

Streamlining of In-Patient Process for Radiology Investigations

By

Pranoti Dhomne

*Dissertation submitted for the partial fulfillment of the
MBA Hospital and Health Management*

Academic year, 2015-2017



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TO WHOMSOEVERMAY CONCERN

This is to certify that Pranoti Dhomne student of MBA Hospital and Health Management from The IIHMR University, Jaipur has undergone internship training at Zydus Hospital, Ahmedabad from 6th Feb 2017 to 6th May 2017.

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 her future endeavors.



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In recognition of having successfully completed her
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and has successfully completed her Project on

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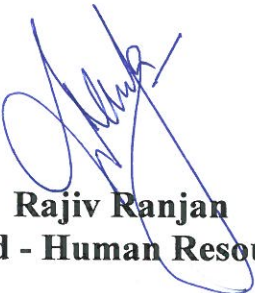
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**Zydus Hospital
Ahmedabad**

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

We wish her all the best for future endeavors


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This is to certify that all ethical issues have been considered while collecting data for my dissertation titled Customer Perception & Buyers Characteristics Towards Healthcare Services.

A handwritten signature in blue ink, appearing to read 'Anurag', is written over a horizontal line.

Signature of student

Acknowledgement

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I genuinely thank my parents, family and friends for their blessings and support.
Pranoti Dhomne
(IIHMR/2015-2017/)

Abstract

Background

Radiology has been a distinctive specialty with many technical challenges from inception and now has the key for many diseases and plays an important role in diagnosing, and planning treatment and its outcome. It is important for every organization to maintain proper health care and to fulfill the requirements thereby bridging the gaps to carve its name in healthcare segment, as many of the customers' attempts to find quality of services.

Objectives: The objective of this study is to understand the In-patients process flow for radiology investigations, thereby identifying and reducing delays and gaps in radiology investigations.

Methodology: Interventional study was carried out at radiology department of Zyduş hospital from 6th Feb to 6th May.

Result There was an improvement in the Smooth Process Flow of Patients i.e. from 55.38 % to 78 % in Pre and post intervention respectively. The study was focused on the factors influencing delay; there was reduction in every segment of delay, when it comes to the total number of delays it has dropped down from 44.53 % to 22 %.

Conclusion

Various factors contribute to patient delays in Radiology Department. It is a complex work environment to be maintained as all the dimensions jump in to the pool (IP, OP, ER & Health Check Up).. There was an improvement in the process flow but radiology being an ongoing department and sustaining improvement interventions being one of the biggest challenges. However, a data-driven approach can be used to reduce patient delays and process flow bottlenecks.

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1 Introduction

Radiology has been a distinctive specialty with many technical challenges from inception and now has the key for many diseases and plays an important role in diagnosing, and planning treatment and its outcome.

It is important for every organization to maintain proper health care and to fulfill the requirements thereby bridging the gaps to carve its name in healthcare segment, as many of the customers' attempts to find quality of services.

“The focus on quality in radiology is expanding rapidly and includes quality control of equipment, quality assurance of our imaging and processes and increasingly, continuous quality improvement”.¹

Hence, to maintain Quality in any department needs to maintain Proper work flow, for which proper streamlining of Patients is of utmost importance.

We all are aware of this fact, “One of the burdens of being a patient is the wait. We build waiting rooms specifically to accommodate this non-value-added activity. Yet this practice is no longer sustainable, due to recent initiatives on patient-centered care and pay-for-quality”.²

“Moving patients effectively through a Department can become a challenge for private and public hospitals”.³

To improve quality, every process in the system is mapped, analyzed with the goal of improving a process and reducing system errors.

1.1 Need for Study

Strategic planning and right tools can make the department run smooth. In an effort to improve the efficiency of process flow and meet the challenges that continually threaten it, radiology department heads who face requirements to be efficient while also maximizing quality, it may jump to decisions that are unwise. Hence to maintain quality these initiatives are needed to be taken.

1.2 Process Flow of Radiology Department

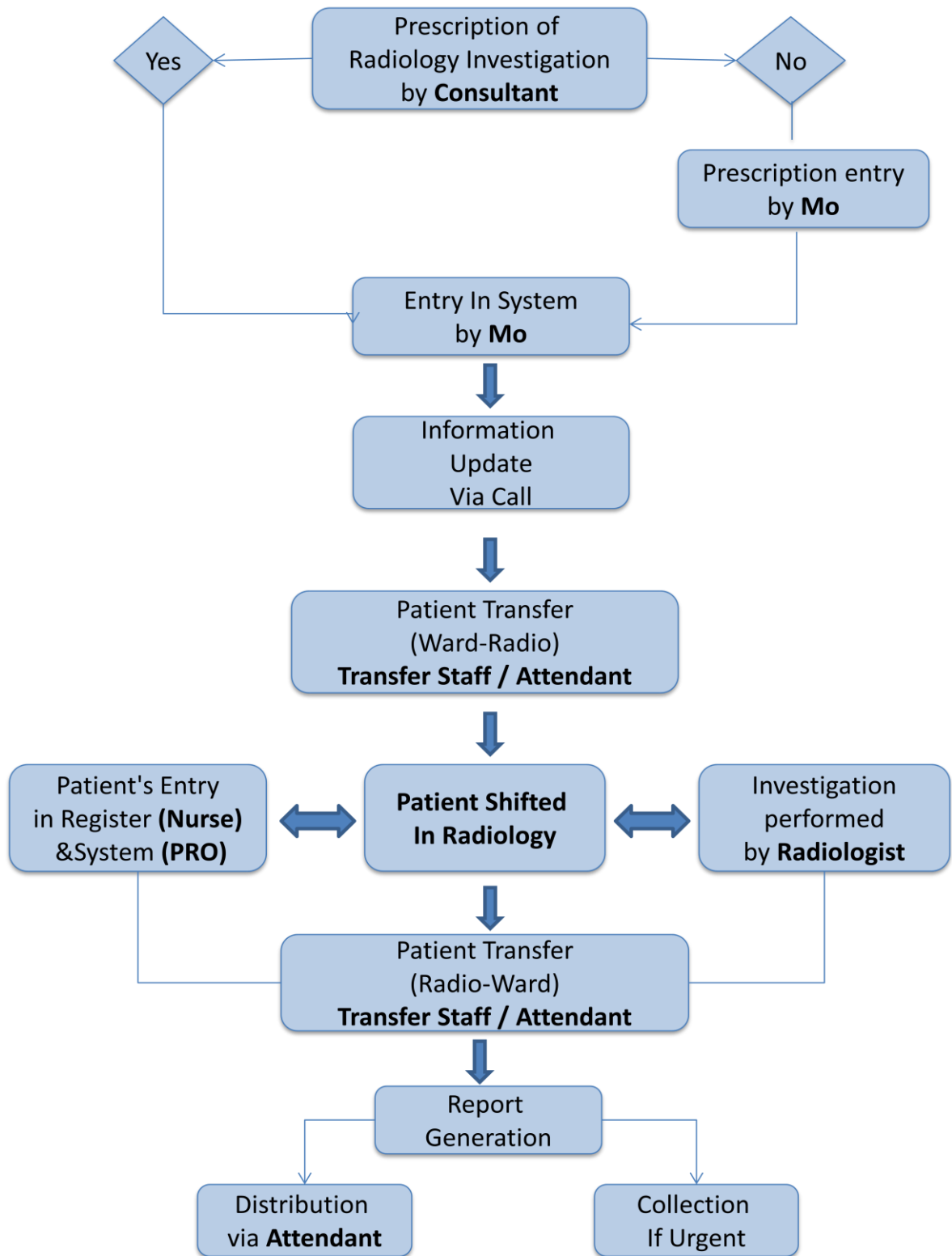


Figure 1- Process Flow

2 Literature Review

According to Frank Seidelmann (2015) “Radiology is one of the largest spend categories at most hospitals, representing nearly 10 percent of annual commercial healthcare spending in the United States. It is also a rapidly growing category: The Advisory Board Company expects that total radiology spend will increase by nine percent year-over-year through 2018. The potential economic value of the radiology department should not be underestimated. Imaging is the largest source of outpatient profit for many hospitals, contributing as much as 35 percent to the bottom line. That figure is almost three times that of the nearest service line.”⁴

Jeff Zagoudis (2016)⁵ had published an article on “Rethinking the Radiology Business Model and states Healthcare spending is on the rise. According to a 2014 forecast by FMI, a market research group, total global healthcare spending will reach \$52 billion by 2018 — less than two years away. Further research shows that nearly half of the money (40 percent) will be spent on equipment, an encompassing term that includes everything from beds to gurneys to imaging equipment. Radiology actually makes up the lion’s share of equipment costs, accounting for approximately 1/5 (depending on the type of facility) of total equipment expenditures, per a 2015 report from market research firm Medical Architecture Planning Systems. At the same time, it is also a major revenue driver for hospitals, with radiology expected to account for \$49 billion of total global medical imaging revenue by 2020, according to BCC Research, a market research company”

Also, Cristen C. Bolan (2010)⁶ had published an article in imaging technology news over Best Practices in Radiology Workflow he says that “the biggest challenge in applying best practices in radiology workflow is seeing the big picture. The entire imaging cycle includes identifying the patient data, conducting the imaging exam according to the proper protocols, and then streamlining and processing the data in a timely manner.” “The clock doesn’t start and stop in the radiology department,” said Paul Chang, M.D., professor and vice-chairman of radiology informatics, medical director of pathology informatics, University of Chicago Hospitals. “It starts when the physician first decides that imaging might contribute to the patient care and only ends when that same physician gets

the report. With the advent of multi-detector computed tomography (MDCT) and the subsequent advances in MDCT technology, radiologists have witnessed tremendous growth in CT exam volume,” said Dushyant Sahani M.D., director of CT, Massachusetts General Hospital, associate professor of Radiology, Harvard Medical School, division of abdominal imaging and intervention. “In most outpatient practices, including the one at Massachusetts General Hospital, contrast enhanced CT (CECT) contributes between 40 to 60 percent of exam volume, and it entails several steps and additional time in comparison to unenhanced exams. With the CT reimbursement for imaging centers and outpatient services getting gradually reduced, improvements in CT productivity and reduced cost for the operations is therefore desired,” said Sahani.

Tejaswi Kocherlakota (2014)⁷ had published a paper on “Patient Flow management in OPD and delivers the information which says Reducing delays and making sure that patients receive the right time will have a significant beneficial effect on the quality of care patient receive. In turn it will improve patient outcome and reduce the cost of care. Patient referred to and treated in hospital & system that “keep the flow” and “keep things moving” will have quicker referral to treatment times. It is useful to structure the overall approach to improve patient flow and thereby reducing delays. Despite the origins of patients flow being in the manufacturing industry there are many ideas and concepts that can be borrowed and adapted to help manage health services.”

Deisell Diaz et al. (2008) conducts a pilot study on “Streamlining Radiology Flow to Improve ED Throughput and **contributes** that In today’s health care industry, more and more physicians rely on radiology images to make a confident diagnosis on patients. As a result, radiology departments have a growing backlog of appointments in many of the services they offer. Even management may not be aware of the true delay drivers. Management may have an opinion of what the drivers are, but if not supported by data, most of the times those opinions can be misleading. Data collection can be painful, but if obtained correctly, it is a powerful vehicle to diagnose the imaging processes, as well as any other process. Once the data has been collected and diagnosed, solutions relevant to the data may be offered and implemented.”

Monica C. Villarreal et al. (2015)⁸ conducted a research on “Improving Procedure Start Times and Decreasing Delays in Interventional Radiology and concludes that Many different factors contribute to patient delays within the IR division—it is a complex work environment with both IP and OP workflows. However, a data-driven, interdisciplinary team-based approach was an effective way to reduce patient delays and workflow bottlenecks. An important next step is to identify the causes of delays contributing the miscellaneous category. This would allow specific interventions to reduce these yet unidentified delays. Our IR department is also installing the HI-IQ electronic patient tracking system. Although it will not eliminate the human element, this will obviate the need for a paper form and allow for a more accurate and consistent recording of delays and workflow process data analysis. QI is an ongoing process, and one of the biggest challenges is sustaining the improvement interventions”.

3 Methodology

- **Study Design-** Interventional study
- **Study Area-** Radiology Department.
- **Duration-** 3 months.
- **Sample size – 510**
- **Sampling Technique**–Convenient Sampling
- **Study participants** –Patients Prescribed for Radiology Investigations.
- **Study Time-** 9am- 5:30pm

Through the principles of QI and patient-centered care, the project was built on three successive but interrelated tasks (Fig 2):

- Understanding of process Flow
- Data collection and analysis
- Implementations of Interventions with repeat data acquisition and analysis.

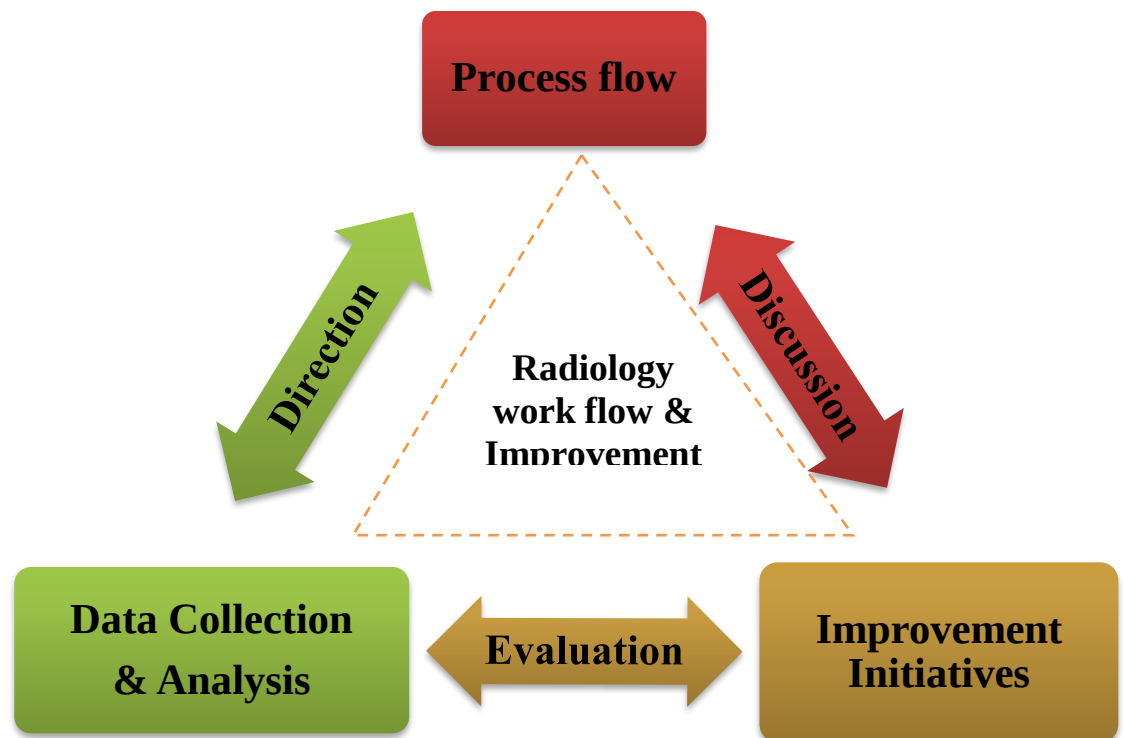


Figure 2- Project Elements

The Process Flow of Radiology Department was observed and Patients prescribed for Radiology Investigations were monitored during this period.

3.1 Data collection:

Data was collected for one month; the patient's information was entered into pre-designed pro-forma having all the relevant details.

- Primary data collection: - Data was collected from personal observation and information gathered by discussion with staff.
- Secondary data collection: Data was collected from patient's files and health system data, which provided procedure order details.

The following times were recorded for each Patient:

- Advice Time: Patient Prescribed for Radiology Investigation by Consultant.
- System entry-
 - Time at which Nursing Staff made an entry in System
 - Time at which it is reflected in Radiology System
- Call Time: Time at which the patient is asked to shift.
- Received time: Time at which the patient entered Radiology Department.
- In time: The time at which the patient entered for investigation.
- Out time: The time at which the patient was shifted out of the Radiology Department.
- Remarks were mentioned according to the flow of patients.

Inclusions:

- In-Patients prescribed for Radiology Investigations.

Exclusions:

- Investigations performed on Sundays.
- Investigations Performed after 5:30 PM

These data were transferred into a database from which graphs were generated. These records gave information necessary to identify potential areas of opportunity for improvement, to plan and implement interventions, and to evaluate the effect of these interventions. Also, Fish borne Diagram was used to understand the causes of delay.

3.2 Fish Bone Diagram

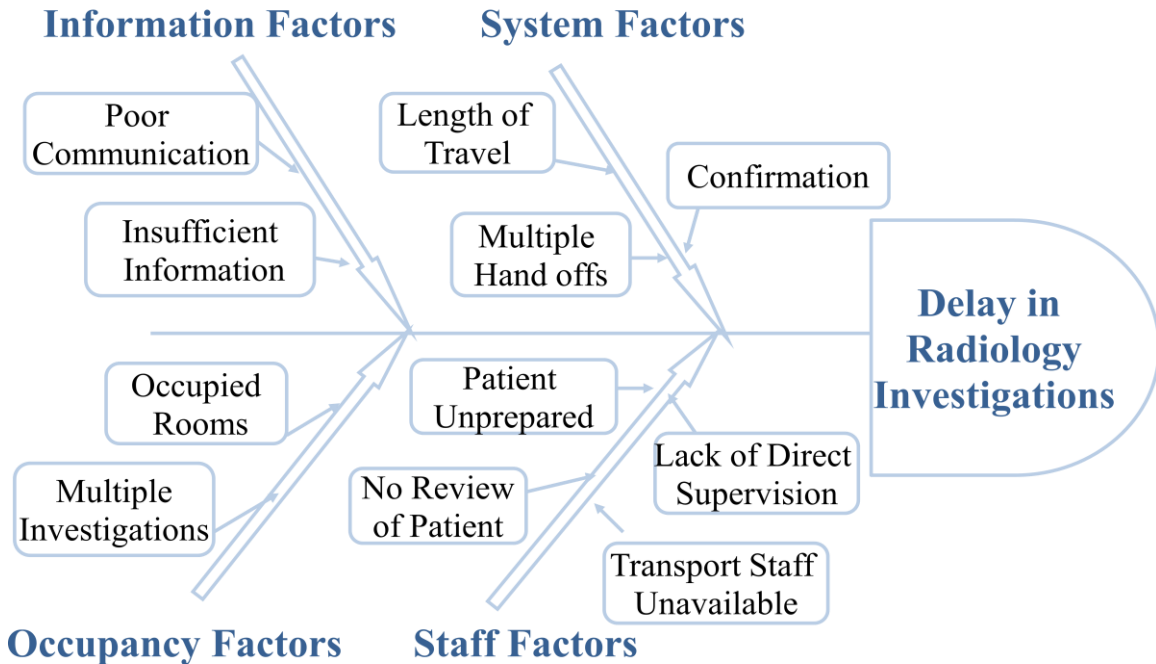


Figure 3- Fish Bone Diagram

3.3 Study tools

- Observational study was used to understand the processes in Radiology Department.
- Data was analyzed in Microsoft excel to evaluate Smooth flow & transfer delays.

Post pathway implementation & intervention were undertaken, & data with almost the same number was reviewed.

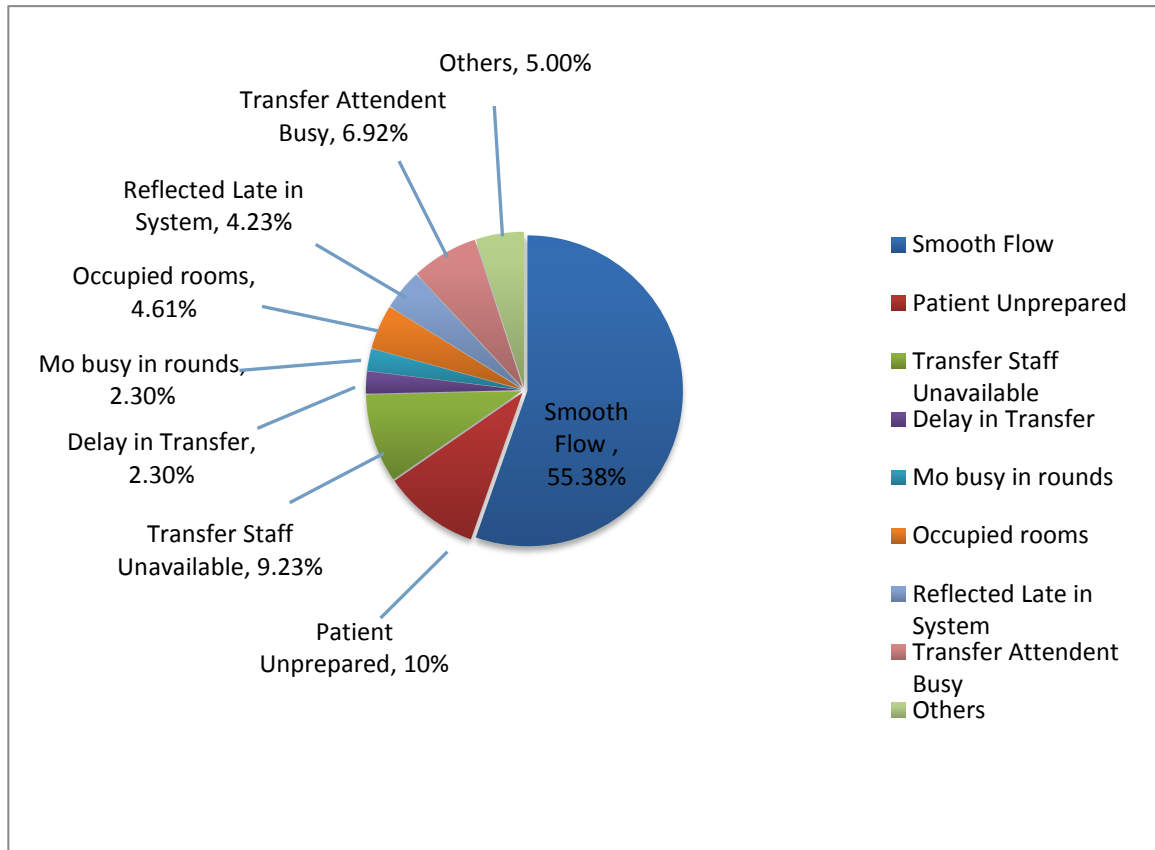
Analysis was done by using MS excel and graphical representation were carried out.

Interventions

- On Job Training Program on “Preparedness of patient for radiology investigations” was conducted for the Nursing in-charges.
- Leaflets were printed and displayed in each and every ward in the hospital containing information on preparedness of patients.
- PRO at Radiology Reception was asked to maintain call records so that there will be proper communication between either side.

- Medical Officers were made aware of patient Preparedness for Radiology Investigations.
- Nursing Staff were educated regarding the importance of shifting of patient in given time also for the proper channel of planned investigation in the morning.
- There was insufficiency of Staff as many dimensions (IPD, OPD, ER, Health Check UP) jump-in to the radiology department for Investigations hence more 2 nursing staffs were recruited.
- Additionally, nursing staff and technicians of radiology department were educated regarding the importance of Quality Indicators, Proper Communication, and Consents, Patient handover, so as to reduce any kind of error in future.

4 Data Analysis

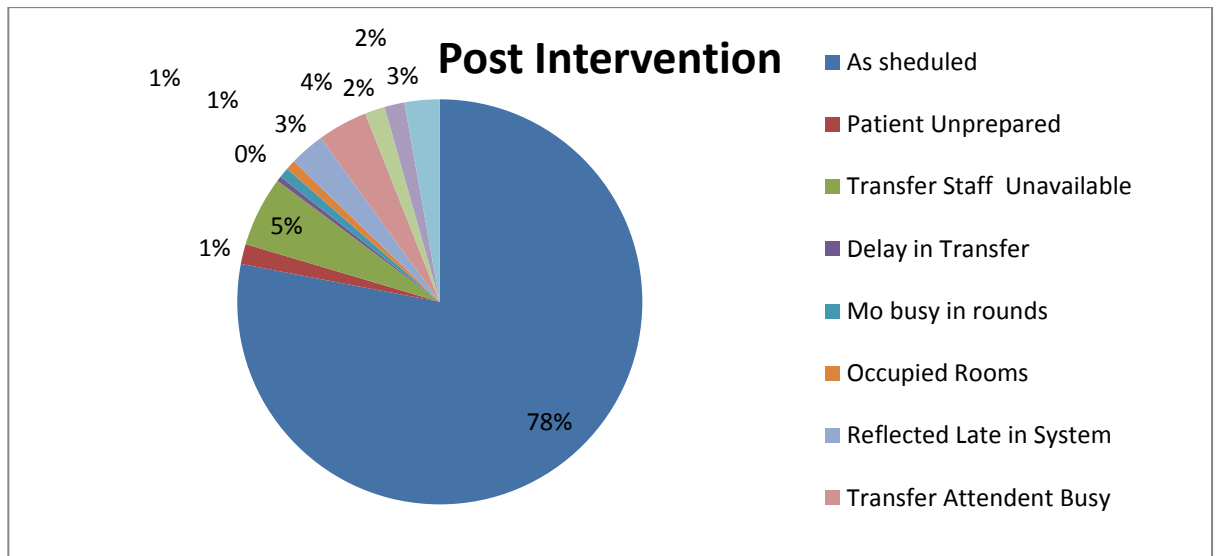


Scheduled and Delayed	%	Freq
Smooth Flow	55.38%	144
Patient Unprepared	10%	26
Transfer Staff Unavailable	9.23%	24
Delay in Transfer	2.30%	6
Mo busy in rounds	2.30%	6
Occupied rooms	4.61%	12
Reflected Late in System	4.23%	11
Transfer Attendent Busy	6.92%	18
Others	5.00%	13
Total		260

Table 1: Pre Intervention analysis of scheduled & delayed cases

4.1 Interpretation: Pre Intervention analysis of Scheduled and Delayed

This is pre-intervention analysis of data set. In which, out of 260 patients 55.38% were the patients transferred as scheduled and in smooth manner rest i.e 44.62% were the patients delayed due to above stated reasons.



As sheduled	78.00%	195
Patient Unprepared	1.60%	4
Transfer Staff Unavailable	5.60%	14
Delay in Transfer	0.40%	1
Mo busy in rounds	0.80%	2
Occupied Rooms	0.80%	2
Reflected Late in System	2.80%	7
Transfer Attendent Busy	4.00%	10
Reflected late due to clinical reason	1.60%	4
Not Performed due to clinical reason	1.60%	4
Others	2.80%	

Table 2: Post Intervention Analysis of Scheduled and Delayed Cases

4.2 Interpretation: Post Intervention Scheduled and Delayed

This is post-intervention analysis of data set, where there was an obvious improvement in smooth process flow i.e. 78% and reduction in delays i.e 22%.

Pre V/S Post Intervention

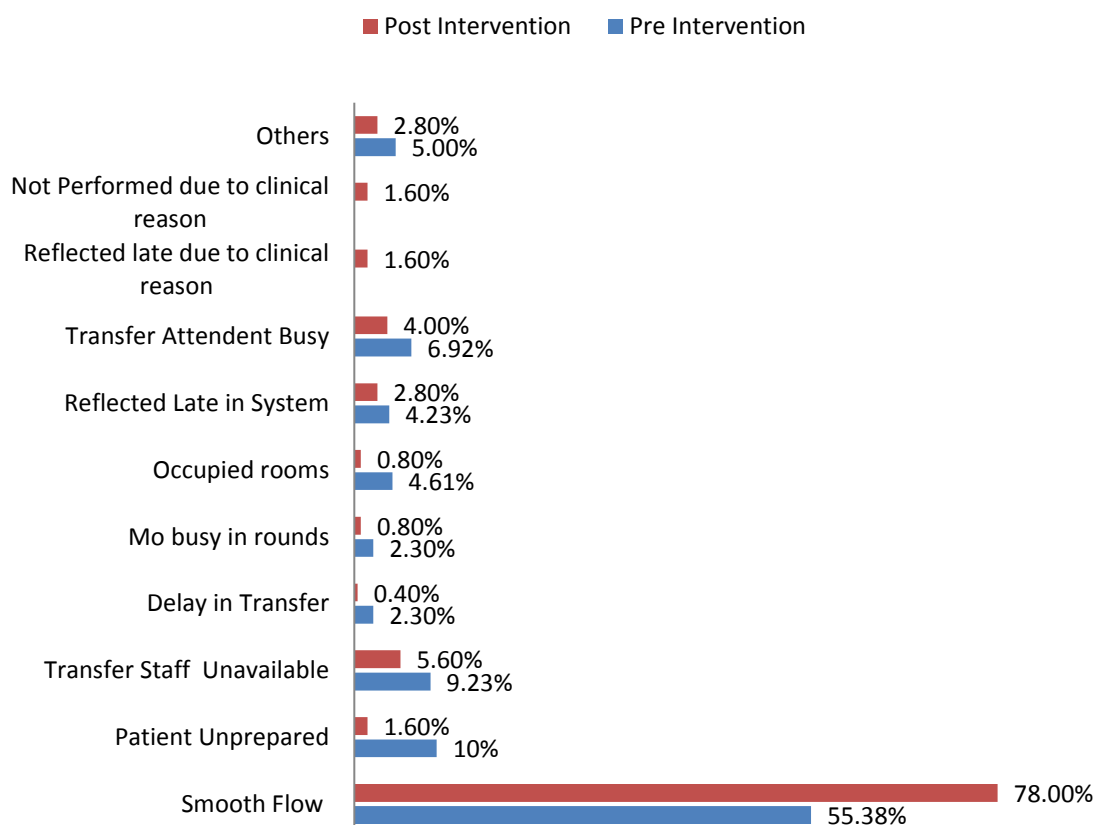


Table 3: Pre V/S Post Intervention Analysis

Smooth Flow & Delay					
		PERCENTAGE		FREQUENCY	
		PRE	POST	PRE	POST
Smooth Flow		55.38%	78.00%	144	195
Patient Unprepared		10%	1.60%	26	4
Delay in Transfer		18.45%	10%	48	25
	Transfer Attendent Busy	6.92%	4.00%	18	10
	Due to lift	2.30%	0.40%	6	1
	Transfer Staff Unavailable	9.23%	5.60%	24	14
Mo busy in rounds		2.30%	0.80%	6	2
Occupied rooms		4.61%	0.80%	12	2
Reflected Late in System		4.23%	2.80%	11	7
Reflected late due to clinical reason			1.60%	-	4
Not Performed due to clinical reason			1.60%	-	4
Others		5.00%	2.80%	13	7

4.3 Interpretation : Pre V/S Post Intervention

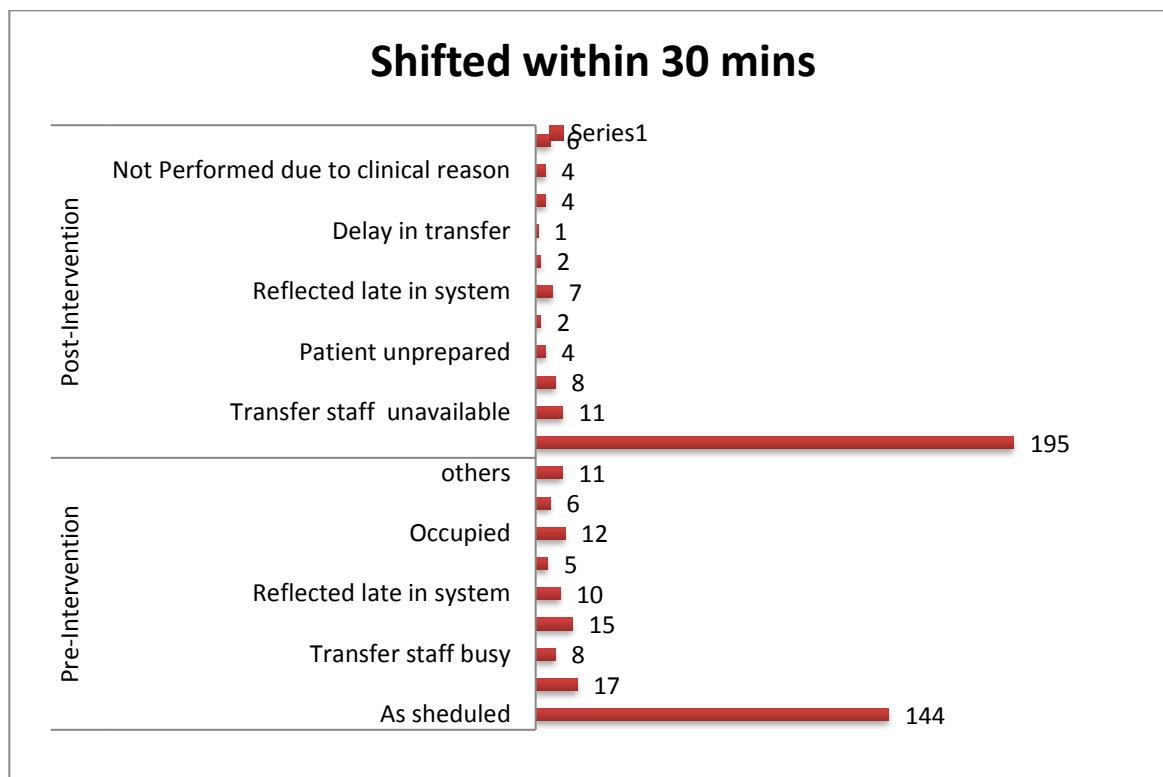


Table 4: Patient shifted within 30 minutes

Patient shifted within 30 mins		
	PRE	POST
As sheduled	144	195
Transfer staff unavailable	17	11
Transfer staff busy	8	8
Patient unprepared	15	4
Reflected late in system	10	2
MO busy in rounds	5	7
Occupied	12	2
Delay in transfer	6	1
Reflected late due to clinical reason		4
Not Performed due to clinical reason		4
others	11	6

4.4 Interpretation: Shifted within 30 Minutes

Improvement was seen in patients getting shifted within 30 minutes and reduction in delays.

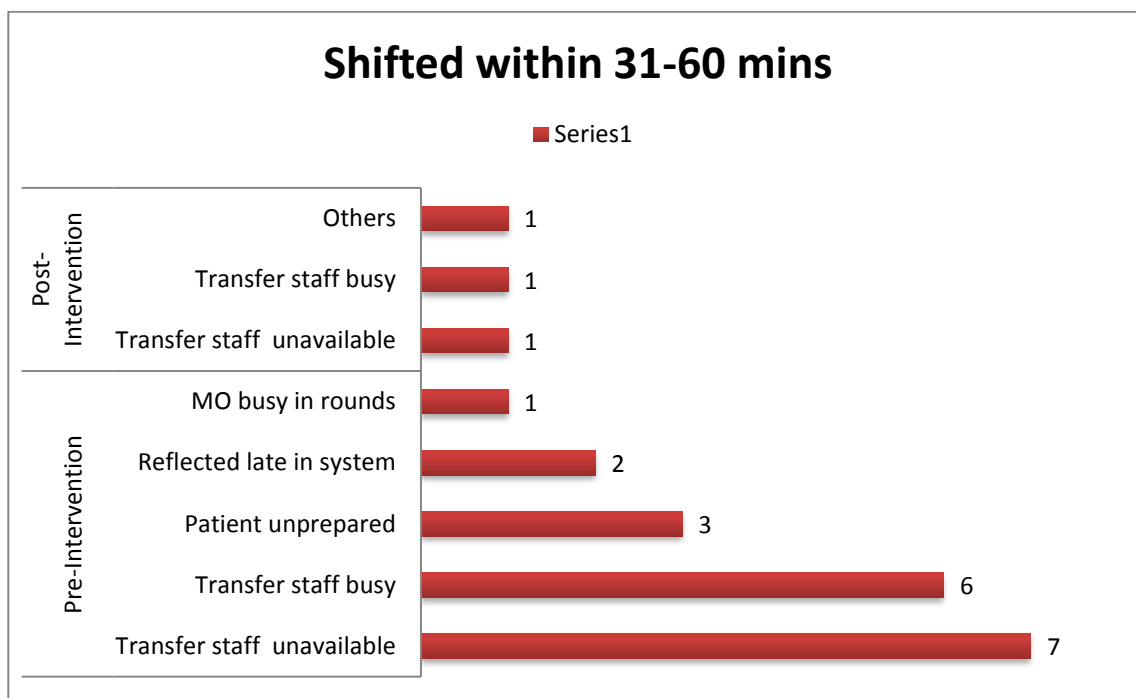


Table 5: Patient shifted within 31-60 Minutes

Shifted within 31-60 mins		
	PRE	POST
Transfer staff unavailable	7	1
Transfer staff busy	6	1
Patient unprepared	3	-
Reflected late in system	2	-
MO busy in rounds	1	-
Others		1

4.5 Interpretation: Shifted within 31-60 mins

Reduction was seen in the patients shifted from 31- 60 min of time i.e from 19- 3 patients, pre and post intervention respectively.

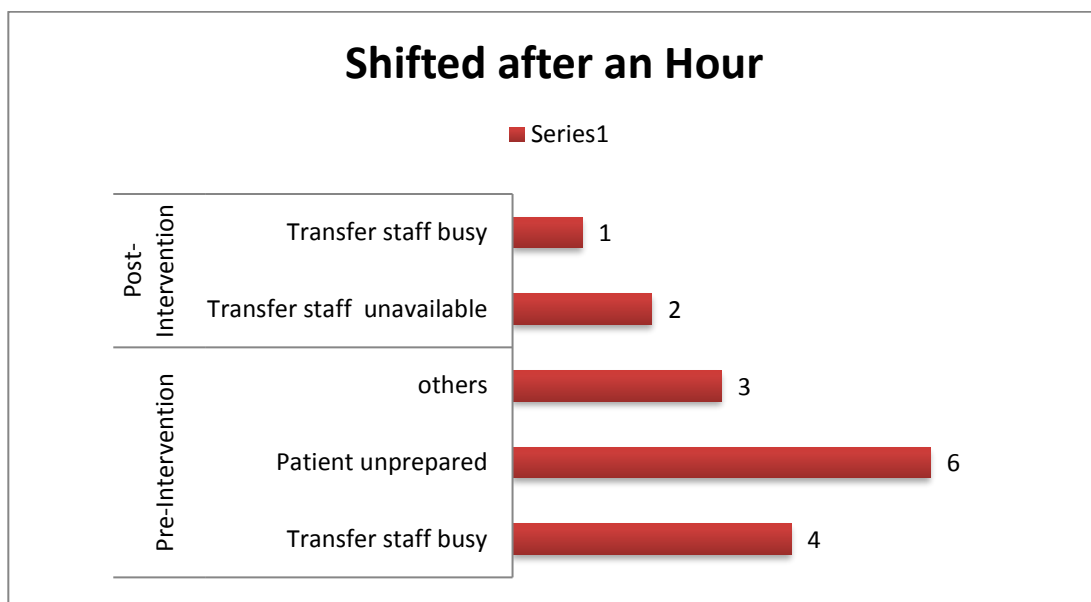


Table 6: Patient shifted within an Hour

Patient shifted after an hour	PRE	POST
Transfer staff busy	4	1
Patient unprepared	6	-
Transfer staff unavailable	2	-
others	-	3

4.6 Interpretation: Shifted after an hour

Reduction in patients shifted after an hour was seen i.e from 12 pre interventional to 4 patients post intervention.

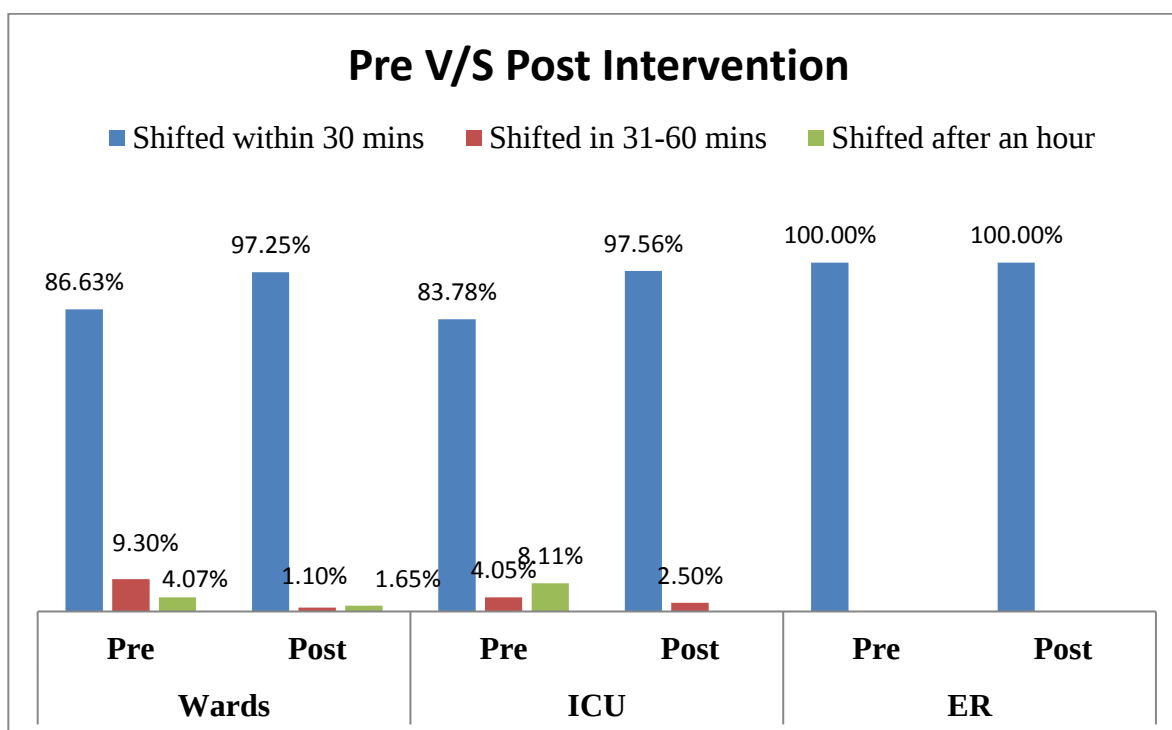


Table 7: Ward wise Distribution of Patients

WARD WISE DISTRIBUTION		
Wards		
	PRE	POST
Shifted within 30 mins	86.63%	97.25%
Shifted in 31-60 mins	9.30%	1.10%
Shifted after an hour	4.07%	1.65%
ICU		
	PRE	POST
Shifted within 30 mins	83.78%	97.56%
Shifted in 31-60 mins	4.05%	2.50%
Shifted after an hour	8.11%	0%
ER		
	PRE	POST
Shifted within 30 mins	100%	100%
Shifted in 31-60 mins	-	-

4.7 Interpretation: Ward wise distribution

- Reduction were seen in all factors as shown in the above mentioned table, Whereas Emergency Department is concerned, none of the patient got shifted in more than 31 minutes during pre and post intervention study.

5 Results

- There was an improvement in the Smooth Process Flow of Patients i.e. from 55.38 % to 78 % in Pre and post intervention respectively.
- The study was focused on the factors influencing delay; there was reduction in every segment of delay, when it comes to the total number of delays it has dropped down from 44.53 % to 22 %.
- Also, some changes were seen in the percentage of factors causing delay
 - a) Patient unpreparedness 10% to 1.60 %,
 - b) Availability of transfer staff 9.23% to 5.60 %,
 - c) Transfer delays 2.30 to 0.40%,
 - d) Engagement of transfer attendants 6.92 % to 4%.
 - e) MO Engrossed in rounds 2.30% to 0.80 %
 - f) Delayed System Entries 4.23% to 2.80 %
- When it comes to the minute wise distribution of shifting process
 - Improvement is seen in one segment i.e.
 - Within 30 minutes- 144 to 195 patients
 - Reduction in other two segments i.e.
 - Within 31-60 minutes -19 to 3 patients
 - >60 minutes- 13 to 3 patients
- And last but not least , when it comes to the ward wise categorization
 - Improvement is seen in shifting of patients
 - Within 30 minutes
 - Wards- 86.63 to 97.25%,
 - ICU's- 83.78% to 97.56 %
 - Reduction in cases in other segments i.e.
 - Within 31 to 60 minutes
 - Wards- 9.30% to 1.10 %
 - ICU's- 4.05 % to 2.50 %

- >60 minutes

Wards- 4.0 % to 1.65%

ICU's- 8.11% to 0 %

- Whereas Emergency Department is, none of the patient got shifted in more than 31 minutes during pre and post intervention study.

6 Discussion

The Improvisation of data collection and execution helped to find the process flow bottlenecks by tracking the time in the process flow, there by assessing, implementing, evaluating and improving the flow of patients in radiology department. This inventiveness had a positive effect on every fragment of process flow which also includes improvement in the flow which increased from 55.38% to 78 % .This shows scope of further improvements of achieving better results.

Collection of data gave privilege to look for more problematic region and trace responses to find solution based on collective informative data. Implementation of interventions was data based and as per the need in the process flow.

The study was focused on the factors influencing delay; there was reduction in every segment of delay, when it comes to the total number of delays it has dropped down from 44.53 % to 22 %.Also, some noteworthy changes were seen in the percentage of factors causing delay, Patient unpreparedness 10% to 1.60 %.

When it comes to the minute wise distribution of shifting process, Improvement is seen in one segment i.e. Patient shifted Within 30 minutes duration- 144 to 195 patients.

Whereas Emergency Department is concerned, none of the patient got shifted in more than 31 minutes during pre and post intervention study. Reduction in every segment of study was observed.

By this study, it is believed that analyzing and evaluating in a proper direction with a proper data collection there by implementing the results will lead to improvement in the quality of care.

When focused on the implementing interventions, factors of delay were evaluated and we observed that unpreparedness of patients for radiology investigations

and delay in transfers, these two were the main reasons of concern, hence focused more on these two aspects.

Improvements in other factors causing delay also occurred although no specific implementations were undertaken for them. Possibly these areas might have contributed in reducing delays, where no such specifications were implemented. Streamlining the process flow in smooth way and reducing delays has a direct impact on improvement in the quality of services.

7 Limitations

- As this study was not randomised, human bias might be subjected.
- Limited study, as interventions were implemented after a month.
- Sundays and gazette holidays were excluded during the study.
- Single handed study
- Less study duration

8 Conclusion:

Various factors contribute to patient delays in Radiology Department. It is a complex work environment to be maintained as the entire dimensions jump in to the pool (IP, OP, ER & Health Check Up). However, a data-driven approach can be used to reduce patient delays and process flow bottlenecks. There was a significant improvement in the process flow but radiology being an ongoing department and sustaining improvement interventions being one of the biggest challenges.

9 Recommendations

- On Job Training Programs must be conducted periodically so as to improve and brush up the knowledge of individuals, also continuous improvement techniques will improve the quality of your department there by reducing errors and delays.
- Also, electronic patient tracking system and more advancement of information Technology must be introduced for better process flow.

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