

Reduced Cycle Time in CT Department from 21 Minutes to 13 Minutes: 38 Percent

An SBTI White Paper

Project Background

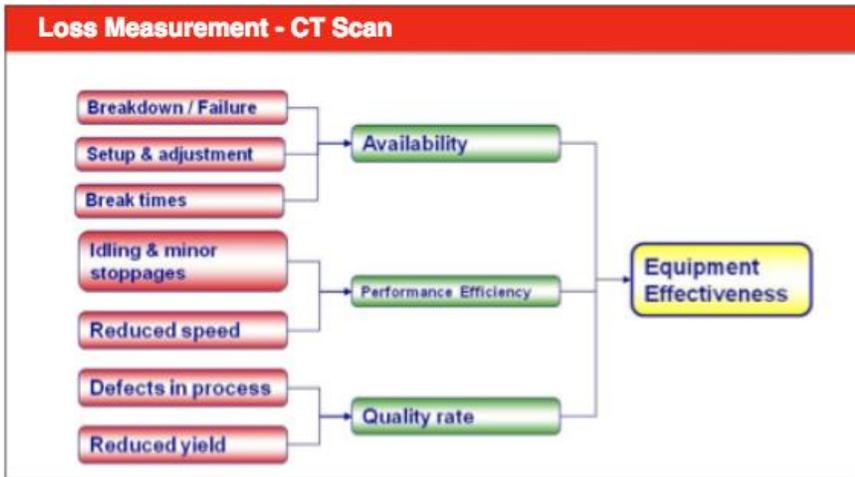
This study was conducted as part of an overall implementation of Lean Sigma in the Radiology Department at Columbus Regional Hospital (CRH) in Columbus, Indiana. Cycle times for CT examinations at CRH were found to be 75 percent higher than national best practice of 12 minutes. External Voice of the Customer (VOC) interviews revealed that, because of high cycle times, physicians were unable to add a case when requested and often, in fact, sought alternative diagnostic imaging sites.

Method

Overall Equipment Effectiveness (OEE) is a Lean tool used extensively by manufacturing in maintenance and equipment reliability to examine equipment availability. OEE represents the percent of potential capacity that the process is achieving, or:
$$\text{OEE} = \frac{\text{Actual Capacity} \times 100}{\text{Potential Capacity}}$$

OEE is typically broken into three elements: % Uptime x % Pace x % Quality.

In the case of a hospital CT scan, % Uptime can be thought of as the percent of time the machine is actually running and providing value. Instead of measuring the “busy-ness” of the room or the staff, the best measure of efficiency is the percent of the time the machine is actually running.



Everything else in the department should be organized to maximize CT scanner uptime. % Pace is the ratio of Ideal Cycle Time to average Cycle Time. Stated another way, % Pace compares the average cycle time to those times when the machine is running its best. % Quality is the rate of defect-free processing, or, as a formula:

$$\text{Quality} = \frac{\text{Processed Amount} - \text{Defect Amount}}{\text{Processed Amount}}$$

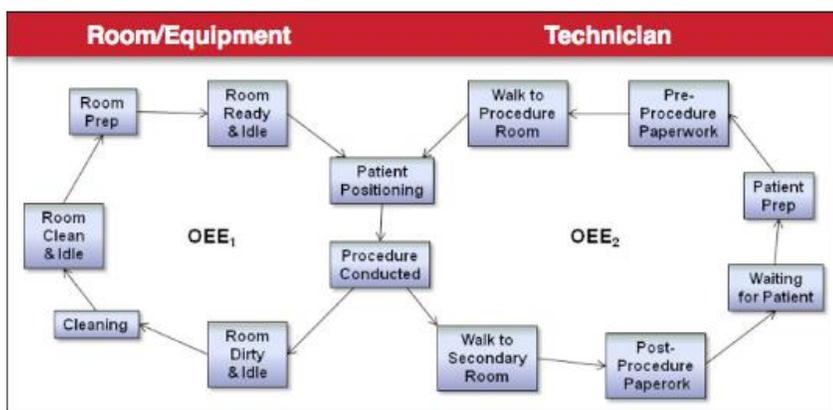
Figure 1: Components of Overall Equipment

Effectiveness (OEE)

A summary of contributions to reduced OEE is displayed in Figure 1. The OEE metric yields two valuable pieces of information: the capacity possible from the process, and, if capacity is low, the best place to look to improve it (Uptime, Pace, or Quality).

Often, as in this case where the combined resources of equipment, room, and technician are necessary to conduct a procedure, the OEE for the room and technician are useful as well as for the equipment.

Figure 2 demonstrates how this is accomplished.



Following the OEE analysis in the CT scan department, the team concluded that most promising OEE opportunity was machine uptime.

A kaizen event was conducted in which the following changes were made:

- Moved non-imaging work out of CT room, effectively leaving the machine room open for procedure time only
- Standardized the process and made it more consistent

*Figure 2: Interaction between OEE Loops
Room/Equipment & Technical*

- Increased efficiency with removal of Non-Value Added Activity steps from the CT exam rooms
- New and more user-friendly CT Control Room layout
- Re-defined job tasks and responsibilities
- Re-developed the staffing matrix

Results

Following the kaizen event, the average cycle time from exam start to exam stop decreased by 38.1% from 21 minutes to 13 minutes (Figure 3). More tellingly, the standard deviation decreased from 86 minutes to 13 minutes, providing more predictability in scheduling. In addition, the cycle time from patient registration to patient exiting the examination room decreased from 45.7 minutes to 34.5 minutes (24.5%), with a much more consistent process.

In effect, by reducing procedure cycle time, the CT department was able to eliminate the waiting list. When physician offices call to schedule a patient, they are told to send them over. As a consequence, the volume of CT examinations rose significantly (Figure 4).

Conclusions / Implications

Overall Equipment Effectiveness (OEE) is a robust Lean tool capable of improving a hospital’s ability to understand and enhance of the efficiency of specialized equipment, treatment rooms and surgical suites, and even equipment technicians.

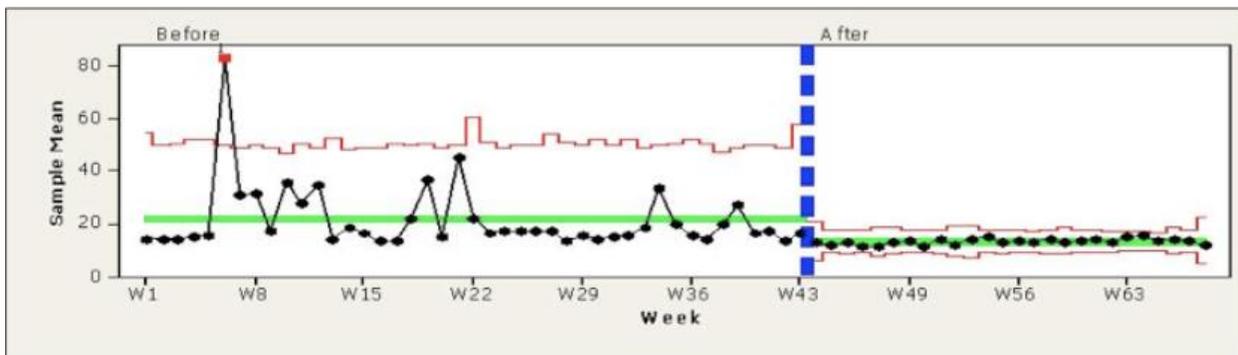


Figure 3: Reduction in CT. Examination Cycle Time

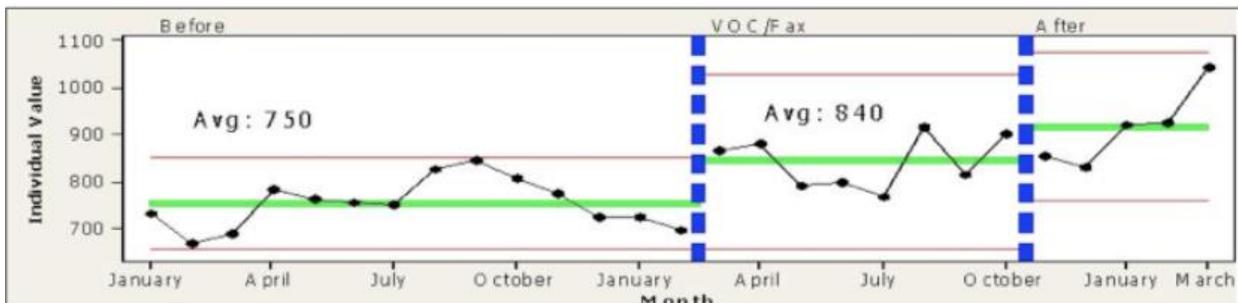


Figure 4: Increase in CT. Examination Volume

