Analysis of turnaround timings for emergency department of government hospital of Hyderabad - a six sigma approach

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ANALYSIS OF TURNAROUND TIMINGS FOR EMERGENCY
DEPARTMENT OF GOVERNMENT HOSPITAL OF HYDERABAD - A
SIX SIGMA APPROACH

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Abstract
Post LPG, the service sector predominantly occupied a pivotal role in the society. Unlike the primary agricultural sector or secondary industrial sector, which is concerned with production of tangible goods, the service is basically intangible and perishable, in the sense that neither the service provider nor the service receiver can store a service. Healthcare industry which is one of the most crucial components of service sector unlike banking, insurance, hotel, transportation and education is one of the world's largest and fastest-growing industries. Healthcare includes many subsectors in it comprising of Hospitals, Medical Infrastructure, Medical Devices, Clinical Trials, Outsourcing, Telemedicine, Health Insurance all of which delivers goods and services to treat patients on preventive, curative, rehabilitative, and palliative care basis. Leading the healthcare from the front is the hospital segment and its significance has been broadened and organizationally they dominate the rest of the health care system. Since service delivery in hospitals is a matter of patient lives which is highly intangible in nature and can’t be physically viewed or touched like a manufactured product and since hospitals are becoming more complex the opportunities for errors abound and as the patients are also demanding for better services, most of the hospitals are now incorporating Six Sigma approach. In the hospital context, six sigma is been applied in the improvement of business processes (Administrative and Logistics) and the medical outcome processes (Clinical and Patient Safety). The overall strategy is to achieve excellence in healthcare by aligning and optimizing processes and by the removal of process-generated errors and defects. This study was conducted in the Casualty Department of a Government Hospital of Hyderabad and follows the Six Sigma DMAIC methodology. The objective of the study was to measure the baseline Sigma level of Casualty process and further streamlining the entire process, finding root causes of waiting time in Casualty, suggesting recommendations in the existing process flow and finding out constraints that limit the department efficiency and productivity, which when removed would improve patient satisfaction and resulting in efficient service delivery. A total sample size of 225 patients was taken for both Emergency and Medico Legal cases by adopting convenience sampling technique. In the study it was found that in a sample size of 225, the range of Turn Around Time was between 5-15 minutes where there were 115 subjects in this interval. The researchers also performed root cause analysis of delayed waiting time and it was found that the process contributing to the maximum delay in waiting time was attributed to man power with 80.6 % of total defects followed by methods attributing to 10.7 % of total defects. Control Phase of DMAIC methodology was not implemented due to several constraints. Changes were proposed that would ultimately improve the overall effectiveness of the Casualty Department leading to increased Patient satisfaction and an efficient delivery of service quality.

Keywords: Casualty, DMAIC, Healthcare, Hospitals, Six Sigma.

1. INTRODUCTION
Healthcare industry which is one of the most crucial components of service sector includes many subsectors in it comprising of Hospitals, Medical Infrastructure, Medical Devices, Clinical Trials, Outsourcing, Telemedicine, Health Insurance all of which delivers goods and services to treat patients on preventive, curative, rehabilitative, and palliative care basis. Leading the healthcare from the front is the hospital segment and service delivery in hospitals is a matter of patient lives which is highly intangible in nature and can’t be physically viewed or touched like a manufactured product and since hospitals are becoming more complex the opportunities for errors abound and as the patients are also demanding for better services, most of the hospitals are now incorporating Six Sigma approach. It is one of the most powerful performance improvement methodologies that are changing the face of modern health care.
delivery today. In the hospital setting, six sigma is been applied in the improvement of business processes (Administrative and Logistics) and the medical outcome processes (Clinical and Patient Safety). The overall strategy is to achieve excellence in health care by aligning and optimizing processes and by the removal of process-generated errors and defects.

1.1 Objectives of Study

Primary Objective

To analyze the cause of waiting time in Emergency department of Government hospital of Hyderabad using the Six Sigma approach.

Secondary Objectives

To map the existing process flow of Casualty Department.
To identify the barriers in the process flow of Casualty Department

2. MATERIALS AND METHODS

2.1 Study design: Descriptive research study.
2.2 Study area: All the subjects were collected from the Casualty Department of Government hospital of Hyderabad.
2.3 Study instrument: In this study there is no need of any usage of instrumentation and the investigator will not perform or do any test on the patients who were interested to participate in the study. A brief template is used as a data collection tool by the investigator and the different touch points of each patient during the entire flow of patient in the Casualty department are documented in the template and are analyzed further in the MS Excel Software.
2.4 Study criteria
2.4.1 Inclusion criteria: Patients who visited the Casualty Department of Government hospital, for emergency care and patients who are treated under the category of Medico Legal Cases are included under the study.
2.4.2 Exclusion criteria: Patients who visited the Casualty Department for the purpose of taking remand and consent from the concerned RMO of the department and who did not avail the emergency services are excluded from the study.
2.5 Sampling method: Convenience sampling technique is used to collect data from the patients.
2.6 Sample Size: A total Sample Size of 225 subjects was taken for the study comprising of both emergency patients and patients who are treated under the category of Medico Legal Cases.

Calculation of Sample Size

Retrospective review of medical records of all patients who presented to Casualty Department of the Government Hospital of Hyderabad during the preceding month was taken and 40 % of the total no of patients in that particular month was calculated and an appropriate sample size of 225 subjects was selected for the study.

3. RESULTS

3.1 Measure Phase

The purpose of Six Sigma team is to improve the efficiency and effectiveness of a process. Effectiveness applies to the output measures important to the customer and the effectiveness of suppliers. The Efficiency measures refer to what occurs inside the process whether it is the amount of time, cost, labor or value occurring between the start and stop points in the process map. The objective of measure phase is to understand the current process performance and finding out the areas of defects in Casualty Department. Here the following activities have been carried out.

- Planning for data collection
- Evaluate measurement system to ensure the data reliability
- Identify the baseline and the target
• Classifying the nature of defects based on their frequencies.
• Doing brainstorming for finding out the root causes of the problem.

Tools used in Measure Phase are:
• As – Is Process mapping
• Data collection plan
• Process Sigma calculation

3.1.1 AS – IS Process Mapping

First step carried out by the investigator is the understanding of the process before going to Data collection. Process Mapping is done under the following steps:

• Investigator observed the patient movement right from the entrance of the patient into the Casualty department to the time the patient is checked out of the Casualty department.
• Mapping of the process was done by the Investigator in his own way.
• Mapping is carried out randomly
• After random mapping, Process Map has been developed.
• At the end AS – IS process was validated by the Investigator.

<table>
<thead>
<tr>
<th>S.no</th>
<th>Type of process</th>
<th>Time interval between one touch point to another touch point</th>
<th>Minutes / Patient (Mean ± SD )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Patient entry process</td>
<td>Patient entry at the registration counter to time patient checked out by nurse towards Duty doctor</td>
<td>1.75 ± 1.44</td>
</tr>
<tr>
<td>2</td>
<td>Doctor consultation Process</td>
<td>Patient arrival at the duty doctor cabin to time when patient was received by duty doctor at cabin.</td>
<td>1.63 ± 1.96</td>
</tr>
<tr>
<td>3</td>
<td>Check out process</td>
<td>Patient arrival at registration counter to time when patient was checked out of Casualty department.</td>
<td>3.3 ± 6.7</td>
</tr>
<tr>
<td>4</td>
<td>Total cycle time Process</td>
<td>Patient arrival at the Casualty Department to time when patient was checked out of Casualty Department</td>
<td>18.3 ± 11.6</td>
</tr>
</tbody>
</table>

TABLE -2. Data showing No of patients within a given range of Turn Around Time.

<table>
<thead>
<tr>
<th>S.no.</th>
<th>TAT (min)</th>
<th>No.of patients</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5 – 15</td>
<td>115</td>
<td>52</td>
</tr>
<tr>
<td>2</td>
<td>16 – 25</td>
<td>62</td>
<td>27.6</td>
</tr>
<tr>
<td>3</td>
<td>26 – 35</td>
<td>29</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>36 – 45</td>
<td>13</td>
<td>5.8</td>
</tr>
<tr>
<td>5</td>
<td>46 - 55</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td>6</td>
<td>56 – 65</td>
<td>2</td>
<td>0.8</td>
</tr>
</tbody>
</table>
In the above given range chart the Upper control limit is 34.15 minutes, Lower control limit is 0 minutes and Control limit is 10.45 minutes. All most all of the samples are coming within the range of Upper and Lower Control limits. Hence as per the above graph we can conclude that the overall process of Cycle Time is under control.

In the above given Mean X bar chart the Upper control limit is 43.1 minutes, Lower control limit is 6.5 minutes and Control limit is 18.3 minutes. All most all of the samples are coming within the range of Upper and Lower control limits. Hence as per the above Graph we can conclude that the overall process of Cycle time is under control.

### 3.1.2 Process Sigma calculation

In the Process Sigma calculation, once the opportunities are decided calculating Six Sigma is an easy task. In our study we found that actual defect measurement was based upon “Sample Inspection” and we found that:

- Total number of Defects – 93
- Total number of Opportunities – 225
- Defects per Opportunities (DPO) - 0.41333333
- Defects per Million Opportunities (DPMO) - 413333.3333
- Percentage of defects - 41.33 %
- Percentage of Yield - 58.67%
- Process Sigma level - 1.72.

Hence we can conclude that the Emergency Department of the hospital is functioning at 1.72 Sigma Quality Level.

### 3.2 Analyze Phase

The prime objective of Analyze phase is to identify the root causes of the problem and opportunities for improvement by analyzing the data and the process. During the Analyze phase Pareto analysis is carried out to find out the main process contributing to delayed waiting time.

**Interpretation of Pareto chart**

Pareto chart of all activities shows that the four main issues that are almost causing 80% of problems of waiting time are:
- Doctor didn’t bother about patient status though doctor was free.
- Doctor already loaded with other patients and no doctor was available free to see the patient
- Doctor left the patient during the course of treatment and discussing with other Duty doctors.
- Nurse was engaged in doing patient’s registration process and no nurse was available free at reception counter.

### 3.3 Improve Phase

**Recommendations**

During the study the investigator interacted with staff, patients and attendants personally to find out their level of expectations. After analyzing the collected data, investigator proposed the following to fill the gaps and increase efficiency.

#### 3.3.1 Registration department

Casualty registration department is not functioning properly. As the registration department is always loaded with patients and as only two nurses are available at the registration counter, the attendants and patients goes directly to doctor for their minor queries. This results in wasting doctor’s valuable time and in turn reduces the efficiency of the department. So in order to improve the efficiency, the registration department should be well designed with adequate staffs who have adequate knowledge of hospital activities and good communication skills.

#### 3.3.2 Manpower

Presently Casualty department of the hospital is running with very low manpower. During this study it was observed that the process contributing the maximum delay in waiting time is because of man power which constitutes to about 80.6% of delay in waiting time and the two main reasons for delay in waiting time is because of shortage of nurses and doctors to receive the patients. It is not only attributed to doctors and nurses but every staff employee in Casualty department ranging from ward boys to doctors. So in order to increase the efficiency there should be optimal man power.

#### 3.3.3 Well organized waiting area

As Casualty department of the hospital caters to a large area, there should be a proper waiting area to manage huge number of patients and their attendants. The existing waiting area is not spacious enough to manage the flow of patients properly. Because of not having a proper waiting area, patient as well as their attendants are creating overcrowding in the physician room making their work more tedious.
3.3.4 Eliminate duplicate patient record writing activity

In existing system, physician records patient’s clinical findings and provisional diagnosis manually and send this record again to the registration counter for final filing of patient details before patient is checked out of the Casualty department. So this results in a duplication of work by nurse. It can be eliminated if new staff is employed for final filling of patient details before patient is checked out of the casualty department. By doing so it improves the efficient utilization of nurse time, which in turn reduces the waiting time of the patient.

3.3.5 Appointing an Administrator in casualty department

Patient inflow into Casualty department is very high. So it is almost impossible to manage such a huge patient flow along with other activities in part of physician. In order to manage efficiently there should be a separate manager in charge of Casualty department who have a sound knowledge of Hospital administration and of Casualty department. This will not only reduce the workload of the physician but also improve the efficiency of the department as a whole.

4. DISCUSSIONS

This study represents the first attempt to assess the cause of waiting time in the Casualty department of Government Hospital of Hyderabad. Our study addressed issues pertaining to identifying the barriers in process flow of Casualty department and finding out the root causes of waiting time in the Casualty department.

In our study we found that the process contributing to the maximum delay in waiting time is because of man power which constitutes to about 80.6 % of total delay in waiting time and the two main reasons for delay is because of shortage of nurses and doctors to receive the patients and followed by methods which constitutes for about 10.7 % of delay in waiting time.

Hence we conclude that if the above proposed measures are implemented in the Casualty department then it ultimately leads to a better functioning of Casualty department which in turn increases the efficiency of Casualty department which is the main intention of our study.

5. CONCLUSIONS

Emergency Department of Government hospital is serving very large population so overcrowding reduction is very desirable. It has a huge potential in contributing towards serving the mankind. In this study the collected data has been analyzed to identify root causes of waiting time and identify the cause for delay in all sub process and overall process and proposed recommendations for improvements and hopefully the proposed recommendations would be beneficial to current scenario. With some precautions we can avoid all the non value adding activities that contributed to reduce the total cycle time and doing value added activities efficiently. Effective communication, staff motivation, departmental coordination can be major tools to improve the overall process. This improvement will work in long term basis if implemented phase wise.

6. LIMITATIONS OF STUDY

The main limitation of the study is that the Control phase of DMAIC methodology is not implemented due to time constraint. Second, limited sample size of 225 subjects is selected for the study. Due to the selection of a small sample size the findings cannot be generalized to a larger population. Third, scope of the study was confined only to one government hospital of particular region of Hyderabad and if multiple hospitals across different geographical contexts are selected the study would have given more comprehensive findings.
ACKNOWLEDGMENTS

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REFERENCES