

**Study on Current Discharge Process of the Hospital in Order to
Identify the Areas of Delay and Improve the Average Turn-
Around Time Using Six Sigma Approach**

**Internship Training
at
BLK Super Specialty Hospital, New Delhi
(February 01 –April 30, 2014)**

**By
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**Under the guidance of
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**Post Graduate Diploma in Hospital & Health Management
2012–14**


**Institute of Health Management Research
Jaipur
2014**

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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Dr. Aditi Makkar** student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from Institute of Health Management Research, Jaipur has undergone internship training at **B L Kapur Super Specialty Hospital, New Delhi** from **1st February 2014 to 30th April 2014**.

The Candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific and analytical. The Internship is in fulfillment of the course requirements. I wish her all success in all his future endeavors.



Col. (Dr.) Ashok Kaushik
Dean, Academics and Student Affairs
Jaipur



Dr. S.D. Gupta
Director, IIHMR,
Jaipur

The certificate is awarded to

Dr. Aditi Makkar

In recognition of having successfully completed her
Internship in the Department of

MEDICAL ADMINISTRATION

and has successfully completed her Project on

**Study on current Discharge Process of the hospital in order to identify the areas of delay and
improve the average turn-around time using Six Sigma approach.**

Dated: st1 February 2014 to 30th April 2014

BLK Super Specialty Hospital, Pusa Road, New Delhi

She comes across as a committed, sincere and diligent person who has a
strong drive and zeal for learning.

We wish her all the best for her future endeavors.



Deputy Medical Superintendent



Head – Human Resources

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DISSERTATION

**STUDY ON CURRENT DISCHARGE PROCESS OF THE
HOSPITAL IN ORDER TO IDENTIFY THE AREAS OF DELAY
AND IMPROVE THE AVERAGE TURN-AROUND TIME
USING SIX SIGMA APPROACH.**

ABSTRACT

The study describes the application of a five-phase LEAN Six Sigma Approach - **DMAIC** (Define, Measure, Analyze, Improve and Control) to streamline the discharge process for all IPD patients.

The study was carried out from 10th February, 2014 to 10th May 2014.

Data collection was done for average discharge TAT for the total number of discharges from all the wards of the hospital.

Primary data was collected for three parameters of the study by recording the time taken for the completion of the related sub-processes.

The sources of secondary data were the records in HIS and observation in the wards.

Within the different phases of DMAIC, six sigma tools applied were:

- ✓ Process Mapping
- ✓ Cause and Effect Matrix (Fish-bone Diagram)

Results were analyzed with help of Microsoft Excel using tables and bar graphs. Analysis was done to calculate the average TAT of month of February and March. The percentages of discharges occurring within the given TAT and those exceeding the benchmark were also calculated.

The percentage analysis led to analyzing the current discharge process to identify the value added and non-value added activities.

Based on the identified wastes and non-value added activities, problem statements were defined

Interventions were designed based on the stated problem statements and recommendations given for improvement of the discharge process.

INTRODUCTION

Discharge, by definition is to formally terminate a patient's care, and releasing him/her from a hospital or health care facility. A patient is discharged only when he/she has recovered fully or satisfactorily according to the concerned physician.

It is imperative to have a timely discharge. A delayed discharge has an impact on the physical, mental, emotional, and psychological status of the patient and also has negative financial implications on the hospital. A patient staying longer than the stipulated time is responsible for unnecessary utilization of the hospital resources and is sheer waste.

“A good discharge experience leaves the patient with positive emotions and strong affinity for returning to the facility” – Paul Clark.

A hospital is the centre for cure but one cannot rule out it being a source of infection especially to the vulnerable individuals. One such vulnerable category is patients who have just recovered from their illness and are ready for discharge.

It is in the interest of the hospital to hasten the discharge process as –

- It will reduce the chances of HAI for the patient.
- Better experience as the patient leaves.
- Reduce anxiety and restlessness of patient and the family.
- The bed is made ready for the next patient who is in more need.
- Better and apt utilization of resources per bed.

Delayed discharge (sometimes referred to as **delayed transfer** or **bed blocking**), refers to the situation where a patient is deemed to be medically well enough for discharge, but, where the patient is unable to leave hospital due to slowing down of the entire process.

A patient visiting a hospital expects complete care from the time of admission to the time of discharge, along with, complete medical care and advice. Although most of these expectations are met, the patient is still eager to leave the hospital premises at the earliest possible. Discharge process still remains an area of concern in terms of the time taken for its completion.

Lengthy ineffective process for inpatient discharge is a common concern of hospitals, as it is an important factor resulting in patient dissatisfaction and a negative image of the hospital.

A major weakness of the discharge process is the relative lack of attention to detail from the hospital team at the time of discharge, compared to the admission process. The energy with which we approach a new admission often dwindles to that which is needed solely to get the patient out of the door. This further leads to an increase in patient anxiety and apprehension; subsequently resulting in a negative cascading effect on the hospital routine, as well as, the patient's routine.

The development and improvement in the discharge process requires a detailed insight into the discharge process being followed and the understanding of the reasons for delay in the hospital.

QUALITY IN HEALTHCARE

Health care's interest in quality management has followed the lead of the manufacturing industry, originally focusing on retrospective review of products and outcomes and eventually undertaking concurrent reviews focused on processes. Critical to such reviews is a healthcare organizations use of an information system that incorporates departmental data into a hospital-wide framework, includes objective criteria for evaluating procedures and outcomes, and tracks modifications to an organization's processes for care delivery. The goal of an integrated, patient-centered information system is to establish a continuous cycle for improving clinical and administrative quality within an organization.

Improving quality while simultaneously reducing costs has replaced cost containment alone as the critical concern facing hospitals. Hospitals are discovering a need to collect data on quality and demonstrate that patient care provides quantifiable benefits, including positive outcomes, wellness, and value at all levels of an institution. Still, total quality management (TQM) programs implemented at many hospitals primarily focus on improving administrative and ancillary processes. A vital but often neglected aspect of TQM is clinical patient care, the area in which continuous quality improvement promises the greatest return for hospitals. Designing information systems to support a patient-centered, dynamic quality control process is one of health care's greatest challenges today. By identifying and managing the link between quality and cost, hospitals can reduce costs and achieve continuous quality improvement.

Different organizations use different methodologies, approaches and tools for implementing a quality management and programmes for continuous quality improvement. The program is likely to have a different name or label, such as TQM (Total Quality Management), Six Sigma, BPR (Business Process Re-engineering), Operational Excellence or Business Excellence. Regardless of the methodology, approach, tool or the name of the continuous improvement programs, each organization will certainly need to use a proper selection and combination of different approaches, tools and techniques in its implementation process.

One of the methodologies used for quality improvement of hospital operations processes is Six Sigma, which constitutes a number of approaches and techniques for quality improvement. One such approach of Six Sigma is DMAIC (**Define, Measure, Analyze, Improve, and Control**) refers to a data-driven life-cycle approach to Six Sigma projects for improving process; it is an essential part of a company's Six Sigma program. DMAIC is an acronym for five interconnected phases: define measure, analyze, improve and control. The simplified definitions of each phase are:

- Define - by identifying, prioritizing and selecting the right project
- Measure - key process characteristic, the scope of parameters and their performances,
- Analyze - by identifying key causes and process determinants,
- Improve - by changing the process and optimizing

AIM OF THE STUDY

To analyze the current discharge process of the hospital in order to identify the areas of delay and improve the average turn-around time using Six Sigma approach.

OBJECTIVES:

- To analyze the current discharge process
- To study the effect of process monitoring on the time taken for discharge
- To identify the areas of delay and factors responsible for increased turn-around time
- To suggest strategies to improve the identified problem areas
- To assess the improvements after the interventions
- To improve the patient satisfaction with the discharge process

RATIONALE

Discharge, by definition is to formally terminate a patient's care, and releasing him/her from a hospital or health care facility. A patient is discharged only when he/she has recovered fully or satisfactorily according to the concerned physician.

A patient visiting a hospital expects complete care from the time of admission to the time of discharge, along with, complete medical care and advice. Although most of these expectations are met, the patient is still eager to leave the hospital premises at the earliest possible.

Discharge process still remains an area of concern in terms of the time taken for its completion. Lengthy ineffective process for inpatient discharge is a common concern of hospitals, as it is an important factor resulting in patient dissatisfaction and a negative image of the hospital. It also affects the resource utilization of the hospital, thus affecting the revenue generation.

The development and improvement in the discharge process requires a detailed insight into the discharge process being followed and the understanding of the reasons for delay in the hospital.

In reference to the above mentioned significance of attention needed to the Discharge Process, this study was taken up as a quality improvement initiative to reduce the TAT and eliminate the problems causing delays in the discharge and inconvenience to the patient during discharge.

REVIEW OF LITERATURE

1. Prevention of delay in patient discharge process- an Emphasis on Nurse's role:

In this study by Peter R, Jessica E, Zaltmann G, planning for a patients post discharge care does not begin on the day when decision is made to release the patient from hospital. It is generally accepted that discharge planning should start before admission or at the time of admission. A combination of various factors like age, multiple pathology and organizational factors like lack of alternative forms of care facilities put patient at risk of delayed discharge. In this article the author provides strategies to improve nurse's participation in discharge planning.

2. The Discharge planning process / Process Improvement:

In the study by Shepperd S. et al, discharge planning is critical to ensuring rapid, safe and smooth transition from hospital to another care environment; it involves social work functions of high risk screening, social work assessment, counseling, locating and arranging services, consultation/collaboration, patient and family education, patient advocacy and chart documentation. It is a complex activity requiring a wide range of clinical and organizational skills to address needs of patient, family, and health care systems and to promote optimum functioning of patients, families and support systems. Delay factors may be internal like waiting for discharge summaries, external like convalescence, palliative care and psychological like social isolation of patient, inadequate support at home, lack of medical aids etc.

3. Research review on tracking Delayed Discharge:

In the study by Zehner, R.B. Mofitt R, a combination of individual, medical and organizational factors interact to put people at risk of delayed discharge. The Literature review identifies that older people, those with multiple pathology and those with some specific conditions such as neurological deficit are most at risk. In other words it is not the clinical conditions that are causing delay but how the organization is managing services to care for these particular groups.

4. Improving the hospital discharge process with Six Sigma Methods at Gulf Medical College Hospital & Research Centre:

This project describes the application of a five-phase Six Sigma define, measure, analyze, improve, and control (DMAIC) approach to streamline patient discharge at Gulf Medical College Hospital & Research Centre. Within the context of the five phases, the tools which have been applied to make decisions are: Control Charts (Statistical Process control Charting, SPC) Process Mapping, Cause-and-Effect Matrices

Based on the data collected and analyzed, the interview sessions held with the care providers and the observations made during the study period various recommendations have been suggested. These can be used in the implement phase to collect baseline data after the recommendations are adopted to improve the discharge process

METHODOLOGY

Key Research Question

What is the gap between the average discharge TAT and the benchmark time and the factors causing the gap?

Other Research Questions:

What are the key problem areas causing delay in discharge process?

What are the activities leading to wastes (of time and resources) in the process?

Will the application of the DMAIC approach help reduce the average discharge time and improve the discharge process in the inpatient department?

STUDY DESIGN

Study Type: The study was a cross-sectional analytical study conducted in all the in-patient wards of the hospital.

Study Period: The study was conducted in the hospital from 1st February, 2014 to 31st April, 2014

Sample Size: The study sample was categorized into 2 types, for primary data and secondary data respectively. For primary data was ??? of the entire sample population i.e. all the patients getting discharged from the hospital during the 2 months of data collection.

Inclusion Criteria: The sample size included all in-patient discharges, to estimate the average discharge time of the hospital. This average TAT could be used for comparative analysis with the benchmark time.

Exclusion Criteria: The discharges of patients admitted in day-care were not included in the sample population, as the procedure for admission and discharge of the day-care patients was different from those of the normal IPD patients with a stay of 1 day or more in the hospital.

Sampling Method: The sampling technique was Non-Probability Purposive Sampling.

STUDY PROCEDURE

The research applied the Six Sigma approach to improve the quality of process by:

- Identifying and removing the causes of defects (errors) and variation.
- Identifying and removing sources of waste within the process.
- Focusing on outputs that are critical to quality improvement of the process.

To accomplish the above mentioned objectives, the approach used in this study is DMAIC which is divided into five phases. DMAIC (Define, Measure, Analyze, Improve, and Control) refers to a data-driven life-cycle approach to Six Sigma projects for improving process; it is an essential part of a Six Sigma program.

DMAIC is an acronym for five interconnected phases: define measure, analyze, improve and control. The simplified definitions of each phase (Fig.1) are:

- Define by identifying, prioritizing and selecting the right process,
- Measure key process characteristics, the scope of parameters and their performances,
- Analyze by identifying key causes and process determinants,
- Improve by changing the process and optimizing performance,
- Control by sustaining the gain

DMAIC is an integral part of Six Sigma. It is systematic and fact based and provides a rigorous framework of results-oriented project management

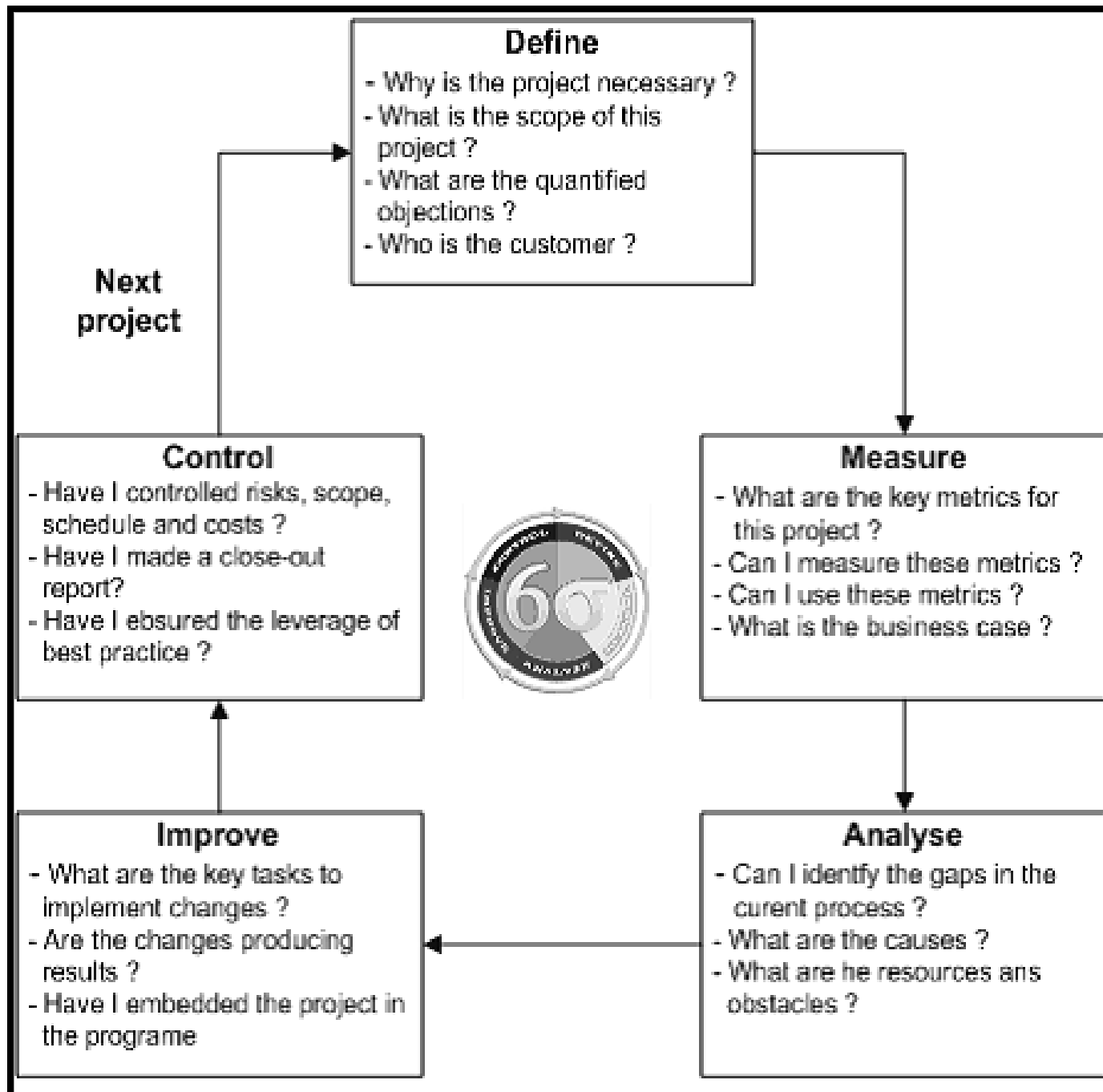


Figure.1

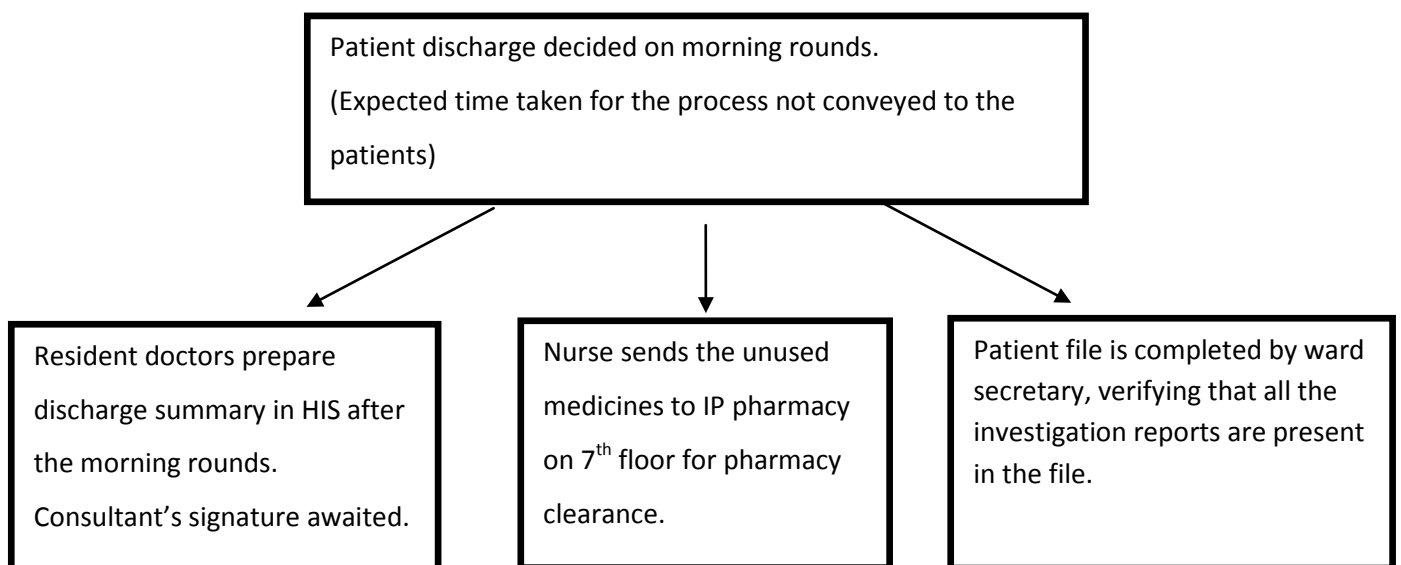
- **PHASE I – DEFINE**

The scope of the problem is defined. This phase aimed at describing the problem quantifiably and the underlying process to determine how performance will be measured. The process was documented to understand the current sub-processes involved in the discharge of a patient from the time when the doctor decides the patient should be discharged to the time when the patient leaves the room.

The tool used for defining the scope of the problem was **Process Mapping**. It is the technique used to follow the detailed flow of a product through a manufacturing cycle. A process map is a pictorial representation of the sequence of actions that comprise a process. The resulting process map depicts the inputs, the performers, the sequence of actions the performers take, and the outputs of a work process in a matrix or flowchart format, usually combining both words and simple graphics. Process mapping is typically conducted by a facilitator working with a small group of performers who are especially knowledgeable about the process. This group often includes the process owner, top performers, and representatives of each work group that participates in the process. The facilitator prompts the group to define the work groups involved, the process inputs and tasks, the sequence of tasks, the resulting outputs, and any other elements of importance.

These concepts of process mapping were applied to the discharge process and a road map was designed as follows:

DISCHARGE PROCESS



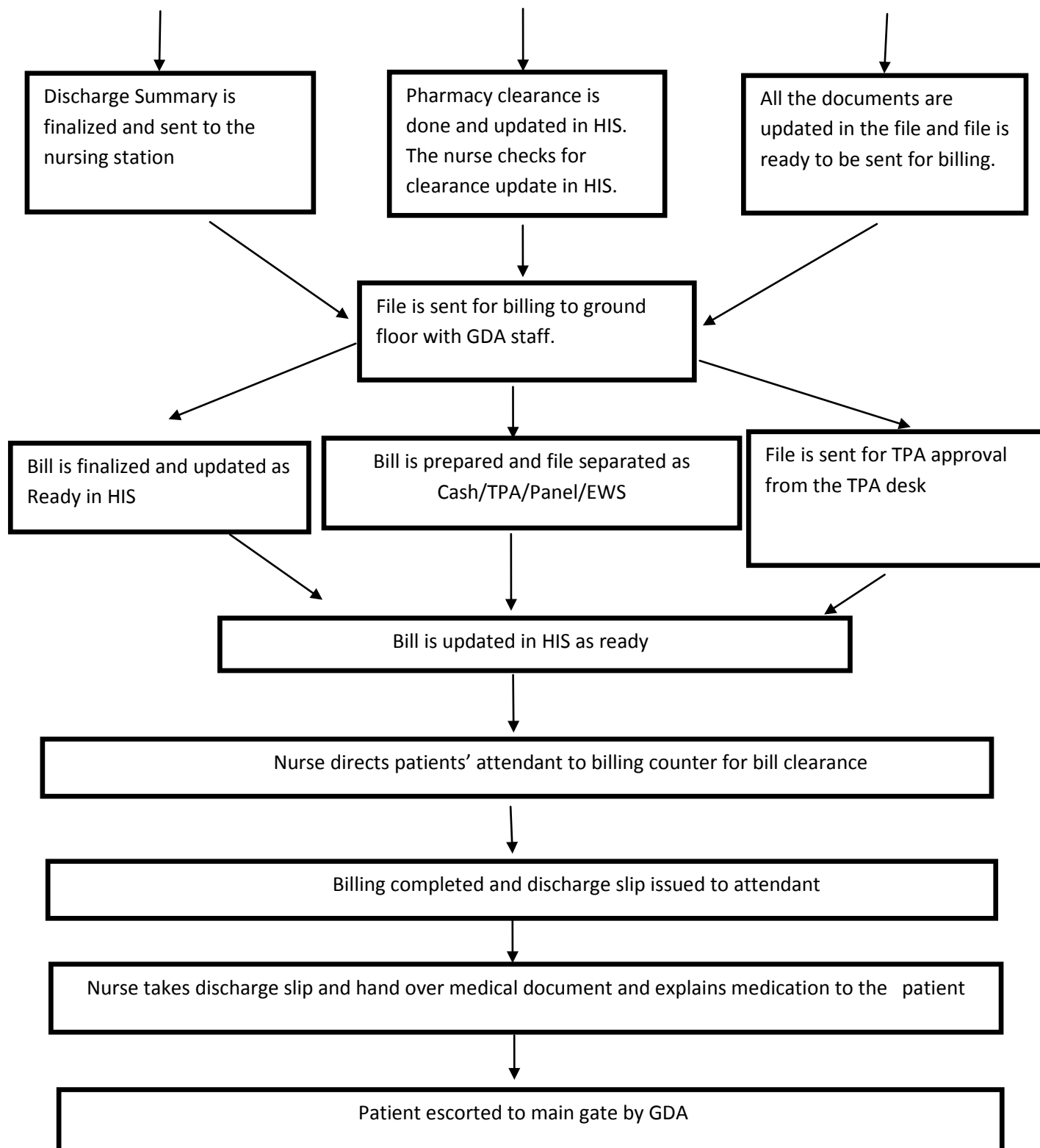


Figure.2

The above process map depicts that there are various phases or sub-processes involved in the discharge process. These sub-processes were described as follows:

- Discharge Summary Finalization: In the morning rounds by doctors' team, it is decided to discharge the patient and the same is informed to the assigned nurse. At the same time,

ward secretary responsible for the ward is informed to finalize the discharge summary in accordance with the doctor's notes mentioned in patient file. After the completion of the rounds, the resident in the team finalizes the tentative discharge summary made by the ward secretary. Then the summary is sent to the consultant for final approval and signatures.

- Pharmacy Clearance: Once the doctors on their rounds have informed the nurse regarding discharge of patient, the assigned nurse collects all the unused medicines from the patient bedside and puts the request for return in the HIS. The unused medicines are packed into one carrying bag and labeled with the patient label and sent to the IPD pharmacy on 7th floor with a GDA from the ward.
- File Preparation: The ward secretary or assigned nurse complete the files by attaching all the documents of investigation reports in the files.
- File Transportation: The file is sent to the billing department with a GDA from the ward.
- Bill Generation: The billing desk receives the file and bill is prepared. After initial bill preparation, the files are segregated based on the mode of payment into cash, TPA or panel. Then the files are sent to the respective desks for the different payment categories.
 - Cash Payment- The status in the HIS is updated as 'Bill Ready'.
 - TPA/Insurance Payment- The file is reviewed as per the initial approval given by the TPA and updated accordingly. The finalized documents are sent to the TPA through the internet for final approval.
 - Panel Payment- The file is reviewed as per the initial approval letter received from the panel and the 'bill ready' status updated.
- Bill Clearance: Once the status is updated as bill ready in the HIS, the patient is informed of the same and requested to clear the bills at the billing desk.
- Room Vacation: The patient is allowed to vacate the room after showing the final bill receipt at the nursing station. The i. v. cannula or any other insertion lines are removed by

the assigned nurse and home care is explained to the patient. Once the patient is ready to leave the room, the wheel chair is called for and the patient is left to the ground floor.

- **PHASE II – MEASURE**

This phase marked the **Data Collection Phase** for the study.

It aimed at measuring the problem; describe it with process and performance facts, data, and metrics. The investigator measures what characterizes the current problem, in terms of the defined process metrics/parameters. The objective of this phase is to establish the current state, or the “baseline” of the process before making any changes. The baseline becomes the standard against which any improvement after implementing the interventions will be measured. This is a key step as the data collected will be used throughout the life of the project.

The baseline of measurement was defined as the turn-around time for the entire discharge process starting from the time the physician decides that the patient can be discharged till the time the room was vacated by the patient. This time was defined as the Total Cycle Time. The benchmark time was taken as 45 minutes since this was the desired TAT for all discharges.

The other parameters or metrics taken for measurement of discharge TAT were defined after studying the process map which depicted the various sub-processes involved as follows:

- Total Cycle Time – It is defined as the time taken from the doctors’ decision of discharge to the time when the patient vacated the room and it is transferred to house-keeping department for preparation.
- Summary Finalization Time – is the time form the decision of the discharge by the doctors to the finalization and handing over of the summary at the nursing station.

- Pharmacy Clearance Time – is the time taken in the clearance of pharmacy. It was calculated from the time when the nurse had prepared the pharmacy return till the time when the clearance is done by pharmacy department in HIS.
- File Preparation Time – is the time from the discharge decision till the time when file is sent to the billing department. It is the time required in compiling the file, attaching all documents of investigation reports.
- File Transportation Time - is the time from the file ready to be sent to billing department till the time the file is received by the billing personnel.
- Bill Generation Time – is the time from the receiving of the file in billing section till the final bill is generated and updated in the HIS.
- Bill Clearance Time – is calculated from the time when the bill is updated as ready in the HIS till the time patient's attendant clear the bill and receive the final receipt.
- Room Vacation Time – is the time between the final bills receipt receiving till when the patient actually vacates the room.

DATA COLLECTION

Secondary Data:

Secondary data was collected for 5 parameters defined after identifying the sub-processes.

Source of Data: The data was collected from the HIS on daily basis and compiled using Microsoft Excel to calculate the average TAT for the five parameters as follows:

Average TAT for CASH Payments			
Measurement Parameters	Average TAT for Month of February	Average TAT for Month of March	Mean TAT
Total Cycle Time	5:17	5:17	5:17
File Preparation Time	0:48	0:45	0:47
Bill Generation Time	1:21	1:24	1:23
Bill Clearance Time	1:09	1:07	1:08
Room Vacation Time	1:51	1:53	1:52

Table

Average TAT for TPA Payments			
Measurement Parameters	Average TAT for Month of February	Average TAT for Month of March	Mean TAT
Total Cycle Time	6:47	7:06	6:57
File Preparation Time	0:49	0:46	0:48
Bill Generation Time	3:36	3:55	3:45
Bill Clearance Time	0:42	0:40	0:41
Room Vacation Time	1:43	1:45	1:44

Table 2

Average TAT for PANEL Payments			
Measurement Parameters	Average TAT for Month of February	Average TAT for Month of March	Mean TAT
Total Cycle Time	4:42	4:44	4:43
File Preparation Time	0:53	0:52	0:52
Bill Generation Time	0:51	0:57	0:54
Bill Clearance Time	1:09	1:04	1:07
Room Vacation Time	1:49	1:53	1:51

Table 3

Primary Data:

The primary data was collected for 3 parameters – Summary Finalization Time, Pharmacy Clearance Time and File Transportation Time, for a sample of 120 patient discharges from 2 out of all the IPD floors, as per convenience sampling technique. The investigator recorded the start time and the end time of every sub process for the daily discharges.

Methodology: Observation by the investigator was the method used for collection of the primary data.

The consolidated average times in the primary data are:

Average TAT			
Measurement Parameters	Average TAT for Month of February	Average TAT for Month of March	Mean TAT

Summary Finalization Time	1:12	1:33	1:23
Pharmacy Clearance Time	0:20	0:25	0:22
File Transportation Time	0:18	0:23	0:20

Table 4

• **PHASE III – ANALYZE**

The phase aims at analyzing the current performance to isolate the problem. Through analysis (both statistical and qualitatively), the root cause of the problem is formulated. Analysis was done in three steps:

1. Calculating the percentages of discharges those were within the benchmark TAT of 45 minutes.
Percentages of discharges were categorized according to the mode of payment as – Cash, Insurance (TPA) and Panel.
2. Cause and Effect Analysis was done using the concept of Cause and Effect Diagram.
3. Analysis of the Mean Cycle Time for each parameter to rate the problem areas as per their contribution to the total cycle time.

I. Calculating the Percentages of Discharges

MONTH OF FEBRUARY

Mode of Payment	Percentages of Discharges in Time Ranges			
	Within 45 mins	Within 45 - 90 mins	Within 90 - 180 mins	Beyond 180 mins
OVERALL	0.51	2.35	19.60	77.53
CASH	0.25	5.16	29.48	65.11
PANEL	0.17	3.40	21.60	74.83
TPA	0.23	0.00	4.61	95.16

Table 5

It is inferred from the above data that in the month of February, the percentage of discharges completing within 45 minutes was only 0.5%. Maximum discharges, 77.5% were completed beyond 180 minutes.

Amongst the various categories of payment mode, the maximum time taken for discharge was in case of the insurance payments, considered in the study as TPA category. 95% of the TPA discharges took more than 180 minutes.

The same has been depicted by the graph below

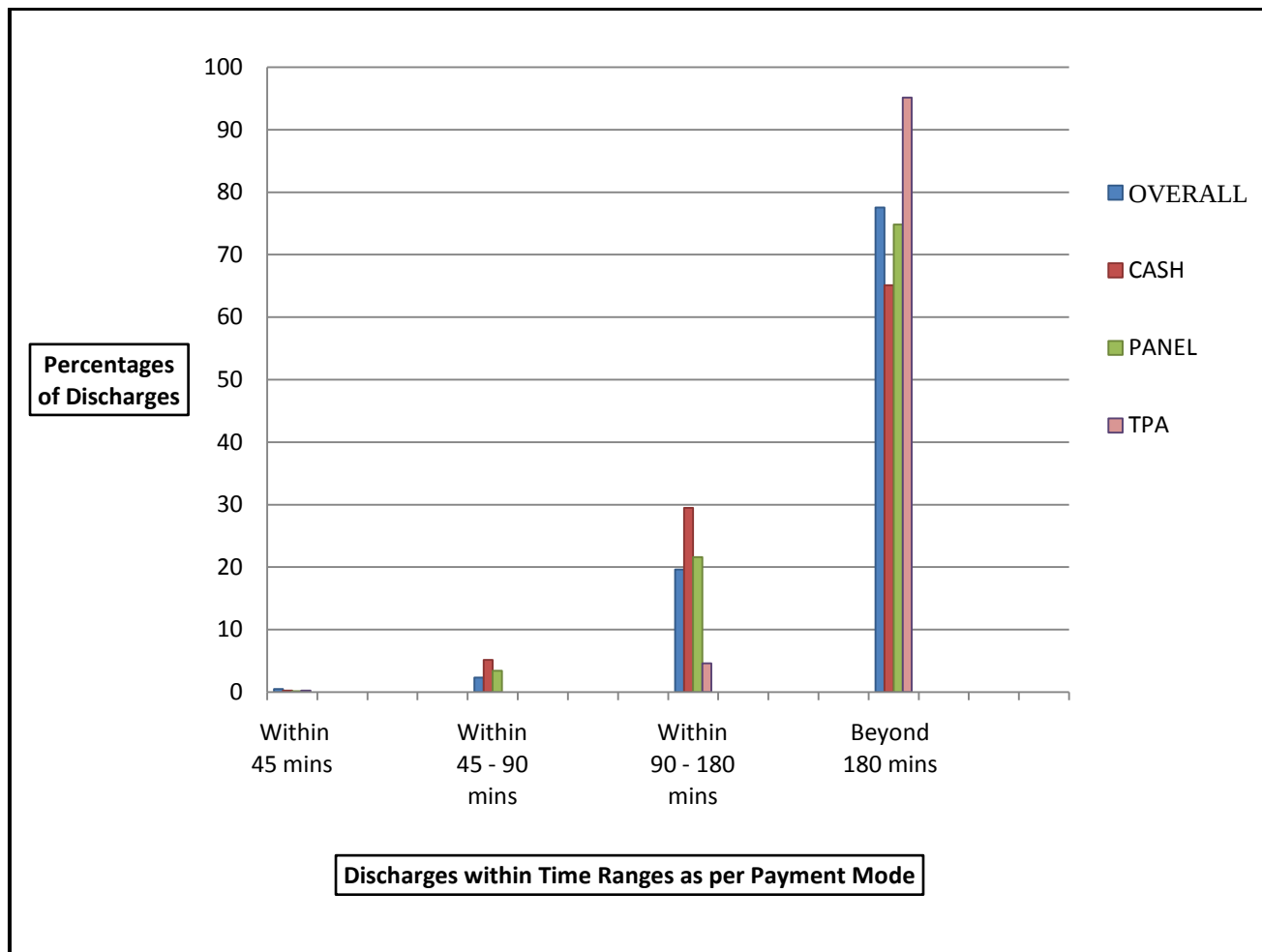


Figure.3

MONTH OF MARCH

Mode of Payment	Percentages of Discharges in Time Ranges			
	Within 45 mins	Within 45 - 90 mins	Within 90 - 180 mins	Beyond 180 mins
OVERALL	0.15	2.61	17.14	80.09
CASH	0.77	5.36	31.80	62.07
PANEL	0.00	3.03	23.29	73.68
TPA	0.00	0.45	5.43	94.12

Table 6

As per the above data, in the month of March, the discharges completing within the benchmark time of 45 minutes was only 0.15%, near to negligible. Maximum percentage of discharges (80% of the overall discharges irrespective of payment mode) took more than 180 minutes.

Amongst the various categories of payment mode, the maximum time taken for discharge was in case of the insurance payments, considered in the study as TPA category. 94% of the TPA discharges took more than 180 minutes.

The same has been depicted by the graph below.

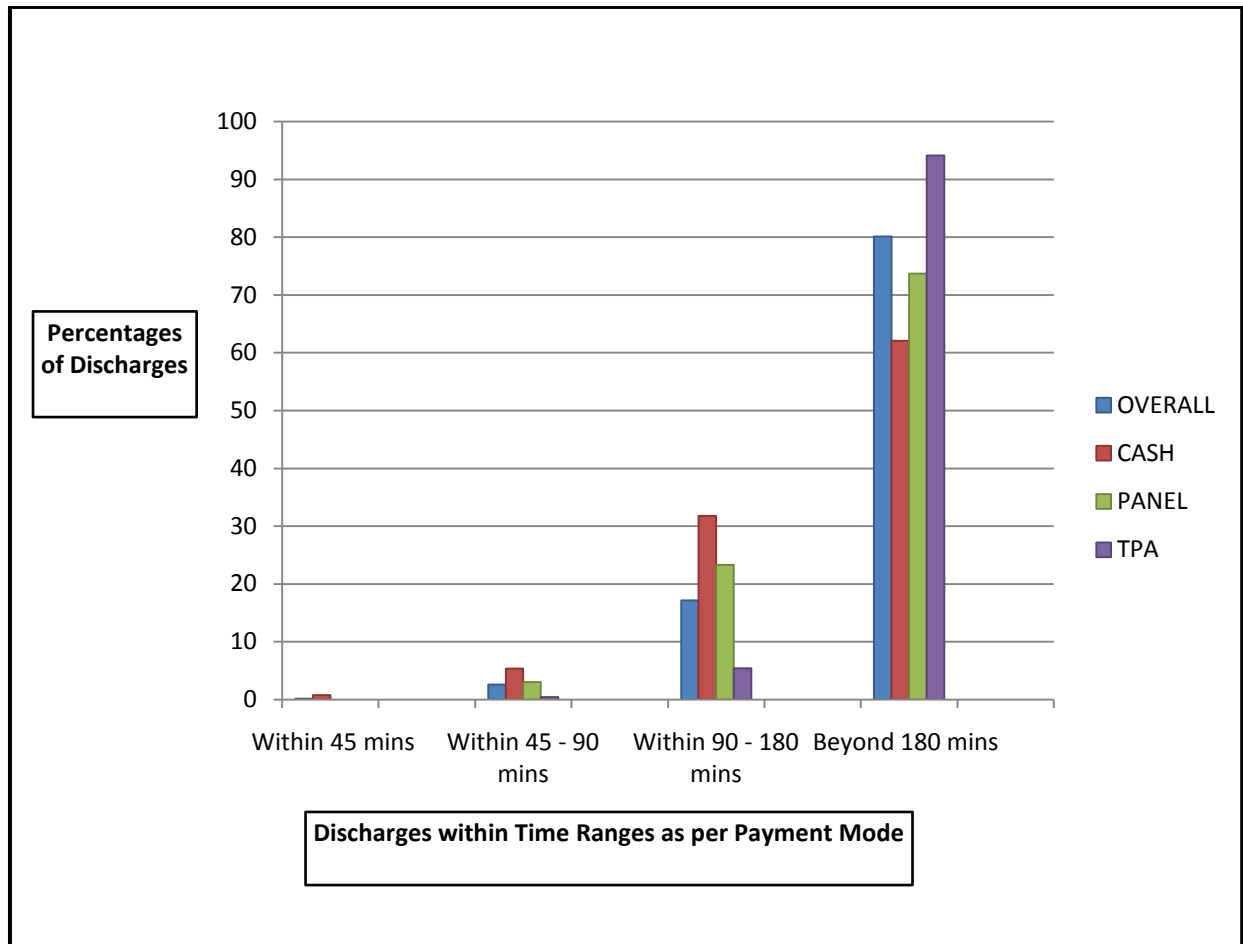


Figure.4

II. CAUSE AND EFFECT ANALYSIS

A Cause-and-Effect Diagram is a tool that helps identify, sort, and display possible causes of a specific problem or quality characteristic. It graphically illustrates the relationship between a given outcome and all the factors that influence the outcome. This type of diagram is sometimes called an "Ishikawa diagram" because it was invented by Kaoru Ishikawa, or a "fishbone diagram" because of the way it looks. A Cause-and-Effect Diagram is a tool that is useful for identifying and organizing the known or possible causes of quality, or the lack of it. The structure provided by the diagram helps team members think in a very systematic way. Some of the benefits of constructing a Cause-and-Effect Diagram are:

- Helps determine the root causes of a problem or quality characteristic using a structured approach.
- Encourages group participation and utilizes group knowledge of the process.
- Uses an orderly, easy-to-read format to diagram cause-and-effect relationships.
- Indicates possible causes of variation in a process.
- Increases knowledge of the process by helping everyone to learn more about the factors at work and how they relate.
- Identifies areas where data should be collected for further study.

In the context of the study, the cause and effect diagram was constructed after studying the mean time for the sub-processes that were calculated in the Measure Phase of the study and investigator's observation.

The diagram was constructed in the following steps:

- The outcome or EFFECT to be analyzed was identified as the Delay in Discharge Process.
- The main CAUSES contributing to the effect being studied were established. These formed the labels for the major branches of the diagram and became categories under which to list the many causes related to those categories. For each major branch, identify other specific factors which may be the CAUSES of the EFFECT.
- For each major branch, other specific factors which may be the CAUSES of the EFFECT were identified.

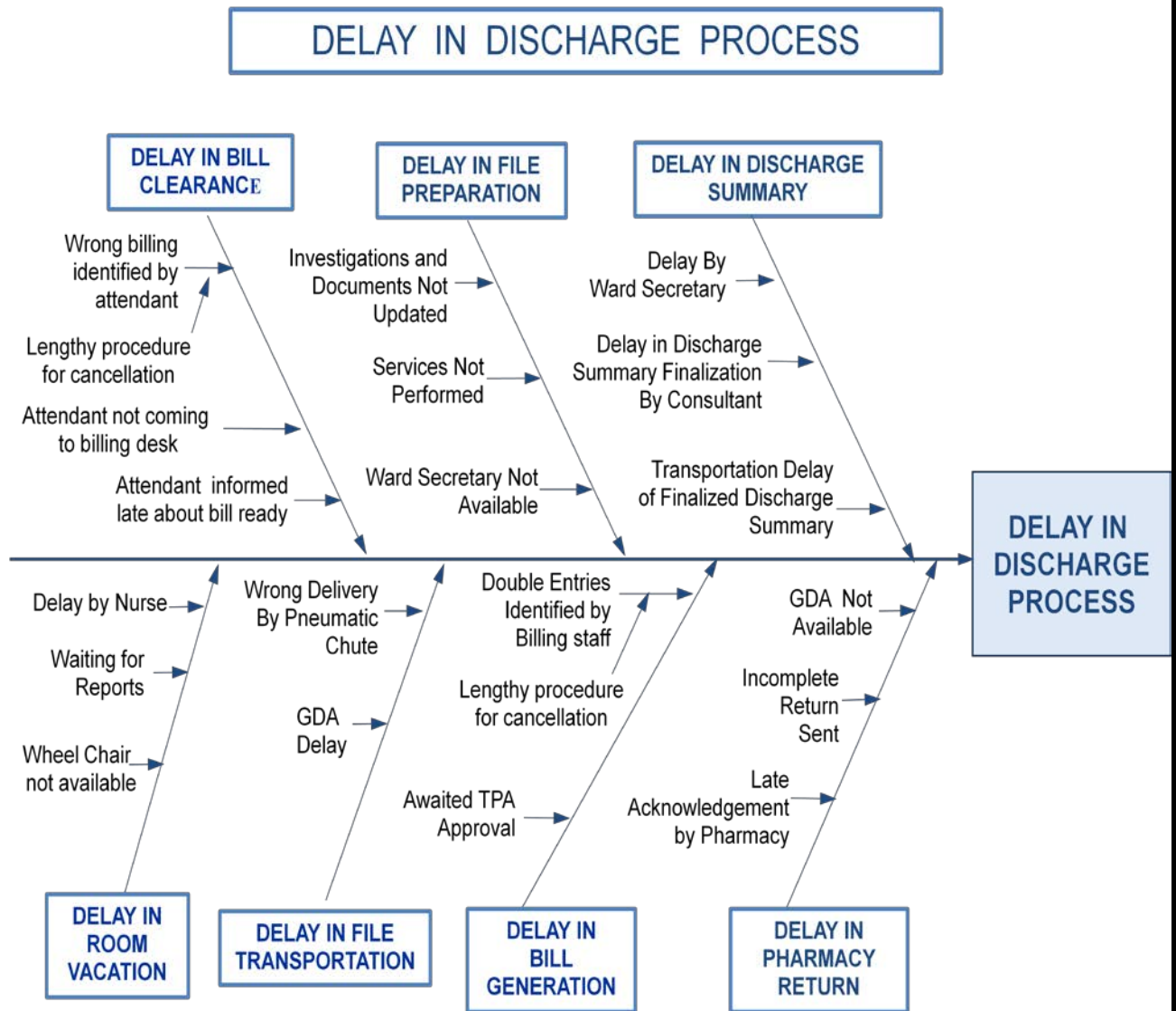


Figure 5

From the above diagram, it was concluded that the following were the major causes of delay in the discharge process:

- Delay in Discharge Summary: This cause could be further an effect of one or more of the following causes:
 - Delay by Ward Secretary - in completing the tentative discharge summary, after the decision of discharge by the doctors on morning rounds.
 - Delay by Consultant – in finalizing the summary made by the resident and the ward secretary, due to being occupied in the morning rounds of patient rooms.

- Delay in Transporting Finalized Discharge Summary – After the discharge summary is finalized by the consultant, the delay is caused due to non-availability of GDA to transport the summary to the nursing station.

➤ Delay in Pharmacy Return: The sub-causes of this effect could be :

- GDA not available to transport the unused medicines of the patient from the ward to the IPD pharmacy for clearance.
- Incomplete Return Sent by the nurse and is not accepted in the pharmacy.
- Pharmacy department taking too long time in acknowledging the return sent from the ward and updating the clearance in the HIS.

➤ Delay in File Preparation: was an effect of the following causes:

Ward Secretary not available in the ward.

Documents in the file not updated in routine. All the reports updated in the file at the time of discharge preparation. At that time, if the printer is not free or not working, it causes delay in preparing the file to be sent for billing.

Services not performed are not checked by the nurse or ward secretary routinely. Thus at the time of discharge, the services not performed have to be cancelled, leading to a delay in sending the file as the HIS does not accept the status of Sent for Billing, until all services are cleared.

The further cause of this effect is that the procedure for cancellation of services is a lengthy one and requires manual transportation of the cancellation forms.

➤ Delay in Bill Generation: was caused by the following:

- Wrong or duplicate entries of investigations done in HIS from the ward during the stay of the patient identified by the billing staff, take a long time to be cancelled from the HIS.
 - Approval of insurance payments by the Third Party Administrator (TPA) takes long time, specially if there is some query from the insurance company regarding the treatment of the patient.
- Delay in Bill Clearance: The sub-causes for this effect were:
- Wrong billing identified by the attendant at the time of bill clearance, as the detailed provisional bill is given to the attendant prior o the final payment. this further leads to confirmation of the doubts in billing regarding wrong entries from the ward and cancellation of services, if any is wrongly charged in the bill.
 - Delay in informing the attendant to clear the bills at the billing desk.
 - Delay caused by the attendant in reaching the billing desk for bill clearance due to delay in arranging money or waiting for relatives.
- Delay in Room Vacation: was an effect of the following causes:
- Delay by nurse in removing the cannula or doing dressing before relieving the patient and explaining the summary to the patient.
 - Delay in availability of wheel chair to transport the patient from the ward to the hospital exit.
 - Wait for pending investigation reports that need to be given to the patient.

III. Analysis of the Percentage contribution of various Mean Cycle Times of the sub processes to the discharge process.

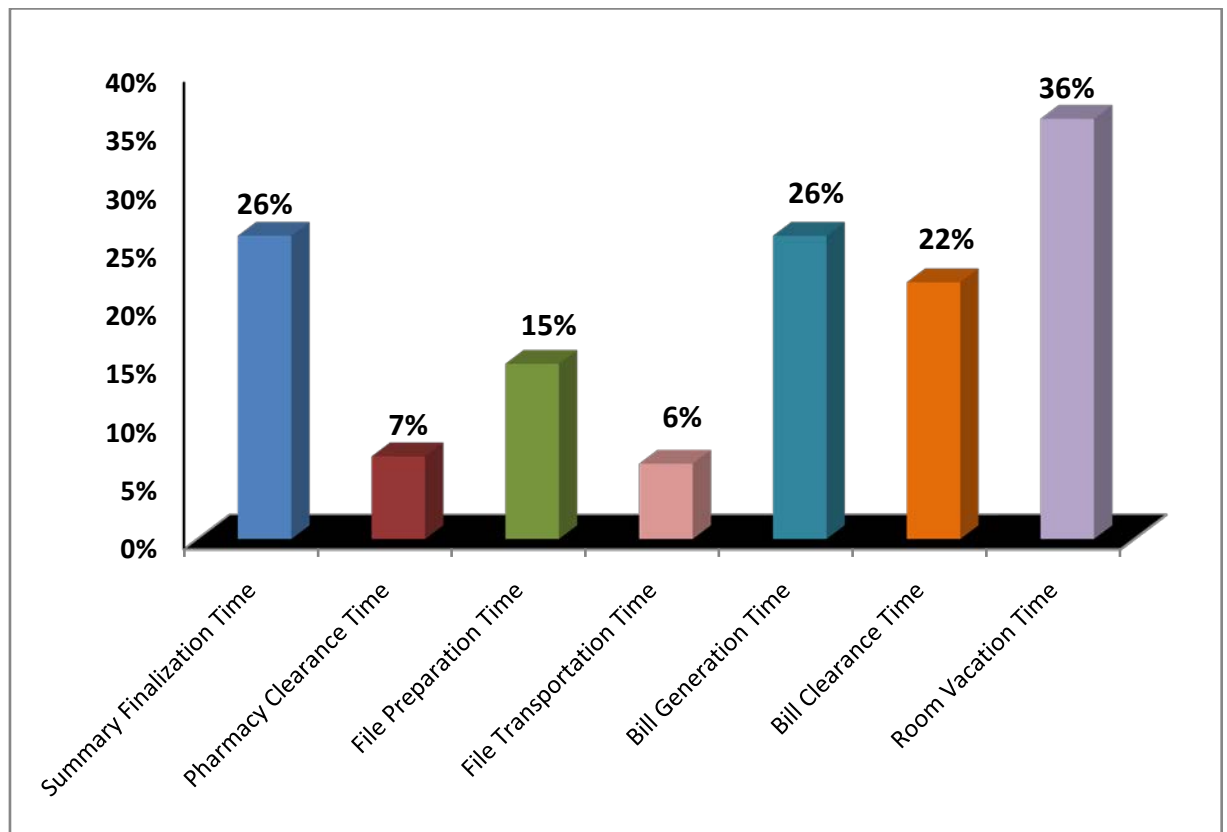


Figure 6

The above graph depicts that a major percentage (36%) of the total cycle time is constituted by the time taken by patient to vacate the room after the bill clearance has been done.

The next is discharge summary finalization which constitutes a significantly large percentage (26%) of the total cycle time.

For all the causes identified in the diagram, the sub-causes were divided into 2 categories:

- **Uncontrolled factors** – are the causes that are not controllable by interventions and are dependent on the situation or the external factors.
- **Controlled factors** – are those which can be controlled by introducing interventions as these are independent of the external factors.

The area of interest for carrying the study forward were the **Controlled factors**, as these are dependent only on the internal environment and customers, that can be modified. These were identified as the Problem Statements for the next phase of the study where interventions were to be designed.

1. **Problem Statement 1: Delay in Discharge Summary**

- Delay by Consultant
- Delay in Transporting Finalized Discharge Summary

2. **Problem Statement 2: Delay in Pharmacy Return**

- Incomplete Return Sent
- Late acknowledgment by Pharmacy Department

3. **Problem Statement 3: Delay in File Preparation**

- Documents in the file not updated in routine
- Services not performed not checked in routine

4. **Problem Statement 4 : Delay in Bill Generation**

Wrong or duplicate entries of investigations done in HIS

5. **Problem Statement 5 : Delay in Bill Clearance**

Wrong billing identified by the attendant at the time of bill clearance

Delay in informing the attendant to clear the bills

• **PHASE IV – IMPROVE**

In the improve phase, the results of the analyze phase are used to make tentative design change recommendations. These recommendations are then piloted, confirmed, and institutionalized in the control phase. The factors identified in the analyze phase are considered for improvements and brainstorming was done to find solutions to the problem statements that were the major controlled causes of delay in discharge.

1. **Problem Statement 1: Delay in Discharge Summary**

- Prior to the intervention the doctors went on rounds and after examination of the patient if the patient was fit for discharge, the nurses were informed the same and the discharge summary was prepared.
- The bottleneck in the process was once the discharge summary was prepared the doctors were not available for signing it off, which resulted in long waiting times.

- **Recommendation:**

The discharge summary should be updated a day prior to the expected date by the resident doctor and ward secretary, such that when the doctors go on rounds they are able to complete the process of discharge summary and sign it at the nursing station, immediately after the rounds. Also the recommendation of Computer On Wheels (COW) was put forward, such that the doctors on their morning rounds can update and sign the summary within the patient room.

2. **Problem Statement 2: Delay in Pharmacy Return**

- **Incomplete Return Sent** – After the assigned nurse has finalized the pharmacy to be returned, the in charge should counter check and signs the return material. This will decrease the waste of time in returning the medicines several times, due to minor errors such as counting.
- **Late acknowledgment by Pharmacy Department** – The recommendation is to introduce a different-colored flash should appear against the patient's name whose pharmacy return is entered in the system and the same should repeat when the pharmacy clearance is done.

3. **Problem Statement 3: Delay in File Preparation**

Documents in the file not updated in routine

Services not performed were not checked in routine

Recommendation

For the above stated problems, the recommendation of daily updating the services not performed by the assigned nurse and processing the cancellation was put forward. The documents were recommended to be updated in the files on daily basis by the ward secretary.

4. **Problem Statement 4 : Delay in Bill Generation**

Wrong or duplicate entries of investigations done in HIS.

Recommendation

The ward secretary should check for any duplication in the entries of investigations while updating the reports in the files. If any duplication is found, the same should be informed to the assigned nurse, who in turn would initiate the process of cancellation on the same day or next day, after the wrong entry has been done.

5. **Problem Statement 5 : Delay in Bill Clearance**

- Wrong billing identified by the attendant at the time of bill clearance
- **Recommendation**

The attendant should be provided with a printed provisional bill a day prior to the expected date of discharge, so that the verifications at the consumer's end are done and any corrections to be done can be completed before the time for final bill clearance.

- Delay in informing the attendant to clear the bills
- **Recommendation**

The recommendation of intervention by IT department was put forward, such that there could be a colored flash against the patient's name as soon as the bill is updated to be

ready in HIS. This will help the nursing staff to identify the patient whose bills are ready, so that the same can be communicated to the attendant without any delay.

- **PHASE V – CONTROL**

In the control phase the interventions suggested as recommendations in the improve phase can be applied to the existing process. Control phase focuses on the measurement of improvement after the interventions are applied. The same parameters should be recorded and analyzed to find the level of improvement with the interventions done.

This phase also monitors the continuous implication of the interventions for quality improvement of the discharge process.

In this study, the control phase could not be carried out due to the time limitation.

CONCLUSION

The study was conducted in a super specialty hospital to improve the discharge process using the DMAIC approach of Six Sigma. The first 5 phases of DMAIC were successfully completed and several tool such as process mapping and cause and effect analysis were used. The aim of using the six sigma approach was to streamline the discharge process.

The first phase of the study defined the problem by constructing a Process Map, which helped understand the various sub-processes involved in the discharge process. In the second phase, the cycle time for each sub-process was calculated as defined parameters. In the third phase, analysis was done for the total cycle time taken, divided on the basis of the various modes of payment during the discharge. From the percentages calculated, the controlled and uncontrolled factors were identified as problem statements. In the fourth phase, solutions to the defined problems were designed and interventions were recommended.

Due to the limitation of time, the interventions could not be measured or monitored as part of the control phase.

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