

# Image is Everything

## *How Children's Medical Center Applied Lean Principles to Improve MRI Utilization*

Ever been in a situation where the numbers just don't seem to add up? The MRI unit at Children's Medical Center in Dallas found themselves in just such a situation in the fall of 2011. The main operating room had three MRI machines that were running at an average monthly capacity of 58%, and yet there was a six week backlog to get scheduled for an image. There were many talented people in each of the relevant functions- radiology, nursing, anesthesia, technologists- but poor communication between them was causing a variety of process problems. First cases in the morning were not started on time, turnover between cases was not handled smoothly, and patients were not prepped and ready to go into the scanner at the time the machines became available. Since the cost of performing an MRI and the subsequent revenue generated were both substantial, these inefficiencies caught the attention of the management team, who decided it was time to apply lean principles to analyze and fix the process problems. The simple lean three step improvement methodology of Assess-Charter-Transform will be used to illustrate the process the team used to achieve stellar results.

### **Step One- Assess:**

The assessment phase takes a strategic approach to identify the large operational gaps, be they in terms of cost reduction, revenue enhancement, patient satisfaction, or productivity. The hospital commissioned a study of all operations before targeting MRI. While the imaging process was certainly not the only process with performance gaps, the compelling factor that led to its selection (in addition to the obvious revenue opportunity) was the inter-connectedness of the process with other areas throughout the hospital. From a big picture perspective, improving the imaging process would help patient flows in multiple areas. It could also help patient safety, as synchronizing ICU patients trip to the MRI unit must be carefully planned and managed to avoid health issues.

### **Step Two- Charter**

The charter phase entails setting clear expectations and gaining broad participation ensure project success. There are two vital elements to a Lean project charter:

- Getting the right people involved (including physicians when necessary)
- Choosing the right scope

In short, this stage involves all of the tasks necessary to launch a Lean project that is destined to succeed in the real world, not just on paper.

The composition of the imaging process team was a bit unusual. In addition to the front line employees that had direct hands-on subject matter expertise, the team also included the two senior managers over radiology, the chief of anesthesiology, and the director of nursing over the unit. By blending the leadership team with the operators within the process, the team was able to act upon recommendations quickly and with guaranteed management buy-in. This commitment laid a solid foundation for eventual success.

With regard to scope, the team defined the beginning of the process as the point at which the study was ordered, and the end was when the patient was discharged from the MRI unit upon recovery after the study was complete. It was felt that looking at the whole process in this fashion would be the only way to effectively address the inefficiencies.

### **Step Three: Transform:**

This stage involves the blocking and tackling of Lean:

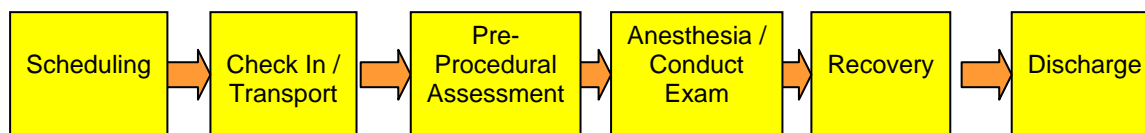
- Analyzing the current process/situation
- Determining the necessary changes
- Implementing the changes
- Measuring the results

The team began by studying the current situation, which consisted of answering two basic questions:

- How do we do it now?
- How well or how badly do we do it now?

The first question calls for process analysis. The team recognized four major internal customers for the MRI process- neurosurgery, the heart center, hematology / oncology, and the intensive care unit. Representatives of the team met with each unit to conduct rigorous system mapping sessions, which were used to identify process breakdowns from the customer perspective. All four groups identified timeliness as a concern, particularly when dealing with inpatients that had to be transported from the floors to the MRI unit.

The team followed up the system mapping sessions with the construction of a traditional cross functional flowchart, which tracked the process from the time an order was processed until the patient was discharged from the MRI unit recovery area. The high level flow was as follows:



Each major step of the process was defined and potential problem causes listed- fifty five in all. The problems were analyzed using traditional cause and effect techniques, and several interesting root causes were found. For example, lack of ownership of the transport process resulted in a significant portion of the utilization inefficiency. The floors had the expectation MRI would come get the patients, the transport unit that was specifically dedicated to patient movement was stretched too thin and often unavailable, and the MRI unit didn't have spare staff to go to the floors for inpatients... so they had to finish with the patient in the scanner before trekking to the floors to get the next one- leaving open machine time. Another root cause that led to multiple process problems was the casualness of ordering an MRI. Physicians tended to order them "just in case" and sent the order without a specific protocol, resulting in the MRI technician and radiologist having to do more pinpointing of diagnosis and throwing the schedule off by consuming more scanner time. The casualness also led to the patient not understanding the seriousness and importance of the procedure, resulting in no shows and late arrivals that caused open machine time as well.

The question of how well or how badly the process was currently performing obviously could only be answered with data. The baseline for measurement was the sixteen-week period leading up to the formation of the team, in which the average number of studies performed per day was about twenty-five. The no show rate for the general anesthesia cases (which accounted for about two thirds of the total) was 11.8%, and 10.8% overall. The afore-mentioned inefficiency in the transport process resulted in an average of 38 minutes between patients wheels out to wheels in, accounting for the lion's share of the reason utilization was low despite the heavy backlog. And

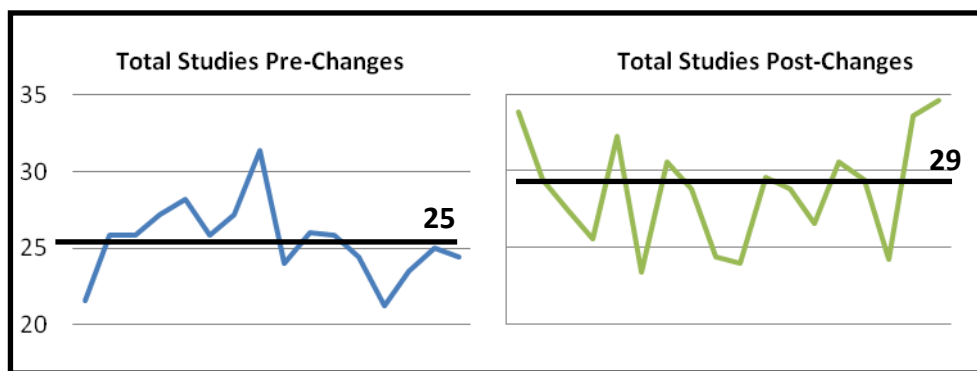
the six week backlog to get an appointment was a key element of the analysis, since additional capacity was available both in the outpatient pavilion adjacent to the main hospital building and in the two affiliated medical centers across town that were a part of the same healthcare system (and therefore a potential scheduling option for the outpatient families).

The data and cause analysis led to the identification and successful implementation of several process solutions. For example, improved use of walkie-talkies between functions helped facilitate patient readiness for room turnover. The unit would announce when a patient was twenty minutes from being ready to leave the scanner... then ten minutes... then five. And at five minutes everyone associated with the turnover would be ready to make it a smooth transition to the next patient.

Another solution was redesigning the screening form nursing had to fill out to ensure the patient was MRI-ready. The old process used a paper form that then had to be transported to the techs. The form was built into their EPIC system so it could be completed online, which made it easier for the nurses to complete and instantaneous for the techs to read. Staff planning was also re-designed to ensure a complete team was available to perform the study; nursing schedules were shifted to five days per week instead of four, nurses were assigned to specific patients for the entirety of the process instead of specialized to one portion of the process, anesthesia coverage was redesigned, etc. In the old process it seemed the unit was always one person short- either the tech or the nurse or the anesthesiologist wasn't available when needed- and these changes addressed that shortcoming.

The team also recognized the need to establish more reliable scan times for planning purposes. They establish step by step exam cards for each procedure and displayed them by the scanners. And radiologists were encouraged to do more protocolling beforehand, so the tech was better prepared to conduct the study.

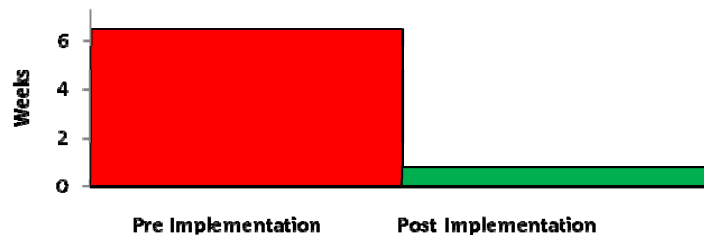
So how did it work? Recall that the utilization before team formation was at 58%, which equated to 25 studies per day. The team had computed that if they could increase their number of studies to 29 per day it would generate over \$2M net per year for the hospital. Below is the graph showing number of studies pre and post implementation:



The time frame for the post-changes shown above covers the time period through the end of 2012. The even better news is that the first quarter of 2013 averaged around 32 studies per day, producing another healthy contribution to the bottom line.

But revenue enhancement was not the only result the team was proud of. The wait time to get an appointment shrunk dramatically, as illustrated in the graph below

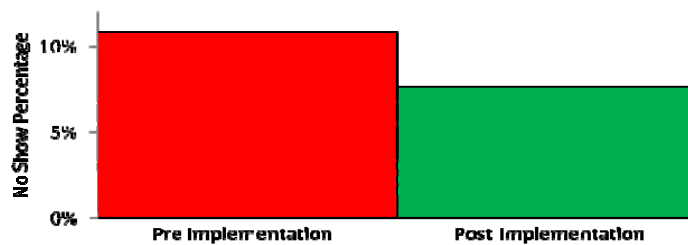
### Time to Get Appointment



Patients can now get an appointment anywhere in the system in under a week now, as opposed to six weeks before. At the onsite of the project the team was contemplating whether buying another MRI machine would be necessary to reduce the backlog, so the process improvements made helped avoid a large capital outlay.

Finally, the no show rate pre- and post- implementation is shown below:

### No Show Rate



This reduction from 10.8% to 7.6% was partially due to the increased emphasis on importance of the study and partially due to the process change of booking young children first in the morning. The logic was that if parents were required to not feed their small children prior to the study then they would be more committed to getting them there and on time in the morning so they wouldn't have to repeat the process. And the data shows that it has been successful.

### Conclusion

While the team has met or exceeded all of the initial project goals, it is by no means finished. The most interesting challenge for the future is thinking through how to get more MRI business to the hospital. This is a large change in mindset from the days in which the unit was swamped and just trying to keep up. The unit has, without a doubt, redefined its image.

And image is everything.

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