Appendix B: Cover Page

"FACTORS CONTRIBUTING TO WAITING TIME AMONG PATIENTS IN RADIOLOGY DEPARTMENT AT A PRIVATE HOSPITAL IN HYDERABAD"

Dissertation Submitted to

The IIHMR University, Jaipur

for the partial fulfillment for the award of

the degree of Master of Business

Administration (MBA)

in

Hospital and Health Management

by

Dr. RICHA SHARMA

Under the Supervision and Guidance of

DR. SANDESH KUMAR SHARMA

2023

Appendix C: Title Page

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Appendix D: Declaration by Student

DECLARATION BY STUDENT

I hereby declare that this dissertation titled "Factors Contributing To Waiting Time Among Patients In Radiology Department At A Private Hospital In Hyderabad"is the bonafide record of my original researchwork. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

Name of Student – Dr. Richa Sharma
Date – 03rd June 2023

Appendix E: Completion Certificate

CERTIFICATE

KIMS HOSPITALS℠

Dt: 26-05-2023

TO WHOM SO EVER IT MAY CONCERN

This is to certify that **Ms. Richa Sharma, ID No: 90402939** has undergone the **Internship** in the department of **Corporate Projects** at **Krishna Institute of Medical Sciences** from **27-02-2023** to **26-05-2023.** During the course of her work, found to be good.

We wish her all the best for her future endeavors.

KIMS is 750 bedded, Multi-Specialty hospital. This is accredited with NABH, NABL & ISO 9001:2015 certified.

For Krishna Institute of Medical Sciences Ltd.

CH. Koteswara Rao

KRISHNA INSTITUTE OF MEDICAL SCIENCES LTD. Secunderabad

Koteswara Rao CH
Sr. Manager - HR
KIMS Groups of Hospitals

Krishna Institute of Medical Sciences Limited
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CIN: L55101TG1973PLC040558

Appendix F: Certificate from Faculty Guide and School Dean

CERTIFICATE

This is to certify that dissertation titled "Factors Contributing To Waiting Time Among Patients In Radiology Department At A Private Hospital In Hyderabad" is a record of the research work undertaken by Dr. Richa Sharma in partial fulfillment of the requirements for the awardof the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur under my guidance and supervision and her approach to the research study has been sincere, scientific, and analytical.

Faculty Guide
IIHMR University, Jaipur

Date :

School Dean
IIHMR University, Jaipur

Date:

ABSTRACT

Long wait times irritate patients and make them think poorly of the service provider. The study examined the variables that affect the patient satisfaction index with imaging services provided by the healthcare provider while focusing on the waiting time, service time, and overall average waiting time for patients in the radiology department.

Objective - To ascertain how long it takes a patient from the moment they arrive at the radiology department to the time they are still waiting after the investigation imaging. To pinpoint the waiting periods for the particular factors and locations that contribute to these times, and to offer potential solutions for reducing these times.

Methodology – To ascertain the turnaround times for patients using the various services provided by the radiology department at KIMS Hospital, an observational study was carried out. There were 110 participants across all four modalities. Participant selection was done via convenience sampling. Every patient who visited the clinic from Monday through Saturday between the hours of 9:00 and 5:00 was included in the study. The data is collected over a period of 2 months from 13th March to 20th April 2023.
The parameters which were taken into consideration were all reported on the data sheets that was developed for the purpose of the research. We conducted a cross-sectional study with single-blind observation. using a single blind observation of patients who received an X-ray, ultrasound, MRI, or CT at the radiology department. Data related to wait times were then examined using MS Excel to compute the fundamental descriptive statistics in average and percentages. Following that, these statistical data were examined using pivot tables and pivot charts, which display graphical data. Root cause analysis (RCA) of the variables causing greater wait times was also conducted.

Results - With a TAT waiting time percentage of 18.52% in March, X-ray was particularly notable. A wait time of more than 15 minutes was also encountered by 8.33% of X-ray patients whereas in April, USG now has the highest TAT waiting time percentage, at 29.63%. The waiting time for X-ray was likewise very long, at 19.44%.

Keywords – Waiting time, TAT, Radiology services

ACKNOWLEDGMENT

I would like to extend our sincere gratitude to everyone who helped make this study on waiting times in the radiology department a success.

First and foremost, I would like to express our sincere gratitude to the administration of KIMS Hospital for approving our request to conduct this research and for giving us with the tools and assistance we needed. I appreciate their dedication to enhancing patient care and their eagerness to look at methods to improve the radiology services provided.
I would like to express our gratitude for our supervisor Dr. Sandesh Kumar Sharma (IIHMR University) and Renuka Mam (GM- Corporate Team), whose direction and support were extremely helpful in structuring the study. Their insightful comments and helpful ideas significantly improved the research process and findings.
I would like to express my gratitude towards KIMS Hospitals radiology department employees for their cooperation and support during the data gathering phase. Their commitment to patient care and their readiness to take part in this study were essential in obtaining data that could be trusted. We appreciate their dedication to enhancing patient satisfaction and service quality. We owe a debt of gratitude to the patients who kindly contributed their time and experiences to this study by taking part. This research would not have been possible without their assistance. We genuinely value their willingness to contribute to the development of radiology knowledge and their dedication to enhancing healthcare services. Finally, I would like to thank all of our friends, family and coworkers for their unflagging support and motivation throughout this research project. Their drive and comprehension were essential in assisting us in overcoming obstacles and maintaining our aims.

We once again want to express our sincere gratitude to everyone who contributed to this study. We really appreciate the opportunity to conduct this research and make a contribution to the enhancement of radiology services and patient care thanks to your significant efforts and support.

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CHAPTER ONE: INTRODUCTION

1.1. Background

By utilizing numerous imaging technologies, the medical specialty of radiology aids in the diagnosis and treatment of a wide range of pathological disorders. Diagnostic radiology and interventional radiology are the other two divisions of the field. Diagnostic imaging aids radiologists in determining the source of your symptoms and keeps track of how effectively your body is responding to any treatments you may be getting for your illness or condition. While catheters, wires, and other tiny equipment and instruments are inserted into your body as part of interventional radiology. Instead of directly peering inside your body using a scope (camera) or with open surgery, interventional radiologists employ this technology to detect or treat diseases in practically any portion of the body. Commonly employed radiological modalities or procedures like X-ray, CT, MRI, USG, PET.

Despite this, there are issues with the radiology departments' protracted wait times. The quality of care is affected, the patient experiences inconvenience, the expense of care rises, and the patient's medical problems are materially impacted by waiting periods. The patient's initial visit to the radiology reception area and the time the report is picked up from the dispatch counter are generally included in the definition of waiting time in the radiology department. Turnaround time management can assist in any case where a strategy or change in work flow needs to be implemented to improve and streamline the patient experience by keeping an eye on this and reducing waiting times.

Nowadays, technology has come up with advanced technologies that helps the hospital’s complex system to run smoothly. As far in KIMS hospital, for radiology department use of QMS software is implemented which helps in queuing of the patients. The radiology secretaries are trained and skilled to enhance effective service delivery in providing the appointments to the patient. Thus, queuing remains one of the most common reason for patient’s agony.

Here at KIMS Hospital (Gachibowli unit), the radiology department comprises of two X-ray machines, one Ultrasound (USG), one CT and one MRI machine. The work flow in radiology department starts when the patient first approaches to the radiology secretary at the radiology reception with their bill to the time they check out from the radiology department after the investigation is performed.

1.2. Problem being investigated

The environment in which KIMS Hospital operates is changing. A large number of patients prefer to seek care from KIMS because it is at the pinnacle of the healthcare system in Hyderabad and throughout Telangana. High patient turnover is also largely attributed to accessibility, the cost of high-quality care, and the reputation of the providers.

Towards this, consistent complaints on services regarding long waiting time in USG, X-ray and CT was observed. The long queues in the peak hours affected the daily operations in the hospital since the available tools and manpower were inadequate which leads to operational deficiency and breakdown in process flow. The staff is overworked due to huge number of patients as they perform registration, billing back and forth. Other factors influencing the delays in waiting time are lack of enough staff, breakdown of billing system, consulting patients for different investigation modalities, not updating with the check-in and check-out of the patient, delay in queuing of the patient.

In order to investigate this issue, the primary method of observing the waiting time delay is from the patient's time in queue to the patient's check-in time, or when the patient enters the investigation. As a result, the study's objectives are to identify the causes of waiting times and suggest potential solutions for improving patient care.

1.3. Importance of the problem

Diagnostic imaging techniques are used as a first line of defence in order to establish a diagnosis or plan of therapy. The goal of this study is to ascertain how long it takes a patient to check in for the investigation after reporting to the radiology desk. By identifying the waiting times for the targeted area, the causes leading to these times, and potential solutions for reducing turnaround time (TAT), this study will improve patient satisfaction and experience and streamline the process flow.

1.4. Aims and objective of the study

AIM – To determine the turnaround time for patients according to work flow in radiology department.

OBJECTIVE –

1. To identify the elements that affect patient wait times for X-rays, CT scans, and MRIs in the radiology department.
2. To assess the time interval from giving appointment to the patient till the queuing time.
3. To analyze the time from queuing of patient to check-in the patient for investigation.
4. To assess the time of patient check-out after the investigation procedure.
5. To provide recommendations based on study findings.

CHAPTER TWO: REVIEW OF LITERATURE

2.1 Waiting Time

One of the most important issues mentioned in several healthcare reports that has an impact on the system is patient wait times. Since estimates of waiting times might differ greatly, there are no agreed-upon definitions of waiting times that are generally applicable. The entire amount of time a patient spent waiting to receive radiological services was recorded in the radiology department. Long wait times are frequently the result of insufficient workflow and limit the capacity to give the correct care at the right time. Patient satisfaction is a crucial indicator of how well healthcare is performing.

The length of time patients must wait before being seen is a crucial sign of the hospital's level of service. Long wait times are perceived by patients as a barrier to actually receiving services, and unreasonable fees can be stressful for both patients and doctors. 2019 (Ramesh G. et al.) Long waits could be interpreted by patients as a sign of subpar medical care, which would damage the hospital's reputation. Delays in waiting times and consultations might make it more difficult to diagnose patients quickly and treat them appropriately, potentially affecting patient outcomes. Therefore, to increase patient happiness and provide the best possible healthcare service, it is essential to decrease waiting times and improve efficiency in these areas.

The effectiveness of extended appointment wait times in the radiology department has been demonstrated, and time motion research is utilized to identify factors affecting patient happiness. This study involved observing and documenting the time spent by patients in different stages of their radiology appointments, such as check-in, check-out, waiting for investigation with actual imaging. By analyzing the workflow researchers identified bottlenecks in the process that contributed extended waiting time such as delayed patient registration and prolonged examination times. In addition, the use of electronic system for patient registration and examination scheduling may help to streamline the processes and reduce waiting time.

To investigate the effectiveness of strategies aimed at reducing patient waiting time in radiology department the author used a structural equation modelling analysis. (Mark M Alipio et al; 2020) SEM analysis revealed that appointment scheduling optimization had

the most substantial impact on reducing waiting times. By adopting strategies like double-booking and flexible appointment slots, clinics were able to accommodate more patients within a given time frame, thus minimizing wait times. The findings of this study provide valuable insights for radiology departments aiming to enhance patient experiences by addressing waiting time concerns. By implementing appropriate interventions informed by SEM analysis, clinics can optimize their operations, increase patient throughput, and ultimately improve patient satisfaction. Also, by designing strategies for healthcare managers and policymakers to enhance the efficiency and quality of radiology services.

Radiology services addressing the need of efficient management during this period of non-business hours are often characterized by limited staffing and resources. The researcher used algorithm to utilize the historical data on radiology reports and identify patterns and other factors contributing to delays in TAT with high accuracy. By implementing the algorithm prediction machine in hospitals and radiology department with low availability of staff can enhance their operational efficiency and optimize resource allocation. The machine learning algorithm helps in predicting the likelihood of delay in turnaround time for the radiology reports. Therefore, by assigning risk score to each study and accounting various factors helps as an aid in resource allocation and decision making to mitigate potential delays. The study concludes by identifying patients who are at risk of delayed TAT, the radiology department can first prioritize these patients and provide them with resources by improving the patient outcome effectively.

The assessment revealed several key observations that were found at the radiology department of a teaching hospital such as average waiting of patients was found to be unacceptably long to receive radiological services. Patients also expressed dissatisfaction on getting incomplete information about the expected duration of waiting period. According to (Onwuzu et al; 2014) factors attributing to these issues are related to lack of communication, high influx of patients, limited staffing resources and equipment constraints. Moreover, the assessment focused on implementing strategies with training the staff on appointment scheduling, prioritizing urgent cases and efficient utilization of equipment can minimize waiting time and improve patient experience by providing timely diagnosis. The study also shows that some hospitals have implemented

mobile check-in with tracking system to the patients to monitor their real time update on their wait times.

2.2 Improving patient flow in and out radiology department

This case report focuses on how to overall improve the efficiency of patient flow in outpatient diagnostic procedures. The study highlights the area of improvement and target strategies to address those issues. According to (Rebecca et al; 2020), Lean methodology is an effective way to evaluate hence improving patient flow. Technological advancements are implemented to maximize the departmental efficiency. Display of wait times in TV or whiteboards via reception staff may be an easy and a cost effective way to improve the perception of patient wait times. Also including the use of an electronic scheduling system, standardizing protocols for patient check-in and registration and streamlining the imaging process by using a team based approach. The organization needs to keep patient flow in mind and take advantage of key redevelopment with restructuring of projects to keep improvising.

The study aimed at streamlining patient flow and reducing delays by implementing several interventions and continuously evaluating and monitoring the ongoing process flow to mark the point of improvement. In this situation, queuing theory is a management technique for managing queues and is very helpful in assessing and forecasting system performance (Randolph 2013). Its use is widespread in telecom, shopping, and healthcare services. With the use of the queuing system, it is possible to imagine how these organizations' healthcare delivery procedures work: patients enter, wait in line to be served, receive their services, and then leave. Making sure that ancillary services like housekeeping and transportation flawlessly coordinate with direct patient care is another important consideration. The service helps in taking patients from one service to another hence, reducing the time to avail the radiology service. It was later observed that patient showed higher level of satisfaction with the care they received.

The study identifies several factors that contribute to longer turnaround time with limited CT scan availability and delays in image interpretation. Often observed due to ED overcrowding leading to poor quality of care and delay in waiting time. A team of

physicians, nurses, technicians and engineers were assembled to understand the current status and barriers with technology and human centered solutions. The team came up with four solutions; Visual analysis (EHR), Communication, Weekly meetings (to review progress on the intervention) and Huddles (encouraging real time solutions of any problem). On the other hand, PACS (picture archiving and communication systems) helped optimize resource allocation, allowing faster diagnosis and treatment decisions.

Radiology department is a service-oriented department which provides value added to diagnosis and patient management. The author Filip Deferme et al; 2015 uses up-to-date software through radiology information system (RIS) for query waiting time but not patient load or staffing problem. Author implemented a three-stage system; Digital signage, Ticketing, Creation of digital dashboards. First stage displays a loop video of specific examination related information. Second stage, the patient will receive a ticket number on registration which will be displayed on digital signage in a sequential order. Lastly third stage, patient dashboard where the staff will evaluate patient throughput and workflow. Apparently, this project is partially implemented but through this process flow patient can direct themselves to radiology department. Digital dashboards indicate waiting room occupancy which gives managers a tool to gain information about process in radiology department. The project contributes to overall operational efficiency leading to better healthcare outcomes for patients.

2.3 Patient satisfaction

The degree to which customers feel their needs and expectations are being met by the service provider is referred to as patient satisfaction. Patient happiness can be used as a quality indicator to evaluate the effectiveness of a program at certain healthcare facilities. The assessment aimed to evaluate the level of satisfaction among patients receiving radiological services. A pretested structured exit questionnaire with 17 questions was created by the authors, Wafaa Yousif Abdel Wahed et al., in 2017 to measure patient satisfaction with the radiology department's services. The degree of service for each domain was graded from excellent to poor. The majority of respondents, according to the report, were happy with the radiological services. The associated factors influencing the patient satisfaction level were participant’s age, education and being an OP patient with highest level of satisfaction reported in relation to communication and staff behavior.

Conceptual model of factors influencing patient satisfaction in figure 2.1 is developed. For an empirical study, the elements influencing patient satisfaction were discovered. These factors can then be used systematically to improve the services and help produce solutions to these issues in the healthcare organization.

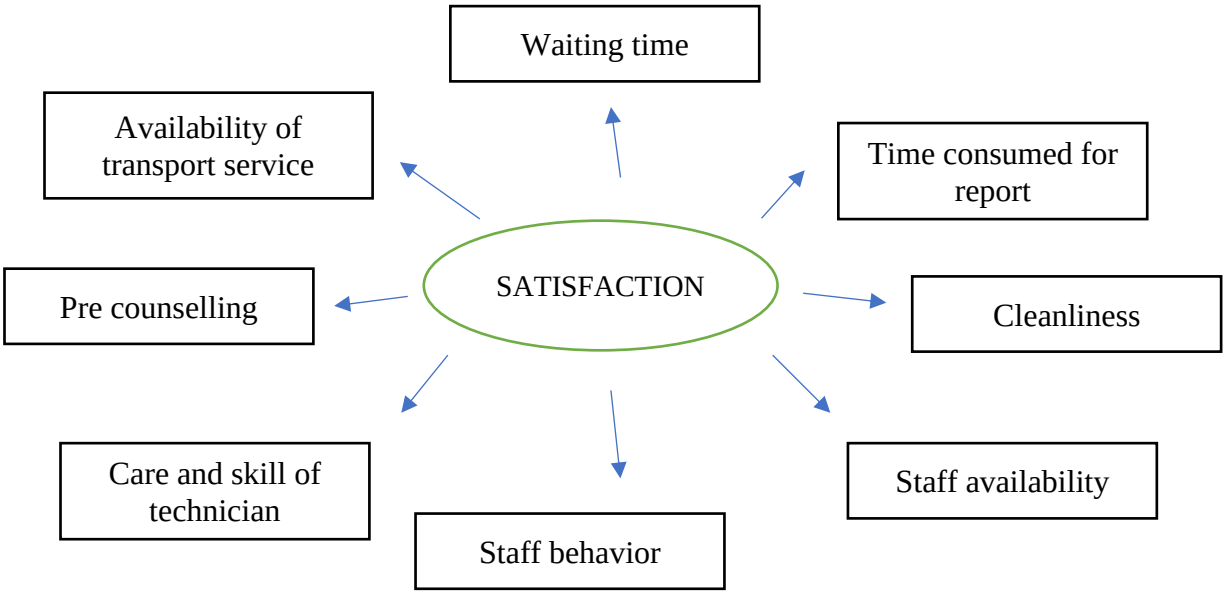


Figure 2.1 factors influencing patient satisfaction

A multifaceted intervention is a quality improvement initiative to enhance patient experience and identify improvement opportunities to address gaps in patient experience of care. The intervention of study involved implementing several strategies and highlights the importance of prioritizing patient-centered care in radiology departments to achieve higher rankings and improved patient satisfaction. Author Neetu Kapoor et al; 2019 implemented surveys and got identification badges for the radiology staff to display the individual's role and survey question on one side and a checklist on other side with respect to the patient. The survey comments were translated into a heat map grid to get the percentage of positive and negative comments listed by the patients. Negative comments and the tool (heat map grid) is useful to identify improvement targets across radiological sites in the hospital.

The purpose of this study was to evaluate the level of patient satisfaction with

radiological services and the related factors at the Hawassa Teaching Hospital. The improvement of clinical efficacy while keeping patient happiness in mind is seen as a component of quality and an important indication for gauging the quality of healthcare. Patient satisfaction was assessed by Teshome Mulisa et al. in 2017 using the SERVQUAL (service quality) test, which included elements including communication, accessibility, service quality, staff courtesy, the physical environment, and privacy techniques. According to the survey, patient satisfaction levels were influenced by their income and education levels. Still, there is room for improvement in the relationship between the sociodemographic characteristics of the patient and the time it takes to get to the exam room. Additionally, it is advised for improved patient care to shorten the time spent scheduling ultrasound sessions and CT scans.

A survey was conducted by Lydia A. Gana et al; 2020 to assess patient satisfaction with radiological services in both public and private health facilities in Kano. The objective was to evaluate the level of service offered and pinpoint areas that needed improvement. Patients who attended the radiology departments of the aforementioned healthcare facilities for radiological treatments were given a total of 140 structured questionnaires, and all of them were collected from the patients after completion. There are six sections to the questionnaire. The results showed that both public and commercial health facilities had relatively low overall patient satisfaction levels. The majority of respondents reported unhappiness with a range of service-related factors, including wait times, employee conduct, and the standard of the facilities and equipment. Patients in both public and private facilities complained about lengthy wait times, which frequently exceeded acceptable thresholds. Patients expressed a great deal of aggravation about this problem, which highlighted the need for increased effectiveness and better appointment schedule management.

CHAPTER THREE: METHODOLOGY

3.1. Research Question

The study is conducted to determine if there is a delay in turnaround time (TAT) for patients according to work flow in the radiology department.

3.2 Study Design

An observational cross-sectional study design is used to explore the conceptual model of patient waiting time. Also, to determine the waiting time for X-ray, CT, MRI and Ultrasound at Radiology Department, KIMS Hospital (Gachibowli).

3.3 Study Setting

The study was conducted at KIMS Hospital, Hyderabad (Gachibowli unit). One of the largest chain of hospitals spread across Telangana and Andhra Pradesh. KIMS was founded in 2000 and has NABH accreditation and now has 13 different units with all types of preventive, diagnostic, therapeutic, rehabilitative, palliative, and supporting care are offered by the hospital under one roof. The section on diagnostic services includes the radiology department. The diagnostic procedures available include general examinations, X-rays, CT, MRI, USG, Doppler, and mammography. The radiology department at KIMS has distributed the services on two floors to avoid crowd and manage queue management.

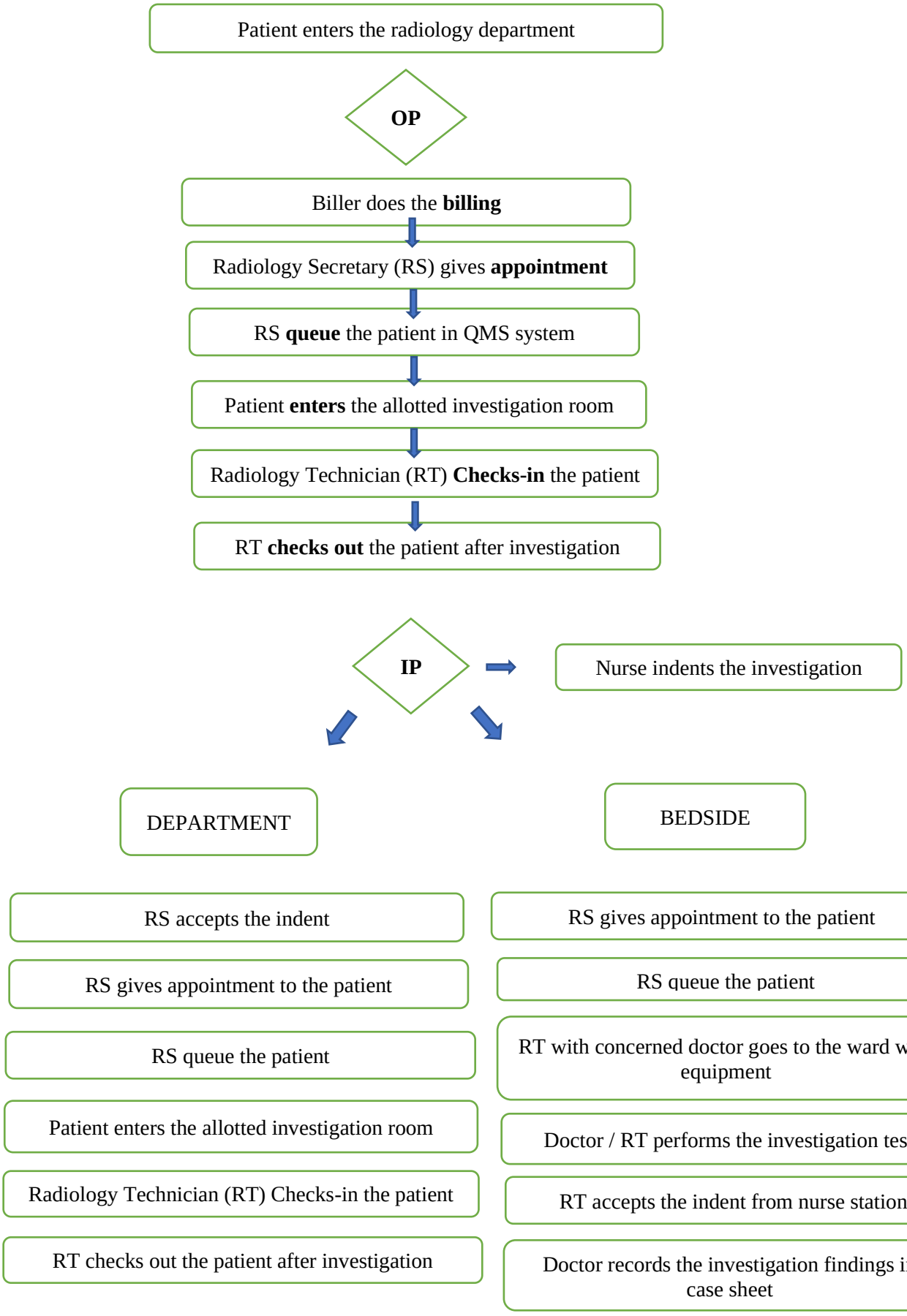
3.4 Study Population

The study population comprises of patients coming to the hospital for various radiological investigations (X-Ray, USG, MRI and CT) including OPD and patients admitted in the hospital (IPD) during the period of two months from 13th March to 20th April, 2023.

3.5 Research Approach – Quantitative method

Quantitative study data was gathered using a standardized procedural flow. The process flow of various investigations being undertaken by the patients coming from OPD and IPD shall be observed on a daily basis according to the stipulated time frame. The waiting period of patients from the time of appointment to check in of the patient to the investigation room shall be recorded.

FIGURE 3.1 Process flow



(a) Study instrument –

Participants were tracked through the service points from arrival of patients to patient check-out after the investigation process. For this study a data sheet was developed which included several parameters like participant's UMRG number, name, service modality, approach time, appointment time, queue time, check-in time and check-out time were recorded. In order to record the waiting times of a random sample of patients who visited the radiology department for their X-ray, ultrasound, MRI, or CT, a cross-sectional study using single-blind observation was carried out. This method involved simply watching the patients and the radiology staff without informing either party of the data collection. Appointments and queuing of the patient was done in the QMS system which showed the present status of patients from both the floors of radiology services by logging into different operator's ID. Based on this observational study, the actual waiting time and actual service times were measured.

(b) Study approach –

Regarding the purpose and objectives of the particular study, prior approval from the hospital administration was obtained. A random sample of patients who attended the hospital's radiology department between March and April 2023 served as the source of the data. The researcher set up shop at the hospital's radiology department reception desk and, at random, observed patients coming in for the department's USG, X-ray, CT, or MRI examinations. Observations were made separately for OPD and IPD patients visiting the department. Identifications of peak periods and evaluation of significant variations were analyzed. Data was recorded on an information sheet. Later, with the help of radiology secretary (RS) credential, the system time was also noted for further observation and analysis.

3.6 Sample size calculation – Total 108 sample size was taken out of which the average TAT was calculated to know the average waiting time of the patient for their investigation to be done. Later, the data was also calculated to know the amount of samples which fall within the time range for X-ray, CT, MRI and USG in the radiology department.

3.7 Sampling technique – A non-probability sampling technique called convenience sampling selects units for the sample depending on how easily they can be reached by

the researcher. This can be due to geographical closeness, availability at a certain time, or participation in the study. Patients that visited the radiology department Monday to Saturday 9am to 5pm was enrolled in the study. This strategy was suitable because patients arrived at the hospital at various times without an appointment, making it simple to meet the necessary criteria. Sampling was different for all four modalities (X-ray, CT, MRI, USG). Data was collected from 13th March to 20th April 2023.

3.8 Operational definitions:

TAT - Turnaround time (TAT) is the period of time between when a process is submitted and when it is finished. Thus, the idea is related to lead time and contrasted with cycle time.

IPD - According to a doctor's or specialist's evaluation, patients from the outpatient department, emergency services, and ambulatory care are accommodated in the hospital's inpatient departments (IPD). Over 24 hours are spent admitting patients.

OPD - The area of a hospital designated for the care of outpatients, or people with health issues who visit the facility for diagnosis or treatment but do not currently need a bed or to be admitted for overnight care, is known as an outpatient department or outpatient clinic.

CHECK IN TIME- It directs patients to check in for their booked appointments by using a computer screen/tablet used by the radiology secretary once the patient enters the investigation room.

CHECK OUT TIME– Once the patient is done with the investigation the radiology secretary checks out the patient with the use of a computer screen/tablet.

APPRAOCH TIME – the time at which the patient approaches the secretary's desk for appointment

APPOINTMENT TIME – the scheduled time/slot for the patient

QUEUE TIME – also known as arrival time, the time when the patient arrives the department for investigation and secretary immediately queues the patient.

3.9 Statistical Method –

The information gathered in the form of observations from 110 patients was then converted to an Excel sheet for interpretation. Data related to waiting times were then

examined using MS Excel to compute the fundamental descriptive statistics in averages and percentages. These statistical data was then analyzed by using Pivot table and Pivot Chart representing graphical form of data. Similar to this, a root cause analysis based on observation exposed important gaps in the process flow of the radiology department. This data is represented as a number of occurrences using MS Excel.

(a) Inclusion criteria –

- Only stable, conscious and ambulant patients are included in the study.
- A radiographer practicing at KIMS hospital and diagnostic centres located in Hyderabad.

(b) Exclusion criteria –

- Hospital personnel who are not Radiographers.
- Unconscious patients were also not included in the study.

3.10 Ethical considerations

Data were gathered for this study in the strictest confidence, and study participants were occasionally treated with respect. The privacy of the participants was not invaded. The data was only used for this study, and patient names were never used; instead, UMR numbers were always used as a unique identification number.

CHAPTER FOUR: RESULTS

4.1 Introduction

According to data gathered by an observational study conducted without the knowledge of staff, only 50% of patients could receive imaging services at the time of their call, and the remaining 50% could not receive imaging services when it was their turn because they did not meet the pre-preparation requirements, which varied depending on which imaging services were being used. In the case of in-patients, the delay resulted from the patient's arrival being delayed after raising the indent from the ward and from the requisition slips' lack of time for registration.

4.2 Analysis

TABLE NO 4.1 – Sample collected for each service

Avg sample Row Labels	March	April	Grand Total
CT	1	7	8
MRI	7	2	9
USG	18	32	50
X ray	20	21	41
Grand Total	**46**	**62**	**108**

TABLE NO 4.2 – Waiting Time of X-ray

Count of TAT Range	X RAY	Grand Total
< 15 min	36.59%	36.59%
Mar	26.83%	26.83%
Apr	9.76%	9.76%
> 15 min	63.41%	63.41%
Mar	21.95%	21.95%
Apr	41.46%	41.46%
Grand Total	**100.00%**	**100.00%**

Figure 4.1 Showing the average waiting time for X-ray

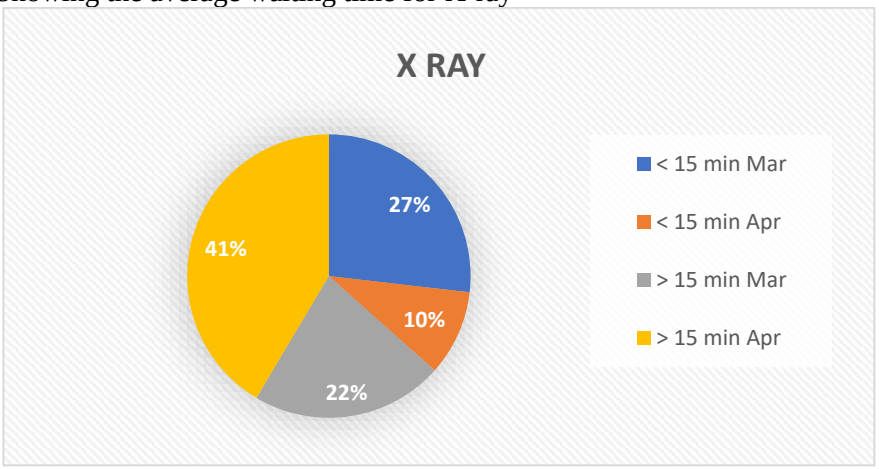


TABLE NO 4.3 – Waiting Time of USG

Count of TAT Range	USG	Grand Total
<20 min	46.00%	46.00%
Mar	12.00%	12.00%
Apr	34.00%	34.00%
>20 min	54.00%	54.00%
Mar	24.00%	24.00%
Apr	30.00%	30.00%
Grand Total	**100.00%**	**100.00%**

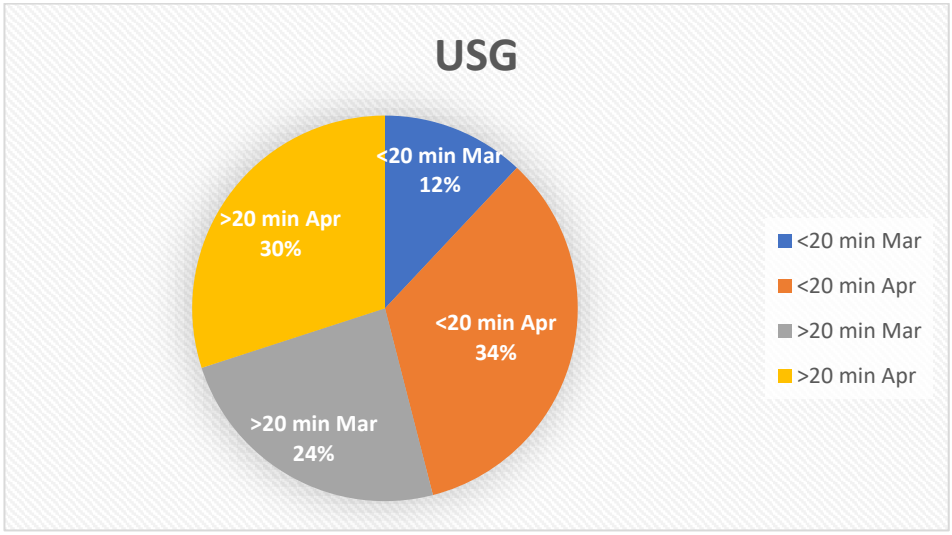


Figure 4.2 Showing the average waiting time for USG

TABLE NO 4.4 – Waiting Time of CT

Count of TAT Range	CT	Grand Total
<15 MIN	87.50%	87.50%
Mar	12.50%	12.50%
Apr	75.00%	75.00%
>15 MIN	12.50%	12.50%
Apr	12.50%	12.50%
Grand Total	**100.00%**	**100.00%**

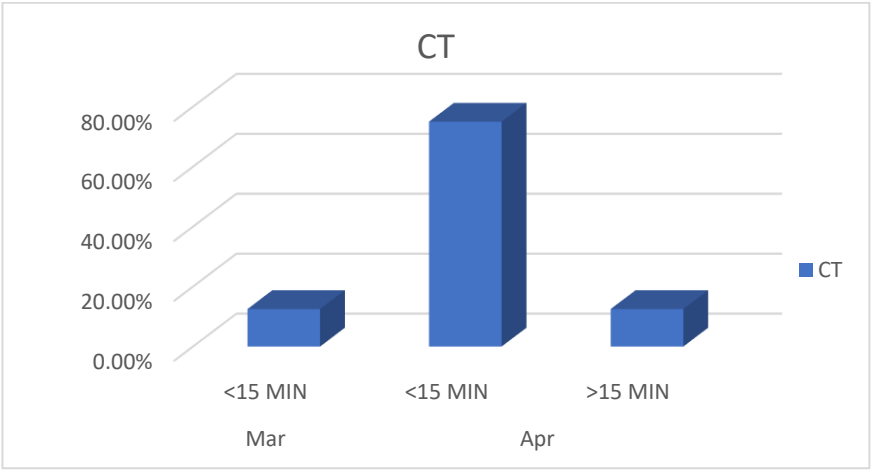


Figure 4.3 Showing the average waiting time for CT

TABLE NO 4.5 – Waiting Time of MRI

Count of TAT Range	MRI	Grand Total
<30 MIN	55.56%	55.56%
Mar	44.44%	44.44%
Apr	11.11%	11.11%
>30 MIN	44.44%	44.44%
Mar	33.33%	33.33%
Apr	11.11%	11.11%
Grand Total	**100.00%**	**100.00%**

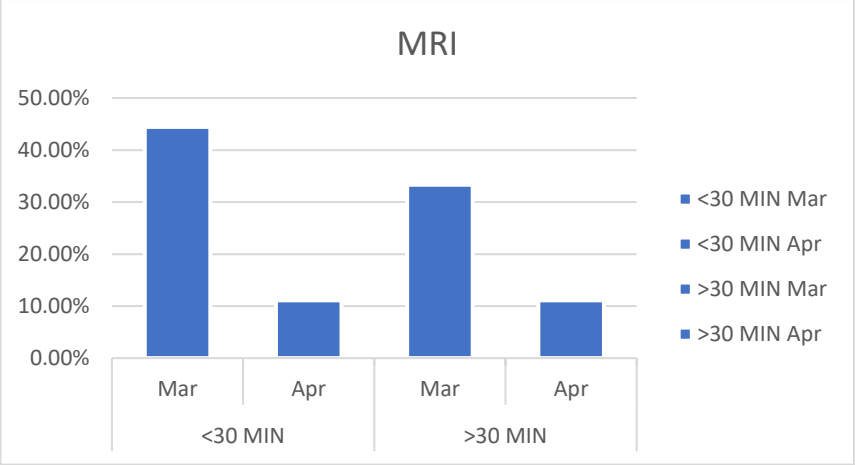


Figure 4.4 Showing the average waiting time for MRI

The study's findings provide crucial new information on the turnaround time (TAT) and waiting intervals that patients undergoing imaging treatments must endure. The study primarily examined four modalities: CT, MRI, ultrasonography (USG), and X-ray.

TABLE NO 4.6–

Count of TAT Row Labels	CT	MRI	USG	X RAY	Grand Total
Mar	**0.93%**	**6.48%**	**16.67%**	**18.52%**	**42.59%**
< 15 min	0.00%	0.00%	0.00%	10.19%	10.19%
<15 MIN	0.93%	0.00%	0.00%	0.00%	0.93%
<20 min	0.00%	0.00%	5.56%	0.00%	5.56%
<30 MIN	0.00%	3.70%	0.00%	0.00%	3.70%
> 15 min	0.00%	0.00%	0.00%	8.33%	8.33%
>20 min	0.00%	0.00%	11.11%	0.00%	11.11%
>30 MIN	0.00%	2.78%	0.00%	0.00%	2.78%
Apr	**6.48%**	**1.85%**	**29.63%**	**19.44%**	**57.41%**
< 15 min	0.00%	0.00%	0.00%	3.70%	3.70%
<15 MIN	5.56%	0.00%	0.00%	0.00%	5.56%
<20 min	0.00%	0.00%	15.74%	0.00%	15.74%
<30 MIN	0.00%	0.93%	0.00%	0.00%	0.93%
> 15 min	0.00%	0.00%	0.00%	15.74%	15.74%
>15 MIN	0.93%	0.00%	0.00%	0.00%	0.93%
>20 min	0.00%	0.00%	13.89%	0.00%	13.89%
>30 MIN	0.00%	0.93%	0.00%	0.00%	0.93%
Grand Total	**7.41%**	**8.33%**	**46.30%**	**37.96%**	**100.00%**

March's TAT Waiting Period:

X-ray has the highest TAT waiting time percentage with 18.52%. There is never less

than a 15-minute wait for any procedure. For CT (0.93%) and MRI (3.70%), the majority of TAT waiting times fell within the range of 15 to 30 minutes. 8.33% of patients wait more than 15 minutes for an X-ray. With a total waiting time for all procedures of 42.59%, USG has a waiting time of 16.67%.

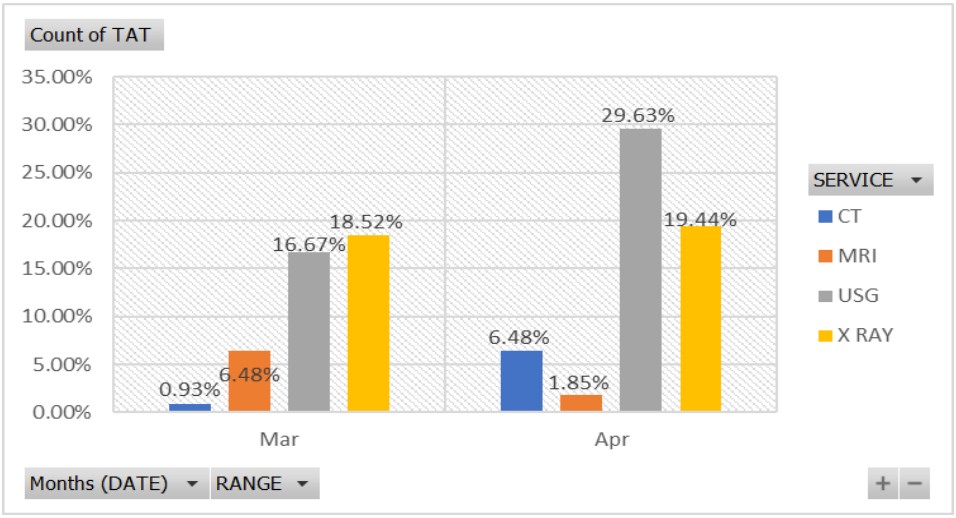


Figure 4.5 Average TAT

April TAT Waiting Time:

As shown in the figure 4.5, with 29.63%, USG has the highest TAT waiting time percentage.

A sizable waiting time of 19.44% is also present for X-ray.

Similar to March, there is never a wait time of more than 15 minutes for procedure like CT or MRI.

For USG, there is a waiting time of over 15 minutes, accounting for 15.74%.

The distribution of TAT waiting times for various radiological services across the analyzed period is shown in the **table no. 4.6**. These percentages can be used as the basis for additional comparisons or research to spot patterns or potential areas for waiting time reductions for particular procedures. The table also highlights the factors that contribute to delays in the provision of specialized services at the KIMS hospital, including the radiology secretary's lack of training, the improper placement of patients on both floors of the radiology department during periods of high patient volume, the complexity of the management information system, and the absence of a transportation service.

4.3 Root cause analysis (RCA)

ROOT CAUSE ANALYSIS OF LONG WAITING TIME

The process of locating the underlying causes of a problem in order to select effective solutions is known as root cause analysis (RCA). In this study RCA will help in identifying the major reason of delay causing longer waiting time in radiology department in a hospital. Root cause investigation for a lengthy waiting time to investigate and assess the cause of each respondent's delay in receiving the services, a root cause analysis was carried out. Longer wait times in radiology departments can be caused by various circumstances. Here are some typical things to think about:

(a) Scheduling appointments: Poor or ineffective appointment scheduling procedures can result in crowding and prolonged wait times. Delays may be caused by problems including overbooking, a lack of time slots

(b) Workload and staffing levels: Inadequate staffing or workforce imbalances can affect wait times. Delays may occur if there are not enough radiologists, technologists, or support personnel to deal with the number of patients.

(c) Emergency cases and prioritization

(d) Communication and coordination

(e) Policies and procedures

(f) Patient no shows and late arrival

To create focused solutions for lowering waiting times in radiology departments, it's critical to undertake a detailed investigation of these elements and pinpoint their underlying causes. Based on an analysis of each case pertaining to the category of IPD/OPD patients, the most frequent causes of delay were determined.

Table 4.7 For OPD Patients – **95 samples**

DELAY REASONS	NUMBER OF CASES	PERCENTAGE
Check-in/check-out time was not updated	25	26
Technician busy in multitasking	6	6
Patient not present on their turn	8	8
Patient's bladder not full	5	5
Increase number of patients in OPD	18	19
System issue	3	3
No delay	24	25
Priortization of emergency patients	5	5
Radiologist busy	3	3

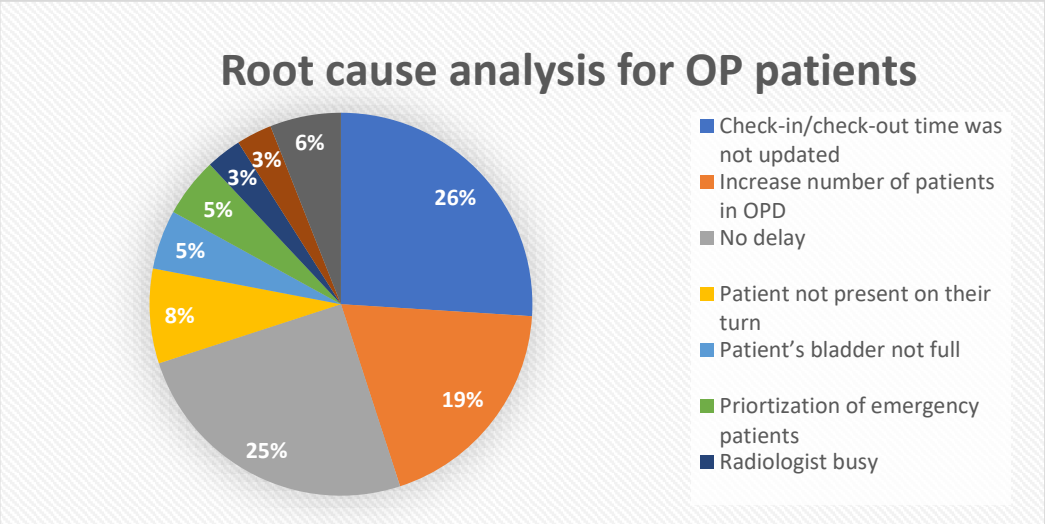


Figure 4.6 Representation Analysis for OP patients

Table 4.8 For IP Patients- **13samples**

DELAY REASON	NUMBER OF CASES	PERCENATGE
Delay in shifting	4	30
System issue	2	15
Check-in/check-out time was not updated	2	15
No delay	3	23
Increase number of patients in OPD	2	15

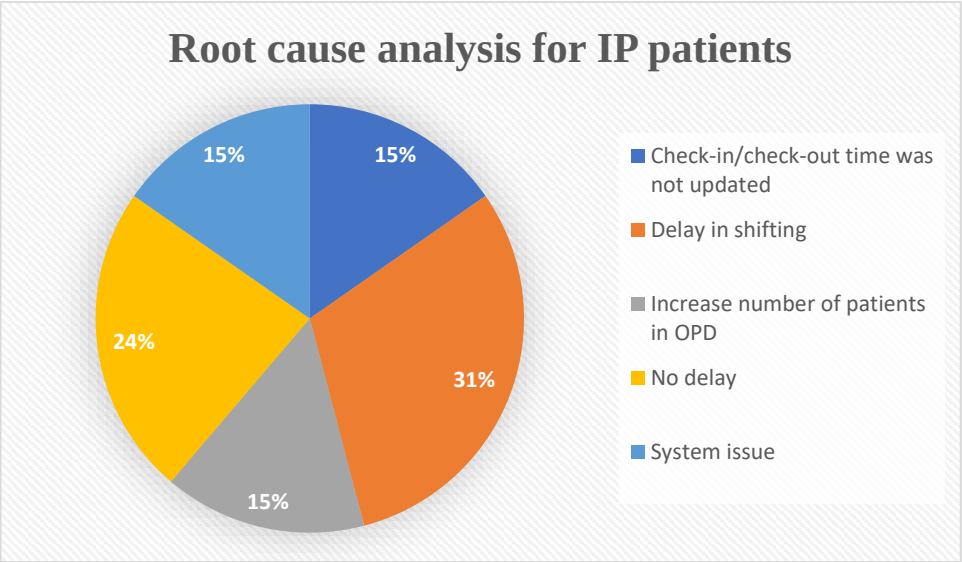


Figure 4.7 Representation Analysis for IP patients

In case of 95 OPD patient cases as shown in **table 4.7** was found that the most common cause of delay is improper updating of queuing and check-in time of the patient before the investigation which was the reason seen in 26% of cases where check-in was not updated by the radiology technician. In 19% of the cases, it was discovered that poor management was due to the inadequate handling of a sizable number of OPD patients by personnel, especially during peak hours, because the radiology department was overloaded. 8% of cases were delayed as patients were unavailable at their time of call. In 5% of cases, investigations into other cases were delayed due to poor coordination and communication between departments, particularly when it came to package investigations like those in sample collection units where patients had to wait for blood tests before having to build up their blood pressure once more for ultrasound. The other 5% delay occurred as IPD patients also come for the imaging in the department so the radiology secretary has to prioritize the IPD patients before the OPD patients and counsel them regarding the same. 3% cases had to wait for the radiologist to come and perform the tests. The other 3% delay was seen because of system issue where the system used to by default select the type of investigation also jumbling of appointments from one investigation to other for the same service which took time in giving appointments to the patients by the radiology secretary. Lastly, 24% cases showed no delay.

In case of 13 IPD patient cases which were examined in **table no 4.8** the most common delay was delay in shifting from ICU to radiology department was found to be 30%. 15% cases also had the similar problem faced by OPD patients regarding the system glitches. The other 15% showed delay as the department was overcrowded with OPD patients and OP consultations due to which the waiting time for IP patients was longer. Lastly, no delay was observed in 23% of the patients.

CHAPTER FIVE: DISCUSSION

5.1 Introduction

The research findings are discussed in this chapter. It also draws conclusions and offers advice based on the study's findings. It also states the limitations and strengths of the study. The results of the above listed data clearly indicate that waiting time is the most important factor that affects the patient's satisfaction and efficiency of the hospital.
To determine the time taken for radiological services in radiology department.
According to the results from the analysis above, the USG service spent the most time performing whole-abdomen examination scans. According to Amandeep et al. (2022), this is accurate.

5.2 Discussion

Batching of patient records may potentially result in lengthy wait delays. Batching results in patient confusion and crowding, which lengthens individual wait times. Due to the way patient flow records are set up, it is imperative that the shift plan take the sizeable volume that is expected during the morning hours into account. Since the personnel are overworked in mornings but largely redundant in the afternoons, this is consistent with staffing levels. (2010) Wagner et al. The long lines may also be related to flow issues, such as service point delays brought on by computer delays or occasionally manual processes. This is explained by the study's findings, which showed that complains of delays caused by long lines were most frequent during the billing, waiting area, and examination times. Even when staff was available to meet patients, patients were periodically delayed at the registration desk and other service points because of a system malfunction or a staffing shortage.
The procedure is a little tiresome, and the patient must wait a while for the ultrasound and x-ray exams. For a smooth, efficient, and timely flow of activities, the department should redesign patient flow numerous times. Lack of an effective flow design may also be to blame for long lines in ack and forth motions. Adoption of a radiological dashboard linked to a HIMS will also reduce congestion because the system will adhere to the first come, first served principle and align processes with QMS. Patients typically require extra time to be attended to at the service locations because there is a lack of staff.

The findings from the examination of the TAT (Turnaround Time) waiting times for radiological services at the KIMS hospital offer important new information on the length of patient waits and the causes of delays. Data from March and April show that waiting times vary depending on the treatment, with X-ray and USG typically having the greatest waiting time percentages.

With a TAT waiting time percentage of 18.52% in March, X-ray was particularly notable. A wait time of more than 15 minutes was also encountered by 8.33% of X-ray patients. This implies that in order to cut down on wait times and improve patient satisfaction, X-ray services must become more efficient. Contrarily, waiting times for CT and MRI scans were noticeably shorter, with the majority of procedures taking between five and ten minutes.

According to April's figures, USG now has the highest TAT waiting time percentage, at 29.63%. The waiting time for X-ray was likewise very long, at 19.44%. No procedure had a wait time of less than 15 minutes, same like in March. The X-ray and USG waiting times are consistently long, which emphasizes the need for tailored actions to address the unique issues related to these treatments.

X-ray (37.96%), CT (7.41%), and MRI (8.33%) are the next greatest percentages when the total number of TATs is considered. USG has the highest rate (46.30%). These figures indicate that the modalities with the longest average TATs are USG and X-ray.

5.3 Determining Factors Contributing To Waiting Time In X-Ray, CT, MRI And USG

Healthcare must effectively control TAT since it has a direct impact on patient care, diagnosis, and treatment. The data shows that TAT reduction efforts must be improved, especially for X-ray and USG, where most instances had delays of more than 15 minutes. The providers may want to use measures like workflow optimization, procedure streamlining, and assigning enough personnel to handle the rising demand to deal with this problem. TAT can be decreased by utilizing technology breakthroughs like automation, digitization, and AI-based algorithms to speed up image processing and interpretation. To find and address the root causes of delays, regular TAT metric monitoring, bottleneck analysis, and continuous quality improvement initiatives are crucial. Healthcare facilities may increase patient happiness, guarantee prompt diagnosis, and boost overall operational effectiveness by putting these measures into

practice.

The radiology department's increased wait times are the result of several causes, which are highlighted by the root cause analysis. Incorrect updating of check-in and queue times, departmental overcrowding, patients not showing up at scheduled times, and a lack of departmental contact for coordinated investigations were all frequent causes of delays for OPD patients. These results point to areas where process enhancements and improved collaboration can shorten wait times.

5.4 Determine Patient Flow In Radiology Department

Delays with moving patients from the ICU to the radiology department were primarily to blame in the case of IPD patients. This emphasizes the necessity of streamlining procedures and effective departmental coordination to guarantee prompt access to radiological services for inpatients.

The radiology department is a service-oriented division that adds value to patient care and diagnostics. In order to query waiting times, the author Filip Deferme et al. (2015) uses modern software through a radiology information system (RIS), but not patient loads or staffing issues. The author used a three-stage system that included digital dashboard creation, ticketing, and signage. A looping video with information specific to the examination is shown in the first step. The second stage is when the patient registers and is given a ticket number that is shown on digital signs in a sequential order. The staff will assess patient throughput and workflow in the third and final stage, the patient dashboard. This project appears to be partially completed, but patients can find the radiology department using this process flow. Digital dashboards show the number of people using the waiting room will be easier to keep a track of patients.

5.5 Limitations of the study

Data collection was affected as the access for HIMS and QMS was not provided so had to cross check the data with the help of other staff during their free time. The very sick, bedridden, road traffic accident cases and infants were given the first priority.

(a) Limited Time: Only the months of March and April are covered by the study. The waiting time patterns throughout the year may not be fully understood within this constrained timeframe. It's possible that this short span won't allow for the recording of seasonal fluctuations, holidays, or other circumstances that could affect waiting times.

(b) Lack of Patient input: The study does not include questionnaires or patient input

about their experiences waiting. Understanding how waiting times affect overall patient satisfaction and how their subjective experiences may differ from those of other patients might help with quality improvement efforts.

(c) Lack of Patient-Specific Factors: Individual patient features, such as the urgency of the examination, the complexity of the case, or the existence of comorbidities, are not taken into account in this study. These elements may add biases or confounding elements and have a considerable impact on the waiting time for a given patient.

When interpreting the findings of the radiology waiting time study, it is crucial to take these limitations into account. In order to provide a more thorough picture of radiology waiting times, future research should strive to solve these constraints by incorporating a wider timeframe, numerous healthcare facilities, patient-specific characteristics, root cause analysis, and patient feedback.

5.6 Strengths of the study

(a) Quantitative Information: The study offers quantitative information on wait times for various radiological modalities, including CT, MRI, USG, and X-ray. Since the data is displayed as percentages, comparison and analysis are made simple.

(b) Time Period: The study's focus on the months of March and April gives researchers a clear window of time within which to examine waiting times. This makes it possible to evaluate performance more specifically throughout those months and makes it easier to spot any temporal trends or changes.

(c) Multiple Modalities: The study looks at the wait times for different imaging techniques that are often used in radiology. It offers a comprehensive perspective of the entire performance and identifies certain areas that need attention by taking into account various modalities at once.

(d) Categories TAT: Waiting durations are divided into distinct TAT intervals in the study, such as " 15 min," " 20 min," " 30 min," "> 15 min," "> 20 min," and "> 30 min." This thorough dissection enables a nuanced comprehension of the distribution of waiting times and aids in the identification of certain thresholds where delays happen.

(e) Comparison over Time: March and April are two consecutive months that the study compares waiting times between. This comparison makes it possible to spot trends, patterns, or variations in waiting times and offers perceptions into how well any interventions or advancements made during that time period worked.

These advantages increase the study's dependability and applicability to healthcare professionals looking to reduce wait times and raise patient satisfaction with radiology treatments.

Overall, the findings indicate that addressing the identified root causes of delays, such as enhancing departmental communication and coordination, managing overcrowding, managing queueing systems, and addressing system issues, can significantly shorten wait times and enhance the patient experience. The delivery of radiological services can be optimized, and patient wait times can be decreased, by KIMS putting into place targeted measures based on these findings. Such advancements would boost patient happiness while also ensuring prompt diagnosis and treatments, which would ultimately lead to better healthcare results.

CHAPTER SIX: CONCLUSION

6.1 Conclusion

A thorough examination of waiting times in healthcare facilities as well as patient satisfaction scores uncovered some intriguing details. In conclusion, it is clear from the study on wait times in the radiology department that reducing long wait times is important for raising patient satisfaction and confidence in the healthcare provider. The study's goal was to ascertain the turnaround time between the patient's arrival and the conclusion of the imaging investigation and to pinpoint the elements and places that contribute to these wait times. The objective was to offer potential remedies for shortening wait times. According to this study, the majority of patients waited for more than 30 minutes before receiving care. As a result, waiting times have a big impact on how satisfied customers are with other service-related factors. As a result, healthcare organizations must act quickly to reduce or shorten the amount of time patients must wait. It was crucial to look into the causes of the delay because the amount of time spent waiting was crucial. Patients' lack of preparation, encompassing both IPD and OPD patients, was the most frequent cause of delay, according to the RCA research on delays or long appointment wait times. The study offers insightful information for healthcare professionals, emphasizing the necessity to concentrate on particular modalities that have larger waiting periods. The study provides the door for finding the underlying reasons of delays and creating targeted solutions by performing a root cause analysis. Process simplification, improved staffing levels, the use of technological innovations, and improved appointment scheduling are all potential remedies.

The information from March and April reveals notable variances in the Turnaround Time (TAT) for various medical imaging modalities, particularly X-ray, CT, MRI, and USG. With a TAT waiting time percentage of 18.52% in March and 19.44% in April in both months, X-ray shone out. In March, 8.33% of X-ray patients had wait times that were more than 15 minutes. These statistics highlight the critical need for increased effectiveness in X-ray services to shorten wait times and raise patient satisfaction. In order to pinpoint and address the underlying reasons of delays, it is essential to continuously monitor TAT data, regularly analyze workflow, and solicit input from patients and staff. Additionally, utilizing automation, digitization, and technology improvements can greatly increase TAT across all modalities.

In conclusion, decreasing radiology department wait times is essential for raising patient

satisfaction and strengthening the public's perception of the healthcare system. According to the study's conclusions, it is crucial to address the issue of lengthy X-ray and USG wait times. Healthcare providers can strive towards streamlining workflow, lowering wait times, and ultimately improving the patient experience in radiology services by implementing targeted interventions based on the root cause analysis.

6.2 Recommendations

In healthcare organizations, patients frequently experience lengthy wait times. The current study discovered process gaps which have been identified in practically all hospitals, however hospitals frequently choose to overlook this, claiming their powerlessness. The high level of patient discontent that ultimately leads patients potentially transferring to another healthcare provider over time could turn out to be a significant financial loss.

Non-medical features of a patient's visit, like the simplicity of registration, the difficulty of paperwork, and wait periods, can be strongly linked to patient satisfaction and perceptions of the quality of their medical care. In turn, this may have an impact on patient satisfaction ratings, which, in incentive-based systems, have a direct bearing on reimbursement rates.

It can be crucial to find strategies to reduce these kinds of non-medical aspects of a patient's health care experience if practices are to continue to make money and if value-of-care targets are to be met. Hospital and other healthcare facilities should therefore take the waiting time issues thoroughly and work to shorten it. According to the study mentioned above, some recommended preventive and corrective actions that can be performed to enhance the process work flow include;

1. The radiologist can be informed of urgent requests, pending reports, and unsigned reports to patients via a dashboard for radiology that helps with work flow metrics.

2. A radiology information system (RIS) was developed to synchronize and streamline all radiology procedures. Because the system occasionally hung, appointment scheduling accounted for the majority of delays. As a result, digitalizing facility operations and automating processes for storing and tracking patient information would make operations highly efficient and enable management to identify any bottlenecks

and take appropriate action.

3. A dashboard for radiology that helps with work flow metrics allows the radiologist to be informed of urgent requests, outstanding reports, and unsigned reports for patients in queues.

4. Transport service to be appointed in the radiology department on both floors to move the patient from one service to other. Proper coordination should be maintained.

5. Timely monitoring to be done regarding the check-in and check-out followed by queuing of the patient by the RT to reduce the difference in turnaround time.

6. Proper training of staff regarding the HIMS and QMS software.

7. Installing a check-in kiosk will allow patients to register themself and receive their token number, freeing up the assistance desk employees to only assist patients with preparation and any form completing, such as PNDT forms in cases of pregnancy.

8. Radiologists' schedules will be changed so that there are always two on duty during OPD hours. Portable USG and other USG assisted operations should be conducted without hindrance for IPD patients, and a separate radiologist should be designated. For OPD patients, there should be at least two operating USG rooms in order to maintain order during busy times. To prevent pandemonium, arrangements should be made for visiting radiologists in the event that none are available on a permanent basis.

9. Provision of a tablet in which QMS system is installed for the RS to easily queue the patient after giving the appointment.

10. Surveys on turnaround times should be conducted by the department on a regular basis to keep an eye on the situation. The survey's conclusions and recommendations must be put into practice and regularly evaluated.

11. Patients who have left for other job or are in another department should receive a text message updating them on the timing of their turn.

12. The availability of current newspapers, magazines, and children's activity books in both languages can assist maintain interest among patients and their peers while they wait, making the waiting time appear shorter.

13. Workflow optimization involves assessing and streamlining the radiology department's workflow while looking for potential bottlenecks and inefficient areas. To maintain efficient patient flow and reduce delays, think about creating standard protocols and guidelines.

Longer wait times must be addressed by healthcare organizations since patients are paying more out-of-pocket for healthcare and are getting pickier about the healthcare providers they receive. Medical practices cannot fail in this area. Together with greater clinical workflow training, better appointment scheduling technologies can help manage patient intake. Therefore, after looking into these above mention recommendations the organization can achieve better operational efficiency.

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