



TPMG Consulting

Case Study: Using Lean Six Sigma Analytics to Improve Patient Wait Times!

Using Lean Six Sigma Analytics to Improve Patient Wait Times

THE PROBLEM

A Clinical Site Administrator for a midsized oncology clinic contacted a needed help for a patient wait time issue. During the preceding 6 weeks, patient wait times for exam visits rose sharply from an average of 13 minutes to 31 minutes. Many of the clinic's patients are sensitive to excessive time spent away from work or personal activities and the clinic's administrator conveyed that several patients noticed the increased wait times and expressed frustration. The administrator is troubled that they will leave to seek treatment and care elsewhere.**

THE SITUATIONAL ANALYSIS

The black belt who accepted the challenge first conducted a situational analysis. First, she wanted to wrap her mind around the issue so she can match everyone's perception of the current state with the reality of the current state. In doing so, she established an operational definition for the performance she wanted to improve.



Black Belt Competencies

1. Enterprise Wide Deployment
 - Enterprise Leadership Responsibilities
 - Organizational Process Mgt and Measures
 - Benchmarking
 - Performance Measures
 - Financial Measures
2. Team Management
 - Team Formation
 - Team Facilitation
 - Time Management
 - Team Evaluation
3. Voice of the Patient Strategies
4. Scoping and Chartering Projects
5. Process Design and Engineering
6. Data Collection, Analysis and Interpretation
7. Descriptive, Prescriptive and Predictive Analytics
8. Root Cause Analysis
9. Waste Elimination
10. Cycle Time Reduction
11. Kaizen and Kaizen Blitz
12. Project Management
13. Theory of Constraints
14. Standard Operating Procedures

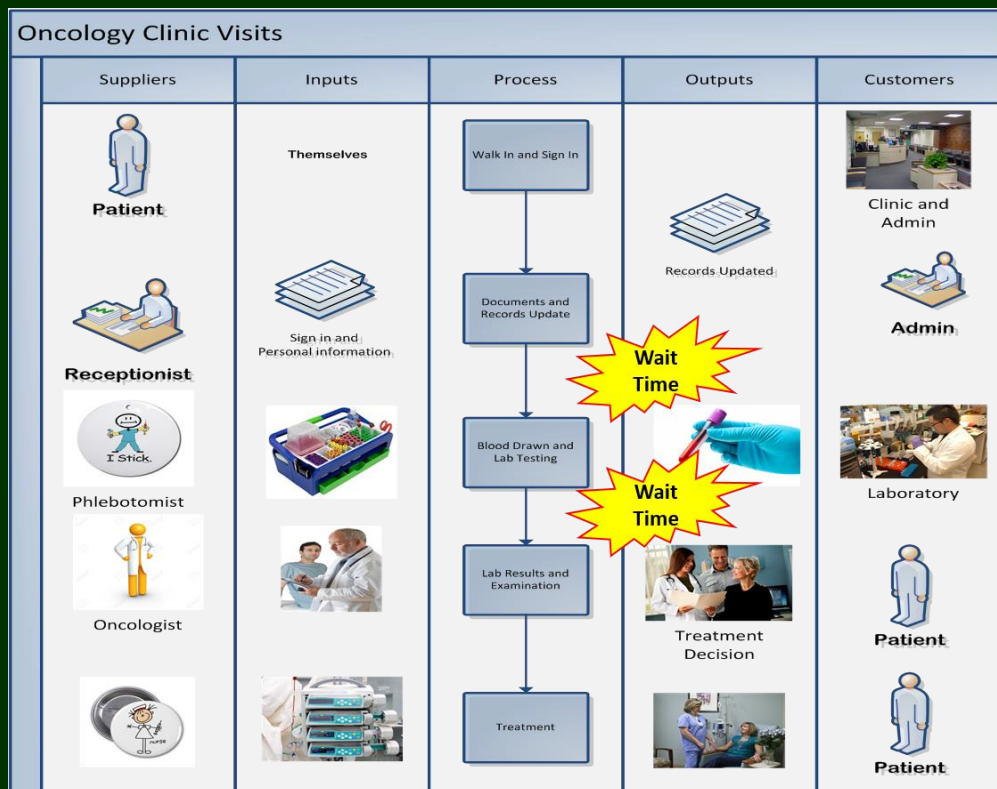
PRACTICAL APPLICATION

Operational Definition: Patient Wait Time

Patient wait time is defined as the time between the patients' scheduled exam appointment time and the time at which the doctor enters the exam room to see the patient.

Process Flow and Scoping

Second, she wanted to scope out the project and the major activities. She drafted a SIPOC diagram (supplier, inputs, process, outputs and customers (see Figure 1)) outlining the 5 major activities in the process; and illustrating the activities mainly associated with patient wait times. Before the Oncologist can begin the exam, all patients must have blood drawn for testing at the on-site laboratory. The laboratory employs 3 full time phlebotomists who draw blood. Each blood draw takes approximately seven and a half minutes. Lab testing typically takes place when the patient arrives prior to the exam appointment with the doctor.



Facts and Data Collection

The clinic is not an environment rich with performance data. A disadvantage, but represents the cards which the black belt was dealt. She moved forward to understand the facts and circumstances. Three new oncologists joined the practice six weeks ago increasing the number of oncologists from 5 to 8. The administrator also mentioned that wait times seem to be higher between 10:00 AM - 12:00 PM and 2:00 PM - 3:30 PM. Clinic business hours are from 8:00 AM to 4:00 PM; and the clinic does not schedule appointments between 12:00 PM and 1:00 PM. An example of the data collected, for a typical day, is shown



A Typical Day at the Clinic

1. 153 Patients
2. 3 Phlebotomists (7.5 min per patient –site manager)
3. 8 Oncologists (3 new –six weeks)
4. Clinic hours are from 8:00 AM until 4:00 PM weekdays
4. No appointments between 12:00 PM and 1:00 PM
5. Rule of Thumb: Bottlenecks explain excess wait times.

Data Collection

1. Appointment Time: 15 minute increments
2. Slot Status (Filled/Unfilled)

Assumptions

1. 6.5 hours available for work (Lunch & 2 breaks)
2. Utilization Target 100%
3. 3 Phlebotomists (7.5 min per patient)
4. 8 Oncologists (3 new –six weeks)

Slot Status and Appointment Data

DATE	Day of Week	Appointment Time	Slot Status
10/4/2010	MON	8:00 AM	Unfilled
10/4/2010	MON	8:15 AM	Unfilled
10/4/2010	MON	8:30 AM	Filled
10/4/2010	MON	8:45 AM	Filled
10/4/2010	MON	9:00 AM	Filled
10/4/2010	MON	9:15 AM	Filled
10/4/2010	MON	9:30 AM	Filled
10/4/2010	MON	9:45 AM	Filled
10/4/2010	MON	10:00 AM	Filled
10/4/2010	MON	10:15 AM	Filled
10/4/2010	MON	10:30 AM	Filled
10/4/2010	MON	10:45 AM	Filled
10/4/2010	MON	11:00 AM	Filled
10/4/2010	MON	11:15 AM	Filled
10/4/2010	MON	11:30 AM	Filled
10/4/2010	MON	11:45 AM	Unfilled
10/4/2010	MON	12:00 PM	Lunch
10/4/2010	MON	12:15 PM	Lunch
10/4/2010	MON	12:30 PM	Lunch
10/4/2010	MON	12:45 PM	Lunch
10/4/2010	MON	1:00 PM	Unfilled
10/4/2010	MON	1:15 PM	Unfilled
10/4/2010	MON	1:30 PM	Filled
10/4/2010	MON	1:45 PM	Unfilled
10/4/2010	MON	2:00 PM	Filled
10/4/2010	MON	2:15 PM	Filled
10/4/2010	MON	2:30 PM	Filled
10/4/2010	MON	2:45 PM	Filled
10/4/2010	MON	3:00 PM	Filled
10/4/2010	MON	3:15 PM	Filled
10/4/2010	MON	3:30 PM	Filled
10/4/2010	MON	3:45 PM	Filled
10/4/2010	MON	4:00 PM	Filled

Analyses and Conclusions - Takt Time Analysis

Takt time is a concept used to determine a time element that equals demand rate and is defined as the time required to deliver quality services (to produce customer requirements). The word Takt is a German word for the baton that is used by an orchestra conductor. In lean thinking, Takt describes how a process can be engineered so work and handoffs can flow at a certain pace.

- Total Time Availability (Avail): The total applicable work time (scheduled time less breaks and lunches).
- Customer Requirements: work products to be produced (patients per day).

The black belt's takt time analysis demonstrates that the organization has the capacity to handle the patient load for a typical day – no natural constraints.

Remember the clinic administrator mentioned that wait times seem to be higher between 10:00 AM and 12:00 PM and 2:00 PM and 3:30 PM.

Takt Time Analysis

- 3 Phlebotomists – 7.6 min/patient = 24 per hour

1,170 Minutes
153 Patients

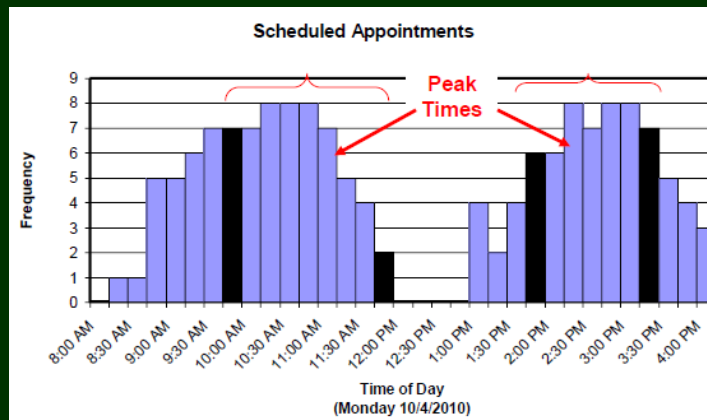
Total Time Avail 3 FTE every 6.5 hour day
Patients Per Day

- 8 Oncologists – 20.4 min/patient = 24 per hour

3,120 Minutes
153 Patients

Analyses and Conclusions – Appointments

Remember the clinic administrator mentioned that wait times seem to be higher between 10:00 AM and 12:00 PM and 2:00 PM and 3:30 PM.



Root Cause Analysis

The black belt's additional analysis seemed to confirm the administrator's assumption, but she wanted to know if the relationship between wait times and peak traffic times were statistically significant. In order to find out, she decided to use a very simple six sigma analytical tool called the Chi-Square Test of Independence. Chi-Square analysis is an approach one uses to determine if there is in fact a relationship between two or more factors (variables); and if so, the significance of the relationship. In this case, the black belt used the method to determine if there is a relationship between slot status (filled/unfilled) and peak times (10:00 AM – 12:00 PM and 2:00 PM – 3:30 PM).

Within 15 minutes she designed and completed her analysis. Her claimed assumption (null hypothesis) was slot status and peak times were not associated and her alternative hypothesis is slot status and peak times were associated. The result of her analysis was very revealing. It concluded that there was a substantial relationship between slot status and peak times. In fact: if slot status and peak times were not related: she would have expected 20 more filled/scheduled slots during non-peak times and 20 fewer filled/scheduled slots during peak hours. The facility was staking appointments during peak hours.

- Clinic administrator also mentioned that wait times seem to be higher between 10:00 AM and 12:00 PM and 2:00 PM and 3:30 PM?

H0: Slot Status and Peak Times are Not Associated
H1: Slot Status and Peak Times are Associated

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Slot Status	No	Yes	Total	Chi-Sq	No Expected	Yes Expected
Filled	60	93	153	<i>p</i> 1.12E-07	79.13793103	73.86206897
Unfilled	60	19	79		40.86206897	38.13793103
Total	120	112	232			

Peak Times

Non - Peak Times

If slot status and peak times were not related: you would expect 20 more filled/scheduled slots during non peak times.

If slot status and peak times were not related: you would expect 20 fewer filled/scheduled slots during peak times.

SOLUTION AND NEXT STEPS

The same analysis was conducted for both the new doctors and original doctors. Those results were equally revealing. The new doctors over-stacked peak time hours by 12 appointments and the original doctors stacked the peak time hours by almost 8 appointments.

Our black belt concluded that the ***under-utilization*** of the clinic's (non-peak hours) capacity, by approximately 20 patients, is responsible for the bottleneck in patient flow and the growth in patient wait times. This fact was hidden in the scheduling dynamic. Our black belt recommended the clinic's business hours be changed from 8:00 AM – 4:00 PM to 10:00 AM – 6:00 PM. The clinic made the change and not only relieved the bottleneck but the solution also added additional capacity to serve 10 – 15 additional patients per day.

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