INTERNSHIP TRAINING AT YASHODA SUPERSPECIALTY HOSPITAL, KAUSHAMBI

By

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PGDHM

2012-2014

International Institute of Health Management Research

New Delhi

INTERNSHIP TRAINING

At

YASHODA SUPERSPECIALTY HOSPITAL, KAUSHAMBI

A STUDY OF WAITING TIME FOR RADIO-DIAGNOSTIC SERVICES USING SIX SIGMA IN OUTPATIENTS DEPARTMENT AT YASHODA SUPERSPECIALTY HOSPITAL, KAUSHAMBI

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2012-2014

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Certificate from Dissertation Advisory Committee

This is to certify that **Dr.Arti Sharma(PT),** a graduate student of the **Post- Graduate Diploma in Health and Hospital Management** has worked under our guidance and supervision. She is submitting this dissertation titled **"A STUDY OF WAITING TIME FOR RADIO-DIAGNOSTIC SERVICES USING SIX SIGMA IN OUTPATIENTS DEPARTMENT AT YASHODA SUPERSPECIALTY HOSPITAL, KAUSHAMBI"** at **"Yashoda Superspecialty hospital Kaushambi"**in partial fulfillment of the requirements for the award of the **Post- Graduate Diploma in Health and Hospital Management.**

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The Internship is in fulfillment of the course requirements.

I wish her all success in all her future endeavors.

Dr. A.K. Agarwal
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The following dissertation titled **"A STUDY OF WAITING TIME FOR RADIO-DIAGNOSTIC SERVICES USING SIX SIGMA IN OUTPATIENTS DEPARTMENT AT YASHODA SUPERSPECIALTY HOSPITAL, KAUSHAMBI"** at **"Yashoda Superspecialty hospital Kaushambi"** is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **Post Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

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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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Date 1/2/14 – 30/4/14

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We wish her all the best for future endeavors

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Area of Dissertation: RADIOLOGY OPD.

Attendance: 96%.

Objectives achieved: Learning of Radiology Processes

Deliverables: Reporting With-in time

Strengths: Hardworking

Suggestions for Improvement: Analytical Skills.

Signature of the Officer-in-Charge/ Organisation Mentor (Dissertation)

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Place:

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ACKNOWLEDGEMENT

I take this opportunity to express my profound gratitude and deep regards to my guide Dr. A.K.Agarwal (Dean-Academic & Students Affair, IIHMR New Delhi) for his exemplary guidance, monitoring and constant encouragement throughout the course of this project. The blessing, help and guidance given by him time to time shall carry me a long way in the journey of life on which I am about to embark.

I also take this opportunity to express a deep sense of gratitude to Dr. Sunil Dagar (GM-Operations & Quality, Yashoda Superspecialty Hospital Kaushambi) for his cordial support, valuable information and guidance, which helped me in completing this task through various stages.

I am obliged to staff members of Yashoda Superspecialty Hospital, for the valuable information provided by them in their respective fields. I am grateful for their cooperation during the period of my assignment.

Lastly, I thank almighty, my parents, brother, sisters and friends for their constant encouragement without which this assignment would not be possible.

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ABSTRACT

INTRODUCTION

Health care quality is a global issue. The health care industry is undergoing a rapid transformation to meet the ever-increasing needs and demands of its patient population. Hospitals are shifting from viewing patients as uneducated and with little health care choice, to recognizing that the educated consumer has many service demands and health care choices available. To move towards higher quality care, more and better information is commonly required on existing provision, on the interventions offered and on major constraints on service implementation.

OPDs are considered as the window to hospital services and a patient's impression of the hospital begins at the OPD. This impression often influences the patient's sensitivity to the hospital and therefore it is essential to ensure that OPD services provide an excellent experience for customers.

RATIONALE

It may not be possible to provide beds for medical care that are needed in the near future for all the population of our country. Emphasis is, therefore, being shifted to outpatient services,, which are a pivotal place from where organised comprehensive medical care can be given to the community. Outpatient services must be prompt and acceptable to the community with a minimum of waiting. All efforts should therefore be directed towards strengthening outpatient department, physically and functionally.

The Objective of the study: - To find out waiting time of the radio-diagnostic services at the OPD; identify the bottle – necks and offer suggestions for cutting down the waiting time which, it is hoped, will be useful in improving the functioning of the OPD so that waiting time can further be reduced and thereby improving the community image of the hospital.

Methodology: The study was Observational, descriptive & cross-sectional in nature as data collected was of a period of 3 months. The study was based in outpatient department of Yashoda superspecialty hospital ,Kaushambi. The methodology adopted was SIX SIGMA Methodology- DMAIC (Define Measure Analyze Improve

Control).The subjects were outpatients who came to outpatients department for the radio diagnostic services (CT, X-RAY & Ultrasound).

***Define*:** Patients' waiting time for the radio-diagnostic services has been defined as "time taken from the billing till start of the investigation and time taken in reporting. Standard waiting time and TAT for the reporting was predefined as per the hospital policy.

Measure: Data gathering was done from Hospital Management system of OPD(CT,X-ray,Ultrasound)

Analyze: The collected Data was analyzed using MS excel & Problem analysis by RCA through observation, patient's feedback and stakeholder's interviews.

Improvement: Recommendations to improve the processes

Controlling: Control measures.

RESULTS & CONCLUSION

The average waiting time for the CT ,X-ray & Ultrasound found to be as 2:14, 1:48 & 1:24 respectively. The average TAT for the reporting came out as 15:10 for CT, 6:28 for X-ray & 21:10 for Ultrasound. The sigma level was calculated which was found to be far below the 6 sigma level .

The results stated above shows that the deviation from the standard policy time is too much. The root causes were identified and the biggest causes found to be was lack of appointment system and arrival of patient in big batches and some other causes such as lack of proper coordination. The recommendation and control measures were suggested for the same.

Our customers conduct business — old business models no longer work. Today's competitive Environment leaves no room for error. We must delight our customers and relentlessly look for new ways to exceed their expectations. This is why Six Sigma Quality has become a part of our culture.
The central idea behind Six Sigma is that if you can measure how many "defects" you have in a process, you can systematically figure out how to eliminate them and get as close to "zero defects" as possible.

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LIST OF SYMBOLS AND ABBREVIATIONS

IP : In Patients

OP : Out Patients

OTC : Over the Counter

US : Ultra Sound

USS : Ultra Sound Scanning

RDT : Radio Diagnostic Technology

CT : Computed Radiography

MRI : Magnetic Resonance Imaging

Pt : Patient

Invstgn: Investigation

OR : Operating Room

Pprtn : Preparation

Appt : Appointment

TLD : Thermo luminescent Dosimeters

GDA : General duty attendant

TAT : Turn Around Time

DPU : Defects Per Unit

TO : Total no. of Opportunities

DPO : Defects Per Opportunity

DPMO : Defects Per Million Opportunities

INTERNSHIP REPORT

HOSPITAL PROFILE

1. PROFILE

YASHODA SUPER SPECIALTY HOSPITAL was founded in the year 2006 by ***Dr. Dinesh Arora*** and ***Shri P. N. Arora*** with a capacity of 100 beds and was inaugurated by ***Hon'ble Shri L. K. Advani***. It is a name synonymous with advanced world class patient care in Delhi NCR. The institution has now grown to become a major tertiary care healthcare provider for all walks of life in the region easily accessible by road & rail.

Yashoda Super Speciality Hospital has been pursuing the aim to deliver world-class patient care services in a comprehensive manner to every individual with an emphasis on quality, service excellence, empathy and patient respect ever since it's beginning. In all its endeavours, it has continuously strived to upgrade its facilities and equipments to match world-class standards and consistently invested in making available the latest medical technologies. In addition to all the general specialities, it has a varied range of Superspeciality services i.e. Cardiology, Endocrinology, Gastroenterology, Joint Replacement, Nephrology, Neurology, Pulmonology, Urology, Neurosurgery, Plastic and Reconstructive Surgery. With a state of the art world-class seamless operation theatre complex with HEPA filters and laminar flow maintaining international standards of engineering, operational safety and infection control. The institution has constant support from well qualified and professional Consultants, Residents, Nurses, Technicians, Administrative and Support staff. The hospital has well equipped critical care units and haemodialysis facilities. The hospital has its own fleet of ambulances including ICU ambulances for transportation of critically ill patients.

The institution has advanced diagnostic facilities including CT scan, Ultrasonography, Mammography, Routine Radiology, ECG, EEG, NCV & EMG, TMT, ECHO, Colour Doppler, Holter Monitoring, PFT, and Diagnostic Endoscopy. Fully Automated pathology, Microbiology & Cytology. The institution has fully functional Blood Bank and Component preparation services.

Yashoda Superspeciality Hospital has designed comprehensive preventive healthcare packages covering varied requirements of all age groups. The Health check-up packages are flexible enough to accommodate the specific requirements and can be tailor made to

suit particular organizations also. It also provides pre-employment health checks at affordable costs.

Along the path to success, the hospital has achieved many recognitions and accolades. The important ones among them being the ISO 9001certification and National Accreditation Board for Hospitals and Healthcare Providers (NABH) Accreditation- the first hospital in Ghaziabad to achieve it. Achieving this recognition in short span of time reflects the dynamic leadership & vision pursued by the management.

This dedication to excellence in quality was achieved by primarily focusing on Patient Safety and Quality of Patient Care, Continuous Quality Improvement via Quality Initiatives & Accreditations. This accreditation is testimony to the fact that Yashoda Super Specialty Hospital Care Pathways are standard driven, reflect global practices and ensure that patients consistently receive quality health care. The achievement of NABH accreditation is an acquittal of our excellence in medical services and the care we provide to each of our patients in hygienic and safe environment.

The rapid and comprehensive growth of Yashoda Super Speciality Hospitals in providing low priced, comprehensive and quality driven healthcare services to its community has resulted in a growing and continuous demand for its services

QUALITY POLICY

Yashoda Super Specialty Hospital is a tertiary care hospital with focus on providing world class and holistic healthcare services with excellence in multi specialties to treat patients with respect, compassion, dignity and ensuring their safety by complying with all legal requirements & significant environmental aspects to maintain adherence with ***NABH*** *standards* through continuous quality improvement.

QUALITY OBJECTIVES with SERVICE STANDARDS

- To focus on Quality of patient care.
- To improve the performance of all professionals in patient care
- To monitor, measure, assess and improve performance and to enhance patient satisfaction.
- To guard, measure and improve patient safety.
- To inculcate an excellent hygienic treatment process
- To involve all employees to participate in improving Quality
- To search for pattern of non-compliance with goals, objectives & standards through:

a. Problem identification
b. Problem assessment
c. Finding the root cause
d. Solution Generation
e. Plan for the solution implementation
f. Implementation of corrective action
g. Monitoring

2. SCOPE OF SERVICES PROVIDED AT YASHODA SUPER SPECIALITY HOSPITAL

SUPER SPECIALTIES

- Cardiology
- Endocrinology and Metabolic diseases
- Gastroenterology
- Joint replacement
- Nephrology
- Neurology
- Neurosurgery
- Plastic, Cosmetic surgery & Reconstructive Surgery
- Pulmonology
- Urology

GENERAL SPECIALTIES

- Anesthesiology
- Audiology & Speech Therapy
- Critical Care Medicine
- Dentistry
- Dermatology
- Dietetics
- ENT
- Internal Medicine
- Minimal Access & General Surgery
- Obstetrics & Gynecology
- Ophthalmology

- Orthopedics
- Pediatrics & Neonatology
- Physiotherapy
- Psychiatry, Clinical Psychology & Psychotherapy

SPECIAL CLINICS

- Preventive Health Checks

24 HR SERVICES

- Blood Bank
- Emergency & Trauma Care Services
- Laboratory Services
- Pharmacy Services
- Radiodiagnosis Services

Services not available at Hospital

- Heart Transplant
- Stem Cell
- Organ Transplant
- Oncology
- CTVS
- Nuclear Medicine
- Interventional Cardiology.

LABORATORY SERVICES

- Out patient services
- In patient care
- Haematology
- Clinical Pathology
- Cytopathology
- Serology
- Clinical Biochemistry
- Microbiology
- Immunology
- FNAC
- Bone marrow aspiration and biopsy

PHARMACY SERVICES

- In patient services
- Out patient services
- Genuine medicines from leading manufacturers
- Wide range of pharmaceutical items, surgical & disposables, life saving and general healthcare products
- Personalized pharmacy services
- We comply with the procedures and rules mentioned in the Drugs & Cosmetics Act, 1940
- Computerized billing discloses the expiry date and batch numbers of medicine

PREVENTIVE HEALTH CHECK-UPs

- Executive Health Check
- Senior Citizen Health Check
- Well Woman Health Check
- Breast Cancer Health Check
- Diabetic Health Check
- Healthy Heart Check
- Healthy Child Check
- Pre-Employment Health Check

RADIODIAGNOSIS SERVICES

The Radiology department is committed to providing safe, reliable and speedy radio diagnostic support round-the-clock on call basis.

The department has facilities for all 'conventional' radiography, including bedside radiographs for the critically ill patient who cannot be moved.

Other modalities include the following:

Ultrasonography: is a real time imaging modality. Cross sectional images of the scanned portion are visualized through various planes to identify, localize and diagnose the complaint.

Doppler examinations to image the blood vessels and profile the haemodynamics within can be carried out on our USG machine. This is invaluable in the management of varicose veins, diagnosis of deep vein thrombosis, arterial blocks.

CT scan: adds to the cross sectional imaging modalities available for accurate localization and diagnosis.

- In patient services
- Out patient services
- General Radiography
- Contrast Radiographic Studies
- Ultrasound Examinations
- Doppler Examination
- Computed tomography with intravenous / oral / rectal contrast where appropriate
- OPG
- Mammography
- Interventional radiology

DIAGNOSTICS:

Laboratory Timings:

Sample Collection Timings: Weekdays 9 am - 9 pm (OPD) , Emergency 24 Hrs .

X-Ray : Weekdays 9 am - 9 pm (OPD) , Emergency 24 Hrs .

Ultra Sound Timings:

Week Days ..... 9:00 a.m. to 9:00 p.m.

Sunday & Holidays 9:00 a.m. to 2:00 p.m., Emergency 24 hours.

Reports are made available within the shortest possible time which will be specified at the time of visit to the hospital.

1. Turnaround time for reports

a. X rays

   i. Normally all X-rays with reports will be handed over to CCA same day by 1730 hours

   ii. All in patients X-rays with reports will be dispatched after 5.30 pm to the respective wings to the nurse in-charge.

b. Ultrasound: 30 Minutes after the scan

c. CT scan:

   i. All scans done till 1400 hrs will be dispatched at 1730 hours and the scan done after 1400 hrs will be dispatched next day.

   ii. However all critical reports will be informed immediately

2. Turnaround time for emergency reports for all Procedures:

In case of an emergency report, the radiologist will see the film and give a verbal report to the referring consultant by phone.

If the patient is referred or wants to go to some other hospital (on request or against medical advice), Reports will be generated within 30 minutes (provided it is during Radiologist's office hours & if there is no emergency ultra sound scanning.

OPD- Out patient department

An **outpatient** (or **out-patient**) is a patient who is not hospitalized for 24 hours or more but who visits a hospital, clinic, or associated facility for diagnosis or treatment.

Table 1

Stations / counter / area	Process
Receiving Customers	Wishing the patient Receiving the customers with radiology request, identifying the customer and procedure required.
Explaining the Procedure	Informing the patient about the procedure going to be performed and duration of the procedure.
Radiation Protection	Confirming LMP dates from Female patients of child bearing age and providing appropriate Lead shielding Lead apron provided to patient to cover non examining part
Preparation of the patient	Clean hospital gown is provided to patient to undress. Area of interest made free from metal objects
Antenatal scan Procedure	All antenatal patients to fill Form – F and Form – G Which Record will be sent to Health department on or before 5th of every month by hand.
Preparation of room/Machine	Required accessories is made ready Machine kept ready with appropriate technical exposure
Processing of films	After exposure film is processed in Digital film processor and once it is ready, kept for reporting
Inventory	Receiving of indent as per department requirement from stores and Pharmacy every Tuesday. Sufficient department stock maintained.
Linen Inventory	Radiographers will maintain stock of clean linen as per requirement and makes sure soiled linen is send to laundry in time
Concurrent Audit	Physical inspection of inventory items of consumables to check stock status and expiry dates of drugs in use- Done Monthly
Maintenance of Equipment	Radiographers will take care of equipments in use and maintain Instrument history log sheets and Bio Medical Engineer will ensure that PMS is carried out in time.

Out Patient with Consultation

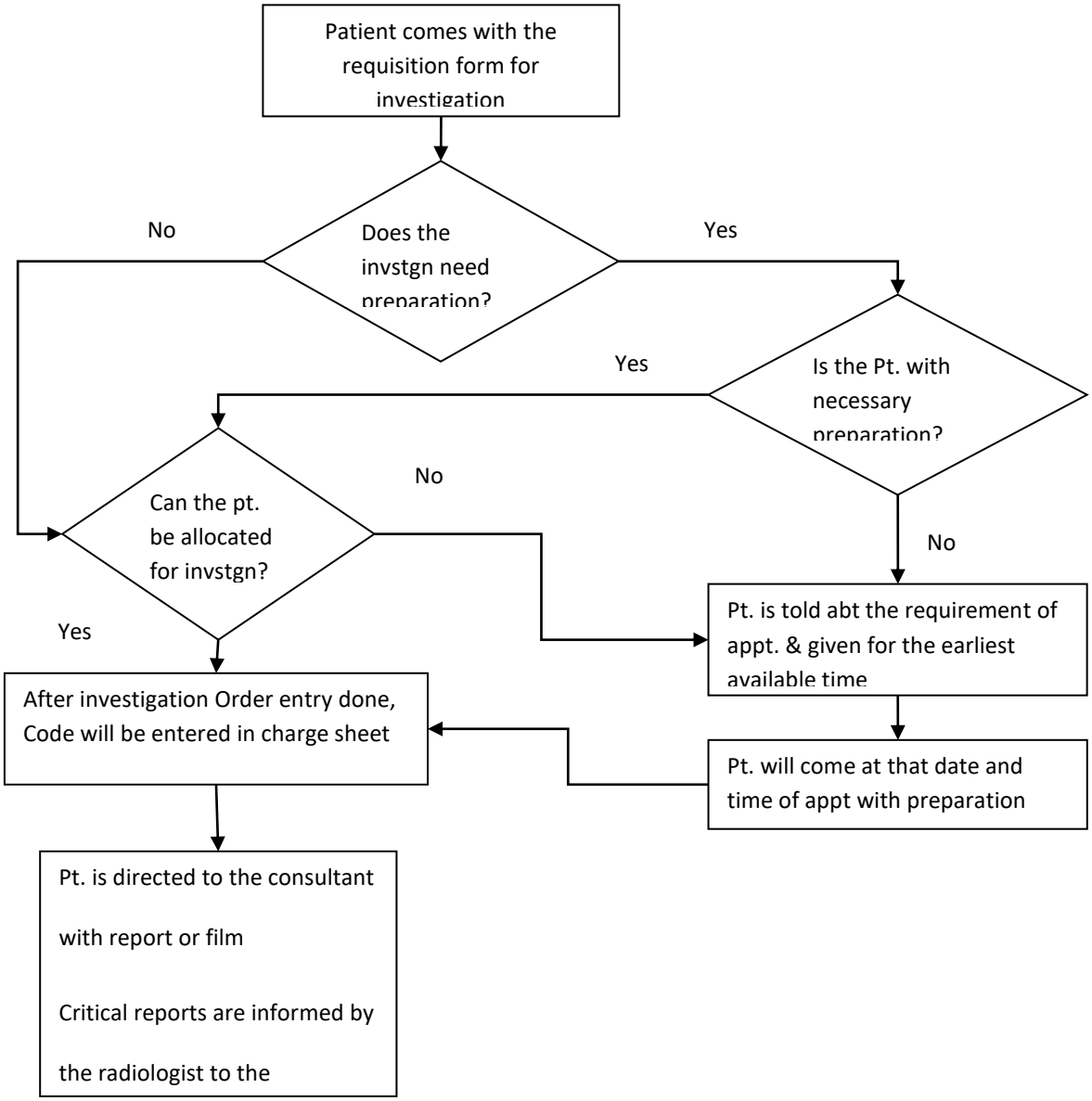

Figure 1

OTC Patients

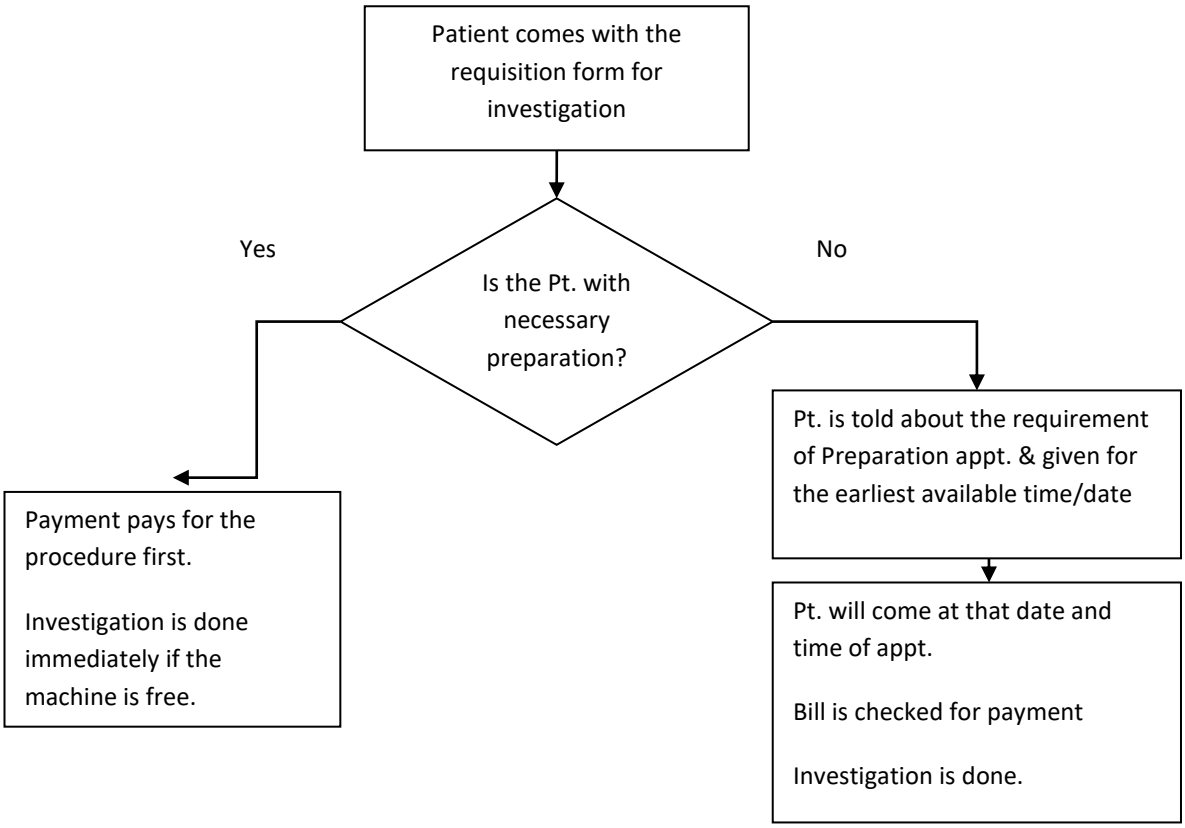

Figure 2

In patients

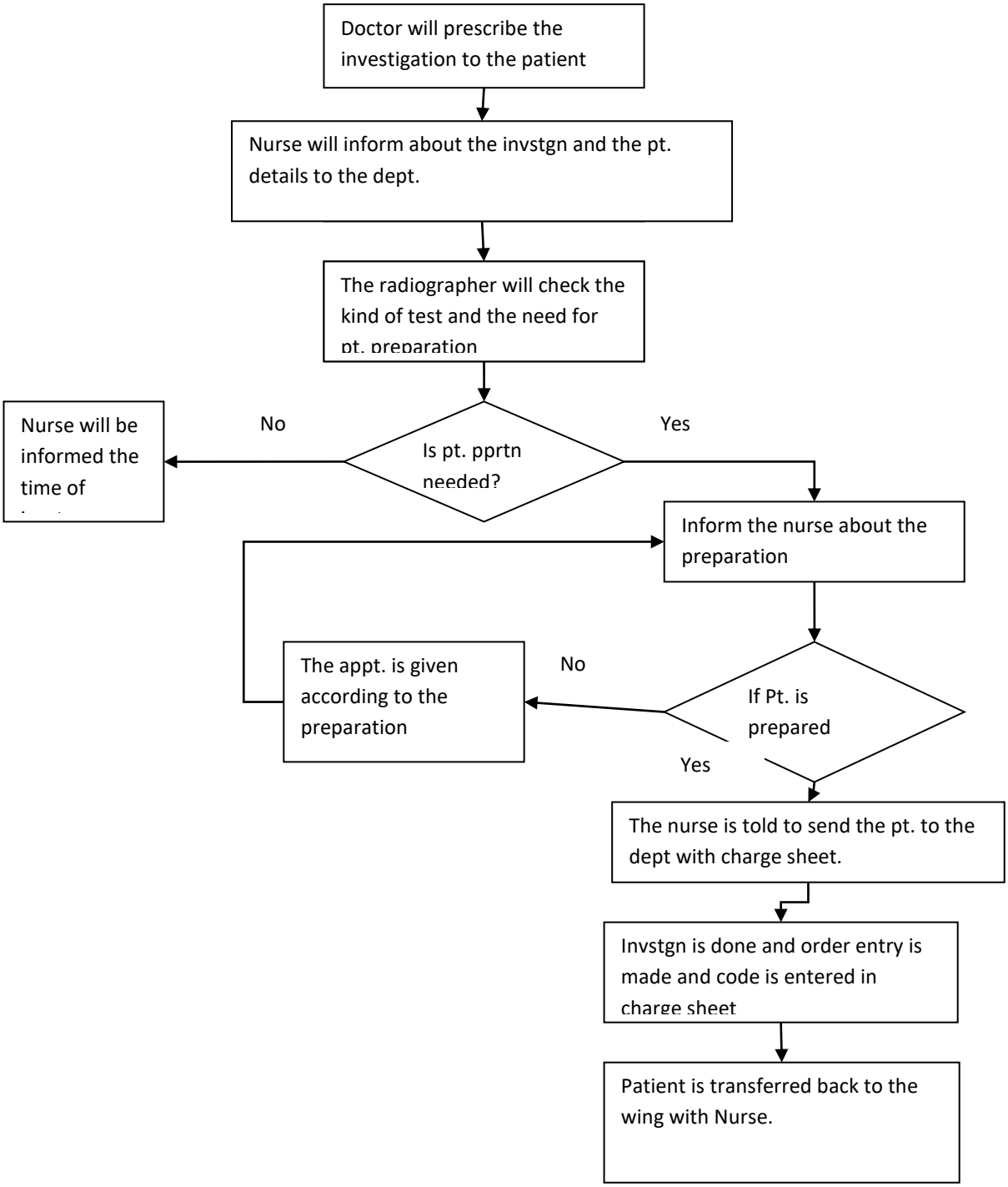

Figure 3

Radiology procedures

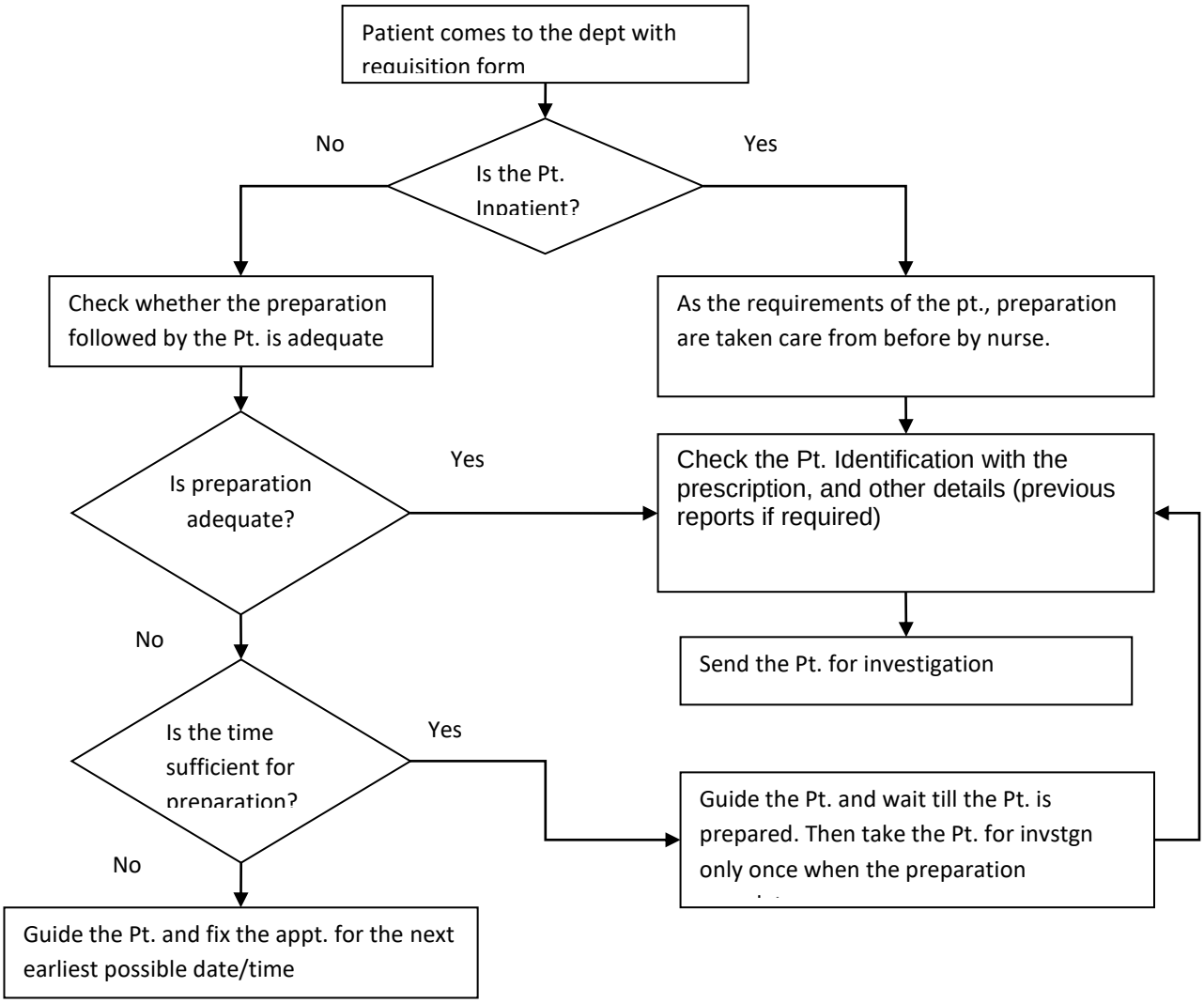

Figure 4

Report Generation

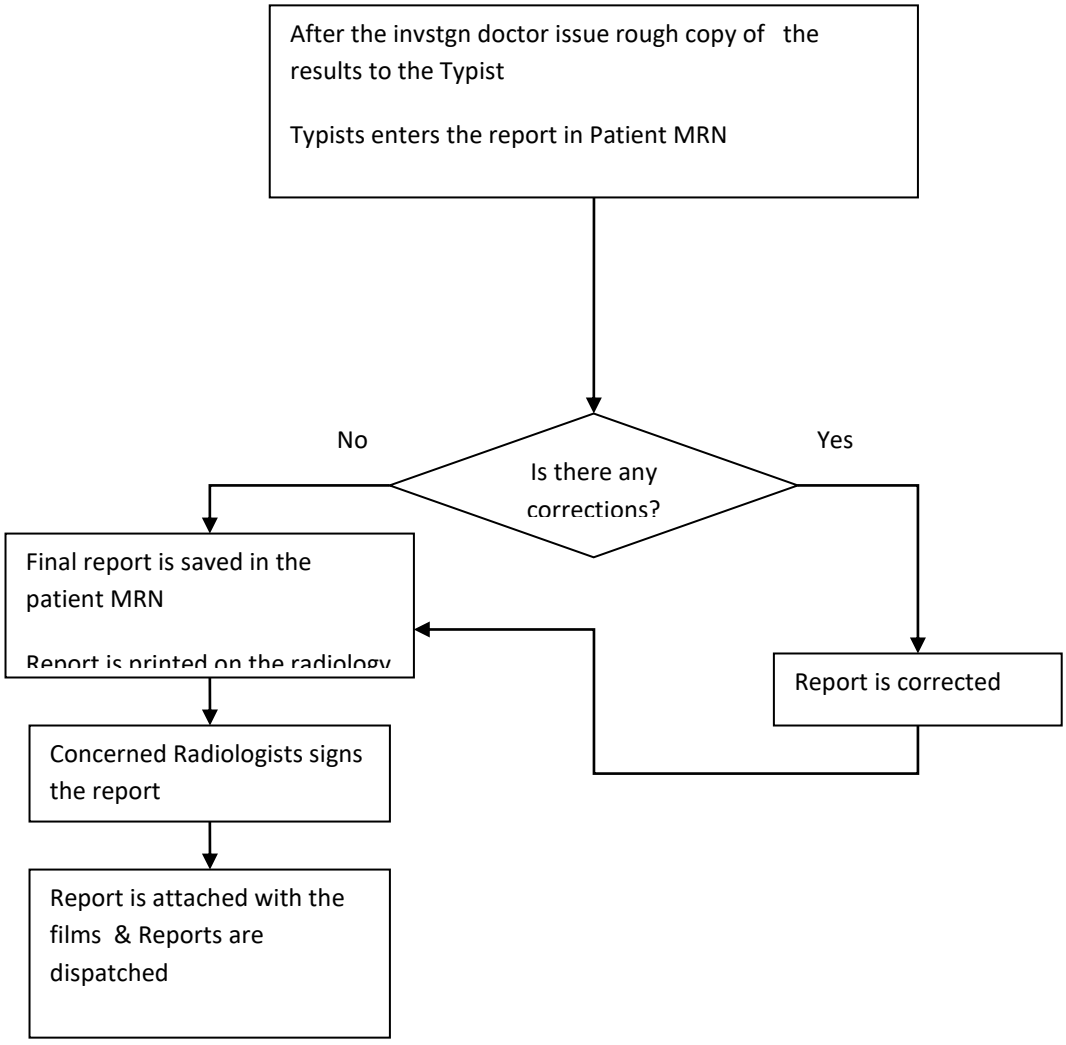

Figure 5

TASKS PERFORMED

1. To streamline the operations of front office including OPD, help desk.
2. Coordinating the activities on the ground floor of the hospital which includes reception area, admission desk, TPA department, Panel department, billing, Emergency.
3. Orienting and educating patients and their families by meeting them, providing educational information in conjunction with direct care providers related to treatments, procedures, medications, and continuing care requirements.
4. To accurately share Cash/ Credit/ Corporate billing and discount information with customers & achieve high levels of customer satisfaction at each interaction.
5. To ensure timely registrations & timely report delivery.
6. Understanding OPD processes and maintaining coordination in the OPD.
7. Coordinating with other managers.
8. Coordinating information and care requirements with other care providers; resolving issues that could affect smooth care progression.
9. Monitors delivery of care by completing patient rounds; interacting with involved departments to negotiate and expedite scheduling and completion of tests, procedures, and consults; reporting personnel and performance issues to the unit manager; maintaining ongoing communication with utilization review staff regarding variances from the care plan or transfer/discharge plan.
10. Counselling of patients-Briefing about the admission and discharge processes.
11. To ensure feedback collected and rectified.
12. To ensure smooth conduct of health checks up.
13. Ensure admission process is done smoothly.
14. Ensuring doctors consultations and all other services are done on time.
15. Ensuring of all support services like housekeeping, maintenance and coordination with paramedical department for timely support.
16. Address complaints of patients effectively.
17. Focus on continuously enhancing customer experience through interaction and involvement to determine expectations.
18. Understanding the processes in the hospital.

KEY LEARNINGS

- Understanding of the processes and operations of various departments in the hospital.
- Understanding of the admission process, discharge process, TPA process.
- Ability to handle Patients and attendants at Hospitals.
- Ability to communicate with both Internal & External customers
- To be Customer centric in approach.
- To be able to attend to Patient concerns and issues.
- Ability to evaluate and analyze Customer preference and feedback and guide efforts towards enhanced customer experience.

INTRODUCTION

Hospitals are shifting from viewing patients as uneducated and with little health care choice, to recognizing that the educated consumer has many service demands and health care choices available. Within all systems there are many highly skilled, dedicated people working at all levels to improve the health of their communities. Recent studies have shown an increased association between satisfaction levels, patient's compliance and success of the treatment. The main beneficiary of a good health-care system is clearly the patient. As a customer of health care, the patient is the focus of the health care delivery system. The long-term survival of hospitals depends on loyal patients who come back or recommend the hospital to other.[1]

OPDs is considered as the window to hospital services and a patient's impression of the hospital begins at the OPD. This impression often influences the patient's sensitivity to the hospital and therefore it is essential to ensure that OPD services provide an excellent experience for customers. Waiting times for elective care have been considered a serious problem in many health care systems since it acts as a barriers to efficient patient flows. It's often one of the most frustrating parts about healthcare delivery system.[2]

The Out Patient Department is critical process for any hospital. Short waiting times and a positive experience represent important drivers of patient satisfaction. Meanwhile, inefficient processes can result in lost revenues and poor community image, not to mention concern over patient safety. Since Out Patient Department (OPD) is frequently a patient's first experience with the hospital, improving the efficiencies is paramount to both customer satisfaction and hospital's bottom line. [2]

Out Patient Department Services are one of the important aspect of Hospital Administration. OPD is the mirror of the hospital, which reflects the functioning of the hospital being the first point of contact between the patient and the hospital staff. OPD is visited by large section of community, the human relation skill/ Public relation functions are of utmost importance. OPD staff should be polite, cheerful, cooperative & efficient. Patients visit the OPD for various purposes, like consultation, day care treatment; investigation, referral, admission and post discharge follow up not only for treatment but also for preventing and promoting services, the first impression of the

hospital is formed from OPD and this is the area frequently visited by a majority of patients. [2]

The OPD should be located on the ground floor, preferably with the separate entrance. The diagnostic services should be easily approachable from here. Reception, waiting area, Doctors chamber, examination room, minor O.T. and medical examination room should be easily accessible. Systematic examination of methods of carrying on activities so as to improve the effective use of manpower and equipment and to set up standards of performance for the activities being performed and also the systematic recording and critical examination of the ways of doing things to make improvements one have to establish time standards for carrying out specified jobs and estimates how long a job should take and the manpower and equipment requirements for a given method. [2]

The advantages of study in hospital OPD are to improve the methods / procedures of various jobs .Out Patient Department should improve both Clinical and non-clinical facilities such as overall OPD layout that can decrease the overcrowding and delay in consultation.

It may not be possible to provide beds for medical care that are needed in the near future for all the population of our country. Emphasis is, therefore, being shifted to outpatient services which are a pivotal place from where organised comprehensive medical care can be given to the community. Outpatient services must be prompt and acceptable to the community with a minimum of waiting. All efforts should therefore be directed towards strengthening outpatient department, physically and functionally.

Globalization and instant access to information, products and services have changed the way. [3]

Our customers conduct business — old business models no longer work. Today's competitive Environment leaves no room for error. We must delight our customers and relentlessly look for new ways to exceed their expectations. This is why Six Sigma Quality has become a part of our culture.

The central idea behind Six Sigma is that if you can measure how many "defects" you have in a process, you can systematically figure out how to eliminate them and get as close to "zero defects" as possible. [4]

RATIONALE OF THE STUDY

As we know that patient coming in hospital are already in grief and pain increased waiting time at OPD department add to their grievances. Patients' satisfaction with an encounter with health care service is mainly dependent on the duration and efficiency of care, and how empathetic and communicable the health care providers are. So the aim of hospital should be to ensure a smooth flow of the patients with minimal waiting time. Reduction in waiting time and turnover time will improve efficiency of hospital as more number of patients would be treated in the same period of time. Also it will improve the patient satisfaction and eventually revenue and profit of hospital. In a competitively managed health care environment, patient waiting time play an increasingly important role in a clinic's ability to attract new business. It is difficult to sell services if individuals are dissatisfied with waiting time. [5]

A study of this nature is critical to public appreciation of the quality of health care operating environment; hence, this study was aimed at assessing patients' waiting time and factors affecting waiting in the outpatients' departments. Data generated from the study could be used by hospital administrators to address gaps in human resources, logistics, infrastructures and other internal procedures towards ensuring an effective health care delivery system.

Wait times for health services arise because

- capacity does not match demand,
- capacity or demand is not well managed and
- There is significant variability over time in the demand for healthcare services.

Waiting time is one of the most noticeable signs of good health care service and is often used as a key performance indicator of health performance especially for outpatients' clinics. [6]

Out Patient Departments (OPD) act as a window to hospital services and a patient's impression of the hospital begins at the OPD.. When well organised and professionally run, not only can OPDs help avoid confusion, frustration and overspending by fearful patients but can also regulate the flow of inpatients to the hospitals. Having observed the importance of OPD, hospitals today are making changes on various fronts to streamline this area.(***SonalShukla 2007)***. [7]

LITERARTURE REVIEW

1. **Need for short waiting time to OPD clients**

   The health facility system, but almost invariably, a high percentage of these patients arrive and leave the hospital at various times. The amount of time a patient waits to be seen is one factor which affects the utilization of health care services (Fernandes et al., 1994; dos Santos et al., 1994) and patients perceive long waiting times as barriers to actually obtaining services (Kurata et al.,1992). In a competitively managed health care environment, patient waiting time play an increasingly important role in a clinic's ability to attract new business. (Mackey and Cole, 1997). [8]

2. Additionally, waiting time becomes a factor in retaining current users of the services. Patient satisfaction has Healthcare systems throughout the world face long and increasing wait times for medical services (Willcox et al. 2007; Siciliani and Hurst 2004; Hurst and Siciliani 2003; Blendon 2002). Sometimes these waits may have little medical impact, but excessive delays may be detrimental to patients' health (CIHR 2007). As a result, there is growing public and patient pressure on political leaders to reduce wait times to acceptable levels of quality of health care; hence, healthcare assessment. [9]

3. Facility performance can be best assessed by measuring the level of patient's satisfaction. A completely satisfied patient believes that the organization has potential in understanding patient needs and demands related to health care (Net et al., 2007). A study in the United Kingdom concluded that, patient satisfaction is directly correlated with waiting times to see a doctor (Maitra and Chikhani, 1992) while another study found that, because of prolonged waiting times, a substantial number of patients left outpatient departments (Fernandes et al., 1994). [10]

4. Long wait times for access to certain health care procedures are a concern in the Ugandan health care system. As governments in Uganda struggle to reduce health care wait times, most government institutions are publishing the data on the wait times for specific procedures in their institutions. [11]

5. A case study at jitra health center Mohamed Najib bin Salleh', Norhayati 'Yusop, Hazlina Haji Ali2 'Faculty of Management of Technology, Uuh4,06010 Sintok, Kedah. This research identify main problem that caused long waiting time at jitra health center thus created congested situation at the place. The

problem was due to the unbalance between the number of patient arrive with number of doctor available in morning hours, the most impressive solution of problem is by introducing system that can estimate patient treatment time. [12]

6. Improving Turnaround Time (TAT) for Out Patient Department dr.worli P. D. Hindu National Hospital & Medical Research Centre, Mumbai In January 2010, P. D. Hinduja Hospital, Mumbai, volunteered to participate in the National Demonstration Project (NDP) for Lean Six Sigma (LSS) in Healthcare, sponsored by QCI. In order to track the waiting time, a study was conducted for 15 days to capture the end to end OPD process for all the services. The total TAT for the OPD process was decomposed into sub-processes. Corrective actions to reduce TAT were applied sub-process by sub-process. One of the most appreciated projects in the NDP for Lean Six Sigma (LSS) in Healthcare, sponsored by QCI.(MUMBAI)The results were rewarding. The idle waiting time for consultation was reduced from 32 minutes to 14 minutes and 47 minutes to 25 minutes for scope (UGI and LGI) services. The hospital was successful in converting 1300 patients without appointment to appointment patients in a month, that is, approximately 50 patients per day. The hospital established its profitability in terms of high patient retention; increased patient satisfaction followed by goodwill and enhanced reputation. [13]
7. Patient Waiting Time: It's Impact on Hospital Outpatient Department, Research Paper Volume: 2 |Issue: 3| Mar 2010•ISSN No 2277 – 8179 Dr. Sandesh Kumar Sharma. Research Scholar (Hospital Management),Suresh Gyan Vihar University. The Out Patient Department is critical process for any hospital. Short waiting times and a positive experience represent important drivers of patient satisfaction. Meanwhile, inefficient processes can result in lost revenues and poor community image, not to mention concern over patient safety. Since Out Patient Department (OPD) is frequently a patient's first experience with the hospital, improving the efficiencies is paramount to both customer satisfaction and hospital's bottom line. This study helps to know the unnecessary and delayed movements in the department so as that with this knowledge the management will be able to take adequate measures to improve the functioning of the department. [14]
8. Reducing waiting time in outpatient services of large university teaching hospital – a six sigma approach prof. dinesh t.a1 , mha, ph.d . dr. sanjeev singh1 , dch,

M.Phil Prem NAIR1 , MBBS, MD Remya T R1 , MHA Amrita Institute of Medical Sciences and Research Centre, Amrita Vishwa Vidyapeetham (Amrita University), Cochin, Kerala, India. Period of Study – January 2012 to April 2012.This paper presented the results of a project of improving the quality of services provided in an outpatient department of an university hospital in India. The project was conducted on the basis of the six sigma methodology and aimed to reduce waiting times in outpatient cardiology office. Significant reduction in waiting time was achieved in the outpatient services of the Cardiology department by using the six sigma approach. In addition to the overall reduction in waiting time for cardiac medical consultation significant reduction in waiting time for getting the lab results was also achieved. As an off shoot of the study nine registration counters were started, registration forms were modified, usherers were appointed to guide patients, additional staff were appointed to handle the telephones in the Cardiology OPD and they were also taught basic telephone etiquette, dedicated biochemistry analyser was provided for the cardiology department and an alert system was put in place for patients waiting for more than one hour. Further data collection through VOC will help to monitor and control any variance. [15]

Six Sigma

First introduced by Motorola in 1986, Six Sigma is a method to measure the quality of a process to fulfil customer's needs which approaches perfection up to 3.4 defects per million opportunities. Data and statistical analysis were used to identify defects in processes and reduce variation. With Six Sigma, defects in a process can be measured by identifying the best method to eliminate defects and approach 'zero defect'.

Six Sigma specifies a very high standard of quality achievement. This is identified through levels of failure and involves very low costs.

What is Six Sigma ?

Six Sigma's aim is to eliminate waste and inefficiency, thereby increasing customer satisfaction by delivering what the customer is expecting . Six Sig ma is a highly disciplined process that helps us focus on developing and delivering near-perfect products and services. Six Sigma follows a structured methodology, and has defined roles for the participants. Six Sig ma is a data driven methodology, and requires accurate data collection for the processes being analyzed. Six Sig ma is about putting results on Financial Statements. [16]

Six Sigma is a business-driven, multi-dimensional structured approach to:

- Improving Processes
- Lowering Defects
- Reducing process variability
- Reducing costs
- Increasing customer satisfaction
- Increased profits

The word *Sigma* is a statistical term that measures how far a given process deviates from perfection.The central idea behind Six Sig ma is that if you can measure how many "defects" you have in a process, you can systematically figure out how to eliminate them and g et as close to "zero defects" as possible and specifically it means a failure rate of 3.4 parts per million or 99.9997% perfect. [17]

A six sigma process is one in which 99.99966% of the products manufactured are statistically expected to be free of defects (3.4 defects per million). The term "six sigma process" comes from the notion that if one has six standard deviations between the process mean and the nearest specification limit, as shown in the chart 1, practically no items will fail to meet specifications . This is based on the calculation method employed in process capability studies.

Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in the work process. Data and statistical analysis are used to identify defects in processes and reduce variation. [18]

Chart 1. Process capability.

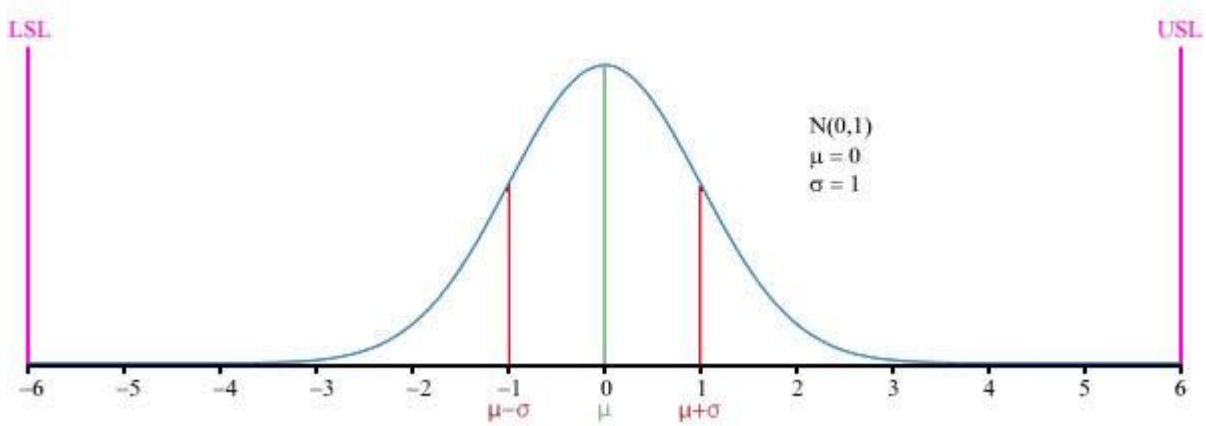

Figure 6

Key Concepts of Six Sigma

At its core, Six Sigma revolves around a few key concepts.

Critical to Quality: *Attributes most important to the customer*

Defect: *Failing to deliver what the customer wants*

Process Capability: *What your process can deliver*

Variation: *What the customer sees and feels*

Stable Operations: *Ensuring consistent, predictable processes to improve what the customer sees and feels*

Design for Six Sigma: *Designing to meet customer needs and process capability*

The performance metrics include:

- Percentage defective.
- Defects per unit (DPU).
- Defects per million opportunities (DPMO).
- Parts per million (PPM).
- Rolled throughput yield (RTY).
- Process sigma.

Before examining each metric, however, it's important to define "defect" accurately to provide a foundation for interpreting these metrics in a meaningful way.

Building the foundation

To use the defect-based metric effectively, it is important to answer:

- What is a defect?
- How can a defect occur?

A defect occurs during any process when the outcome of the process is not the expected outcome. Of course, expected outcome means the conditions of a defect are specified in advance.

Six Sigma's implicit goal is to improve all processes, but not to the 3.4 DPMO level necessarily. Organizations need to determine an appropriate sigma level for each of their most important processes and strive to achieve these. As a result of this goal, it is incumbent on management of the organization to prioritize areas of improvement.

SIX SIGMA KEY ELEMENTS

T here are three key elements of Six Sig ma Process Improvement.

Customers

Processes

Employees

The Customer:

Customers define quality. They expect performance, reliability, competitive prices, on-time delivery, service. Today, Delighting a customer is a necessity. Because if we don't do it, someone else will!

Customer needs : Least waiting time

The Processes:

Defining Processes and defining Metrics and Measures for Processes is the key element of Six Sigma. Quality requires to look at a business from the customer's perspective, In other words, we must look at defined processes from the outside-in. By understanding the transaction lifecycle from the customer's needs and processes, we can discover what they are seeing and feeling. This will give a chance to identify week area within a process and then we can improve them.

The Employees:

The company must involve all employees in Six Sig ma Program. Company must provide opportunities and incentives for employees to focus their talents and ability to satisfy customers. This is important to six sig ma that all team members should have a well defined role with measurable objectives. [19]

Etymology of "six sigma process"

The term "six sigma process" comes from the notion that if one has six standard deviations between the process mean and the nearest specification limit, as shown in the graph, practically no items will fail to meet specifications. This is based on the calculation method employed in process capability studies.

Capability studies measure the number of standard deviations between the process mean and the nearest specification limit in sigma units, represented by the Greek letter σ (sigma). As process standard deviation goes up, or the mean of the process moves away from the center of the tolerance, fewer standard deviations will fit between the mean and the nearest specification limit, decreasing the sigma number and increasing the likelihood of items outside specification. The upper and lower specification limits (USL and LSL, respectively) are at a distance of 6σ from the mean. [20]

OBJECTIVES

Problem statement

Increased waiting time has created patient's dissatisfaction .

Research Questions

1.What is the average waiting time for the radio diagnostic services(CT, X-RAY,Ultrasound)

2.What are the Root causes for the increased waiting time and TAT for reporting.

Objectives:

General Objective:

To find out waiting time of the radio-diagnostic services at the OPD; identify the bottle – necks and offer suggestions for cutting down the waiting time which, it is hoped, will be useful in improving the functioning of the OPD so that waiting time can further be reduced and thereby improving the community image of the hospital.

SPECIFIC OBJECTIVES

The main objectives of the study were:

(i) to study the patient's waiting time for the radio diagnostic services in the outpatient department.

(ii) to study TAT for the reporting of radio diagnostic services in the outpatient department.

(iii) To find out average waiting time and average TAT for reporting.

(iv) To identify the factors that affect waiting time & TAT reporting.

(v) Recommend ways of minimizing the delay; and

(vi) Control measures

RESEARCH METHODOLOGY

Material & Methods

The **study area** was Yashoda Superspecialty hospital, Kaushambi. This was a *observational cross sectional study* of waiting time conducted in outpatient department of the hospital. The study population was outpatients coming for the CT,X-RAY & Ultrasound. The average footfall for the unit is around 1600 patients monthly. Three months data was collected through the HMS. The data analysis part was done with the help of MS excel software.

Sampling Method:

Stratified Sampling method

Inclusion & Exclusion Criteria:

All OPD patients coming for the CT, Ultrasound & X-RAY were included in the study. Colour Doppler & mammography patients were excluded from the study.

Variables/Attributes:

1.Waiting time: Time taken between the billing and the Procedure being performed.
2.TAT for Reporting: Time taken in getting the reports ready for dispatch.

Data Collection

The data was collected through Hospital Management System. The data collected was of 3 months duration.

Methodology for Data Analysis

The DMAIC method under Six Sigma which consists of the following five steps was used to achieve the objectives of this study.

Step 1 - Define
Step 2 - Measure
Step 3 - Analysis
Step 4 - Improve
Step 5 – Control

Collected data was analyzed statistically and presented by frequencies, percentages, mean and standard deviation. The data was presented graphically as well as in tables

Define : Define the Problem or Project Goals that needs to be addressed.
Measure: Measure the problem and process from which it was produced.
Analyze: Analyze data & process to determine root causes of defects and opportunities.
Improve: Improve the process by finding solutions to fix, diminish, and prevent future problems.
Control: Implement, Control, and Sustain the improvements solutions to keep the process on the new course.

In the subsequent sections details of DMAIC Methodolog y is given.

DEFINE

This is the first step that refers to defining the goals of the project.Identify potential benefits and critical to quality ("CTQ") factors.

Today's imaging technologies provide greater speed and superior image quality. In the hospital Radiology department are revenue generating areas. However, when workflow is encumbered by inefficiencies, this causes loss in revenue to the organization and patient dissatisfaction. Even with the latest equipment installed, organizations face delays in report turnaround time and a backlog of patients waiting for appointments.

Diminished capacity and productivity can lead to a variety of problems:

- Delay in diagnosis and treatment
- Patient dissatisfaction
- Potential loss of outpatient business
- Loss of revenue

This DMAIC approach focuses on:

- Optimizing time
- Optimizing human and equipment resources
- Improving service delivery(for patients, staff, radiologists, referring physicians)

CTQs

- Patient's waiting time to get their investigation done.
- Turn Around Time for reporting
- Standard policy time

EXPECTED BENEFITS

Customer: Critical to Quality (CTQ)

- **Reduce Wait Time**

Internal: Critical to Quality (CTQ)

- **Improve Patient/Staff Satisfaction**
- **Enhance Patient Outcomes**
- **Increase capacity and operational efficiency**

MEASURE

This phase refers to the analysis of the existing system with various measurement techniques for the defects and levels of perfection that exist.

There are three important part of Measure Phase.

(1) Data Collection Plan and Data Collection

A data collection plan is prepared to collect required data. This plan includes what type of data needs to be collected, what are the sources of data etc., The reason to collect data is to identify areas where current processes need to be improved.

(2) Data evaluation

At this stage, collected data is evaluated and sigma level is calculated. This gives approximate number of defects.

A *Six Sigma defect* is defined as anything outside of customer specifications.

A *Six Sigma opportunity* is the total quantity of chances for a defect.

First we calculate Defects Per Million Opportunities (DPMO) and based on that a Sigma is decided from a predefined table:

This is the method used for measuring results as we proceed through a project. This beginning point enables us to locate the cause and effect of those processes and to seek defect point so that the procedure can be improved.

Before we go ahead, lets define two terms:

IDENTIFICATION OF DEFECTS AND OPPORTUNITIES

A **Six Sigma defect** is defined as anything outside of customer specifications.

A **Six Sigma opportunity** is the total quantity of chances for a defect.

1.WAITING TIME

DEFECT: A defect is defined as any process output that does not meet customer specifications, or the total number of failed opportunites. In this particular case the defects are the number of patients having to wait more than the specified TAT.

Opportunities which can turn into defects are as follows:

1.Radiologist not available

2.Equipment breakdown

3.Emergency case

4.In case of CT contrast test

5.Lack of appointment system

2.For TAT Reporting:

DEFECT: A defect is defined as any process output that does not meet customer specifications, or the total number of failed opportunites. In this particular case the defects are the number of patients having to wait more than the specified TAT.

Opportunities which can turn into defects are as follows:

1.Radiologist not available.
2.Medical Transcriptionist not available.
3.Investigation film misplaced before reporting.
4.Patient takes film without written report to show to consultant.

WAITING TIME

For X-ray:

Standard waiting time as per hospital policy: 15 minutes

Defects Per Unit - DPU

$$DPU = \frac{\text{Total Number of Defects}}{\text{Total number of data}}$$

Total number of defects= 1852

Total number of data available= 2100

Defects per unit=1852/2100= 0.88

Total number of Opportunities - TO

TO = Total number of Product Units x Number of Opportunities

Number of Opportunities=5

Total Data available=2100

Total number of Opportunities=2100 x 5=10500

Defects Per Opportunity - DPO

$$DPO = \frac{\text{Total Number of Defects}}{\text{Total Opportunity}}$$

Total number of defects=1852

Total Opportunities=10500

Defects Per Opportunity=1852/10500=0.176

Defects Per Million Opportunities - DPMO

DPMO = DPO x 1,000,000

Defect Per Opportunity=0.176

DPMO=0.176 x 1,000,000=176000

Defects Per Million Opportunities or DPMO can be then converted to sig ma values using Yield to Sigma Conversion Table .

Sigma Level= Between 2.4 to 2.5 sigma level

For CT

Standard waiting time as per hospital policy: 15 minutes

Defects Per Unit - DPU

$$DPU = \frac{\text{Total Number of Defects}}{\text{Total number of data}}$$

Total number of defects= 180

Total number of data available= 200

Defects per unit=180/200= 0.9

Total number of Opportunities - TO

TO = Total number of Product Units x Number of Opportunities

Number of Opportunities=5

Total Data available=200

Total number of Opportunities=200 x 5=1000

Defects Per Opportunity - DPO

$$DPO = \frac{\text{Total Number of Defects}}{\text{Total Opportunity}}$$

Total number of defects=180

Total Opportunities=1000

Defects Per Opportunity=180/1000=0.18

Defects Per Million Opportunities - DPMO

DPMO = DPO x 1,000,000

Defect Per Opportunity=0.18

DPMO=0.18 x 1,000,000=180000

Defects Per Million Opportunities or DPMO can be then converted to sig ma values using Yield to Sigma Conversion Table .

Sigma Level= Between 2.4 to 2.5 sigma level

For Ultrasound

Standard waiting time as per hospital policy: 15 minutes

Defects Per Unit - DPU

$$DPU = \frac{\text{Total Number of Defects}}{\text{Total number of data}}$$

Total number of defects= 1667

Total number of data available= 2204

Defects per unit=1667/2204= 0.76

Total number of Opportunities - TO

TO = Total number of Product Units x Number of Opportunities

Number of Opportunities=5

Total Data available=2204

Total number of Opportunities=2204x 5=11020

Defects Per Opportunity - DPO

$$DPO = \frac{\text{Total Number of Defects}}{\text{Total Opportunity}}$$

Total number of defects=1667

Total Opportunities=11020

Defects Per Opportunity=1667/11020=0.151

Defects Per Million Opportunities - DPMO

DPMO = DPO x 1,000,000

Defect Per Opportunity=0.151

DPMO=0.599 x 1,000,000=151000

Defects Per Million Opportunities or DPMO can be then converted to sig ma values using Yield to Sigma Conversion Table .

Sigma Level= Between 2.5 to 2.6 sigma level

For All Investigations

Standard waiting time as per hospital policy: 15 minutes

Defects Per Unit - DPU

$$DPU = \frac{\text{Total Number of Defects}}{\text{Total number of data}}$$

Total number of defects= 1852+180+1667=3699

Total number of data available= 2100+200+2204=4504

Defects per unit=3699/4504= 0.821

Total number of Opportunities - TO

TO = Total number of Product Units x Number of Opportunities

Number of Opportunities=5

Total Data available=4504

Total number of Opportunities=4504 x 5=22520

Defects Per Opportunity - DPO

$$DPO = \frac{\text{Total Number of Defects}}{\text{Total Opportunity}}$$

Total number of defects=3699

Total Opportunities=22520

Defects Per Opportunity=3699/22520=0.164

Defects Per Million Opportunities - DPMO

DPMO = DPO x 1,000,000

Defect Per Opportunity=0.164

DPMO=0.164 x 1,000,000=164000

Defects Per Million Opportunities or DPMO can be then converted to sig ma values using Yield to Sigma Conversion Table .

Sigma Level= Between 2.4 to 2.5 sigma level

TAT REPORTING

For X-ray:

Standard TAT for reporting as per hospital policy: <12 hours

Defects Per Unit - DPU

$$DPU = \frac{\text{Total Number of Defects}}{\text{Total number of data}}$$

Total number of defects= 1031

Total number of data available= 2128

Defects per unit=1031/2128= 0.48

Total number of Opportunities - TO

TO = Total number of Product Units x Number of Opportunities

Number of Opportunities=4

Total Data available=2128

Total number of Opportunities=2128 x 4=8512

Defects Per Opportunity - DPO

$$DPO = \frac{\text{Total Number of Defects}}{\text{Total Opportunity}}$$

Total number of defects=1031

Total Opportunities=8512

Defects Per Opportunity=1031/8512=0.121

Defects Per Million Opportunities - DPMO

DPMO = DPO x 1,000,000

Defect Per Opportunity=0.121

DPMO=0.176 x 1,000,000=121000

Defects Per Million Opportunities or DPMO can be then converted to sig ma values using Yield to Sigma Conversion Table .

Sigma Level= Between 2.6 to 2.7 sigma level

For CT

Standard TAT for reporting as per hospital policy: <12 hours

Defects Per Unit - DPU

$$DPU = \frac{\text{Total Number of Defects}}{\text{Total number of data}}$$

Total number of defects= 71

Total number of data available= 200

Defects per unit=71/200= 0.355

Total number of Opportunities - TO

TO = Total number of Product Units x Number of Opportunities

Number of Opportunities=4

Total Data available=200

Total number of Opportunities=200 x 4=800

Defects Per Opportunity - DPO

$$DPO = \frac{\text{Total Number of Defects}}{\text{Total Opportunity}}$$

Total number of defects=71

Total Opportunities=800

Defects Per Opportunity=71/800=0.089

Defects Per Million Opportunities - DPMO

DPMO = DPO x 1,000,000

Defect Per Opportunity=0.089

DPMO=0.089 x 1,000,000=89000

Defects Per Million Opportunities or DPMO can be then converted to sig ma values using Yield to Sigma Conversion Table .

Sigma Level= Between 2.8 to 2.9 sigma level.

For Ultrasound

Standard TAT for reporting as per hospital policy: <12 hours

Defects Per Unit - DPU

$$DPU = \frac{\text{Total Number of Defects}}{\text{Total number of data}}$$

Total number of defects= 441

Total number of data available= 2170

Defects per unit=441/2170= 0.203

Total number of Opportunities - TO

TO = Total number of Product Units x Number of Opportunities

Number of Opportunities=4

Total Data available=2170

Total number of Opportunities=2170x 4=8680

Defects Per Opportunity - DPO

$$DPO = \frac{\text{Total Number of Defects}}{\text{Total Opportunity}}$$

Total number of defects=441

Total Opportunities=8680

Defects Per Opportunity=441/8680=0.051

Defects Per Million Opportunities - DPMO

DPMO = DPO x 1,000,000

Defect Per Opportunity=0.051

DPMO=0.051 x 1,000,000=51000

Defects Per Million Opportunities or DPMO can be then converted to sig ma values using Yield to Sigma Conversion Table .

Sigma Level= Between 3 to 3.1 sigma level

For All Investigations

Standard TAT for reporting as per hospital policy: <12 hours

Defects Per Unit - DPU

$$DPU = \frac{\text{Total Number of Defects}}{\text{Total number of data}}$$

Total number of defects= 1031+441+71=1543

Total number of data available= 2128+2170+200=4498

Defects per unit=1543/4498= 0.343

Total number of Opportunities - TO

TO = Total number of Product Units x Number of Opportunities

Number of Opportunities=4

Total Data available=4498

Total number of Opportunities=4498 x 4=17992

Defects Per Opportunity – DPO

$$DPO = \frac{\text{Total Number of Defects}}{\text{Total Opportunity}}$$

Total number of defects=1543

Total Opportunities=17992

Defects Per Opportunity=1543/17992=0.085

Defects Per Million Opportunities - DPMO

DPMO = DPO x 1,000,000

Defect Per Opportunity=0.121

DPMO=0.085 x 1,000,000=85000

Defects Per Million Opportunities or DPMO can be then converted to sig ma values using Yield to Sigma Conversion Table .

Sigma Level= Between 2.8 to 2.9 sigma level

RESULTS

Table 2

WAITING TIME

MODALITY	% DEFECTS	DPMO	SIGMA LEVEL
X-RAY	88%	176000	2.4-2.5
CT	90%	180000	2.4-2.5
ULTRASOUND	76%	151000	2.5-2.6
ALL	82.1%	164000	2.4-2.5

Table 3

TAT REPORTING

MODALITY	% DEFECTS	DPMO	SIGMA LEVEL
CT	36%	89000	2.8 – 2.9
X-RAY	48%	121000	2.6 -2.7
ULTRASOUND	20.3%	51000	3.0-3.1
ALL	34.3%	85000	2.8-2.9

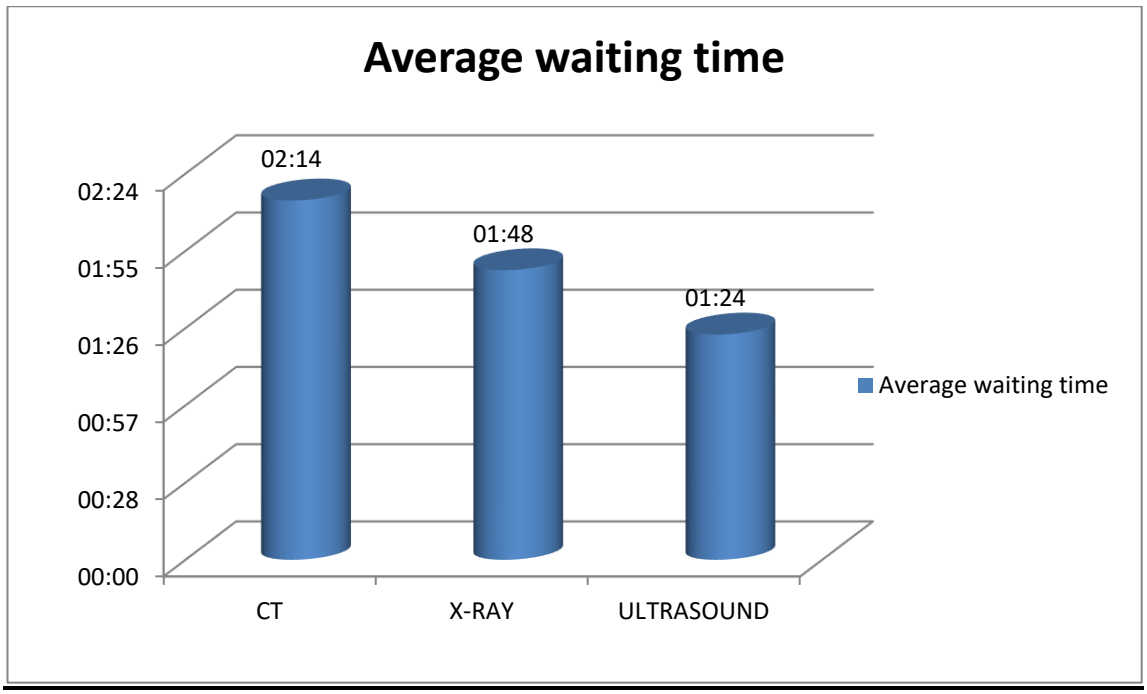

Figure 7

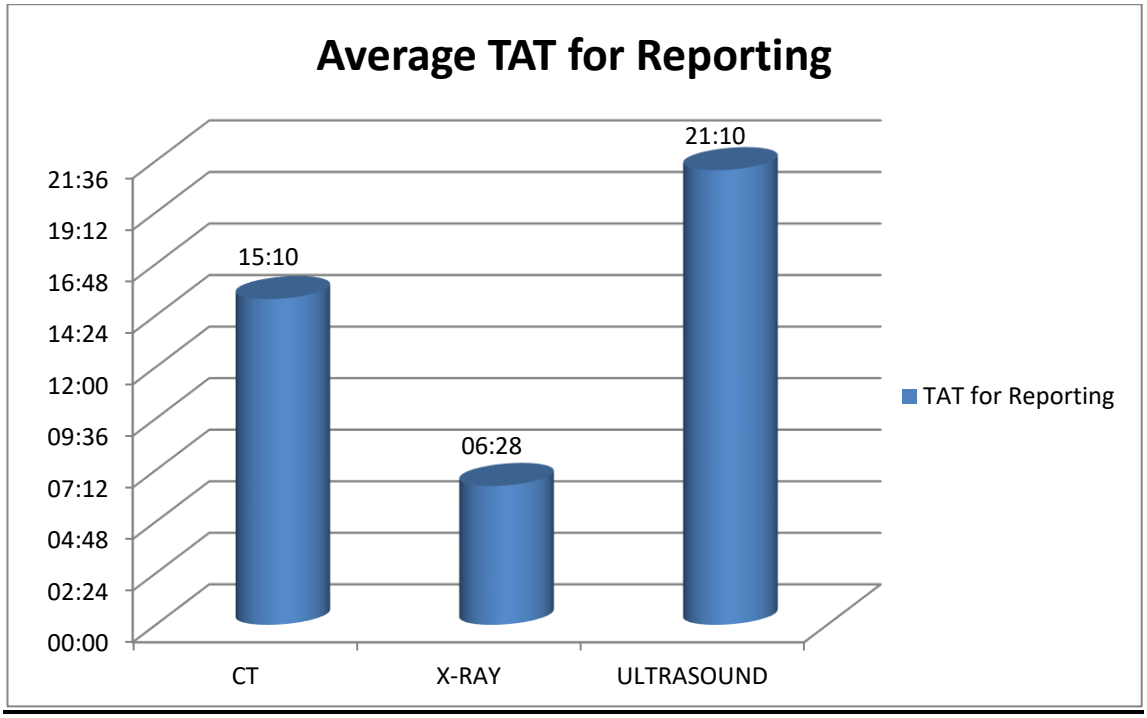

Figure 8

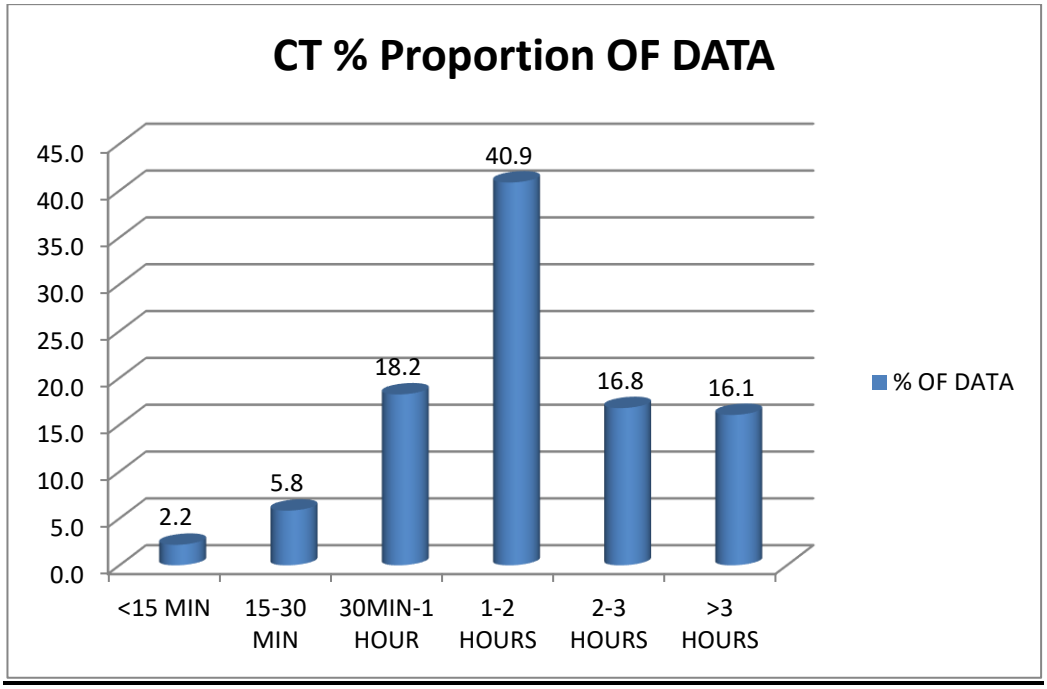

Figure 9

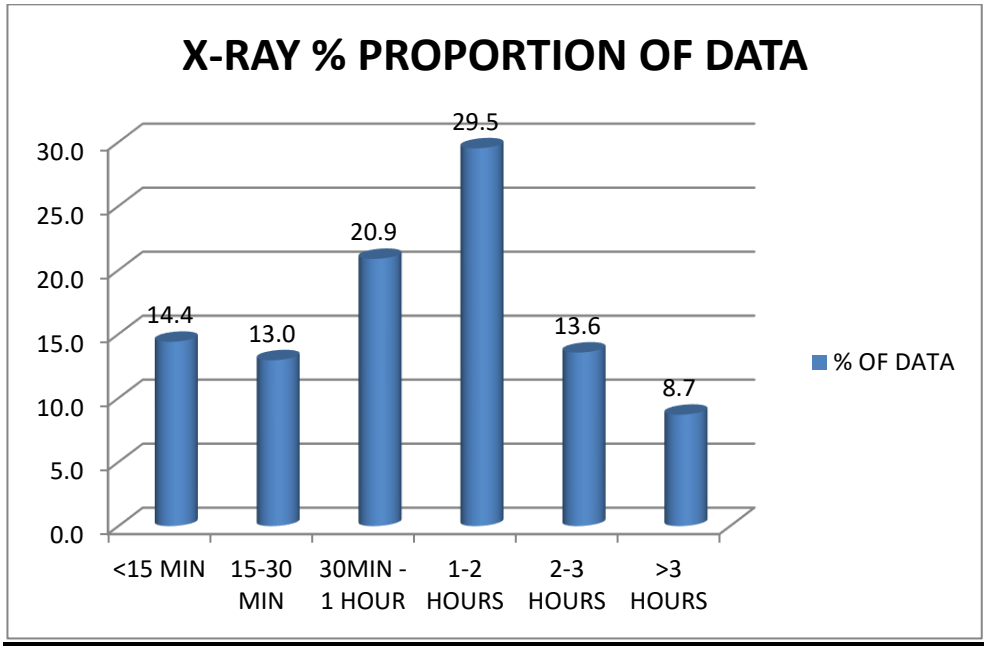

Figure 10

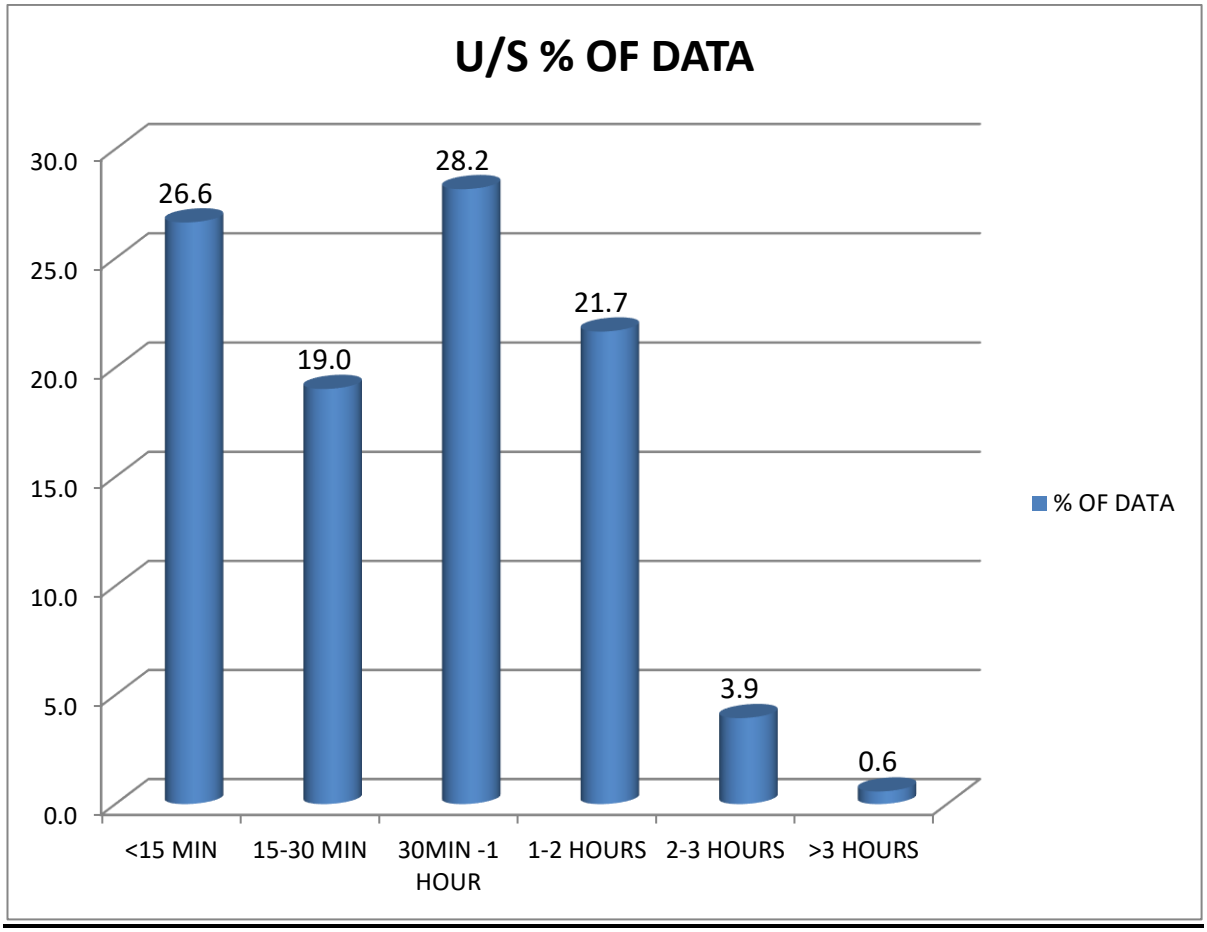
U/S % OF DATA
30.0
25.0
20.0
15.0
10.0
5.0
0.0
26.6
19.0
28.2
21.7
3.9
0.6
<15 MIN
15-30 MIN
30MIN -1 HOUR
1-2 HOURS
2-3 HOURS
>3 HOURS
% OF DATA

Figure 11

WAITING TIME

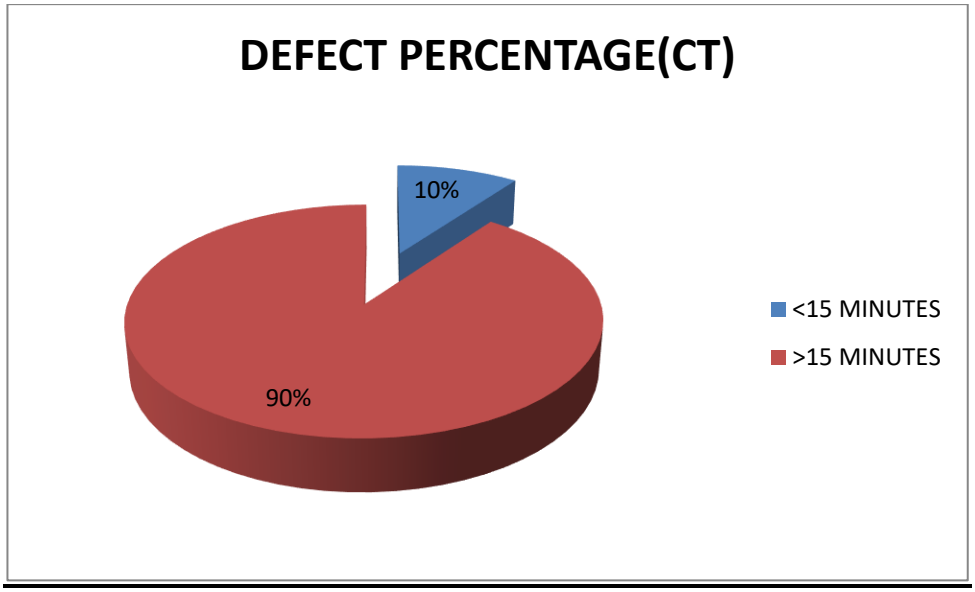

Figure 12

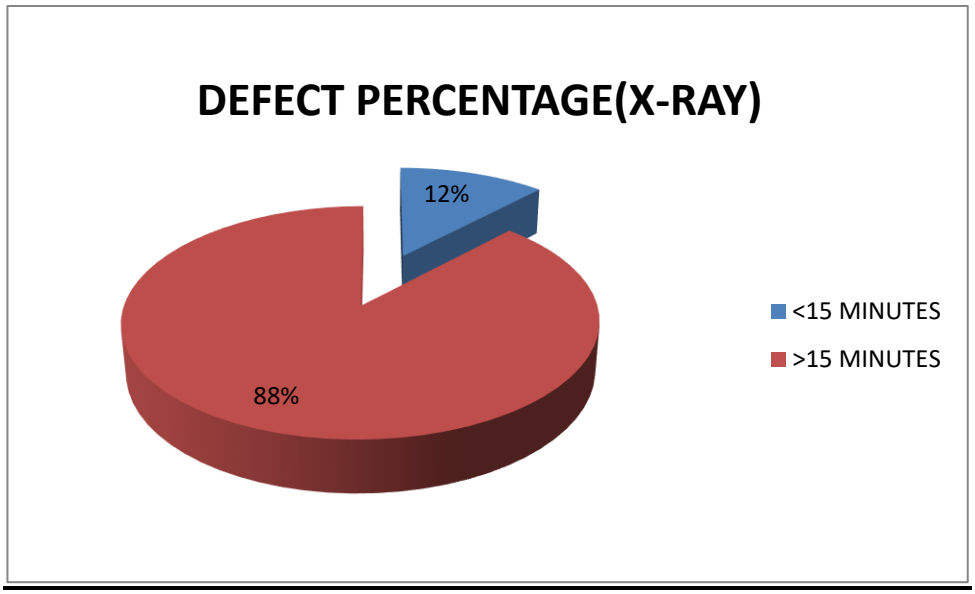

Figure 13

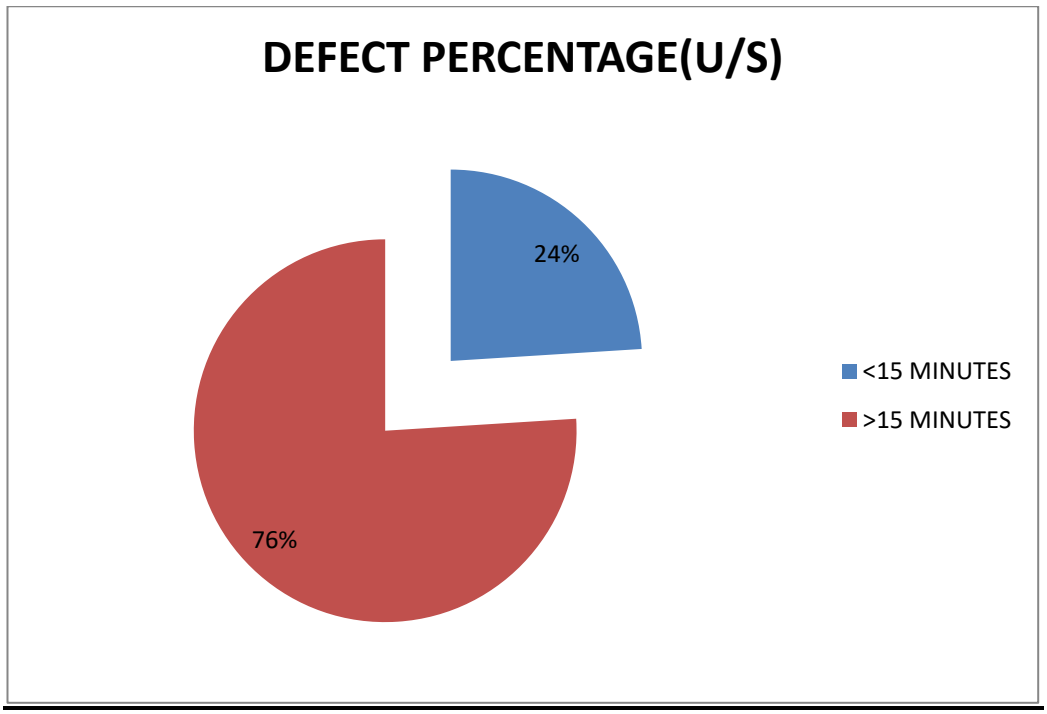

Figure 14

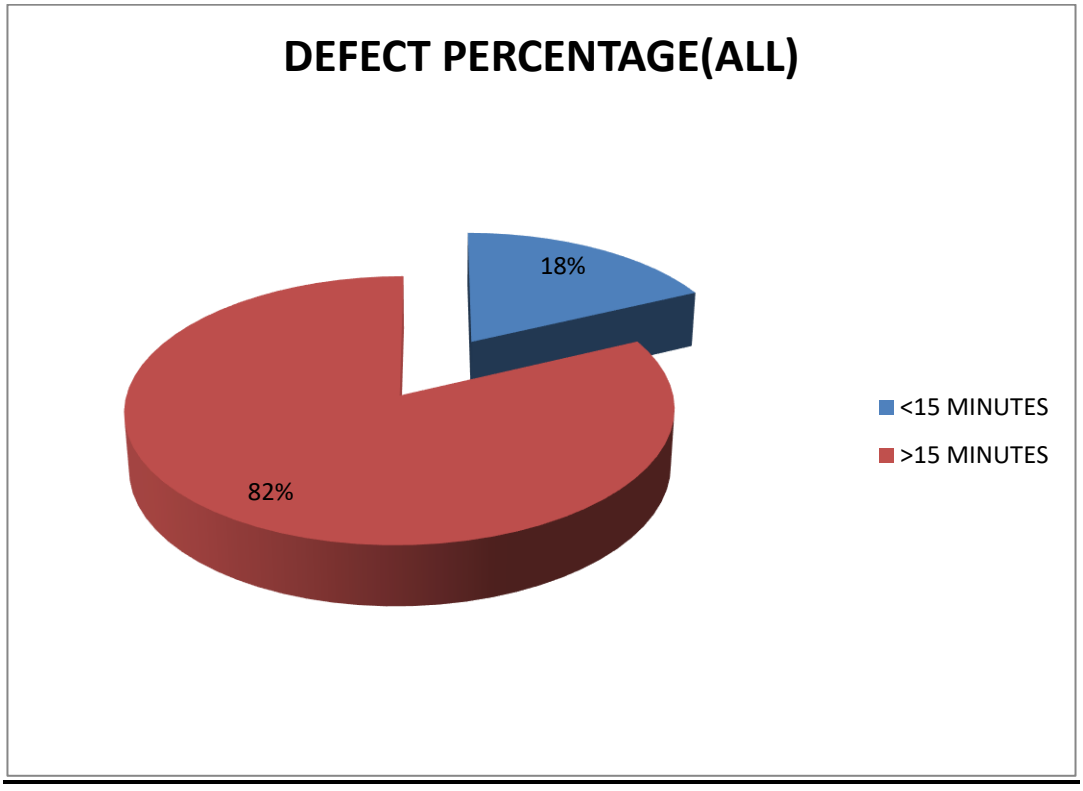

Figure 15

TAT REPORTING

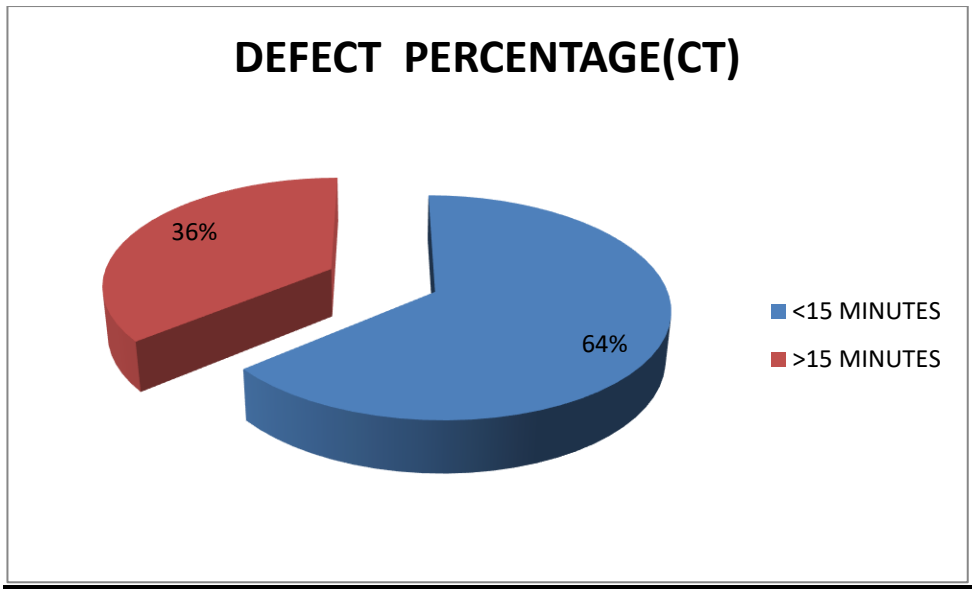

Figure 16

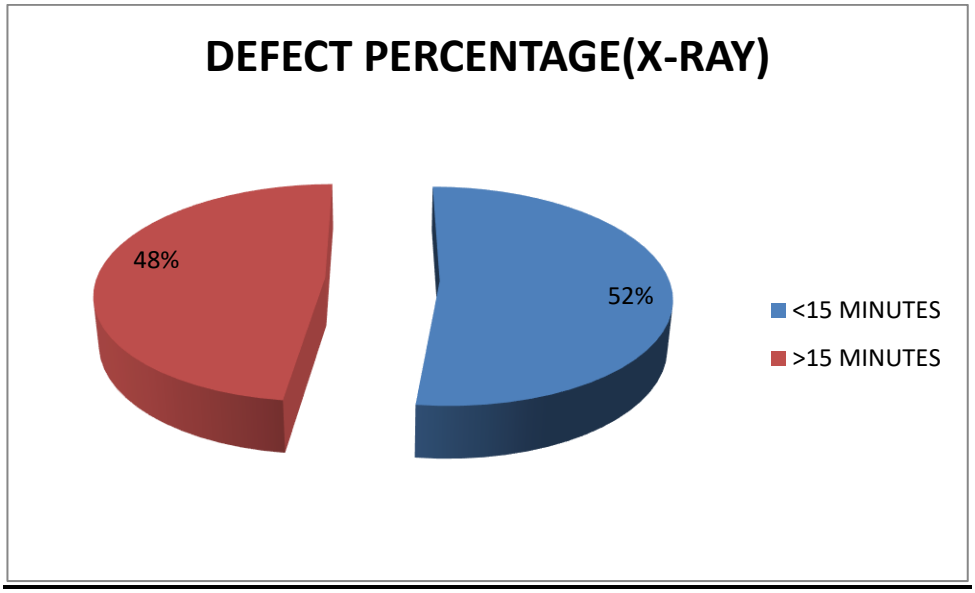

Figure 17

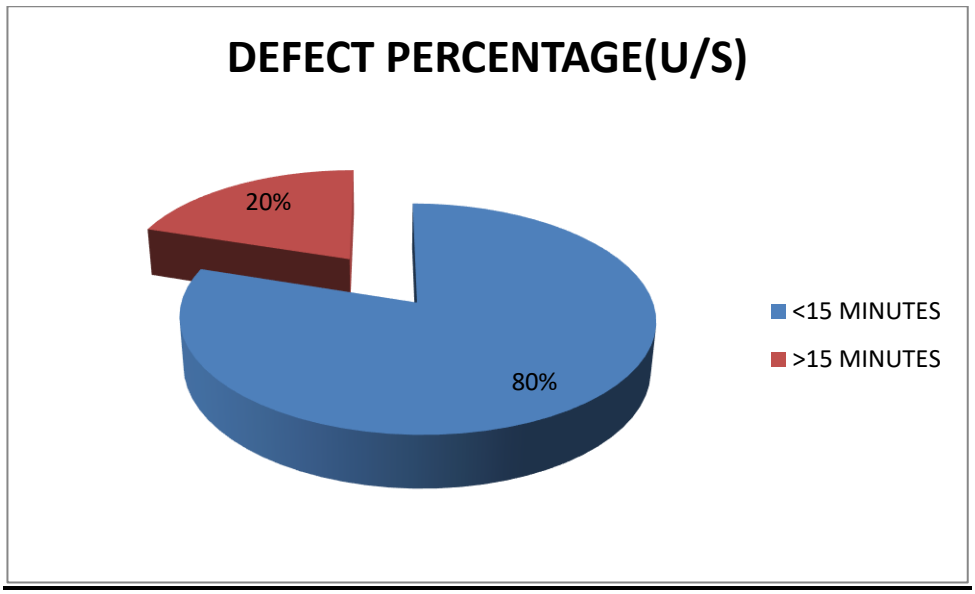

Figure 18

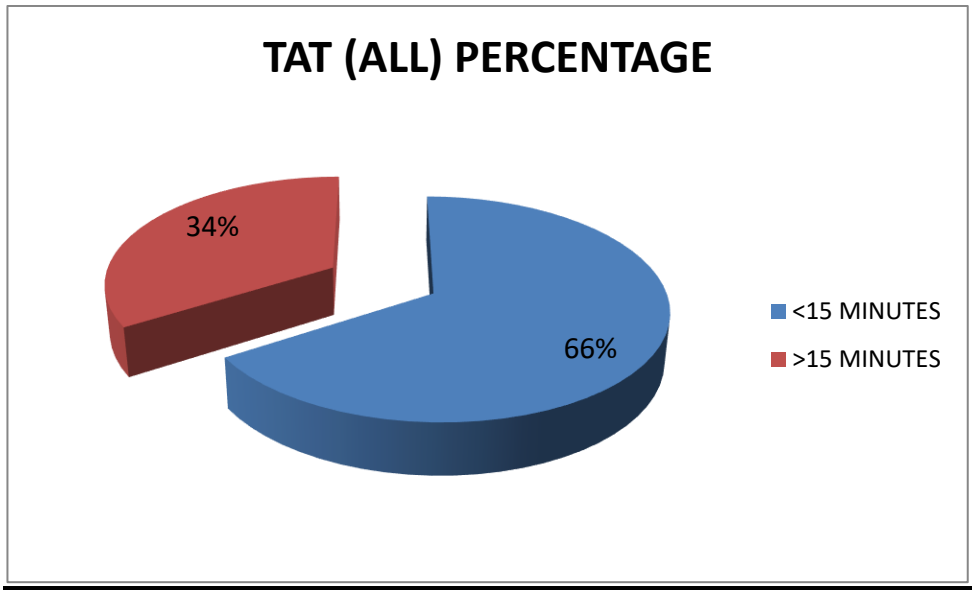

Figure 19

ANALYZE

The analyze phase was undertaken to determine any disparity that may exist in the goals set and the current performance levels achieved. The understanding of the relationship between cause and effect is necessary to bring about any improvements, if needed.
*Analyze phase seeks to discover root causes of the major contributes to the problem.

RCA(Root Cause Analysis)

Brainstorming session was carried out and all the causes were listed in the Fish Bone Diagram.

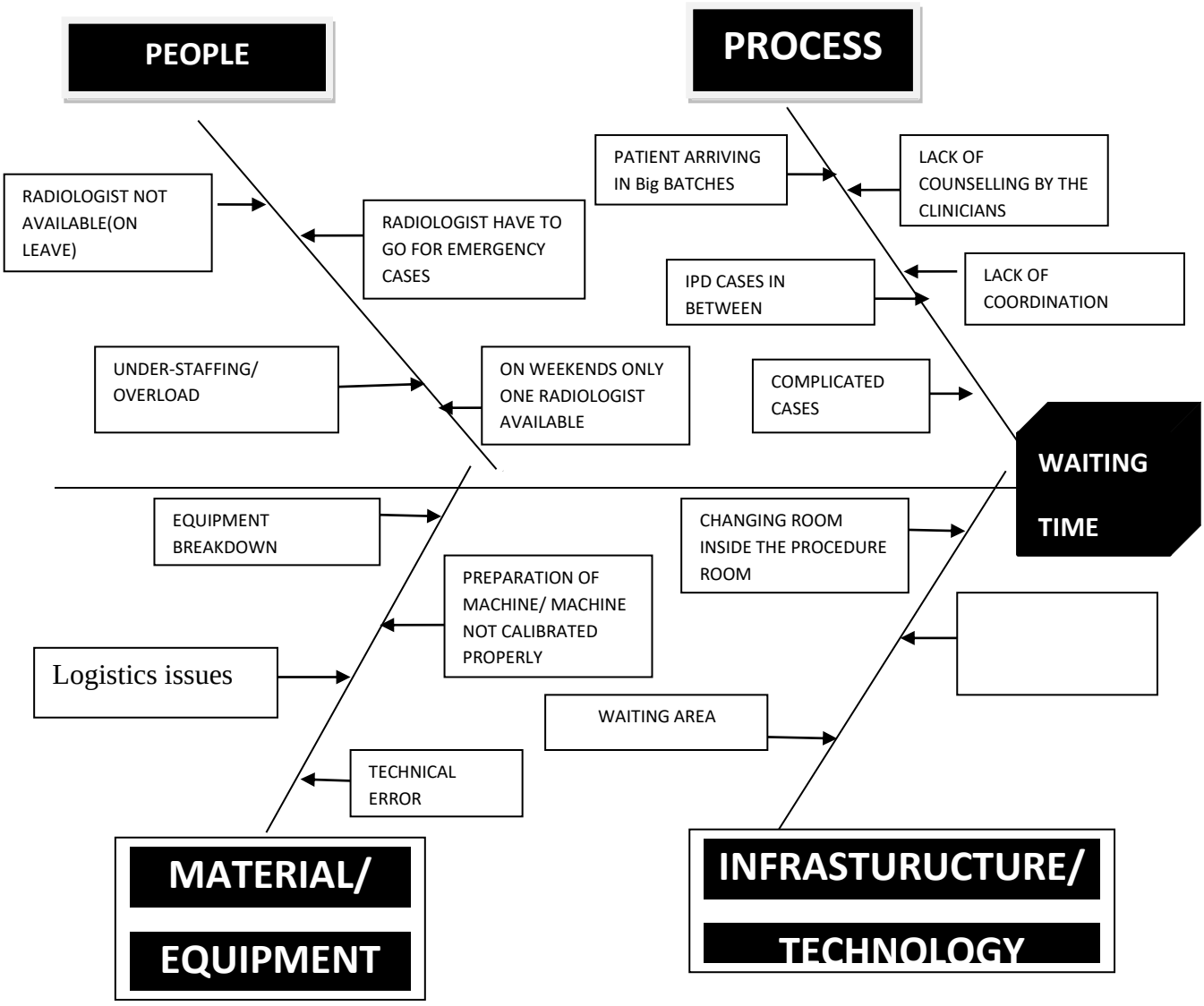

Figure 20

CAUSES OF DELAY IN REPORTING

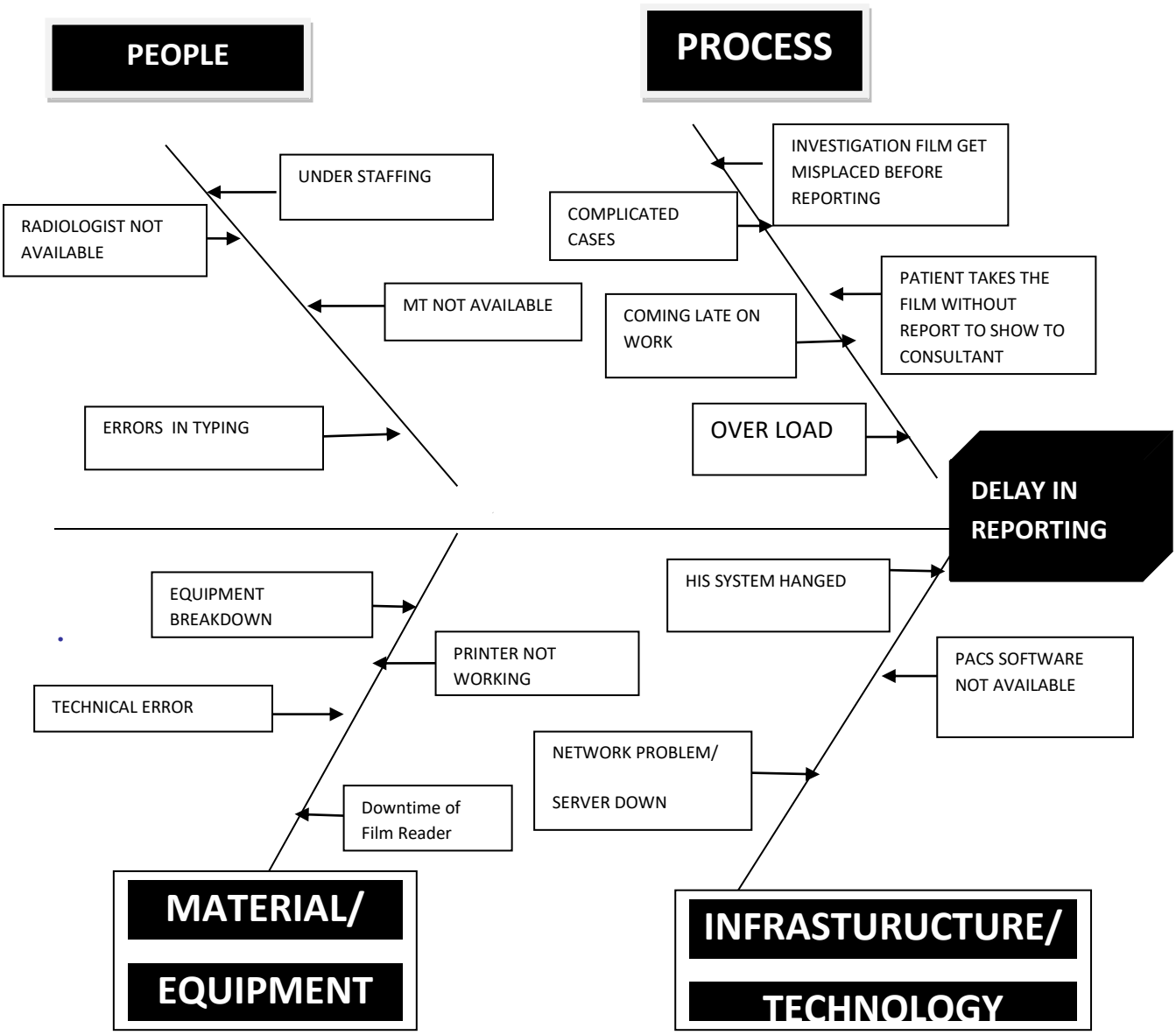

Figure 21

IMPROVEMET MEASURES/ RECOMMENDATIONS

To identify potential solutions that eliminate root causes.

1. **Appointment System.-**Block appointment & Dynamic staggerd- The diversity of the patient groups demanding service, and the diversity of the investigation mix poses a great challenge to effective and efficient design of the service delivery system. Whereas some investigations are simple and require short service times, others are complex and require longer service duration. Strategies must therefore, be developed to cope with the investigation mix, and ensure minimum delays and congestion at the facility.
2. **Starting of OPD on time**
3. **Streamlining the procedure of distribution**-- In healthcare facilities, arrivals consist of acute (unscheduled) and elective (scheduled) patients. Congestion at the facility could be attributed to a number of factors[2]. Delays and facility congestion have also been attributed to the quality and experience of the medical staff, and the allocation of medical capacity between distinct demand streams - outpatients, inpatients, and emergencies.
4. **Counselling--**Patients don't get proper instructions to get investigation done like fasting or full bladder so, Proper counselling of patients should be done by the clinicians.
5. **On the call radiologist**-- Radiologist not available: In case of absence- On the call radiologist should be made available.
6. **For IPD patients** –Separate machine.
7. **PACS** software Facility.
8. **Alternate MT**—In case of MT not available: Provision of alternate MT
9. **CALL CENTRE TO GIVE APPOINTMENTS**--Although Call-centres are common in commercial industries like telecom, the concept has been alien to hospitals. Hospitals usually have reception desks which manage general enquiries and appointments. To streamline the process of hospital visits and minimize wait times for patients by using m-health initiatives. A secondary objective is to improve transparency and accountability in the OPD's.
10. **TOKEN SYSTEM**-- The token number will be sent as SMS remains the queue number which is displayed on electronic display boards in real time.
11. **Reduce Workload** --HIRE MORE STAFF(RADIOLOGIST) on the basis of workload

12. **Preventive maintenance** of machines—Periodic checks and calibration
13. **Training of OPD Coordinators-** To improve the coordination .

CONTROL

1- Design effective quality controls.
2- Design dashboards/ scorecards.
3- Audit the controls.

A) Design control

To ensure that the breakthrough is maintained, the quality improvement team needs to develop effective quality control by feedback loop.

Measure the end results or the outcome of the improved process must be measured to be by random samples taken every week using the following data collection plan

The act of comparing actual performance to specifications will be the role of quality professional:-

 plotting the actual performance on control chart

 monitor the chart for trends and pattern and special causes

B) Design dashboards/ scorecards.

During this phase ,control tools are implemented such as dashboards or balance scorecards to monitor key indicators. Dashboard will be maintained monthly by continuous monitoring and will track the critical points.

C) Audit the control

- Routine reporting of result is maintained
- Clear documentation of control is done

DISCUSSION

To maintain the quality and brand image, the hospital is required to streamline some of its processs and standardize the services. Today's Hospitals have been developed as one of the best health care service providers especially in OPD ,the health care centers provide excellent modern facilities and has enormous potential to grow.

The average waiting time for the CT ,X-ray & Ultrasound found to be as 2:14, 1:48 & 1:24 respectively. The average TAT for the reporting came out as 15:10 for CT, 6:28 for X-ray & 21:10 for Ultrasound.

The defect percentage for the waiting time for all the 3 modalities came out to be 82% and defects in TAT reporting came around as 34%. So most number of defects found in the waiting time for CT.

The sigma level was calculated as around 2.5 sigma level for the waiting time and around 3 sigma level for the TAT reporting which was found to be far below the 6 sigma level .

The results stated above shows that the deviation from the standard policy time is too much. The root causes were identified and the biggest causes found to be was lack of appointment system and arrival of patient in big batches and some other causes such as lack of proper coordination. The recommendation and control measures were suggested for the same.

In healthcare facilities, arrivals consist of acute (unscheduled) and elective (scheduled) patients. Congestion at the facility could be attributed to a number of factors. Delays and facility congestion have also been attributed to the quality and experience of the medical staff, and the allocation of medical capacity between distinct demand streams - outpatients, inpatients, and emergencies

Our customers conduct business — old business models no longer work. Today's competitive Environment leaves no room for error. We must delight our customers and relentlessly look for new ways to exceed their expectations. This is why Six Sigma Quality has become a part of our culture.

The central idea behind Six Sigma is that if you can measure how many “defects” you have in a process, you can systematically figure out how to eliminate them and get as close to “zero defects” as possible.

Consumers evaluate products based on intrinsic and extrinsic dimensions. Intrinsic dimensions include tangible and core attributes directly related to quality, while extrinsic dimensions are image variables such as price, brand name etc. It has been found that as consumers has become more educated and experienced, they tend to engage in comprehensive processing of all available dimensions, consumers are more likely to rely on extrinsic attributes. The study indicated that auxiliary service quality dimensions such as ‘‘non-physicians care’’ and ‘‘convenience’’ were important for satisfaction .Patients satisfaction influences patient retention rate and effectiveness of medical care. [21]

Management must provide the facilities in OPD to avoid long waiting time.

CONCLUSION

Patients coming to hospital are responsible for spreading the good image of the hospital and therefore satisfaction of patients attending the hospital is equally important for hospital Management. Various studies about outpatient services have elicited problems like overcrowding, delay in consultation, proper behaviour of the staff etc. The study reveals the average time spent by the patients and expresses their view towards the hospital and hospital's services in undergoing various procedures. The study throws light on the various services provided by the hospital and the total time consumed in important activities. [22]

The amount of time a patient spends at a health facility has often been used as a measure of patient satisfaction with the service being provided. A patient's experience of waiting can radically influence his/her perceptions of service quality (Afolabi&Erhun, 2003). It was shown that the overall satisfaction of patients with medical services is closely related to their satisfaction with waiting time (Trop J Pharm Res, June 2003).[23]

As we know that patient coming in hospital are already in grief and pain increased waiting time at OPD department add to their grievances. Patients' satisfaction with an encounter with health care service is mainly dependent on the duration and efficiency of care, and how empathetic and communicable the health care providers are. So the aim of hospital should be to ensure a smooth flow of the patients with minimal waiting time.

Reduction in waiting time and turnover time will improve efficiency of hospital as more number of patients would be treated in the same period of time. Also it will improve the patient satisfaction and eventually revenue and profit of hospital.

The study measured the average waiting time and average TAT for the reporting and calculation of sigma level was done. There is scope of improvement in both the activities so as to increase the level of patient satisfaction. The diversity of the patient groups demanding service, and the diversity of the investigation mix poses a great challenge to effective and efficient design of the service delivery system. Whereas some investigations are simple and require short service times, others are complex and require longer service duration. Strategies must therefore, be developed to cope with the investigation mix, and ensure minimum delays and congestion at the facility.

LIMITATIONS OF THE STUDY

1. This study is limited to only Radiology department(X-ray,US,CT).
2. The time taken in the registration and billing process was not taken into the consideration.
3. The data was collected through HMS.
4. Further studies need to be conducted in the OPD and other interrelated departments so as to find out the loopholes in the whole process and to rectify them accordingly.

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