Analysis of pain areas in Radiology Services

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Introduction

- As an integral part of hospital, radiology services are availed by all clinical departments of the hospital.
- As it is a frequently availed services, very often it is observed that the rush and crowd in the department reaches an unmanageable level during peak hours.

- Such situations has led to potential opportunity losses. Such as delayed service leading to refund, unhappy customers and other clinicians.
- The data pertaining to this is explained in further slides.

- These circumstances calls for action to improve the processes within the dept.

- Possible improvement scenarios and lean initiatives are explained in the later part of the report.

Refunds due to delays and unhappy customers

MRI Cancellations at Radiology Department due to delay in providing services (past 1 month)

CANCELATION NO	PATIENT NAME	BILL DESC	BILL DT	Comments
BCAN00031579	VINOD.K	MRI PELVIS	06/09/2019	MRI NOT DONE
BCAN00031838	SARASU N	MRI FOOT	18/09/2019	TEST NOTDONE INFORMED BY SALINI ECHS STAFF
BCAN00031886	ASHIKE	MRI SHOULDER JOINT (SINGLE)	19/09/2019	PT NOT WILLING
BCAN00032019	BEERANKUTTY L	MRI LUMBAR SPINE SCREENING	25/09/2019	TEST NOT DONE
BCAN00032272	MARY THOMAS	MRI LUMBAR SPINE SCREENING	07/10/2019	TEST NOT DONE REFUND
BCAN00032314	PREMALATHA	MRI BRAIN SCREENING	09/10/2019	TEST NOT DONE
BCAN00032375	GOVINDAN KUTTY NAIR K	MRI LUMBAR SPINE	12/10/2019	SCAN NOT DONE REFUND BILL

Total No. of cancelled cases due to prolonged waiting time - 7

Ultrasound cancelations

USG Cancellations at Radiology Department due to delay in providing services (past 1 month)

CANCELATION NO	PATIENT NAME	BILL DESC	BILL DT	Comments
BCAN00031854	NITHYA DILEEP	USG - NECK/THYROID	18/09/2019	TEST NOT DONE
BCAN00031844	SINDHU V. V.	USG - NECK/THYROID	18/09/2019	dr refund
BCAN00031964	UMMER	USG - CAROTID DOPPLER	23/09/2019	TEST NOT DONE
BCAN00032020	SURYA C	USG - 2ND TRIMESTER ANOMALY SCAN	25/09/2019	REFUND THIS TEST
BCAN00032057	LINUMOL THOMAS	USG - TVS (TRANS VAGINAL)	26/09/2019	pt can't wait
BCAN00032066	DILNA E K	USG - WHOLE ABDOMEN/PELVIS/KUB	27/09/2019	USG NOT DONE
BCAN00032072	MAJEED.M	USG - WHOLE ABDOMEN/PELVIS/KUB	27/09/2019	TEST NOT DONE SO BILL CANCELLED
BCAN00032154	ROOPADEVI C H	USG - 1ST TRIMESTER (ROUTINE)	02/10/2019	REFUND
BCAN00032256	SALEENA A	USG - WHOLE ABDOMEN/PELVIS/KUB	07/10/2019	TEST NOT DONE
BCAN00032470	SHANIBA K.T.	USG - 1ST TRIMESTER (ROUTINE)	16/10/2019	PT CANT WILLING TO DO SCAN REFUND

Total No. of cancelled cases due to prolonged waiting time - 10

Call for action

- An on going lean six sigma project shows the patient pain points and the reasons for delay in the radiology department.

"LEAN SIX SIGMA APPROACH ON OPTIMIZATION OF RADIOLOGY SERVICES"

Project Title :
"LEAN SIX SIGMA APPROACH ON OPTIMIZATION OF RADIOLOGY SERVICES"

Aim
Implementation of Lean Six Sigma methodology for optimizing the process in the Radiology department.
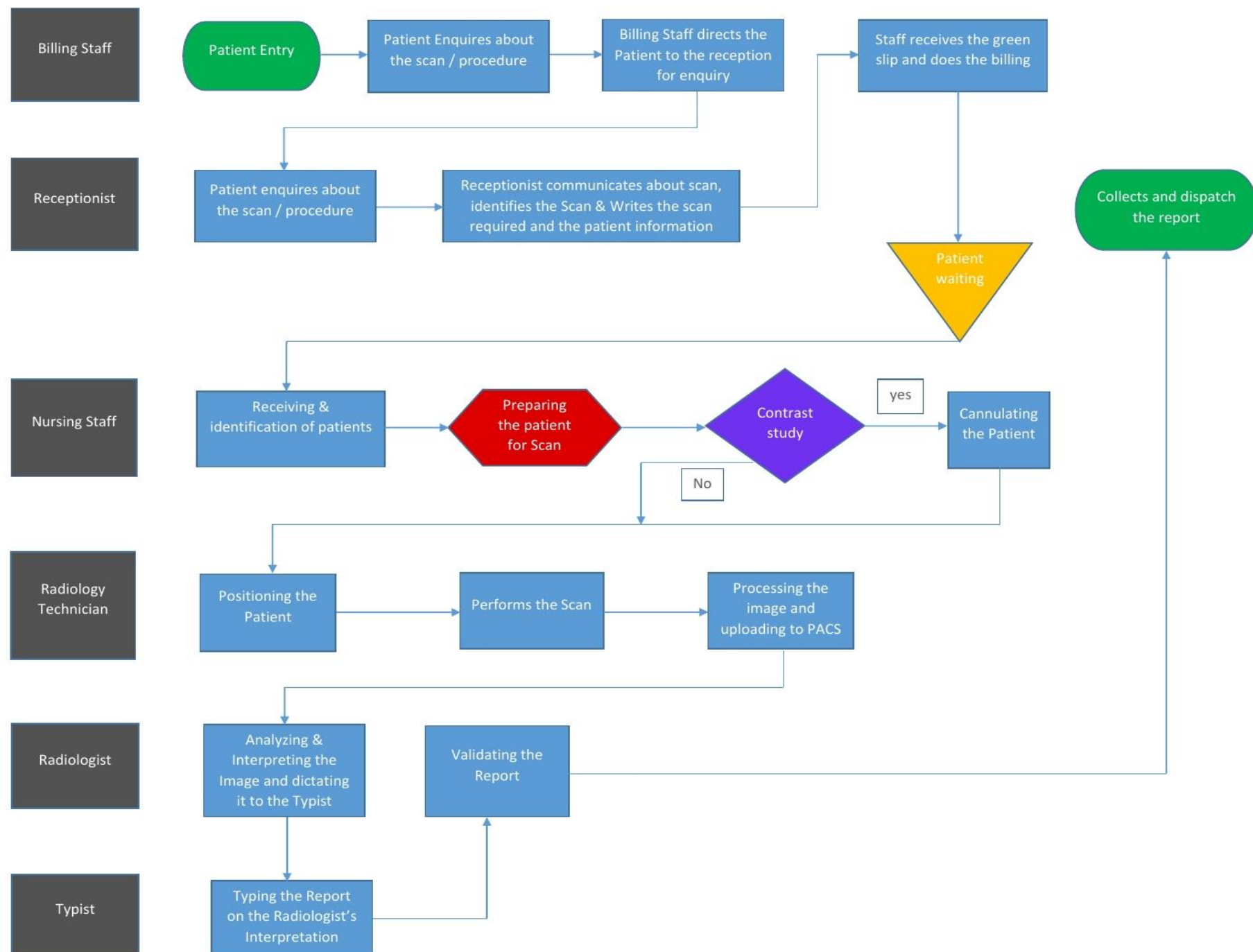
Objectives:
- Improving the workflow of the department
- Improve the accessibility of the procedures in MRI, CT Scan and USG
- Identify the root causes to address the problem
- Improve the utilization of MRI & CT

# Modality - MRI

Ideal Process Flowchart
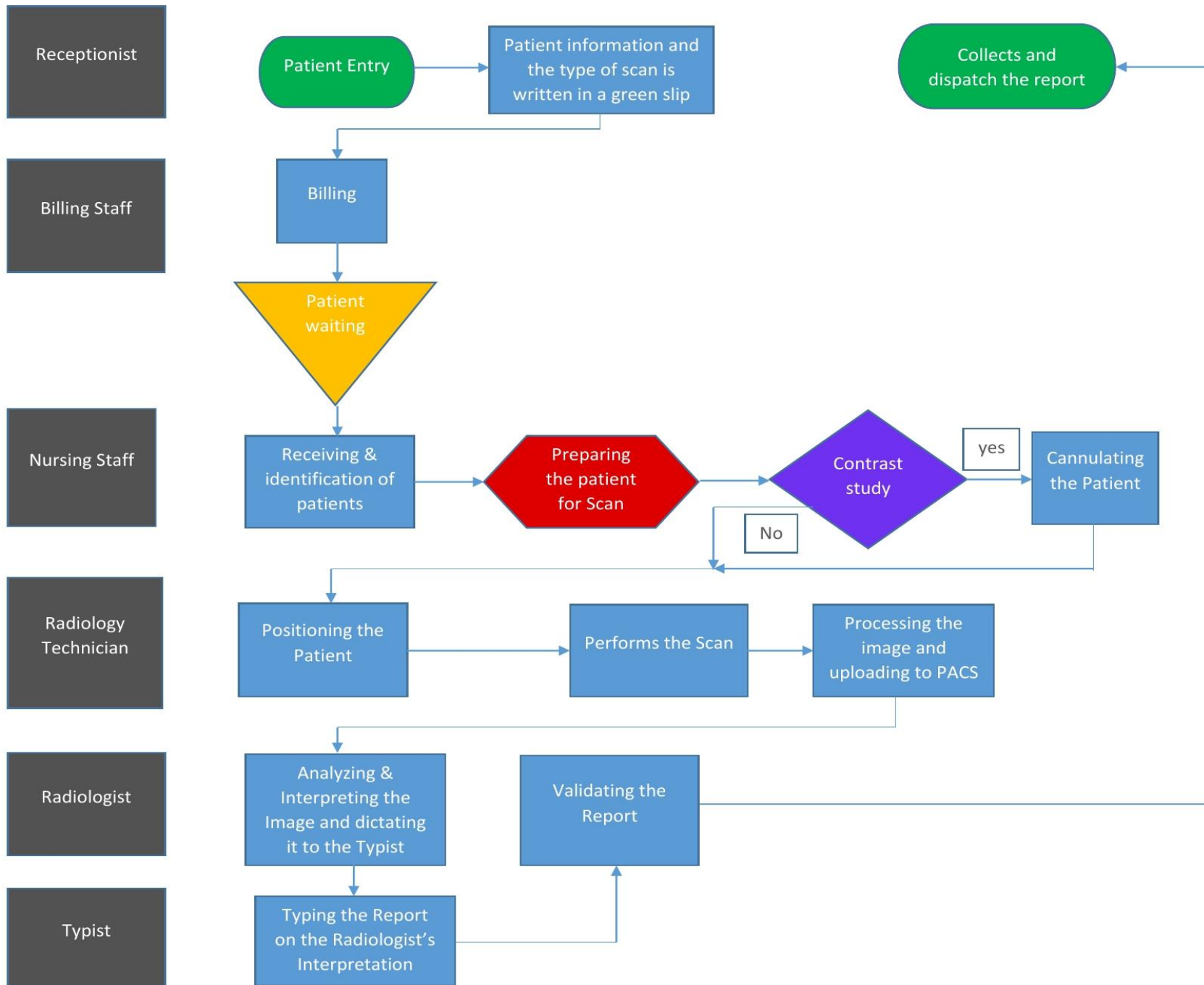
Observed Process Flow Chart

Observation from the process map

- It has been identified that the current process flow is deviating from the ideal process flow. Due to several factors patient/ patient party comes directly to the billing counter thinking that it is the reception and waits in que for the scan and queries.

- The billing staff directs the patient towards billing counter, from the reception patient queries are handled, radiology referral form is filled up, appointment time is given and the patient is sent for billing by giving a green slip containing patient information and billing code.

- The patient again has to come back to billing counter to get the billing done which is leading to confusion among the patients, unnecessary movements, crowding in the billing and reception area increased waiting time for billing etc.

Process Mapping
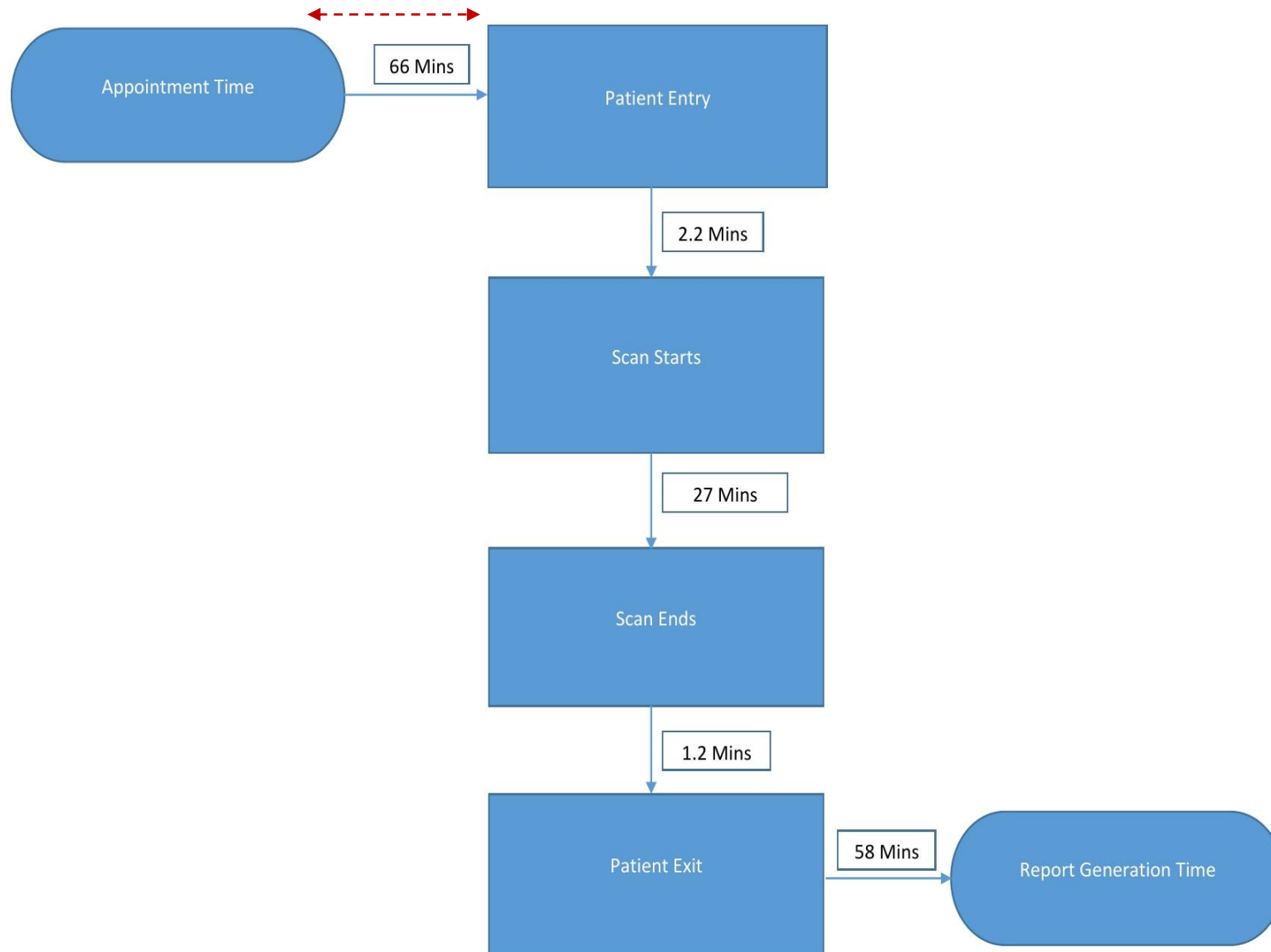
Operational Definition

Metric	Definition	Data collection source
Patient Waiting Time	The time between Appointment time and Patient entry to the Scan Room	Appointment Time- Radiology Referral Patient Entry – Direct Observation
Preparation Time	Time between Patient Entry and Scan Starting time.	Direct Observation
Scan Time	Time between the Starting and ending of the scan	Direct Observation
Patient leaving time	Time from scan ending to patient Leaving	Direct Observation
Report Turnaround Time	Time from Patient leaving to report validation	HIS

DATA EVALUATION

Average time taken in each step of the process:

- Waiting Time – **66 Minutes**

- Preparation time – 2.2 Minutes

- Scan Time – 27 Minutes

- patient leaving time – 1.2 Minutes

- Report Turnaround Time – 58 Minutes

❖ Since there is no benchmark waiting time set in the department, 20 minutes is taken as the criteria for maximum waiting time limit. All the cases having waiting time more than 20 minutes is considered as delay or the defect.

Project Charter

Project Title

"LEAN SIX SIGMA APPROACH ON OPTIMIZATION OF RADIOLOGY SERVICES"

Problem Statement

The pre – test patient waiting time in the ultrasound, MRI, CT Scan in Radiology Department of the Hospital was observed to be high which results in frequent customer agitation in the reception.

Rationale

Radiology department is one of the revenue generating areas in a hospital. The potential for additional revenue to the hospital comes with increasing patient capacity for these services, so all the bottle necks, errors and wasteful steps should be identified and eliminated for achieving maximum patient. Increased waiting time and report generation time will lead to decreased patient satisfaction.

Aim Statement

Optimizing the process in the Radiology department and thereby reducing the patient waiting time for CT, MRI Scan & Ultrasound Scans to 20 minutes.

Customer CTQ

Waiting Time – Appointment time given to time of patient entry to the scan room.

Scope

Patients coming to CT Scan, MRI, Ultrasound Scan.

Expected Outcomes

- Identifying the bottlenecks in the process.
- Streamlining the process in the Radiology department
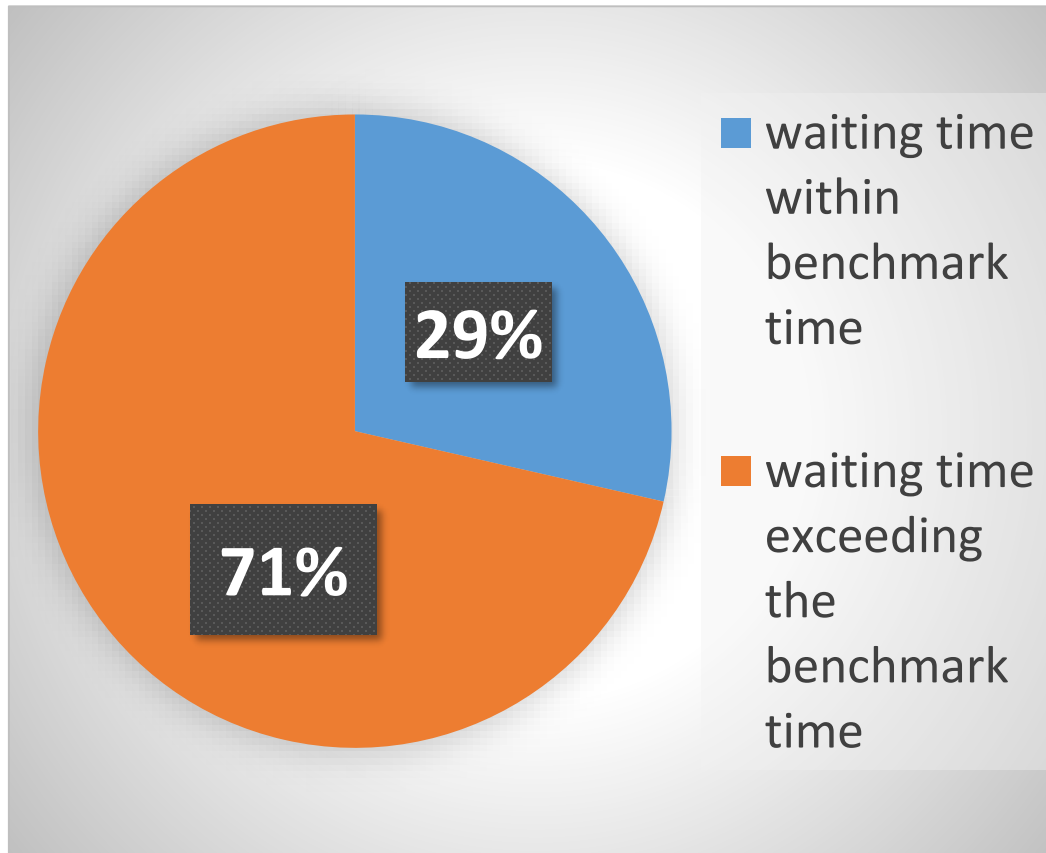- Reducing the patient waiting time to 20 minutes.

Stakeholders

Radiologists , Radiology Technicians , BSA Staffs, Nursing Staff , Operation Staffs
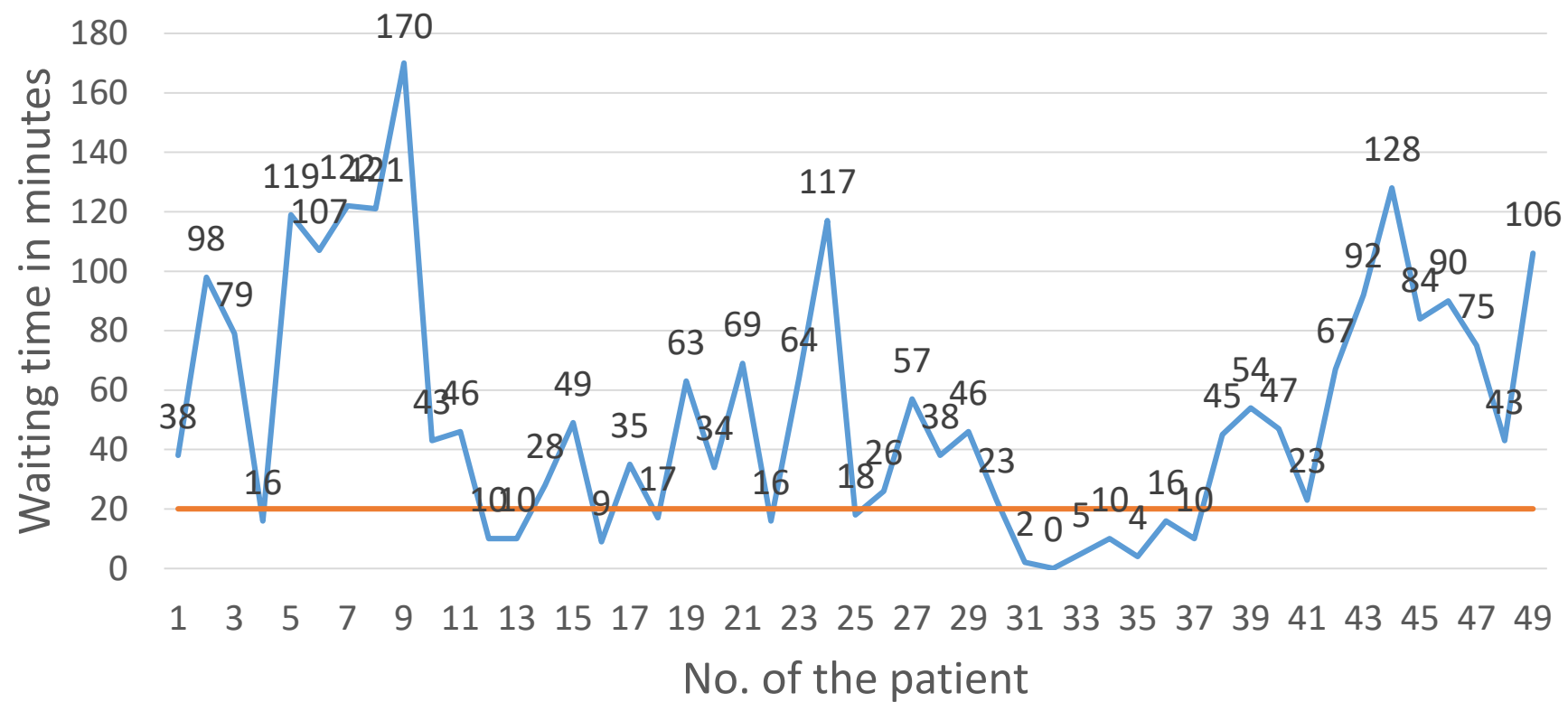
Plan

- Data Collection

- Process mapping

- Analysis

- Preparation of recommendation
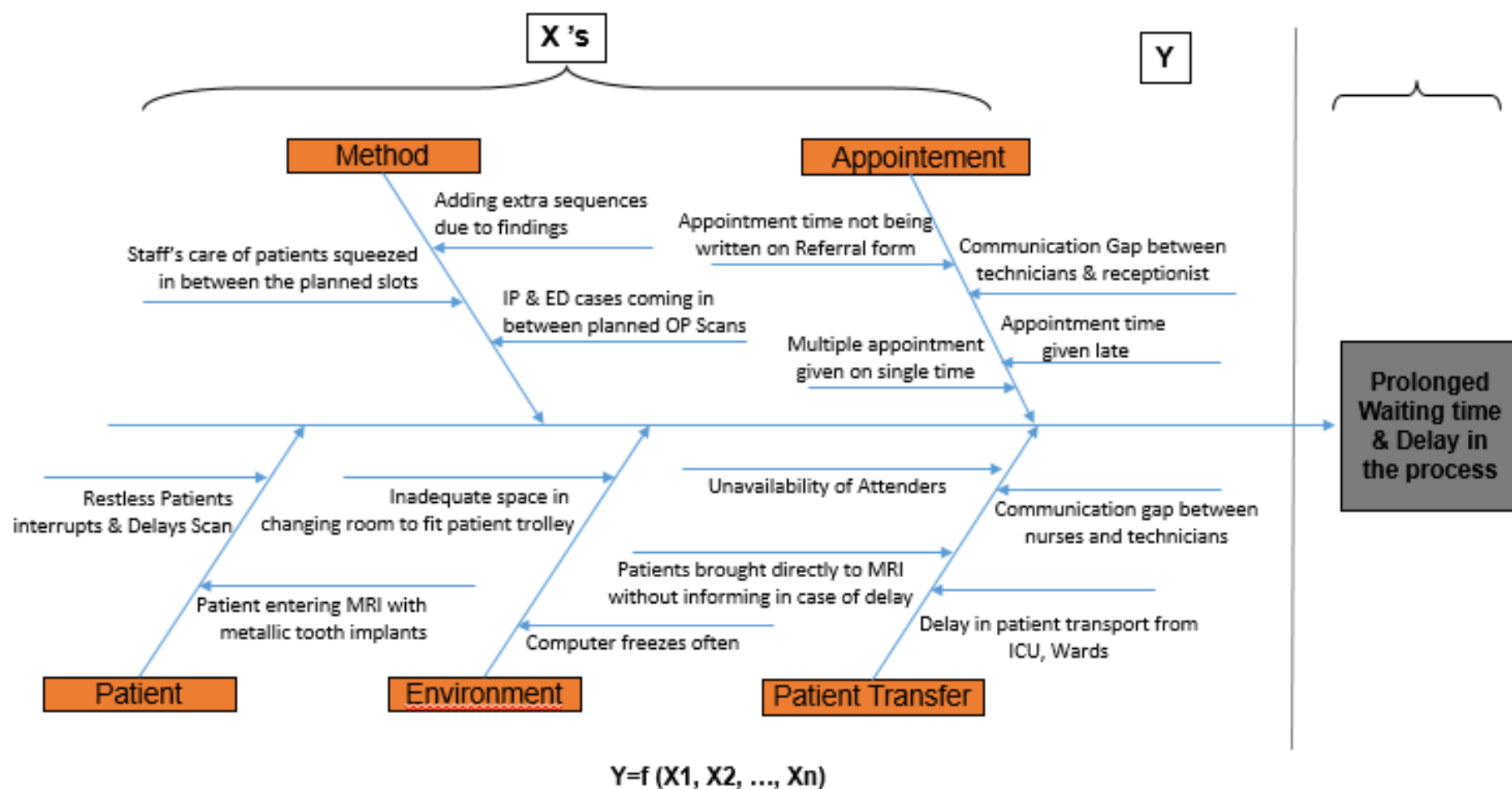
Graphical Analysis

After Evaluation of the data collected for MRI Scan,
It was observed that only 29% of the patients could get service within 20 minutes &
the remaining 71% had to wait more than 20 minutes to get the service.

Cause & Effect Diagram for MRI Scan Waiting time

X 's

Y

Method

Appointement

Adding extra sequences due to findings

Appointment time not being written on Referral form

Communication Gap between technicians & receptionist

Staff's care of patients squeezed in between the planned slots

IP & ED cases coming in between planned OP Scans

Appointment time given late

Multiple appointment given on single time

Prolonged Waiting time & Delay in the process

Restless Patients interrupts & Delays Scan

Inadequate space in changing room to fit patient trolley

Unavailability of Attenders

Communication gap between nurses and technicians

Patients brought directly to MRI without informing in case of delay

Patient entering MRI with metallic tooth implants

Computer freezes often

Delay in patient transport from ICU, Wards

Patient

Environment

Patient Transfer

Y=f (X1, X2, …, Xn)

Problems Identified

Appointment Related

- Appointment time given delayed than the actual time which increases the waiting time and restrict other scans from being performed.

- Multiple appointment given on a same time.

- Communication gap between the receptionists and the technician in deciding the appointment time for the patients.

- The appointment time is supposed to be written on the patient's Radiology Referral form, this is observed to be not happening in some of the cases which causes confusion to the technician in deciding which patient is to be taken in for the next case.

- The planned order is being altered due to confusion in taking patients for scan.

- Appointments are given prior to billing. If the patient doesn't turn up on that time and doesn't come back for scan it disturbs all other appointments after that.

Patient shifting Related

- Communication gap between Nurses and technicians on shifting the Inpatients from wards,ICU and ED. Confusion in the time of shifting the Inpatient.

- Delay in bringing Inpatients from the ward.

- Patients not being sent from the wards & ICU on the given time slot given by the technicians.

- If there is any delay in shifting the patients from the wards and ICU the nurses doesn't communicate with the technicians and bring the patients without informing which increases the waiting time.

- Unavailability of attenders for shifting the patients during the peak hours.

Safety Related

- Entry of patients to scanning room with hair clips ,pins, metallic implants(teeth).

Method Related

- Care of patients of staffs are being forced to push in between normal scheduled slots which increases the waiting time of other patients.

- IP and ED cases coming in the OPD timing (9am-6pm) increases the waiting time for OPD patients and restricts the number of OP Scans.

- Delays caused due to findings in the scan and adding extra sequences to the planned scan.

Infrastructure

- Trolley patients are brought from ICU, Wards to MRI without changing the dress to patient gown. The changing room in MRI is too small to occupy an inpatient bed/trolley because of it the changing happens in the corridor which can be covered by a curtain.
  This not only increases the waiting, delays the process but also can reduce the patient satisfaction
  because of lack of privacy.

Others

- In patients coming with ornaments and finding it difficult to remove from the corridor just before the scan which leads to cutting the ornament and delaying the scan.

- Restless Patients causing the delay or stopping of the scan in between.

- System lagging when sage and other software are opened at a time.
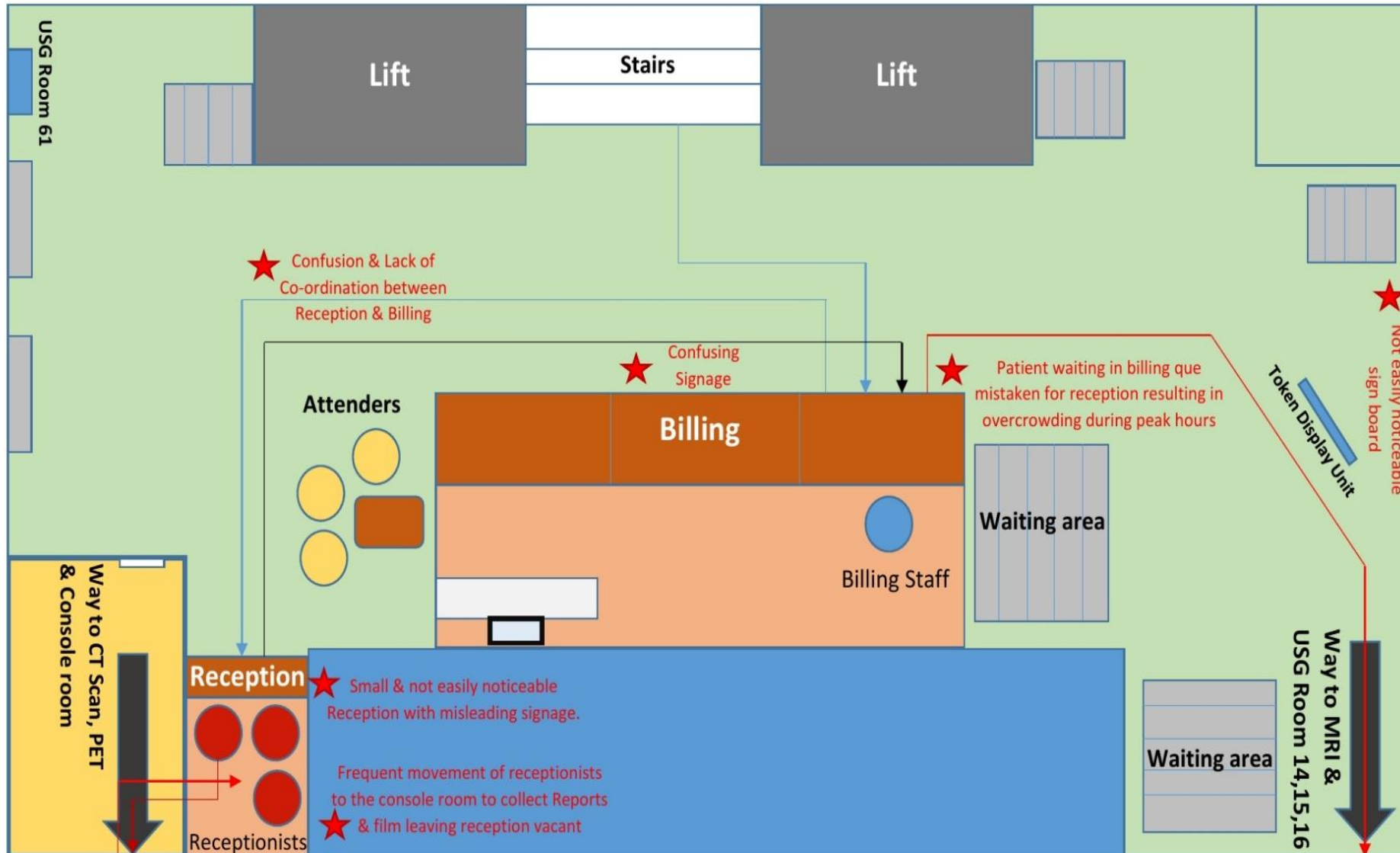
Pareto Analysis
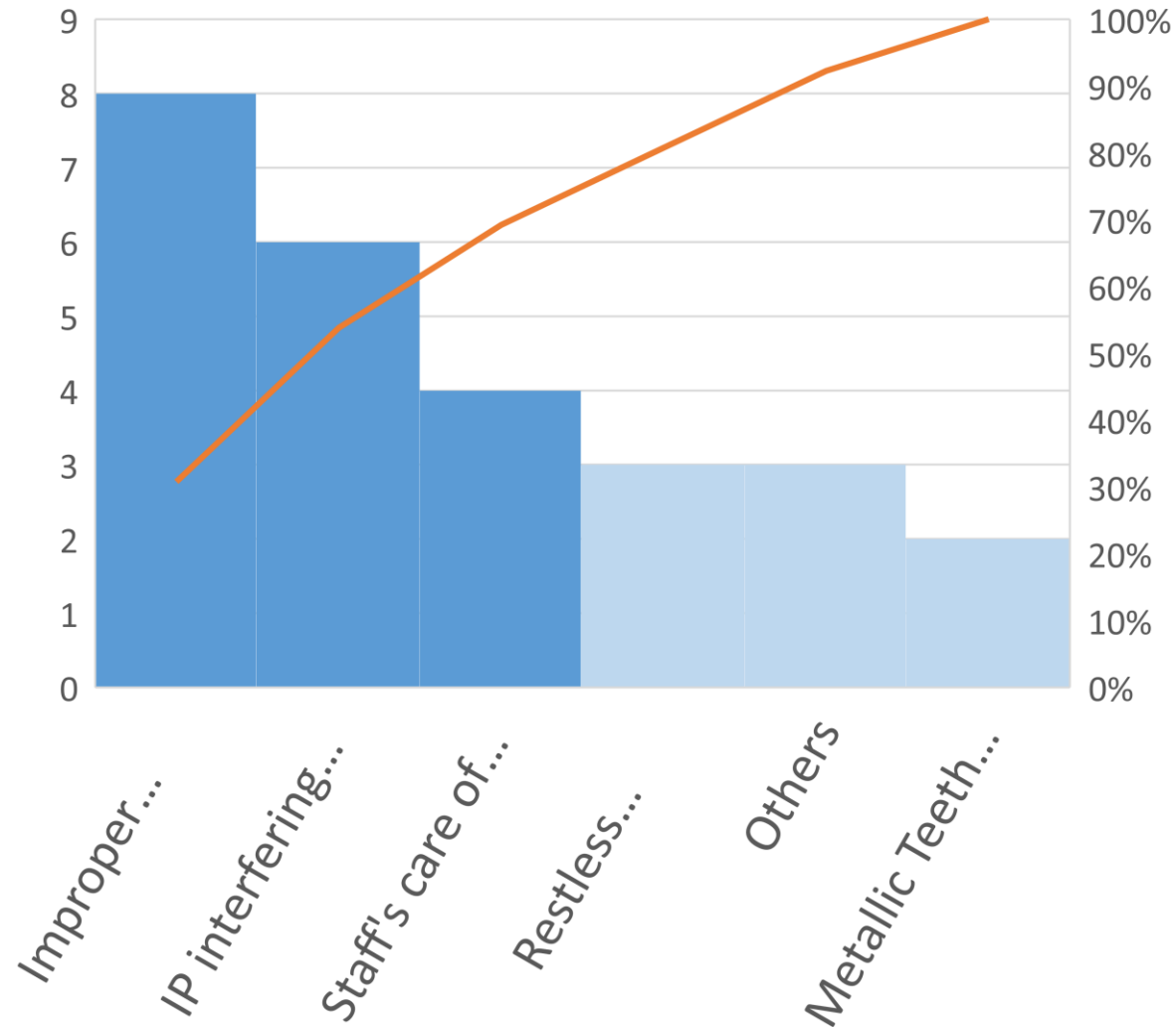
From the pareto analysis it has been identified that the major causes of delay are:

- **Improper Appointment**
- **IP interfering during OP hours**
- **Squeezing in staffs care of patients into the planned appointment slots**
- **And restless patients interrupting the scan**

1) Problems in Reception

Observations from tracking the patient transport in the billing area & reception:

- Wrong signage in large and eye – catching font labelled as Reception instead of billing.

- The Predominantly built large counter in the Center with 3 server areas is under utilized. The two available space for server is kept vacant and one in the corner is used as billing area.

- Radiology reception is small and interiorly placed and it is not easily noticeable.

- Misguiding and not easily noticeable signage is placed in front of the reception counter.

- Patient waiting in billing que mistaken for reception resulting in overcrowding during peak hours.

- Over crowding in the reception area due to lack of space.
- Reception counter often become vacant because of the frequent movement of receptionist to console room and billing area for collecting film and to collect report.
- Unwanted Movement of patients from billing area to reception counter and then again to the billing counter.
- Patients finding it difficult to find the way to the MRI Scan room due to not easily noticeable signage.
- Over processing of billing where waste of patient transport also comes in.

Lean wastes observed in the process

Sl. No	Waste	Definition	Observation
1	Transportation	Unnecessary movement of materials, information or equipment	• Unnecessary movement and waiting for the film and report
2	Over processing	Doing more than the customer is requiring Eg: deviation from standard work, unnecessary or cumbersome processes, extra steps outside of the process to protect quality of the part	• The procedure for billing is deviating from the ideal process flow. • Generation of billing code from the reception and getting the bill done at billing counter is an unnecessary step which makes the patient wait in three ques just for a billing.
3	Motion	Any movement by the people that is not of value to the customer	• Frequent movement of receptionists to the console room and doctors room to collect the report and the film.
4	Waiting	Waiting for information, equipment, materials, people	• Waiting for attenders to shift the patients especially from ICU, ED , Wards. • Waiting for the film to get printed by the receptionists.

Solution
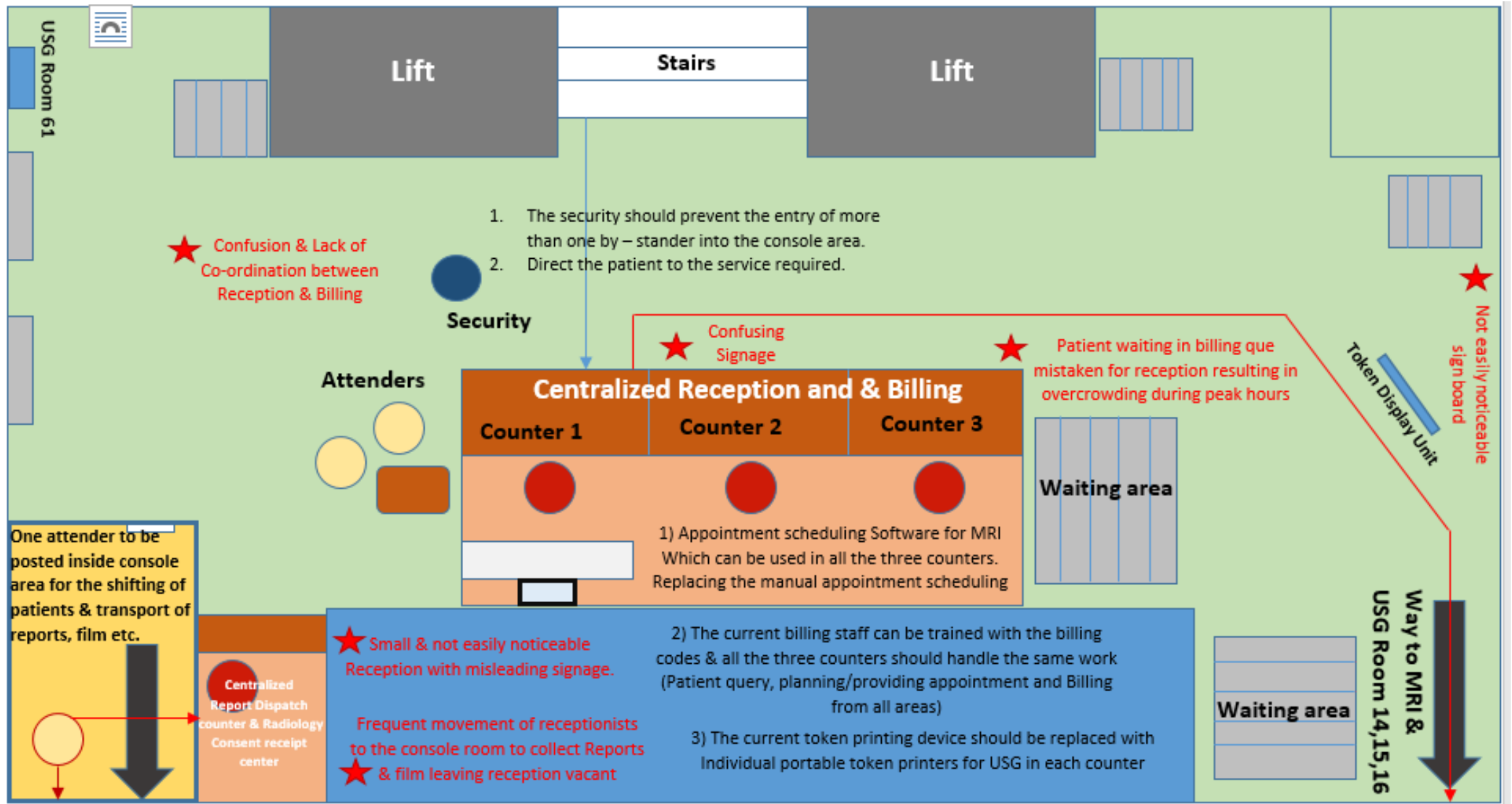
2) Improper Appointment system.

Problem

- The appointment time given to the patients by the receptionist were sometimes found to be late than the actual time, which increases the waiting time for the patient and restrict the chances for giving appointment to other patients.

- Multiple appointment given on a single time slot.

- Communication gap between the receptionists and the technician in deciding the appointment time for the patients.

- The appointment time is supposed to be written on the patient's Radiology Referral form, this is observed to be not happening in some of the cases which causes confusion to the technician in deciding which patient is to be taken in for the next case.

- The planned order is being altered due to confusion in taking patients for scan.

- Appointments are given prior to billing. If the patient doesn't turn up on that time and doesn't come back for scan it disturbs all other appointments after that.

Recommendations

- Current method followed in the selection of the patient for scan is more like a walk-in system with the discipline of First Come First Served (FCFS).

- Appointment time is given manually calculating with 30 minutes time interval, most of the time during the peak hours the calculations go wrong and the appointment given are found to be beyond what it is supposed to be.

- Lack of an efficient scheduling system is the reason for all the mentioned problems.

- The manual appointment allotment practice that is followed currently can be replaced by an appointment scheduling software by keeping the OP trend   (Walk-in) same.

- The appointment should be designed in such a way that it can fit appointment, walk-in and emergency cases without any bottlenecks.

- 30 Minutes time slot should be provided for an appointment.

- Cases having scan time above 45 minutes can be given two slots of 30 minutes.

- In the OP hours (9 am to 6 pm) there will be total 18 slots with 30 minutes of time, from this four slots should be kept vacant with a two-hour gap for the Radiographers which can be utilized for taking in VIP patients, international patients, acute emergency cases and to manage if there is any bottleneck caused by the entry of emergency cases and walk-in patients.

- The software should have access from the OPDs, wards, ICU, Emergency department and the other user areas so that the doctors and nurses from OP & IP can identify the status of the appointments and the slots vacant.

- The IP cases should be strictly restricted to after OP hours (from 6 O' clock). Only Clinical emergency IP cases shall be allowed to take during the OP hours.

- The user areas can have the access to book the vacant appointment slots and that time of the user areas request for booking can be approved by the receptionists.

SCHEDULING MODEL

Sl. No	Slot Category	Appointment Time
1	OPD	9:00
2	OPD	9:30
3	OPD	10:00
4	OPD	10:30
5	Technician's Slot	11:00
6	OPD	11:30
7	OPD	12:00
8	OPD	12:30
9	Technician's Slot	13:00
10	OPD	13:30
11	OPD	14:00
12	OPD	14:30
13	Technician's Slot	15:00
14	OPD	15:30
15	OPD	16:00
16	OPD	16:30
17	Technician's Slot	17:00
18	OPD	17:30
19	OPD	18:00
20	IP	18:30
21	IP	19:00
22	IP	19:30
23	IP	20:00
24	IP	20:30
25	IP	21:00

Pareto chart of the MRI procedures
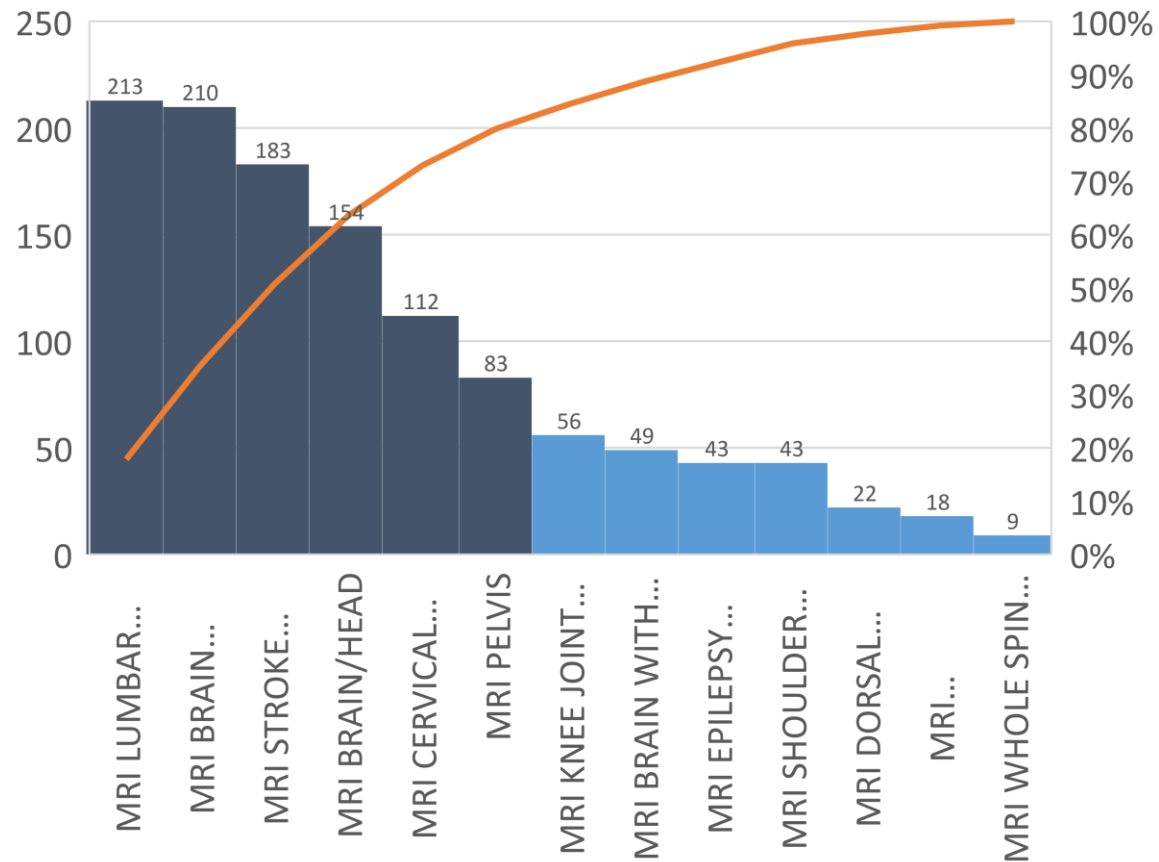
From the data collected from June 2019 – August 2019, following procedures are the most frequently occurring MRI Scans that comprises of the 80% of the overall scans:

MRI Procedure	Scan time in minutes
MRI Lumbar Spine	30
MRI Brain Screening	20
MRI Stroke Protocol	30
MRI Brain/ Head	35
MRI Cervical Spine	30
MRI Pelvis	60

3) IP & OP cases interfering during OP hours

- ## Problems

- Communication gap between Nurses and technicians on shifting the Inpatients from wards, ICU and ED.
Confusion in the time of shifting the in-patient.

- Delay in bringing Inpatients from the ward.

- Patients not being sent from the wards & ICU on the given time slot given by the technicians.

- If there is any delay in shifting the patients from the wards and ICU the nurses don't communicate with the technicians and the patients are brought without informing which increases the waiting time.

- OP cases are being squeezed into the normal scheduled cases

- Average of 5 cases in a day are being squeezed into the normal scheduled cases which is a major cause for delay in the process

Solution

- The transfer of IP cases from the wards and ICUs mostly happens late and has to be squeezed in between the other planned cases which not only increases the waiting time for the OP patients but also prevents or restricts the chance of an additional OP case.

- This can be solved by introducing and implementing a strict policy that will reduce or prevent the entry of IP cases during the busy OP hours unless and until it is a clinical emergency case.

- The criteria for considering the Clinical emergency cases should be well defined by the user areas and only those patients coming under such criteria should be transferred in the OP hours for the scan.

3) Solution for the bottleneck caused due to inconvenience in dress changing for IP patients.

Problem

- Trolley patients are brought from ICU, Wards to MRI without changing the dress to patient gown. The changing room in MRI is too small to occupy an inpatient bed/trolley because of it the changing happens in the corridor which can be covered by a curtain. This not only increases the waiting, delays the process but also can reduce the patient satisfaction because of lack of privacy.

Solution

- The dress changing for the bed ridden patients from IP should be done in the wards itself before bringing to radiology for scan.

- MRI Compatible patient gowns should be provided in the Wards/ICU.