the inflow of patients is increasing, and many variables are constantly changing, additional variation will be seen within a system’s processes. That is where Continuous Process Improvement comes in. The tools exist to facilitate improvement, including Lean, Six Sigma, Theory of Constraints, and simulation analysis. These tools, properly employed by experienced professionals, and working in harmony
with the key executives and staff of any given hospital, can elevate the quality of patient care, streamline the processes, reduce their variation, and satisfy the key stake holders.

About the author:

James O. Pearson is a Quality and Business Management expert with over 30 years industry experience. He has guided Quality and Business Process Improvement initiatives leading to sustainable operational improvement and organizational change leveraging Lean Sigma methodologies for large global enterprises as well as a range of other corporations and not-for-profit organizations.

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