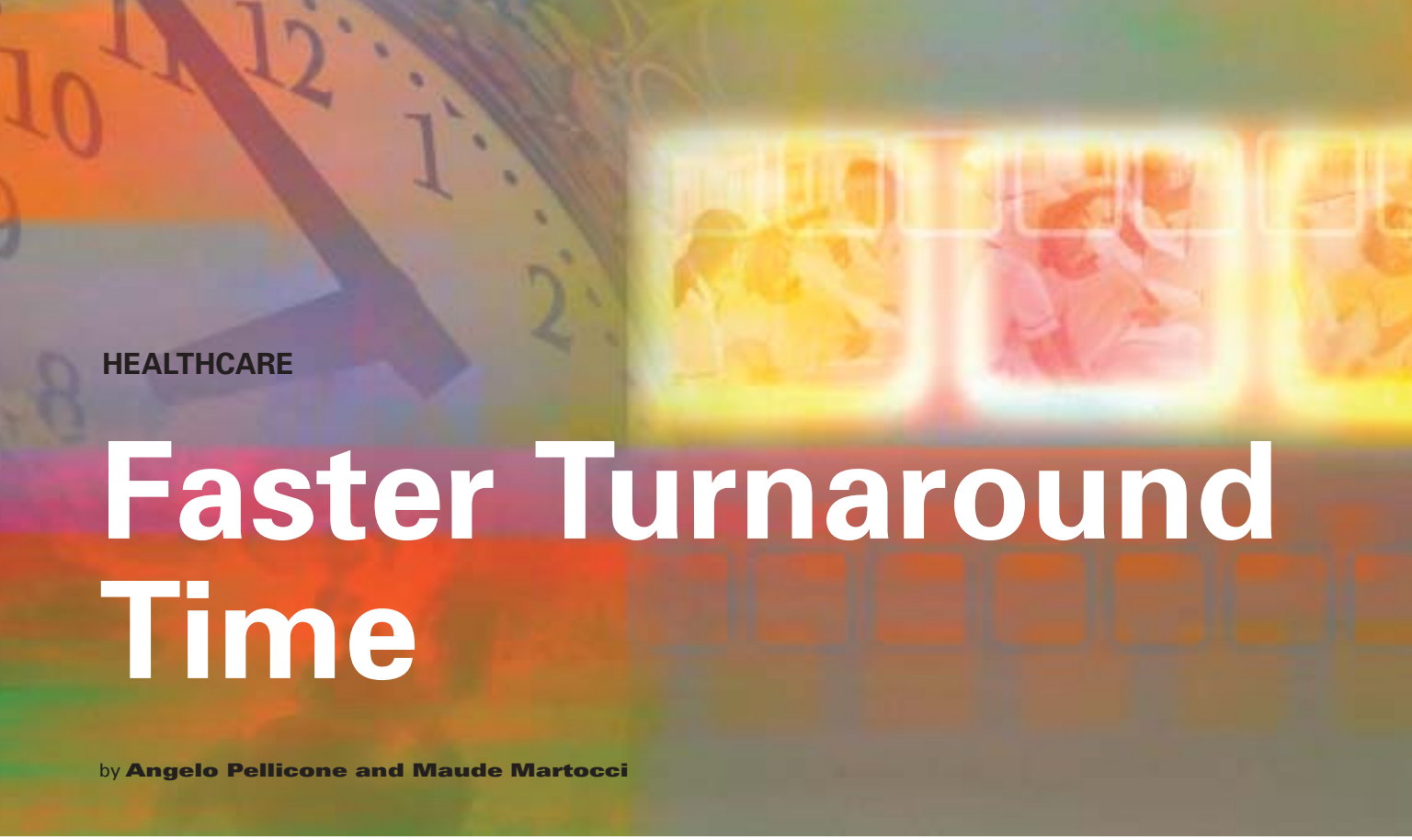


HEALTHCARE

Faster Turnaround Time

by **Angelo Pellicone and Maude Martocci**

North Shore University Hospital (NSUH) in Manhasset, NY, is part of the North Shore-Long Island Jewish Health System in Great Neck, NY. In 2004, NSUH used Six Sigma to reduce noticeable delays in bed assignment turnaround time.

The hospital decided to concentrate on patient flow because it had started seeing increased patient volume, especially in the aging population, which made it difficult to balance capacity needs. Delays in the post anesthesia care unit (PACU) and the emergency department (ED) resulted in diversion (a situation in which the facility does not have the staff or available beds to accept additional patients), start time delays in the operating room (OR) and decreased patient and physician satisfaction.

After conducting a capstone project (see "Capstone Projects and Six Sigma," p. 36) that focused on patient flow, the hospital realized staff were incorrectly using the bed tracking system (BTS)—an electronic system that describes the status of each bed. Delays in bed turnaround time resulted in delayed notification to the admission registered nurse—an RN who is responsible for the admission process—of a clean and ready bed. This often led to delays in OR throughputs and ED holds, and impacted the movement of patients throughout the hospital. The findings of this capstone project led to the Six Sigma project.

The total turnaround time (TAT) in question extended from the time discharge instructions were given to the patient to the time the admission RN was made aware of a clean and ready bed. Many people were involved in the process of discharging a patient and preparing the bed for the next admitted patient. Communication among departments and staff members within each department was critical to ensure the patient flow process resulted in an efficient and timely experience.

In 50 Words Or Less

- **After seeing an increase in patient volume, North Shore University Hospital implemented Six Sigma to reduce worsening delays in bed turnaround time.**
- **In six months, the Six Sigma team decreased its mean turnaround time by 136 minutes and went from 1 sigma to 2.3 sigma.**

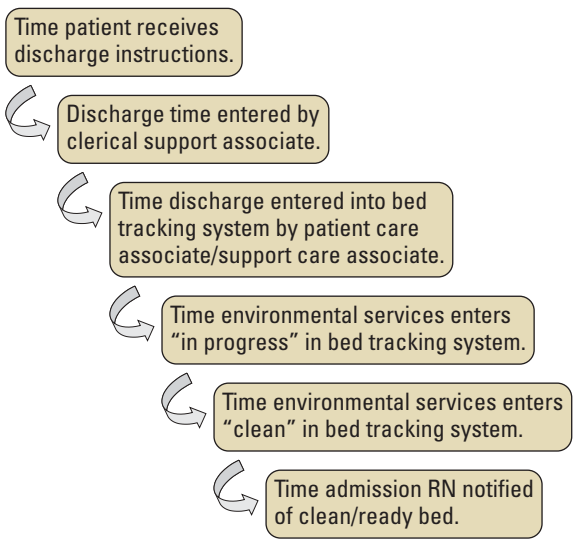
History and Problem Identification

The project initially focused on one surgical nursing unit—the fourth floor Cohen Pavilion or Four Cohen. Although it was a neuroscience unit, Four Cohen received patients from various entry points, including the PACU, ED and critical care. In 2004, Four Cohen had 2,578 discharged patients.

Many hospital employees knew the TAT process was slow, but it was never measured to determine how slow. Once the Six Sigma team took a closer look at the process, it realized several factors were at play:

- Historically, the clerical support associate (CSA) was supposed to control the process but, according to policy, was not responsible for the process. Over time, however, the CSA ended up driving the process by default.
- The environmental services department's responsibilities within the process were monitored and constantly measured using the BTS. The perception throughout the hospital was that the response and TAT of environmental services was a major cause of the delay. In truth, this portion of the process—the time from when the discharged patient left the room to the time the room was clean—took an average of 55 minutes, which was better than the national standard.
- Although RNs were recognized as the patient care team leaders, communication among the team members and RNs was deficient. The patient care team consisted of an RN, a patient care associate (PCA), a support care associate (SCA) and a CSA. At the end of the process, admission RNs used three methods to determine if a clean bed was available: unit rounds; admission, discharge, transfer census; and phone calls from the unit. It was an inefficient, laborious process.

FIGURE 1 High Level Process Map



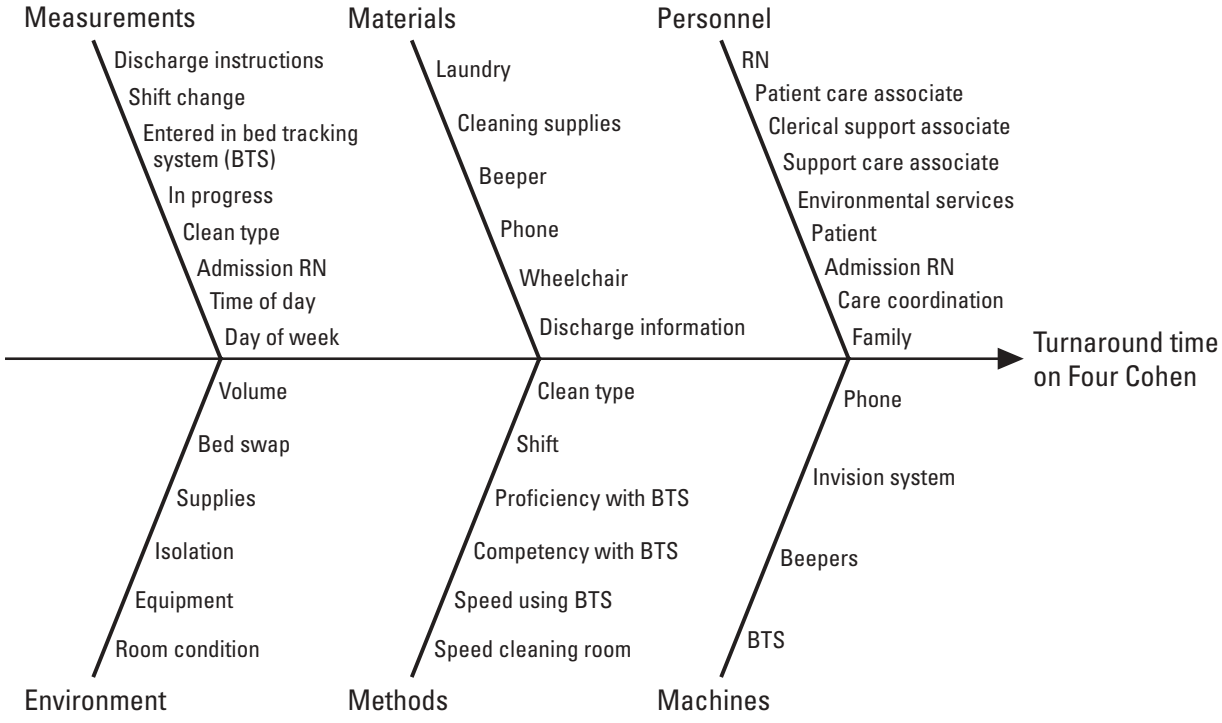
Define and Measure

During the define phase, the team developed a high level process map (see Figure 1) that began when the RN gave discharge instructions to the patient and ended when the admission RN was notified of a clean and ready bed. After determining the primary customers were the admission RNs, the team surveyed them to establish the target and upper specification limits. This voice of the customer helped establish a target TAT of 120 minutes, with an upper specification limit of 150 minutes. A unit clock was used to ensure valid time measurement, and a data collection log sheet was created to measure the time between each step in the process.

The Six Sigma team conducted a fast track decision making session and used change acceleration process (CAP) tools, such as the threat/opportunity matrix, to establish buy-in from the Four Cohen staff to further justify the need for process improvement. The team explained that, if successful, the new process would present an even patient flow, which would lead to greater staff and patient satisfaction. If unsuccessful, there would be further delays in the ED and PACU and increased physician and patient dissatisfaction—all of which could lead to loss of revenue.

The team also permanently removed the CSA from the process because it needed to capture the true time the patient exited the room. The practice on Four Cohen, as in the rest of the hospital, was to have the CSA enter information into the BTS, even though the policy clearly dictated this was the responsibility of the PCA or SCA who escorted the patient from the room. Following the fast track decision making session, the entire staff was re-educated.

FIGURE 2 Cause and Effect Diagram



In the measure phase, the team first identified the data to be continuous. Then, it established operational definitions. A defect was defined as any time the TAT took more than 150 minutes. The team performed a measurement system analysis by having a team member on the unit shadow the process for one week. This measurement system proved 96.5% effective.

After collecting data on 195 patients, the team calculated the defects per million opportunities

$$\frac{\text{(Defects) } 130}{\text{(Opportunities) x (total units)}} \text{ x } 1{,}000{,}000 = 672{,}725 \text{ DPMO}$$

$$\frac{}{1 \qquad 195}$$

(DPMO):

The calculated DPMO of 672,725 equaled a score of 1 sigma. The mean, or average, TAT of the current process was 226 minutes, with a standard deviation of 170 minutes. After reviewing the data, the team set a goal to shift the mean to 120 minutes and reduce variation by 50%, to 85 minutes.

The team also completed a cause and effect diagram (see Figure 2) to help identify all the variables that impacted the TAT process. This tool helped target the vital X variables and gave the team direction as it began the analyze phase.

Analyze and Improve

During the analyze phase, the variables that impacted the process (X's) were discussed and targeted for statistical analysis. The team sorted the data and distinguished between patients who were transferred to rehabilitation and those who were discharged home. For this particular project, the team decided to focus on the discharged patients because they were more within the hospital's control. The team then used a control impact matrix to prioritize the X's, highlight what was within the hospital's control and determine what had the biggest impact (see Figure 3, p. 34).

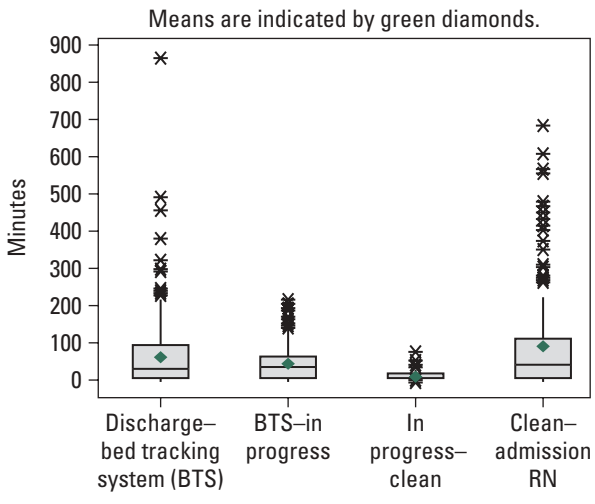
The goal was to shift the mean TAT and reduce

the standard deviation. Hypothesis testing involved searching for statistically significant differences in shift, day of week and length of time needed to complete each step of the process.

FIGURE 3 Control Impact Matrix

Control	Impact: High	Impact: Medium	Impact: Low
In our control	• RN discharge instruction. • Patient care associate/ support care associate. • Environmental services (ES). • Bed tracking system (BTS) process. • BTS proficiency. • Admission RN notified. • Condition of room.	• Care coordination. • Break time. • Beepers. • Cleaning supplies. • Shift change. • Specialty bed.	• Invision. • Clerical support associate. • ES travel time. • Scripts. • Wheelchair. • Phone.
Out of our control	• Family. • Transport company/ emergency medical services. • Patient volume. • Isolation.	• Room change request. • Day of week. • Time of day. • Male vs. female.	• Patient. • Roommate.

FIGURE 4 Turnaround Time By Each Step in Process



H_0 = There is no difference in the amount of time needed to complete each step.
Reject H_0
One-way analysis of variance: P = 0.000

A graphical breakdown using an analysis of variance and a two-sample t-test proved there was no statistically significant difference in the process based on the day of the week or shift. Therefore, the team focused on the length of time needed to complete each step of the process. The null hypothesis said there was no difference in the amount of time needed to complete each step. It was rejected. The p-value = 0.000, which was less than 0.05; thus, the team concluded there was a statistically significant difference (see Figure 4).

As the team investigated further, it discovered both a communication and a technical failure at two key steps in the process that caused great delay.

An "ah-ha" moment arose when the team realized the staff lacked proficiency in using the BTS. This led to delays in the "time environmental services enters 'in progress' in BTS" step in the process. It was wrongly assumed the entire staff was adept. The lack of communication between the RNs and other patient care team members was then identified as a priority because it started the process. The lack of communication of a clean and ready bed to the admission RN was also identified because it was a more considerable cause of delay than originally expected.

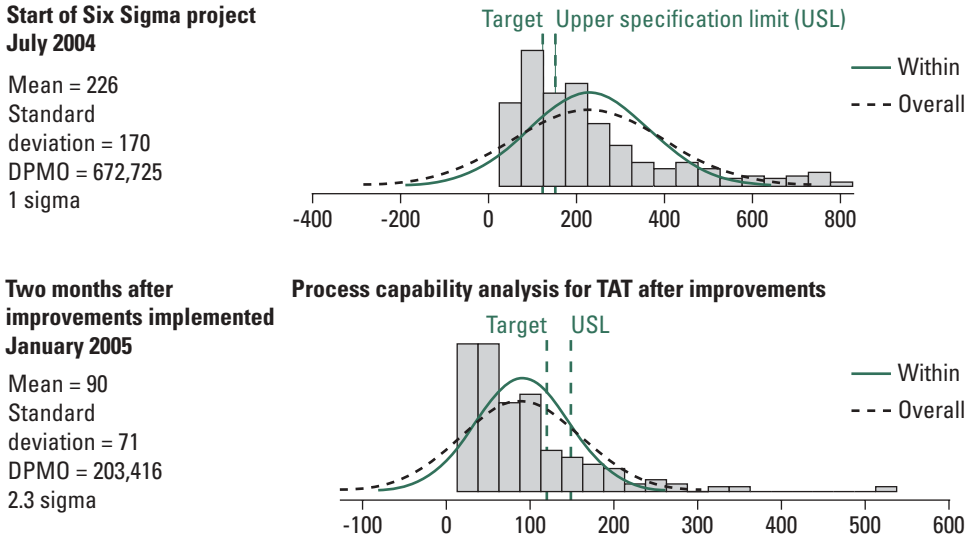
Another ah-ha moment came when the team realized how efficient the environmental services part of the process was. It was not the problem!

Fast Track Decision Making Session

Data were presented to the extended team and improvement strategies were discussed at a fast track decision making session. The staff came up with the following solutions:

1. Revise the discharge assessment sticker to include documentation of communication between an RN and a PCA/SCA.
2. Re-educate PCAs/SCAs on the use of the BTS. This training is now part of the orientation of all new patient care services staff and part of

FIGURE 5 Change Over Time



DPMO = defects per million opportunities
TAT = turnaround time

an annual mandated topics competency evaluation.

3. Create bedside laminated cards with BTS instructions.
4. Reformat admission RNs' beepers to the BTS to provide immediate notification of a clean and ready bed.

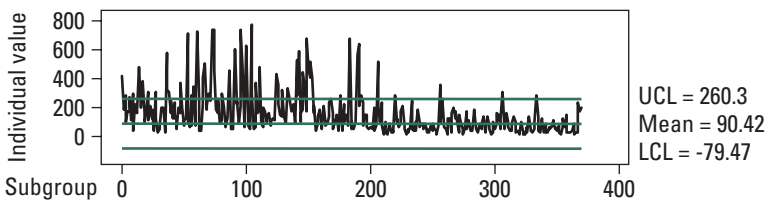
Once the project was turned over to its process owner, Four Cohen's nursing management team, the process went from a mean TAT of 226 minutes with a standard deviation of 170 minutes to a mean TAT of 90 minutes with a standard deviation of 71 minutes. The sigma score went from 1 sigma to 2.3 sigma at the end of the six-month project (see Figure 5).

A monthly individual and moving range chart was used to continue monitoring the TAT on Four Cohen (see Figure 6), and the improvements continued. Since the completion of the project, the TAT has improved to 69 minutes (see Figure 7).

Action Plan

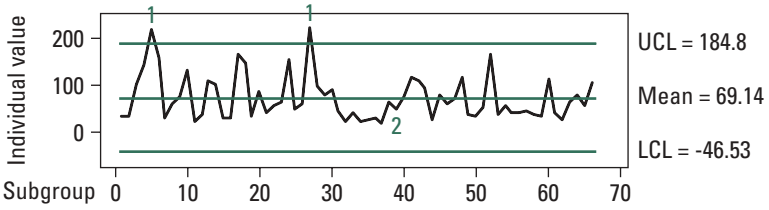
The success of the project and the response from the staff was so favorable,

FIGURE 6 Individual and Moving Range Chart



UCL = upper control limit
LCL = lower control limit

FIGURE 7 Control Chart for Four Cohen As of June 10, 2005



UCL = upper control limit
LCL = lower control limit
DPMO = defects per million opportunities

Mean = 69
Standard deviation = 48
DPMO = 46,705
3.1 sigma

Capstone Projects and Six Sigma

North Shore-Long Island Jewish Health System, the third largest nonsectarian health system in the United States, is comprised of 14 hospitals. The system is currently in its sixth wave of Six Sigma training, having completed more than 60 projects. The system's Six Sigma institute is part of its corporate university, known as the Center for Learning and Innovation.

Since the program began, the center has trained 24 Black Belts, 70 Green Belts and two Master Black Belts. In conjunction with Six Sigma training, employees acquire valuable change management skills by taking classes in change acceleration process (CAP) and fast track decision making.

CAP is a philosophy and tool set designed to help overcome cultural barriers to change by creating a shared need, shaping a vision and mobilizing commitment.

Fast track decision making is North Shore University Hospital's version of General Electric's work-out process. It is a rapid problem solving approach that includes team involvement and in-meeting decisions. This catalyst for change focuses on the process to drive improvement and empowers the people closest to the process to develop and implement appropriate solutions.

The health system also challenges employees with capstone projects that are designed to:

- Analyze the potential value fixing deficiencies will produce and compare it to the costs entailed.
- Isolate the two largest improvement opportunities and identify the fixed and variable associated costs. These costs cannot interfere with clinical quality.
- Make use of tools learned during CAP and the fast track decision making session.

For additional information on North Shore-Long Island Jewish Health System, visit www.northshorelij.com.

Four Cohen served as a pilot for the rest of the hospital. As a result of this project, and with the new emphasis on patient flow, there have now been rounds on all nursing units that include RNs, physicians and other members of the patient care team.

Patient satisfaction survey scores improved in two categories relating to discharge during the four months after the project ended. The first category—extent to which the patient felt ready for discharge—improved from 78.8 to 79.2. The second category—speed of discharge process—improved from 75 to 83.2.

Continuing with the success of this project, the hospital decided to conduct another Six Sigma project to address the time between the admission RN being notified of a patient admission from the ED to the time the bed is assigned.

These initiatives have allowed the North Shore-Long Island Jewish Health System to view the admission and discharge process in a continuum. The efficiency of the admission process has a direct relationship to the efficiency of the discharge process. Although this was known qualitatively, the team was finally able to quantify it with data and metrics.

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