



LEAN SIGMA: A TURNAROUND STRATEGY FOR SERVICE SECTOR ORGANIZATIONS

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Abstract

The American model of economy of scale in operations was successfully challenged by Japanese model called Lean Manufacturing. Lean coupled with the Six Sigma approach in inculcating 'quality' as the way of life seems to be bringing wonders in manufacturing industries not only in Japan but also across the world. However, on the service sector, many of the IT companies and some of the hotel industries seem to be adopting the 'six sigma' as a strategy to reduce error or defects in their business processes. Lean is an approach that seeks to improve flow in the value stream and eliminate waste. It's about doing things quickly. 'Six Sigma' uses a powerful framework (DMAIC) and statistical tools to uncover root causes to understand and reduce variation. It's about doing things right (defect free) not once but every time. Integrating Lean and Six Sigma creates a win situation. Lean and six sigma are methods that help improve process and performance. It can be applied to any model which has an input, process and output cycle. Lean focuses on the process which converts the input to a desired output, emphasis on efficiency (speed/flow) and it aims at removing waste and improving the flow. And six sigma focuses on the output and emphasis on effectiveness (quality) and it helps detect defects and improve performance. Efficiency helps achieve same level of effectiveness (quality/accuracy) with lesser time or with less effort. Effectiveness help us improve same level of efficiency (time/effort) with less error or higher quality/accuracy. Even though a project aims at improving either efficiency or effectiveness, it ends up doing both. Hence applying lean sigma in hospitals, IT Companies, Educational Institutions, Hotels and Banks help improve both efficiency and effectiveness. This paper illustrates how it can be utilized in service sectors like hospitals.

Key Words: Lean Manufacturing, Six sigma, Lean Sigma, Service Sector, and Quality Management.

1.0 INTRODUCTION

Lean sigma also called Lean Six Sigma can be defined as utilizing a problem solving method focusing on rapid implementation of tasks correctly initially, while reducing wait times.

The philosophy of lean provides the strategy and creates the environment for improving flow and eliminating waste. Empowered staff are encouraged to continuously improve to create value adding opportunities that otherwise would not be identified. Six Sigma helps to quantify problems, makes evidence based decisions (this prevents wasting time on anecdotal evidence), helps to understand and reduce variation and identifies root causes of variation to find sustainable solutions. Furthermore, it quantifies the financial benefits and savings. This helps to focus efforts in the areas that offer the most potential for improvement.

A combination of both can provide the philosophy and the effective tools to solve problems and create rapid transformational improvement at lower cost. Potentially, this could increase productivity, improve quality, reduce costs, improve speed, and create a safer environment for customers and employees of not only manufacturing sector but also in the service sector.

Two popular quality improvement tools in healthcare are Lean and Six Sigma. Hospitals around the world are adopting these two tools or hybrid versions of these two tools called 'Lean Six Sigma' with little evidence of how good they are to produce sustainable quality improvement (Glasgow et al., 2010). A systematic review conducted by Glasgow et al. (2010) had revealed that there is still a lack of research evidence in this field specially using Lean Six Sigma together in a hospital setting.

1.1 Lean Methodology

Great thinkers like Taylor and Mayo believed that scientific investigation of the production process can create more efficiency. The dream of Henry Ford led to the mass production of affordable quality transportation. Being a believer of 'Taylorism' Ford believed that production could be controlled scientifically. His advance in rapid production had significantly lowered the cost of cars and kept the quality intact at the same time. Taylor and Mayo's theory led to further research for quality outcomes in the 1940's. These efforts helped the US in the Second World War and led to advanced quality management tools such as 'Total Quality management' (Zidel, 2006).



After the Second World War, Japan tried to rebuild their manufacturing companies to capture the US market. Taiichi Ohno is the leading name in that manufacturing rebuilding time. He had introduced the Toyota Production System (TPS) that was designed to get rid of wasteful and unnecessary little added value activities in manufacturing and made the car more affordable to people. Lean methodology was derived from that TPS. Lean had a diverse set of tools that is rapidly deployable and can provide immediate results (See figure 1). The most common tool used in the Lean method is Value Stream Mapping (VSM) (Wennecke, 2008). Lean is vastly efficient for its simplicity but it has limitations due to statistical rigidity. But this rigidity had opened up the opportunity to adopt another methodology such as Six Sigma to address the process flows and bottlenecks (Landeghem, 2007).

1.2 Six Sigma Methods

Motorola had researched a perfect method to improve their manufacturing process for telecommunication equipment via statistical analysis in the early 80s (Varkey et al, 2007). This research was rooted with Deming's Total Quality Management. Later on in the early 90s GE's CEO had implemented Motorola's process method to eliminate manufacturing variation and speed of the production.

Today's Six Sigma is originated from this process oriented method. 'Sigma' is a statistical term that reflects the number of standard deviations. Six Sigma revolves around the question how many defects will be generated from a given production process. The aim is to reach the level of quality of six standard deviations from the average.

Although Six Sigma is very popular, it is costly and time consuming to implement. However from a healthcare prospective using Lean and Six Sigma is beneficial. The Lean method provides speedy abatement of unnecessary steps in a given process; on the other hand Six Sigma is a data centric method that provides higher quality and better service or products.

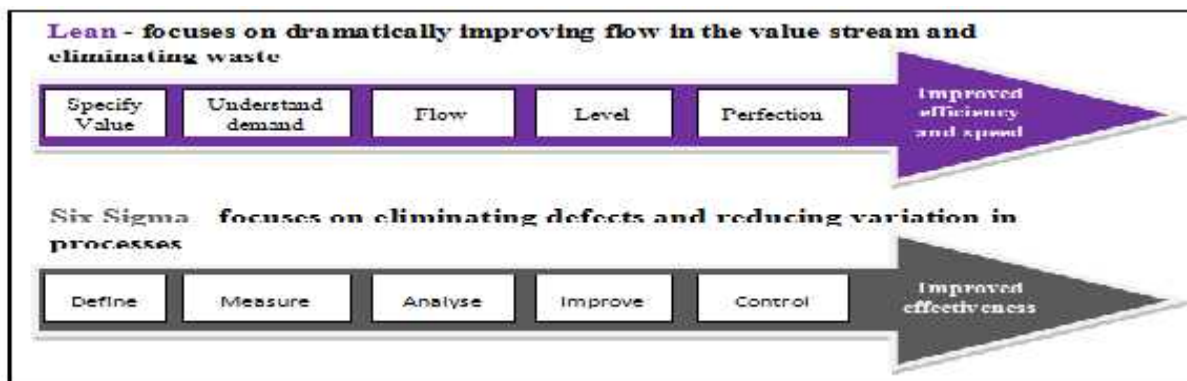


Figure 1: Integrating Lean and Six Sigma Methodology

1.3 The benefits of using lean six sigma

Increases revenue

Lean Six Sigma increases your organization's revenue by streamlining processes. Streamlined processes result in products or services that are completed faster and more efficiently at no cost to quality. In other words, Lean Six Sigma increases revenue by enabling your organization to do more with less – Sell, manufacture and provide more products or services using fewer resources.

Decreases costs

- Lean Six Sigma decreases your organization's costs by:
- Removing "Waste" from a process. Waste is any activity within a process that is not required to manufacture a product or provide a service that is up to specification.

Improves efficiency

Lean Six Sigma improves the efficiency of an organization by:

- Maximizing it's efforts toward delivering a satisfactory product or service to the customers
- Allowing the organization to allocate resources/revenue produced from newly improved processes towards growing the business.

In other words, Lean Six Sigma enables you to create efficient processes so that your organization can deliver more products or services, with more satisfied customers than ever before.



Develops effective people/employees

Lean Six Sigma creates effective employees within your organization by:

- Involving employees in the improvement process. This promotes active participation and results in an engaged and accountable team.
- Building trust. Transparency at all levels of the organization promotes a shared understanding of how each person is important to the organization's success.

2.0 USE OF LEAN SIGMA IN HOSPITALS

Bed availability is one of the key operational focuses of hospitals around the world. There is a growing demand for hospital beds. Overcrowding of hospital emergency departments, delay in patient admission and poor quality of care are the growing trends with high bed demand. A study conducted by Orendi (2008) reported that due to bed shortages some patients are hospitalized in inappropriate wards which do not suit their pathologies and as a result there is a greater chance of getting lower quality care. That brings the big concern of in-patient safety in hospitals.

2.1 Rationale of using lean six sigma

Lean and Six Sigma are both powerful methodologies for improving quality and efficiency in the healthcare process. Lean focuses on delivery value to the customer. On the other hand Six Sigma puts more emphasis on quantifying and reducing the variation of the process (Kumar et al, 2011). The aim of Lean thinking in a hospital setting is to improve patient flow and get rid of waste. On the other hand Six Sigma identifies and quantifies problems that are related to a variation in process design. Below there are some common similarities and differences between Lean and Six Sigma

• Common Features

- Both are business process improvement methods.
- Both methods focus on the customer needs.
- Both methods have a proven track record in improving quality.

• Differences

- Lean is good for a quick and initial improvement process whereas Six Sigma is better for long term improvement, where solutions to the problems are unknown.
- Lean requires low investment whereas Six Sigma requires high investment.
- Lean puts more focus on statistical tools whereas Six Sigma puts more emphasis on the statistical method to reduce the process variation.
- Lean does not require any formal organizational structure whereas Six Sigma requires formal organizational structures such as black belts, yellow belts etc.
- Lean focuses on mapping the end-to-end process and uses value stream to identify the interaction between processes whereas Six Sigma does not consider the interaction between processes.

Six Sigma does not focus on process speed; as a result it requires more time to see the improvement achieved by applying Six Sigma. On the other hand organizations that implement Lean alone show limited improvement across the organization due to absence of an organizational infrastructure in the method (Anthony & Kumar, 2012). So the combination of these two quality improvement methods can eliminate those limitations (See figure 2).

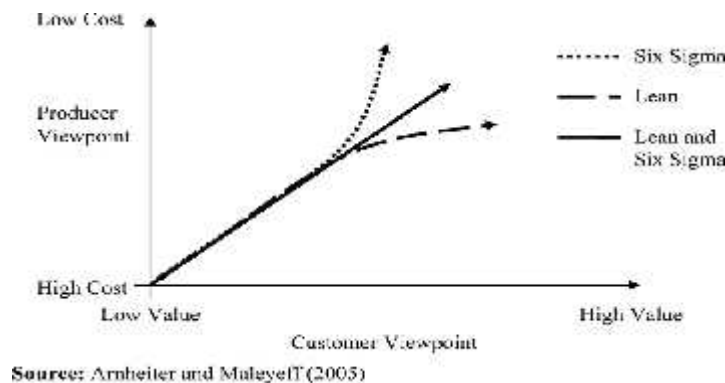


Figure 2: Integrated Lean Sigma Process



In the case of hospitals, whenever the patients visit, it is essential that they get enough attention as early as possible. If the Lean method only was implemented, the solution could be a very fast process in-patient flow but patients could be dissatisfied due to lack of attention from the physician. On the other hand if Six Sigma only was implemented, patients would have a great visit but medical facilities would not be sufficient for such number of patients (Anthony & Kumar, 2012).

2.2 Lean Sigma implementation in Bed Management Process

It is strictly focused on customers and their expectations of hospitalization while valuing their opinions. Lean focuses on the process which converts the input to a desired output, emphasizes on efficiency (speed/flow) and it also aims at removing waste and improving the flow. And six sigma focuses on the output and emphasis on effectiveness (quality) and it helps detect defects and help improve performance. Efficiency helps achieve same level of effectiveness (quality/accuracy) in less time or with less effort. Effectiveness help us improve same level of efficiency (time/effort) with less error or higher quality/accuracy. Even though a project aims at improving either efficiency or effectiveness, it ends up doing both. Hence applying lean sigma in bed management in hospital helps improve both efficiency and effectiveness. Lean always asks the question, “Why does this process exist at all? What is the value and the value stream?” Six Sigma starts with “How can we improve this process?” It does not ask “Why does it exist at all?”

In the case of a patient seeking a medical facility, it is important that the patient receives due attention at the earliest possible time in a predetermined flow. If one were implementing Lean thinking only, the solution could lead to very fast process in a flow, but the patient would be dissatisfied due to lack of attention from a physician. If one were implementing Six Sigma alone, the patient will have a great visit, but the medical facility may not be sufficient for the required number of patients in order to be a financially viable organization. The types of projects performed within the healthcare organizations were focused on three categories: Cycle time reduction, process flow improvement; and medical-error reduction.

Therefore hospitals face issues such as high bed demand, limited hospital beds, requirements to manage costs and patient stays etc (Cesta, 2013). In order to understand a different concept to improve patient flow it is essential to understand what the definition of patient flow is. According to Cesta, (2013) “Patient flow is a well-organized method of looking at all the processes involved in the patient care process and support patients as they travel through the hospital”. All the processes are interrelated with each other, such as delay in the patient discharge process or unnecessary length of stay which can hamper smooth patient flow in the hospital. So, an effective quality management tool is essential to maintain smooth patient flow in the hospital.

Due to the current reimbursement environment in the health industry hospitals should minimize in-patient length of stay and maintain efficient patient flow in the hospital. In-patient flow and bed management represent a significant revenue input. Private medical insurance plans and government policy limit patient stay in the hospital according to disease severity and procedure. Over-staying in the hospital causes financial and operational losses for the hospitals. The following researchers demonstrate how the Lean and Six Sigma methods reduced patient’s duration of stay as part of an effective bed management process and improved the financial performance of the hospitals.

Projects reported by Van Den Heuvel (2006) have shown the effectiveness of Six Sigma in the hospital discharge process. The project reduced the duration of stay in hospital delivery rooms from 11.9 hours to 3.4 hours and the hospital had annual savings of \$68,000. The Commonwealth Health Corporation introduced Six Sigma and invested \$900,000 and later reported the improvement to be worth more than \$2.5 million. Other healthcare organizations followed them and had even better results. A great example of that is Mount Caramel Health System, consisting of three hospitals in Columbus and Ohio which reported financial benefits of \$3.1 million (Van Den Heuvel, 2006).

By implementing Six Sigma the Sharp Grossmont and Memorial hospital improved median time between orders and actual discharge by 20%. The aim of the project was to reduce patient’s duration of stay which increases the profitability per discharge and increases the number of available beds in their hospital (Atkins, 2008).

Barrier and possible drawback of the Lean Six Sigma method in the bed management process

The ASQ Lean Six Sigma hospital advisory committee (ASQ, 2009) had illustrated the level of Lean Six Sigma adoption in US hospitals. Failure to sustain the improvement was mentioned as one of the key challenges in successful Lean Six Sigma implementation in a hospital setting. The study also demonstrates other challenges in implementing Lean Six Sigma in a



hospital setting challenges like leadership commitment, resource unavailability, employee motivation, lack of expertise or skills etc.

Another study conducted by Feng & Manuel (2008) represents the survey result of 56 hospitals in the US. Among them 15 had Six Sigma hospital and 41 were non Six Sigma hospitals. The survey result demonstrates that the main barrier of implementing Six Sigma in hospitals is lack of commitment from organizational leadership.

Grove et al (2010) had identified the fundamental challenges of implementing Lean thinking in a large primary care trust in NHS UK. They are lack of understanding of what the Lean method is all about, poor communication, high process inconsistency, and poor leadership and so on.

A study conducted by De Souza and Pidd (2011) had reported that the barriers of implementing Lean thinking in the UK's NHS are more people and organization based where people's perception is that they will be treated as widgets. The early perception about Lean was that it was meant to be for the manufacturing industry leading to failure attempted in a hospital setting. Functional and professional silos are other possible barriers of Lean thinking in a hospital setting.

A study conducted by Anthony & Kumar (2012) among NHS Scotland demonstrated that lack of management commitment is one of the key barriers in implementing Lean Six Sigma in the NHS. Motivating and communication with the employees about the whole process is one of the key success factors of Lean Six Sigma. Upper management direct involvement is critical for successful Lean Six Sigma implementation. Management must provide enough resources and training to make the process successful in total; rather than putting the process responsibilities on a few people in the organization, it should be taken seriously by every member of the organization.

3.0 LEAN SIGMA METHODOLOGY

Lean Six Sigma is simply an effective methodology used to fix a problem. It is based on common sense practices and is completed in five phases as shown in the figure 3. Table 1 gives important phases and corresponding activities for each phase.

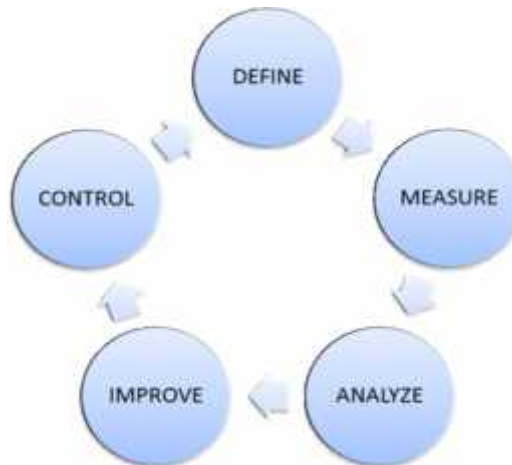


Figure 3: Lean Sigma Methodology

Table 1: Lean Sigma Process

Phase	Description
Define	Define the problem and what is required to satisfy your customer. Here we go to where the work happens and interview staff and management about the present state of operations and identify the problem that affects efficiency and effectiveness in the process.
Measure	Map the current process to collect data. Here we look at the "as-is" processes (observing and inquiring) and collect the associated data to understand the nature and extent of the issue.
Analysis	Investigate and identify what causes the problem. We analysis the data measuring the problem using various methods or software. <i>In this we review the data collected during the measure phase. We have to analyze both</i>



	<i>the data and the process in an effort to narrow down and verify the root causes of waste and defect</i>
Improve	Implement a fix that will solve the problem. At this state we move on to solution development to fix the problem identified..
Control	Sustain the improved results. <i>In this we have to continuously manage and monitor the process. Expand the improved process throughout the organization.</i>

3.1 Statement of the problem

Bed management is the allocation and provision of beds. Beds in specialist wards are a scarce resource .The “bed” in this context represents not simply a place for the patient to sleep, but the services that go with being cared for by the medical facility, such as admission processing, physician time, nursing care, necessary diagnostic work, appropriate treatment, and the like. It refers to all the resources (e.g., physicians, nurses, medical equipment and supplies) that are needed to provide care for the patients.

Delay is a universal problem in the process of any sort of business including hospital. Hospitals cannot force a patient to leave if they cannot find a place to provide safe and sufficient care. Beds may be unavailable for new, acutely sick patients because of the continued presence of the previous patients and also due to not updating the number of vacant beds and rooms in time. This shortage of beds is known as a “bed blocking”. Therefore two problems arise: discharge delay and unavailability of bed for new patients. It has been noted that there is (a) delayed process and procedure for discharge (b) not updating the number of vacant beds and rooms on time leads to confusion and prolonged admission time (c) the delay in discharge causes bed blocking which is one of the primary reasons for cancellations of admissions for planned (elective) surgery (d) admission to inappropriate wards (medical vs. surgical, male vs. female, etc). In order to explore the possibility of implementing Lean Sigma, a study was conducted on a Private hospital located in Kotayam, Kerala, India.

3.2 Admission Process

Patients may come to the emergency department for emergency cases. After being treated here, if they need further care they may be admitted into the wards. Otherwise patients visiting the hospitals as Out Patients (OP) might require a planned treatment for which they need to get admitted as In Patients (IP) in the hospital. In both the cases the admission process starts with the admission department, wherein the admission desk takes patient information and does the necessary paper work and procedure as follows:

- Firstly when a patient comes in, they check if beds are available or not. If beds are available then they proceed with the procedure to provide the bed to the patient.
- If a patient is coming for the first time, they have to open a new file.
- If the patient has come earlier to consult a doctor, he / she has to get the file report from report keeping department.
- Along with the file the patients are assisted by an attendee to the ward to admit the patient.
- If the patient has some sort of health insurance, the bystander with the patient or the patient himself should apply for it before getting admitted or after the patient is admitted.

3.3 Discharge process

- First the Senior Doctor checks the patient and once confirmed to be stable, he approves for the discharge.
- The house surgeons have to prepare the doctors summary.
- After preparing the doctors summary the report goes to billing section for final billing.
- After the billing, the file goes to the pharmacy and the patient or the bystander has to collect the medicines to be taken home for further prescribed medication.

Once a patient gets discharged and leaves the bed, the house keeping department cleans the rooms and gets it ready for the next patient. Immediately after cleaning they are expected to enter the availability of bed online so that admission department can check online and allot bed for the next patients.

4.0 DATA COLLECTION

To understand the process in place and ascertain the need for the lean sigma, primary data collected through a standard questionnaire and also through on-site observation on a given date. It was observed that the following number of discharges happened in the wards mentioned below:



Table 2: Number of Discharges on 23 And 24 June 2014

Specialty Group	Discharges on June 23	Discharges on June 24
Medical and surgery	1	1
Plastic and reconstruction surgery	5	4
Dermatology	3	1
Ophthalmology	3	4
Orthopedics	3	4
Nephrology	4	0
Medicine female ward	4	8

It was observed that patients were discharged only after five to six hours after the doctors approved the discharge of the patient. The delay was primarily due to the discharge summary and pharmacy activities.

4.1 PERT analysis

Optimum time $t = (O + 4M + P) / 6$ Where,

- The most pessimistic (P) case when everything goes wrong.
- The most optimistic (O) case where everything goes right.
- The most likely (M) case given normal problems and opportunities.

For getting admitted into the hospital rooms/wards, here it has been noted that O = 5 minutes; M = 10 minutes; P = 15 minutes Therefore, Optimum time $t = 10$ minutes

Hence any admission process which takes more than 10 minutes is a delay.

For Discharge, here it has been noted that O = 1 hour; M = 2 hour; P = 6 hour Therefore, Optimum time $t = 2.5$ hours
Hence any discharge which takes more than 2.5 hours is a delay.

Frequency Table

Table 3: Time taken for getting admitted (in minutes)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 5 minutes	1	3.2	3.2	3.2
	(5-10)minutes	10	32.3	32.3	35.5
	(11-15)minutes	9	29.0	29.0	64.5
	Above 15 minutes	11	35.5	35.5	100.0
	Total	31	100.0	100.0	

Table 4: Time to get discharged from the Hospital

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	(2-3)hours	8	25.8	25.8	25.8
	(3-4)hours	7	22.6	22.6	48.4
	5 hours and above	16	51.6	51.6	100.0
	Total	31	100.0	100.0	



5.0 FINDINGS

- Roughly two thirds of the admissions were delayed probably due to discharge delay and various other reasons like confusion regarding availability of bed due to failure in updating the number of vacant beds and rooms, miscommunication among nurses, admission department, housekeeping etc. regarding the availability of bed.
- 87.9% of staff and 90.3% of patients agreed that there was a delay in discharge process of patients due to discharge summary and pharmacy activities.
- 21.2% of staff and 48.4% of patients were highly dissatisfied with the time taken for procedure and paper work involved in admitting a patient. 15.2% of staff and 48.4% of patients were highly dissatisfied with the time taken to admit the patient from the time they reach the admission counter to getting admission to a ward.
- 15.2% of staff and 51.6% of patients were highly dissatisfied with the time taken to discharge a patient after doctors' approval for discharge primarily due to paper work involved in discharging a patient
- Nearly half of the patients were highly dissatisfied with the time taken for the pharmacy to provide medicines at the time of discharge. However the delay in the billing section was much higher than the pharmacy which accounts roughly two third of the patients delay.
- 27.3% are dissatisfied with the updating of vacancy of bed online. The house keeping department immediately after a person gets discharged should clean the beds and rooms and make it available for the new patient. And once the room was cleaned and ready for a new patient they have to update it online. The problem here was a delay in updating the status rather than cleaning itself.
- Similarly 24.2% were dissatisfied for not updating the occupancy of bed immediately after their admission into the bed.
- As a result 12.1% of patients and staff were are dissatisfied with the reliability of information available online
- 27.3% staff were dissatisfied with the connectivity (both wired and wifi) available in the hospital.
- One third of the staff quotes frequent technical errors and non-availability copier machines or printers for the delay in the process. Paper Jam or not working copier machines were the prime nature of technical errors. This causes delay in discharge and lead to bed blocking and consequently admission delay.
- 12.1 % of the respondents attribute the space utilization as one of the reasons for the delay. Transition lounges, architecture and operations are inherently linked. In this case each department was far away and moving from one unit to other was quiet difficult.
- Nearly half of the of patients (48.4%) were highly dissatisfied with the location of the nursing stations from the patients' room, location of doctors' room from the patients' room and location of the patients' room from the pharmacy and the billing counter. This makes it inconvenient for the patients and the bystanders to reach out to the nurses or doctors in case of emergency. And at the time of discharge half the time was wasted on getting to the pharmacy and billing section, since they were very far away from the patients wards.
- 36.4 % of the patients were dissatisfied with the number of staff available in each ward during the peak time.
- 21.2% of the patients were dissatisfied with mix of patients from different wards in one common ward due to non-availability of beds in the relevant wards.

5.1 Suggestions

- **Discharge lounges:** Firstly the bed blocking has to be taken care of. While the patient waits to be discharged, make the patients wait in the discharge lounges while the bystanders follow up the procedures for discharge process. The discharge lounges should be in a place to provide immediate healthcare in case of emergency and should be comfortable to wait in.
- **Update vacancy and occupancy of bed online:** After the discharge of patient the housekeeping should clean the room and make it ready for new patients. Once they make ready the bed and the room, they have to update the vacancy of bed online immediately without procrastinating; the same should be done in case any bed is being newly occupied to avoid confusion among the staff as well as at the admission department during the time of new admissions.
- **Discharge summary:** The discharge summary - the prime reason for the delay in discharge process- could be addressed by preparing it and updating it continuously as and when it happens rather than preparing at the last minute. Similarly providing small printers for each office would make it available all the time and preparing discharge summary would be taken care by the respective staff, rather than keeping centralized printers of high capacity with low availability.



- **Technical assistance** (by way of exclusive computer savvy persons) for preparing summary and updating vacancy or occupancy position would reduce a considerable delay instead of depending on house surgeons, housekeepers, and staff nurses for these tasks.
- **Pharmacy delay:** a detailed study for the delay needs to be carried out and ensure that adequate staff, medicines and systems were available to arrest the delay.
- **Using RFID:** RFID system can be used to track patients, doctors and expensive equipment in hospitals in real time. An instant assessment of critical equipment and personnel locations was also possible through RFID technology.

Benefits of using RFID Systems

- Track continuously each patient's location.
- Track the location of doctors and nurses in the hospital.
- Track the location of expensive and critical instruments and equipment.
- Restrict access to drugs, pediatrics, and other high-threat areas to authorized staff.
- Monitor and track unauthorized persons who are loitering around high-threat areas.
- Facilitate triage processes by restricting access to authorized staff and "approved" patients during medical emergencies, epidemics, terrorist threats, and other times when demands could threaten the hospital's ability to effectively deliver services.

The implementation of it can save time, improve efficiency, effectiveness and this in turn will increase both employee as well as patients satisfaction. This will help in patient flow which in turn will help increase the revenue.

6.0 CONCLUSION

This study focused on the application of lean sigma in bed management operations and patient flow in a hospital. Bed management was not just restricted to the allocation of bed but it was coupled to the entire process starting with the admission process to the discharge process. The Lean Sigma methodology has been applied in this project to analyse the entire process to identify the defect in the process if any and take corrective measures to improve the process as a whole to provide better customer and employee experience and provide excellent health care. It has been noted that customers and employees have given high level of importance to the following criteria: (a) admission and discharge process (b) proper bed management and patient flow (c) proper utilization of infrastructure and information technology.

According to the study two third of the patients and staff say that there is a delay in both admission and discharge process. Using the PERT analysis we saw that the optimum time for admission is 10 minutes and for discharge is 2.5 hours; any admission or discharge which took more than these timings was a delay.

Every process was coupled with the other one and a delay in any one of the processes affects the entire process. It has been observed that: (a) if there is a delay in the discharge of a patient; it affects the admission process since the stable person to be discharged was blocking the bed which is required by an acute person who has to be admitted. (b) This delay in discharge is caused due to delay in preparation of discharge summary and the pharmacy. (c) This delay in preparing discharge summary is mainly because of procrastination from the house surgeons and due to not having access to printer and copier machines to print or copy the discharge summary on discharge. (d) The delay in pharmacy is due to inadequate staff and lesser number of computers to enter the patients' medicine report. This delay in discharge affects the admission process adversely. (e) The delay in admission is also caused by not updating the vacancy and occupancy of bed on time; this in turn causes confusion at the admission counter, delaying the admission of the patient. Hence it can be concluded that each process depends on all the rest and a delay or improper management of one activity in the process can affect the other activities bringing down both the customer and the employee satisfaction.

Suggestions have been provided which the management can consider, so that the quality of service and the process quality can be improved as a whole. In order to improve the bed management and patient flow, all the factors affecting the process have to be considered and rectified, since one activity in the process depends on the other and affects all the other.

Therefore proper bed management and patient flow can improve the satisfaction of patients as well as employees and it would help generate more revenue and increase the future demand for bed and hospital services by patients.



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