

Use of Process Improvement Tools and Concepts to Increase the Aggregate Mean/Index Door-to-Balloon Time in Acute Myocardial Infarction (AMI) Cases from 47% to Greater Than 90%



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About the Organization

- Large nonprofit hospital
- Client of Juran Health Care



The Project Team

- Project Champion: Hospital COO
- Project Team Leader: Director, Strategic Clinical Development
- Project Core Team Members:
 - Sr. Clinical Informatics Analyst
 - Director, Cardiac Catheter Lab
 - ER Nurse



The Problem

- A large nonprofit hospital was struggling to meet the Centers for Medicare and Medicaid Services' (CMS) new standard for door-to-balloon time, which was reduced from 120 minutes to 90 minutes in July 2006. Using the numbers from the third and fourth quarters of 2006, the hospital's aggregate mean/index rate for the door to balloon time within 90 minutes was only 47 percent.
- It was evident that changes were needed, as noncompliance with the new standard could result in lost revenue from CMS and have a negative impact on clinical outcomes, patient satisfaction, and length of stay.



Project Goal

Increase the aggregate mean/index door-to-balloon time from 47 percent to greater than 90 percent by January 2008.



Root Cause Analysis

The team identified the potential root causes of the delayed door-to-balloon time by ...

- Using the Six Sigma define, measure, analyze, improve, and control (DMAIC) process
- Analyzing process maps, cause and effect diagrams, baseline measurements, failure mode & effect analysis (FMEA), and voice of the customer



Root Cause Analysis (continued)

- **Time from EKG to first call to cardiologist affected door-to-balloon time:**
 - Higher times from EKG to first call to the cardiologist were predictive of higher door-to-balloon times and were responsible for 11 percent of the variation in door-to-balloon times.
- **Time from EKG to first call to the cath lab affected door-to-balloon time:**
 - Higher times from EKG to first call to the cath lab were predictive of higher door-to-balloon times and were responsible for 16 percent of the variation in door-to-balloon time.



Root Cause Analysis (continued)

- **Physician practices in the emergency department affected patient arrival time to the cath lab:**
 - The team identified that some emergency department physicians got the patient to the cath lab statistically faster than others.
- **Cardiologist practices in the cath lab affected time from arrival in the cath lab to balloon inflation:**
 - The team identified that some cardiologists had statistically faster times from patient arrival in the cath lab to balloon inflation time and needle stick-to-balloon inflation time.
- **Incomplete or inaccurate documentation resulted in decreased compliance with door-to-balloon times:**
 - The team found that a significant number of cases that were noncompliant with the 90-minute standard were a result of incomplete or inaccurate documentation.



Addressing Root Causes

By analyzing the process map, the team identified failures within the process that could be potential root causes. They broke the patients into two groups:

- **For the patient walking into the emergency department:**
 - The process in place consisted of 40 steps to enter the emergency department and then receive treatment.
 - Of those steps, only five, or 12.5 percent of them, were pure value added.
 - Twenty-one (52.5 percent) of the steps were business-required non-value steps but were nonetheless necessary to treat the patient.
 - This left 14 steps, or 35 percent, not adding value to the desired outcome.
- **For the patient arriving by ambulance:**
 - There were even more steps to enter and receive treatment—44.
 - The team determined that 15 of these steps, or 34 percent, were non-value added.

Removing the waste discovered by the team could allow the hospital to meet its 90-minute target.



Return on Investment

- At the onset of the project, only 47 percent of patients met the door-to-balloon standard of less than 90 minutes.
- After the pilot was implemented by the Juran Institute, the door-to-balloon compliance rate increased to 82 percent, while the sigma level increased from 1.62 to 2.4.
- Both of these advancements were significant improvements for the hospital.



Monitoring and Evaluating Over Time

The Juran-coached team generated a number of potential improvement strategies to reduce door-to-balloon time. “Red Rules,” non-negotiable steps in the process with defined accountability, were developed and are listed below:

- Emergency department physician activates cath team within five minutes of obtaining EKG showing positive myocardial infarction.
- Orders revised to indicate what drugs are given by emergency department versus cardiology M.D.
- Staff and physicians educated on each process step, with clarified roles and documentation requirements.
- Emergency department staff gives cath lab staff face-to-face report at time of transfer.
- Physicians provide information on documentation performance at regularly scheduled meetings and one-on-one as needed.
- Code Save-a-Heart order set and flow sheet revised.
- Shift from retrospective to prospective data collection.
- Physician progress notes revised to indicate reason for delay.
- Case-by-case feedback mechanism established to facilitate immediate improvement or education.

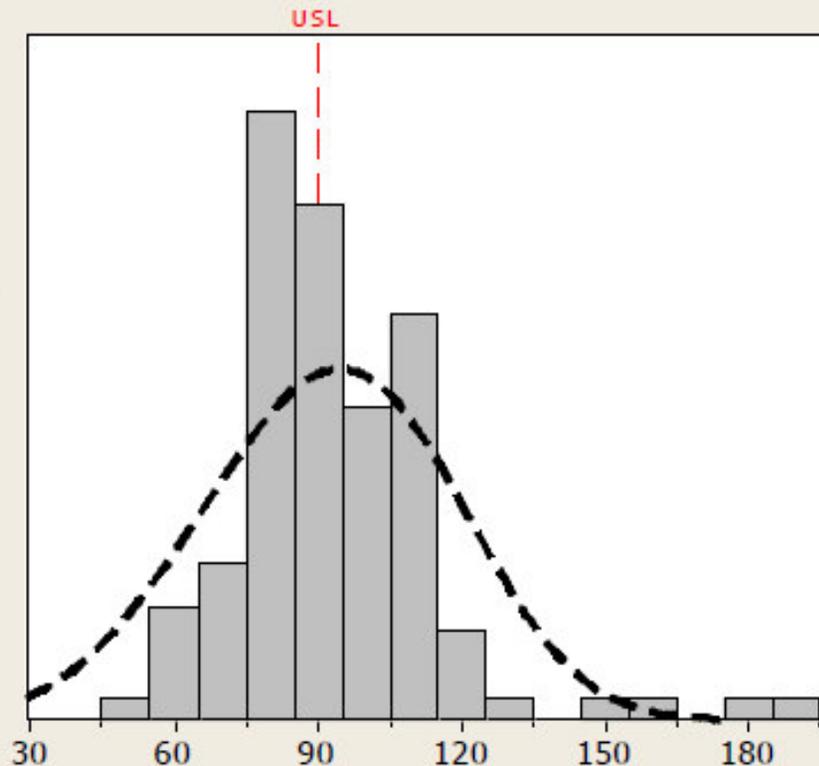


Process Capability for Door-to-Balloon Time

Process Capability for Door-to-Balloon Time Calculations Based on Weibull Distribution Model

Process Data	
LSL	*
Target	*
USL	90
Sample Mean	93.0481
Sample N	104
Shape	4.0093
Scale	101.639

Observed Performance	
PPM < LSL	*
PPM > USL	451923.08
PPM Total	451923.08



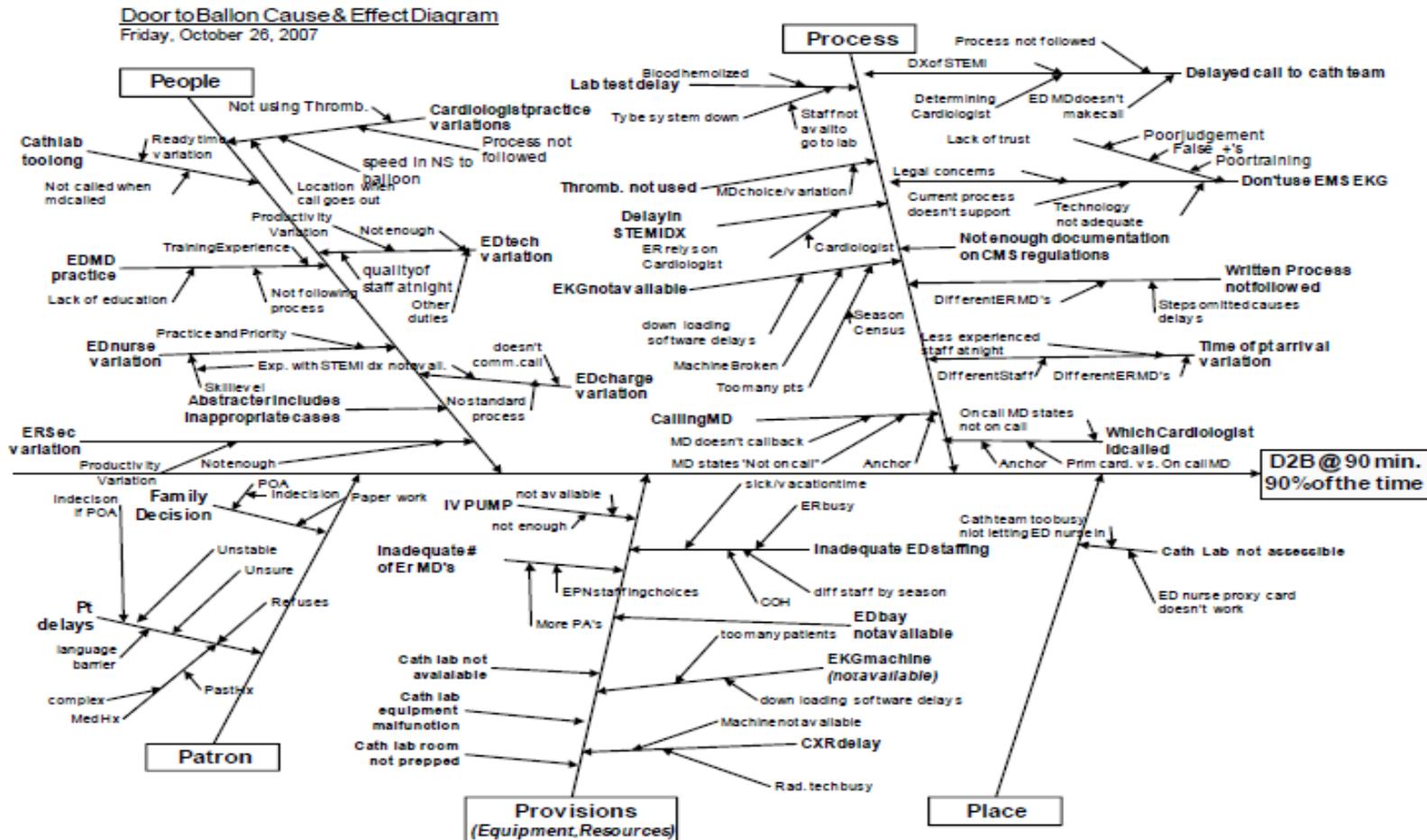
Overall Capability	
Z.Bench	-0.10
Z.LSL	*
Z.USL	-0.12
Ppk	-0.04

Exp. Overall Performance	
PPM < LSL	*
PPM > USL	541129.75
PPM Total	541129.75

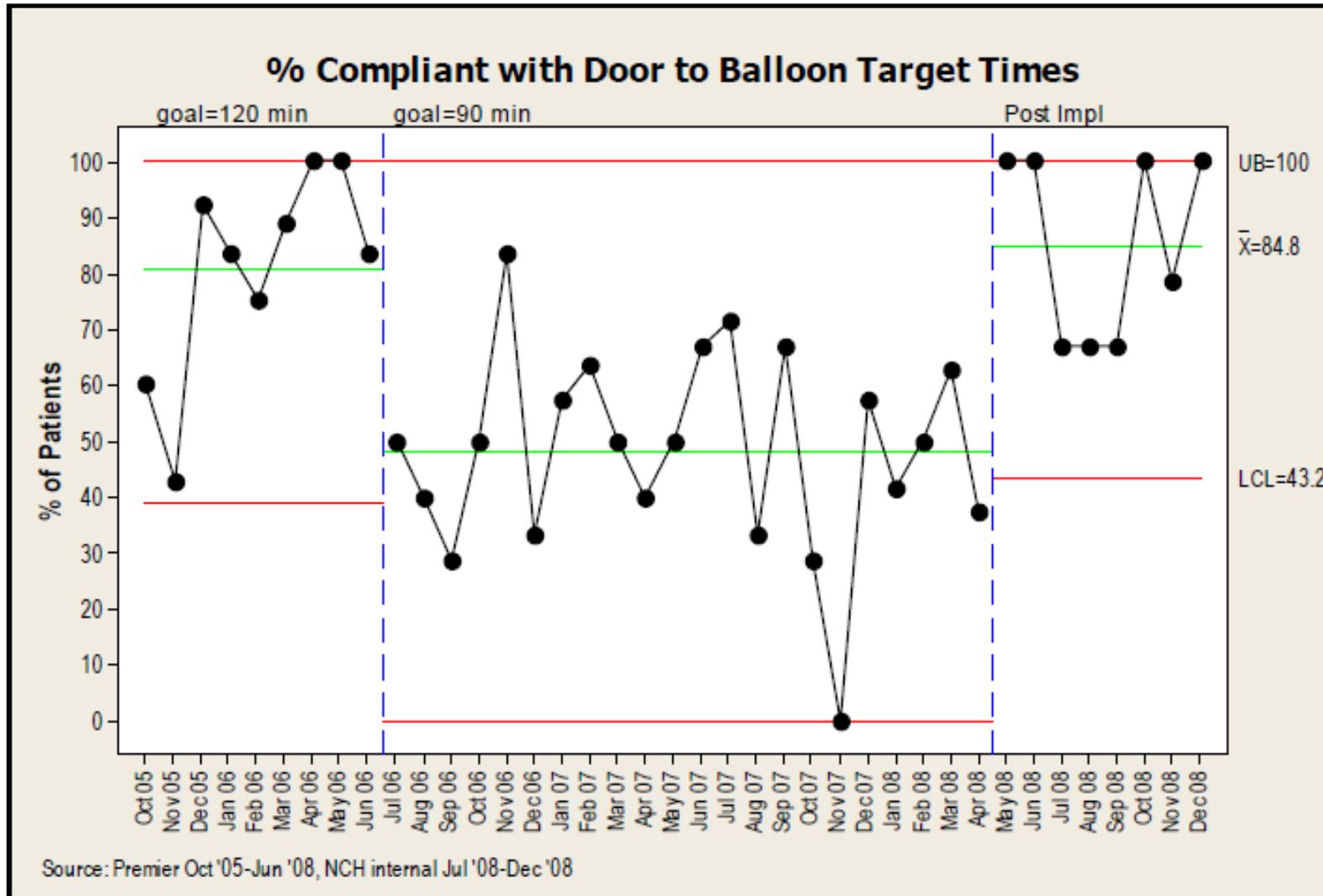
Source: Powerchart Mar 1, 06-Mar 31, 07



Door-to-Balloon Cause & Effect Diagram



Percent Compliance from Oct. 05 to Dec. 08



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