Six Sigma—no, it’s not a sorority or a secret society. It’s a quality improvement method developed by major companies like GE and Motorola that aims to get as close to “zero defects” as possible.

Some ORs are learning to apply Six Sigma to improve processes such as turnover time and surgical case delays.

Six Sigma creates a framework for change. The main idea is that if you can measure how many “defects” are in a process, you can figure out how to eliminate them in a systematic way. A defect can mean you are failing to meet a customer’s needs—such as a surgeon’s needs for less downtime between cases.

A key concept is achieving stable operations—consistent, predictable processes to improve what the customer sees and feels.

Within GE, Six Sigma has become a way of life. “It is now the way we work, in everything we do and in every product we design,” the company says.

Two GE consultants—both RNs and Six Sigma “black belts”—explained how they helped an Ohio hospital with 12 ORs use Six Sigma to improve patient throughput and surgeon satisfaction. A black belt is trained in Six Sigma to work on quality improvement full time. A quick introduction to Six Sigma is in the sidebar.

“At the beginning of the project, some in the OR thought the surgeons were the major factor in turnover time—which turned out not to be the case,” says Rosalie Sager, RN, senior consultant and black belt with GE’s Performance Solutions group. “That belief was driving a wedge between the surgeons and the staff.”

**Step 1. Define the problem**

The project team began by identifying the outcome it wanted, which GE terms the Y. The Y was “to decrease the cycle time, or turnover time, for procedures.”

The defects identified were:
- turnover time of more than 20 minutes for simple procedures (those of 60 minutes or less)
- turnover time of more than 35 minutes for complex procedures (those of more than 60 minutes).

As often happens in ORs, the team found a lack of consensus on what turnover time meant. “Everyone had a different perception,” notes Eleanor Killam, RN, MBA, a GE senior consultant and black belt with GE’s Performance Solutions group. “That belief was driving a wedge between the surgeons and the staff.”

**Step 2. Measure what you care about**

Next came the assessment phase—collecting data and getting a high-level view of the process. The team collected a year’s worth of data on the elements of turnover time, such as the scheduled case time, the patient-in-room time, the induction time, and gaps in the schedule.

Some of the data was available from the OR information system, and other data was collected manually and through observation.

**Step 3. Find the critical causes**

The team analyzed the data and used exercises and statistical tools to dissect the turnover time process. The aim was to identify the main causes of variation in turnover time—what GE calls the critical Xs. By the end of this step, the team had identified the following critical Xs:
- add-on cases
- anesthesia provider not available
In examining the data, the team learned about the differing perceptions of turnover time. They found surgeons were not aware of all of the activities that needed to occur before the next patient could be brought in.

“Part of the work was getting everyone to talk to each other and understand these activities,” Killam said. “It really helps to show them the data, to segment the data by different services, and to calculate the variation, or the standard devi-

- materials not available
- schedule and room change.

A process map, or flow chart, shows the many steps in the turnover process, including where delays can happen.
The team learned it was important to understand the variation in turnover times, not just the average. Once the times were graphed, they could see there was a large standard deviation, meaning a broad distribution of turnover times. That broad variation helped to explain why people had different perceptions—they actually were having different experiences.

Some tools the team used in the analysis:

- **Process map.** A process map, or flow chart, shows the many steps in the turnover process, including where delays can happen.
- **Main effects plot.** This chart shows the drivers of variation. A main effect is a measurement of the average change in output when a factor is changed from its low level to its high level. It is calculated as the average output when a factor is at its high level minus the average output when a factor is at its low level. For example, improving anesthesia availability could affect the process by 70 minutes.
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Fishbone diagram. This diagram illustrates the factors that contribute to variations in turnover time. After identifying the factors, the team conducted a brainstorming session to identify the ones that were key drivers causing the most variation.

Work-Out. The Work-Out, a term trademarked by GE, is a rapid, 4- to 8-hour team approach to problem solving that tackles a problem, generates potential solutions, and develops an action plan.

**Step 4. Improve the process**

After identifying the critical Xs, the team focused on improving them.

“This is a very structured approach to making change happen,” says Killam.

The process generates a set of action items, with responsibility, accountability, and target dates for each.

Among the solutions identified were:

- **Anesthesia providers**: The team put in place policies and procedures, called a standard operating procedure, to improve accountability.
- **Instrumentation**: To improve instrument availability, ownership and accountability for the Central Sterile Department were transferred to Surgical Services.
- **Schedule and room change**: In analyzing the block schedule, the team found utilization varied widely from 31% to 83%. Only 1 of the 6 services met the requirement for 70% to 75% utilization.

“The data was quite convincing when they looked at it—only one service was meeting its target, and you have capacity,” Killam says. “Then other surgeons cannot get on the schedule because all of the time is blocked. We presented it in a graphical manner, and it was quite compelling.”

The difficult part, of course, is getting buy-in from the top of the organization to make changes.

- **Add-on cases.** There was no room set aside for add-ons. “It is very difficult for an OR to plan when they are trying to squeeze cases in. If there is more capacity for urgent cases, the schedule becomes more predictable,” she notes. The team worked with the trauma orthopedic surgeons to free up the trauma room for add-ons. This process was highly political, and the team continued to work on it after the consulting engagement ended.

**Step 5. Control the process**

At the end of the project, the process owners, such as the OR committee, assume accountability for the process. They are taught tools they can use for ongoing monitoring of the process. They decide what data they want to collect and who will receive regular reports.

“Most facilities today are developing scorecards. That’s what we try to do—at least get the big Y on the scorecard, and that scorecard gets passed up to the senior level,” says Donna Seecof, RN, MSN, senior consultant and black belt with GE.

**Outcomes**

The outcomes of the project included:

- a reduction in case delays, including improvements in block scheduling and delays, which increased OR capacity by 6%. If increasing surgical volume to fill this capacity is not feasible, the OR could improve productivity by changing staffing.
- a decrease in average turnover time for complex cases by 60% and for simple cases by 52%.

More information on Six Sigma is at [www.healthcare.isixsigma.com](http://www.healthcare.isixsigma.com)
An introduction to Six Sigma

What is Six Sigma?
A disciplined, data-driven problem-solving approach that:
• identifies what is most important to the customer
• identifies process defects
• measures those defects versus opportunities
• eliminates those defects
• leads to sustainable change through process redesign.

Six Sigma is another word for standard deviation.
• The higher the sigma number, the fewer the defects. At Six Sigma, the level of defects is 3.4 in 1 million.
• Most companies operate around Three to Four Sigma.
• Moving from Three Sigma to Six Sigma represents a 20,000 times improvement in quality.

Six Sigma performance

99% Good (3.8 Sigma)
• 52 incorrect-site procedures in every 5,000 procedures
• 100,000 wrong drug prescriptions per 1 million filled each year.

99.99966% Good (6 Sigma)
• 1.7 incorrect-site procedures in every 500,000 procedures
• 3.4 wrong drug prescriptions per 1 million filled.

Source: GE Healthcare.