Evaluation of process excellence tools in improving donor flow management in a tertiary care hospital in South India

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Abstract:
BACKGROUND: Process Excellence is a value based approach and focuses on standardizing work processes by eliminating the non-value added processes, identify process improving methodologies and maximize capacity and expertise of the staff.

AIM AND OBJECTIVES: To Evaluate the utility of Process Excellence Tools in improving Donor Flow Management in a Tertiary care Hospital by studying the current state of donor movement within the blood bank and providing recommendations for eliminating the wait times and to improve the process and workflow.

MATERIALS AND METHODS: The work was done in two phases; The First Phase comprised of on-site observations with the help of an expert trained in Process Excellence Methodology who observed and documented various aspects of donor flow, donor turn around time, total staff details and operator process flow. The Second Phase comprised of constitution of a Team to analyse the data collected. The analyzed data along with the recommendations were presented before an expert hospital committee and the management.

RESULTS: Our analysis put forward our strengths and identified potential problems. Donor wait time was reduced by 50% after lean due to better donor management with reorganization of the infrastructure of the donor area. Receptionist tracking showed that 62% of the total time the staff wastes in walking and 22% in other non-value added activities. Defining Duties for each staff reduced the time spent by them in non-value added activities. Implementation of the token system, generation of unique identification code for donors and bar code labeling of the tubes and bags are among the other recommendations.

CONCLUSION: Process Excellence is not a programme; it’s a culture that transforms an organization and improves its Quality and Efficiency through new attitudes, elimination of wastes and reduction in costs.

Key words: Donor wait times, lean, process excellence, Six Sigma

Introduction

Health care reforms are the mainstream of all political and personal discussions. Health care is one service sector where there is no scope for errors or lapses. Nowadays, reforms in the field of transfusion medicine are the most sought after. Technology alone is not enough to support progress; better utilization of resources and error reduction are essential to maintain the momentum of growth.

Process excellence combines together people, process, and products (popularly known as P3), which is a systematic approach to quality and operational process improvement. It combines the tools and methodologies of six sigma, lean thinking, and design
excellence to drive dramatic improvements in all areas of performance. The concept of lean was introduced by the Toyota Production Systems which focused on waste reduction by streamlining a process. Six Sigma approach was introduced by Sir Bill Smith, a Motorola Engineer which focused on preventing defects through problem solving. Looking at the scenario today, the combination has delivered greater results. Lean Six Sigma is a value-based approach and focuses on standardizing work processes by eliminating the nonvalue-added processes, identifies process improving methodologies, and maximizes capacity and expertise of the staff.

Using Lean Six Sigma approaches in health care processes is a new area of research. It does not just denote organization of processes that generate usable information rather it denotes processes that generate sufficient information at lowest costs; processes that use valid information for rational managing and processes that have sufficient quality of product or service with continual road for improvement.[1]

This paper is a contribution to set a framework for Lean Six Sigma improvement project in transfusion practices. In our study, after determining the potential waste, we have successfully used the five stage lean sigma process, i.e., Define, Measure, Analyze, Improve, and Control (DMAIC)[2] to improve the workflow pattern and turnaround time involved from donor entry to donor exit from the blood bank. During the study, value stream maps and potential improvement possibilities have also been identified. Value stream mapping technique suggests creating a process flow chart to understand the current state and analyze the possible areas of improvement.[3] The study has suggested definitive changes in certain sections of the blood bank and certain definitive proposals in reconstruction plans approved by the expert hospital committee and the management.

Aim
This study aims to evaluate the utility of process excellence tools in improving donor flow management in a tertiary care hospital in South India by studying the current state of donor movement within the blood bank and providing recommendations for eliminating the wait times and to improve the process and workflow.

Objectives
- To assess the current state of donor movement within the blood bank from the time of his/her entry to his/her exit from the blood bank and provide recommendations for eliminating the wait times
- To offer recommendations for process and workflow improvement so as to improve staff productivity and there by provide better services to donors, clinicians, and ultimately to the patients.

Materials and Methods
The work was done in two phases.

Phase I comprised 2 days of on-site observations with the help of an expert trained in process excellence methodology, and the following data were collected and documented:
- Donor flow
- Donor turnaround time
- Total staff details and operator process flow
- Process opportunities.

Phase II comprised constitution of a study team, analysis of the data collected, application of the DMAIC process, and value stream mapping of the current and the ideal state. The most integral part of the Lean Six Sigma initiative is the DMAIC process; hence, the emphasis.

The process aims at defining the problem, measuring the extent of the problem, analyzing the root cause, improving the existing scenario, and finally sustaining the solution. Figure 1 gives a diagrammatic representation of the DMAIC cycle.

The data analysis, the value stream maps and the recommendations were presented before an expert hospital committee and the management, and an outline work plan to achieve the desired goals has been laid. Well-equipped and state-of-the-art analyzers committed staff and good donor flow were among the strengths observed during the study.

The primary focus of our department was application of Lean Tools to improve the donor turnaround time owing to the problems enlisted below:
- Reception staff handled multiple tasks such as receiving donor form, samples, issue of blood components and billing
- No proper guidelines to the donors since the same person handling the preexamination of donors, reception, and issue of blood
- No separate waiting area for the donors
- No privacy during medical examination
- Manual writing on the tubes and bags increased wait times of the donors
- Disparity seen while taking up a donor for phlebotomy causing aggression among other donors.

Figure 2 captures the images of the problems faced by our Department of Transfusion Medicine at our department. Donor and reception staff tracking was
done by the personnel trained in process excellence and methodology. The overall wait time of the donor was

![Diagram](image1.png)

**Figure 1:** Diagrammatic representation of the Define, Measure, Analyze, Improve and Control cycle

![Images](image2.png)

**Figure 2:** (1) Crowding of donors and bystanders in prescreening room thus jeopardizing privacy of donors. (2) Common waiting room thus making it difficult to identify donors and creating chaos. (3) People crowding outside medical examination room further breaching the privacy of the donor. (4) Donors declared medically fit waiting in verandahs before calling up for phlebotomy creating hindrance in the common path of other hospital staff

![Chart](image3.png)

**Figure 3:** Receptionist tracking done by the staff trained in process excellence and methodology

| Tracking done | Value Added (Processing) | Walking Time | Other Non Value Added Activities |
|---------------|--------------------------|--------------|---------------------------------|
| Receptionist Tracking - 32 mins. | 22% | 16% | 62% |

**Table 1:** Donor tracking before and after lean

| Before lean | After lean |
|-------------|------------|
| Entry time | Entry time |
| Preexamination wait time | Preexamination wait time |
| Medical examination waiting time | Medical examination waiting time |
| Donor bleeded in phlebotomy | Donor bleeded in phlebotomy |
| Bleeding completion time | Bleeding completion time |
| Refreshment | Refreshment |
| Donor exit | Donor exit |
| Overall wait time | Overall wait time |

| Preexamination wait time | Medical examination waiting time | Donor bleeded in phlebotomy | Bleeding completion time | Refreshment | Donor exit | Overall wait time |
|--------------------------|---------------------------------|-----------------------------|----------------------|-------------|------------|-----------------|
| Before lean | After lean |
| Entry time | Entry time |
| Preexamination wait time | Preexamination wait time |
| Medical examination waiting time | Medical examination waiting time |
| Donor bleeded in phlebotomy | Donor bleeded in phlebotomy |
| Bleeding completion time | Bleeding completion time |
| Refreshment | Refreshment |
| Donor exit | Donor exit |
| Overall wait time | Overall wait time |

| Preexamination wait time | Medical examination waiting time | Donor bleeded in phlebotomy | Bleeding completion time | Refreshment | Donor exit | Overall wait time |
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| Bleeding completion time | Bleeding completion time |
| Refreshment | Refreshment |
| Donor exit | Donor exit |
| Overall wait time | Overall wait time |

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| Bleeding completion time | Bleeding completion time |
| Refreshment | Refreshment |
| Donor exit | Donor exit |
| Overall wait time | Overall wait time |

| Preexamination wait time | Medical examination waiting time | Donor bleeded in phlebotomy | Bleeding completion time | Refreshment | Donor exit | Overall wait time |
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| Donor bleeded in phlebotomy | Donor bleeded in phlebotomy |
| Bleeding completion time | Bleeding completion time |
| Refreshment | Refreshment |
| Donor exit | Donor exit |
| Overall wait time | Overall wait time |

| Preexamination wait time | Medical examination waiting time | Donor bleeded in phlebotomy | Bleeding completion time | Refreshment | Donor exit | Overall wait time |
|--------------------------|---------------------------------|-----------------------------|----------------------|-------------|------------|-----------------|
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| Entry time | Entry time |
| Preexamination wait time | Preexamination wait time |
| Medical examination waiting time | Medical examination waiting time |
| Donor bleeded in phlebotomy | Donor bleeded in phlebotomy |
| Bleeding completion time | Bleeding completion time |
| Refreshment | Refreshment |
| Donor exit | Donor exit |
| Overall wait time | Overall wait time |

| Preexamination wait time | Medical examination waiting time | Donor bleeded in phlebotomy | Bleeding completion time | Refreshment | Donor exit | Overall wait time |
|--------------------------|---------------------------------|-----------------------------|----------------------|-------------|------------|-----------------|
| Before lean | After lean |
| Entry time | Entry time |
| Preexamination wait time | Preexamination wait time |
| Medical examination waiting time | Medical examination waiting time |
| Donor bleeded in phlebotomy | Donor bleeded in phlebotomy |
| Bleeding completion time | Bleeding completion time |
| Refreshment | Refreshment |
| Donor exit | Donor exit |
| Overall wait time | Overall wait time |
found to be 46 min with maximum wait time of 37 min observed after completion of medical examination and before taking up a donor for phlebotomy. Reception staff tracking was done for 32 min and it was observed that 62% of the total observed time was wasted in unnecessary walking and 22% of the time was wasted in other nonvalue-added activities such as talking over the phone and talking to other staff/nursing staff.

Figure 3 shows the receptionist tracking done by the staff trained in process excellence and methodology.

Results and Recommendations

Keeping all the above data in mind following recommendations have been laid down and work in the regard is being carried out.

Reorganization in the infrastructure and personnel of the donor area (i.e. reception, donor registration room, prescreening room, counseling room, medical examination room, donor, and common waiting area) was the first recommendation and it has been successfully accomplished. It incorporates the following enlisted changes:

- Exclusive reception area and staff for receiving the donors and guiding them to fill the predonation form
- Only one donor can enter the prescreening room and medical examination room at a time; thus ensuring privacy of donor
- Separate waiting area for the donors.

After this strategic reorganization of area and personnel, donor tracking was done by the same expert trained in process excellence methodology after 1 month. The overall wait time of the donor was reduced to 50% (i.e. 25 min) with a wait time of only 18 min observed after completion of medical examination and before taking up a donor for phlebotomy in contrast to the 37 min observed before the introduction of lean concept. Table 1 shows the donor tracking done by the staff trained in process excellence and methodology before and after lean transformation.

Reception staff tracking after 1 month showed that the duties and responsibilities of the each staff have been clearly defined and awareness of the same has increased.
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Figure 5: (1) Staff in-charge of issue counter receiving samples, guiding nursing staff, attending phone. (2) Different staff in-charge of reception area receiving and guiding donors to fill Donor History Questionnaire, guiding bystanders. (3) Common waiting area for donors and bystanders. (4) Donor registration area. (5) Prescreening area where only one donor can enter at a time ensuring privacy of donor. (6) Medical examination room where also only one donor can enter at a time ensuring privacy of donor. (7) Exclusive waiting area for donors among the staff. The reception staff is exclusively responsible for receiving the donors at the reception; guiding them to fill the Donor History Questionnaire and prescreening. Thereafter, the newly appointed auxiliary nurse midwife staff guides the donors to the medical examination room and further to the phlebotomy room. After completion of donation the same staff guides the donors to the refreshment room.

Figure 4 depicts the plan of the previous and the new infrastructure which will provide the readers more insight regarding proposed changes in infrastructure and its importance in improving the workflow of our blood bank.

Figure 5 captures the images of the existing scenario of our Department of Transfusion Medicine after application of lean concept.

Certain recommendation still under process requiring mention includes the following:
- Registration of donors will be done in the medical examination room and a token number would be given to them
- Donors will be taken up for phlebotomy in accordance to the token number
- Bar code labeling will soon replace the manual writing on tubes and bags, samples, registers, and all subsequent downstream stages.

**Conclusion**

Lean is not a program; it is a culture that transforms an organization and improves its quality and efficiency through new attitudes, elimination of wastes, and reduction in costs. Figure 6 gives a diagrammatic representation of the impact of lean tools.

In our department, there was an absence of lean layout with space constraints subsequently leading to disconnected activities, excess motion, excess waiting, underutilization of skills and hence hindrance to the lean workflow. The application of Lean tools uncovered significant opportunities of process improvement. The implementation of lean recommendations was a key component in this emerging paradigm; the most pronounced change being the reorganization of the donor area which helped in improving the donor turnaround time and staff productivity.

This paper sets a framework for Lean Six Sigma concept application to plan improvement in Department of Transfusion Medicine. Among the leading approach is the DMAIC approach. It also brings about certain risks which should not be overlooked and should be addressed beforehand before implementation. This paper would be a contribution to any organization/employee who consciously improves its/his work process.

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**Conflicts of interest**
There are no conflicts of interest.

**References**

1. Rizhvi HR. Application of lean six sigma approach in a laboratory experimental case study. Int J Lean Think 2013;4:2-13.
2. Sokovic M, Pavletic D, Kern Pipan K. Quality improvement methodologies – PDCA cycle, RADAR matrix, DMAIC and DFSS. J Achiev Mater Manuf Eng 2010;43:476-83.
3. Javonovic R, Delic M. Planning the use lean six sigma as a framework for a blood bank management improvements. Int J Ind Eng Manag 2013;4:237-44.