

Study on Evaluating the Effect of Lean Methodology on
Quality Assurance in Department of Radiology in The
Mission Hospital, Durgapur

By

Neha Joshi

*Dissertation submitted in partial fulfillment of the requirements of the degree
MBA Hospital and Health Management*

Academic year, 2017-2019



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TO WHOMSOEVER MAY CONCERN

This is to certify that **Dr. Neha Joshi** student of MBA Hospital and Health Management from The IIHMR University, Jaipur has undergone internship training at **The Mission Hospital, Durgapur** from **4th February to 30th April 2019**.

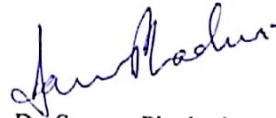
The Candidate has successfully carried out the study on topic **Study on Evaluating the Effect of Lean Methodology on Quality Assurance in Department of Radiology in The Mission Hospital, Durgapur** assigned to her during internship training and her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish her all success in all her future endeavors.

A handwritten signature in blue ink, appearing to read 'Ashok'.

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

A handwritten signature in blue ink, appearing to read 'Sameer Phadnis'.

Dr. Sameer Phadnis
Associate Professor (Guide)
The IIHMR University, Jaipur

16 May 2018

THE IIHMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **Study on Implementation of Lean Methodology for Quality Assurance in department of Radiology in the Mission Hospital, Durgapur** submitted by **Dr. Neha Joshi** Enrolment No- **IIHMR- 606** under the supervision of Dr. Sameer Phadnis, Associate Professor The IIHMR University, Jaipur for award of MBA in Hospital and Healthcare Management of the University carried out during the period from February 4, 2019 to May 4, 2019 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other institute or other similar institution of higher learning.



Signature

Dr. Neha Joshi



Ref: TMH/HRD/OG/April/19/88

Date: 01/05/19

TO WHOM IT MAY CONCERN

This is to certify that **Dr. Neha Joshi** has done three months dissertation on **A Study on implementation of Lean Methodology for Quality Assurance of Radiology** at The Mission Hospital, Durgapur, West Bengal from 04/02/2019 to 30/04/2019.

During the period of dissertation **Dr. Neha Joshi** has been found sincere, hard working having an attitude to learn.

We wish her a successful future and brilliant professional career ahead.

For The Mission Hospital, Durgapur



Ramesh Lall
Sr. General Manager - HR

ABSTRACT

Study on Evaluating the effect of Lean Methodology on Quality Assurance in department of Radiology Department.

Author: Dr Neha Joshi

Background: The Department was facing difficulties in managing the patient flow process, report turnaround time and backlog of patients waiting for appointments, frequent equipment failures, increased number of activities that did not add value to the customer. Therefore, implementation of lean was suggested with the active participation of all the members of Radiology.

Objectives:

- To ascertain the effect of lean management and Re- Engineering on selected indicators of Quality Assurance in Radiology department.
- To create Value Stream Mapping of the process flow in Radiology Department.
- To Identify the non-value-added time in the process flow from the value stream mapping.

Methodology: It is Cross sectional study which is prospective in nature where the study subjects i.e. patients were followed at each step following their entry into the Radiology Department to their report submission and exit.

Results:

The TAT was considerably reduced in USG department from 3 hours 16 min to 1 hour 50 min by just allocation of work and streamlining the process flow. Equipment breakdown was monitored. New CT 128 slice is installed in the department for reducing the TAT in the CT department caused due to frequent breakdowns.

Dragon software was suggested for removing the transcription errors that took most of the time in correction and verification. Reducing the excessive movements by the technicians in handing over the reports across the departments was also reduced by shifting the typist in the sonologist room.

Due to CT department under construction fair amount of changes could not be brought to CT department, which will be under process changes are incorporated which will take time for further strengthening and smoothing the process.

Scheduling the patient flow to the department was managed to some extent but due to deficiencies in the manpower could bring much changes.

Acknowledgements

The opportunity provided to do dissertation at The Mission Hospital, Durgapur was an enriching and valuable experience. I am highly obliged to have met so many experienced professionals who led me throughout my study period. I am sincerely grateful to all of them for sharing their honest and illuminating views on several aspects related to the project.

First and foremost, I would like to acknowledge Dr. Partha Pal, (Chief Medical Superintendent) and Dr. Tarakanath Taraphdar (Assistant Medical superintendent) who inspired, guided and helped me to complete my project at their respected organization, I take this moment to recognize their contribution gratefully.

I would also like to thank Dr. Ashok Bharati, Consultant Radiologist TMH whose support and guidance was extremely crucial for the fulfillment of the project.

I am extremely thankful to my Guide and support Dr. Sameer Phadnis (Associate Professor) for his constant motivation.

I recognize this opportunity as a big milestone in the development of my career. I will strive to use the knowledge and skills gained in the best possible way.

Lastly, I want to express my respects and love to my parents and my sibling for constant encouragement and motivation in my higher studies.

Sincerely,

Dr. Neha Joshi

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INTRODUCTION

ABOUT THE ORGANISATION



1) Introduction:

The Mission Hospital first started its operation from April 02, 2008 with 305 beds built in an area spanning three acres at plot No.219 (P), Immon Kalyan Sarani, Sector 2C, Bidhan Nagar, Durgapur-713212. This hospital has the credit of being the first super specialty quaternary care hospital in Eastern India outside Kolkata that has taken an initiative to amalgamate and integrate the best in healthcare including technology and manpower and is the first and only **NABH**

Accredited hospital outside Kolkata in West Bengal. This hospital has been set up with the vision of providing individuals access to quality healthcare at affordable prices. The hospital has been able to cement its ground in Durgapur and the neighboring areas through its patient centric approach and high-quality care, and patients are benefiting from the facilities of the hospital. Their competence level in treating surgical & medical emergencies including trauma is well known in the medical circles in Eastern India.

SALIENT FEATURES OF CLINICAL ACTIVITIES OF THE MISSION HOSPITAL

1. First tertiary care hospital in the district.
2. We perform more than 2500 complex adult, paediatric and neonatal heart surgeries every year.
3. We perform more than 1500 congenital heart surgeries every year.
4. 4000 complex cardiology procedures including Electrophysiology studies every year.
5. Our Neuro-surgical team perform more than 450 elective and 600 emergency neuro surgeries every year.
6. The orthopedic team perform approximately 500 Joint Replacement and 600 emergency orthopedics operation every year.
7. We are proud to have the only dedicated, consolidated (trauma team) which amalgamate with the team of emergency doctors and has been consistently handling complex trauma cases to the tune of 100-125 cases every month. These high numbers are due to the proximity of the hospital to the high-speed National Highway N0.2.
8. Full-fledged department of Gastroenterology, Hepatology with facilities for ERCP, double balloon endoscopes.
9. Department of nephrology and Kidney Transplant doing 1500 dialysis every month.
10. 132 bedded critical care unit with specialized isolation unit.
11. 60 full times, dedicated, renowned, in campus consultants.
12. Pneumatic chute for the first time in India.
13. State of the art blood bank, with facilities for stem cell and aphaeresis at par with the best in the country headed by MD Transfusion Medicine.
14. A successful Bone Marrow Transplant done.
15. Advanced Department of Laboratory Medicine with facilities for Molecular Biology.
16. One of the busiest Emergency Department in West Bengal treating more than 1,00,000 patients per year.

SPECIAL FEATURES ABOUT THE INFRASTRUCTURE:

1. 1,10,000 sq. ft. centrally air-conditioned 370 bedded tertiary care hospital situated in an area spanning 3 acres.
2. 7 Operation Theatres with laminar air flow and HEPA filters with epoxy coated walls and floors.
3. 110 fully equipped critical area beds with facilities for blood gas, separate ECHO, X-ray and ultrasound machine for each critical area.
4. 1.5 tesla 16 channel MRI with facilities for cardiac MRI
5. Multi-channel High definition CT scan.
6. Dedicated ultrasound and ECHO machine for Emergency.
7. Two Digital Flat Panel Cath lab, Philips Allura FD10C with Clarity, the best in its category in the world.
8. Specialized stone clinic with facilities for PCNL (Percutaneous Nephrolithotomy), ESWL (Extra corporeal shock wave lithotripsy).
9. Specialized Neonatal intensive care unit.
10. Fully computerized central sterilization unit (CSSD).

ACADEMIC ACTIVITIES

1. 3 years master's in emergency medicine in association with North Shore Long Island University, New York, USA.
2. 1-year Diploma for technician in Critical Care, Operation Theatre and CSSD in association with WBUT. Students who pass out from higher secondary courses who come from low socio-economic strata are screened and channelized into the course, at the completion of which they get a salary of Rs.15,000/- and above in various hospitals all over the country. Special emphasis is also given on girl students and orphans. Bank loans are also provided so that they can take the course.
3. Internship in Master in Hospital Administration from renowned Universities.

About the Radiology Department – Radiology Department is headed by Consultant Radiologist Dr Ashok Bharati and Sonologist and Dr Nandita Nayak. Radiology Team consist of 13 technicians consisting of X- Ray, MRI, USG and CT and 3 typist, 1 sister, GDA staff, 2 coordinators. It is situated on the Ground Floor beside the Emergency Department. It caters to patients from IPD, OPD, Health checkup and Emergency department. The Organogram of the department is described below: -

ORGANOGRAM: -

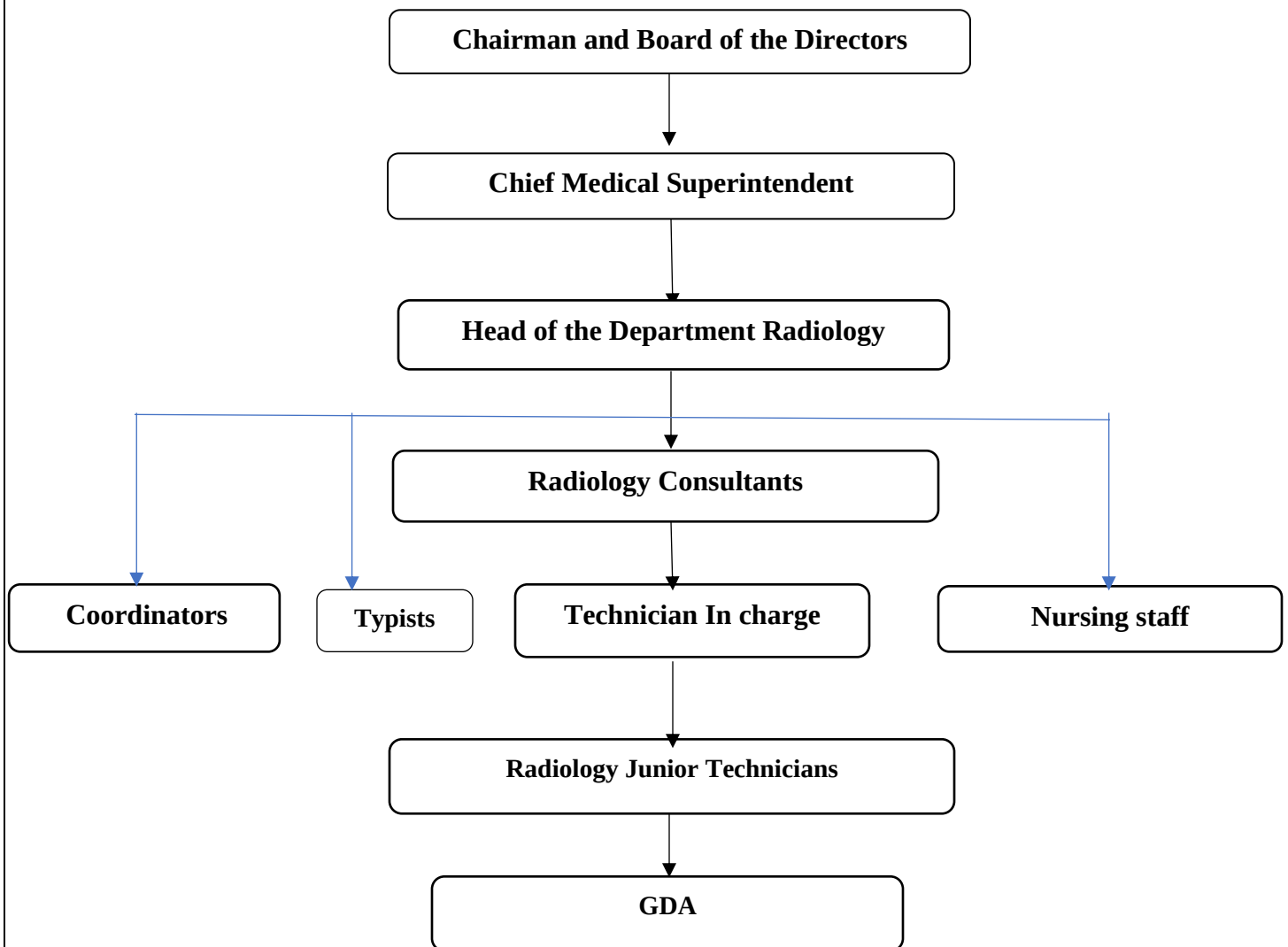


Figure 1. Organogram

PROCESS FLOW OF THE DEPARTMENT [OPD patients]

The radiology department caters to the need of OPD patients, both referred from the OPD clinics (hospital-based and outreach) of The Mission Hospital and other doctors; patients from IPD of this hospital, as well as other hospitals and Emergency department.

As a policy, patients needing emergent radiological investigations are given priority.

1. The Patient /attendant arrives at the Front Office, where billing is done, and the patient is directed towards the Radiology Department.
2. The Radiology OPD encounters three type of patients
 - One that take prior appointment due to lengthy investigations.
 - Others which are planned Health Checkup patients.
 - The third category is Unplanned OPD patients.
3. OPD starts at 10 am till 5 pm.
4. The billing usually take place in morning, patients are taken at first come and first serve basis. Radiology Department caters to patient that comes from far off areas, therefore the billing is normally done at 8 am for OPD patients.
5. Before Investigation the patient ID proof is checked.
6. Consent is taken for special Investigations, also department follows screening of patient before undergoing procedure the patient history is taken to check for any previous procedure.
7. Patient waits in the Waiting Area
8. Patient name is recalled by the staff nurse: -

For CT Investigations the patient dressing is done prior to investigations, for contrast patients preparation time may exceed to 2-3 hours similarly for the USG patients the investigations should be carried out with empty stomach or full bladder.

9. Reports are sent for typing to typist.
10. Cross Verified by the radiologist and errors are corrected.
11. Reports are dispatched from the counter and handed over to the patients.

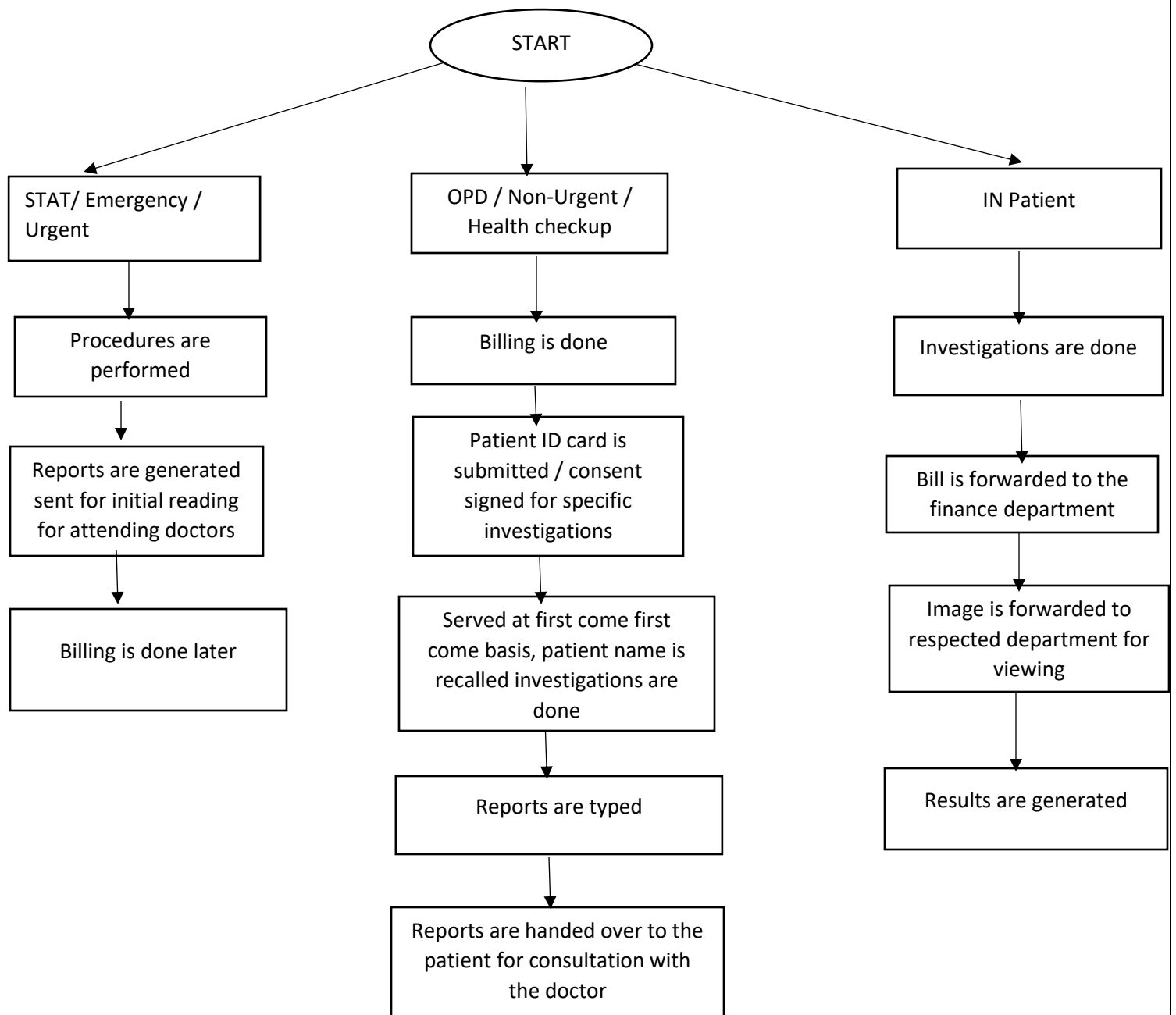


Figure2. Process flow

INTRODUCTION

Lean System was initially developed for the production company but recently it has also been implemented in the service industry specially in the healthcare system. An evident reason for implementing lean in healthcare industry specifically the radiology department was to increasing demand for diagnosis hospitals also urge for bringing down cost incurred and turn-around time. Lean focuses on overall development that includes increasing the efficiency and productivity of the department along with cooperation from the employees. The Emphasis was being on new capital investment in the budget; thus, investment strategies were built from within the department simultaneously prioritizing lean. The process by which Six sigma improves quality is the use of continual analysis of an organization's management systems and workflows to unclog bottlenecks and eliminate steps that are waste by identifying defects and minimizing variability manufacturing and business process for service industry it includes improving the experience of patients and physicians. Six Sigma projects that are carried out in organizations follow a defined sequence that aim at cost reduction and Increased profits. DMAIC that is an integral component of six sigma is an acronym for Define, Measure, Analyze, Improve, and Control. These steps represent an improvement cycle that is repeated frequently to identify best practices that help in moving towards perfect processes.

The current value stream map pertaining to the process flow of the Radiology department of Mission Hospital, Durgapur, was analyzed and the prospective value stream map of the process flow and the patient pathway was redesigned with the help of tools of lean health care application pertaining to Quality Improvement. The greatest limitation of the study was the resistant to change exception new things as part of the normal process flow which took time and patience. The CT AND USG are profit generating areas for the hospital. The rate of reimbursement for these services are exponential, the timing of scans (especially in CT) are relatively low, and therefore, the potential for adding revenue to the hospital comes with an increasing patient footfall and capacity for these services. However, the present scenario is a very competitive one for radiology departments at hospitals as many outpatient diagnostic centers are actively built that draw patients and efficient physicians. This is a major factor for challenge for hospitals.

The Lean Management process is divided into categories, which are: Process management tools, quality tools, equipment tools material tools and production tools (Wilson 2010). The process management category comprises of a set of tools that focus majorly on problem solving.

A deviation from a standard benchmark would be considered as a problem therefore certain benchmarks were set to reduce it which directly impacted the quality of the product / outcome. Shewhart Deming cycle (Lean Manufacturing), PDCA and Six Sigma Define – Measure – Analyze –Improve (Liker and Meir, 2007).

The lean Management tools are: -

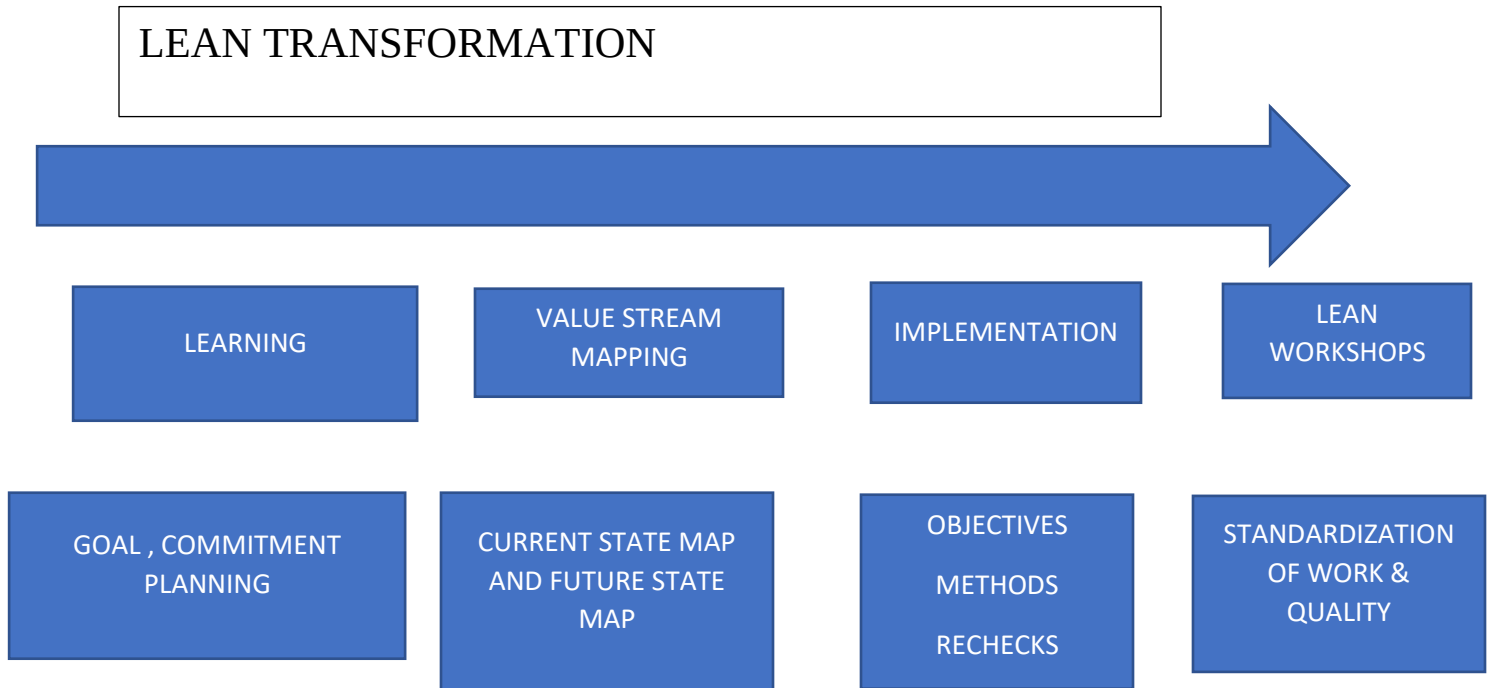
- 5 s
- KANBAN (pull system)

- VALUE STREAM MAPPING
- SMED
- POKA-YOKE (Error Proofing)
- ELIMINATION OF TIME BATCHING
- TOTAL PRODUCTIVE MAINTANCE
- MIXED MODEL PROCESSING
- SINGLE POINT SCHEDULING
- RANK ORDER CLUSTERING
- MULTI PROCESS HANDLING
- REDESIGNING WORKING CELLS
- CONTROL CHARTS.

Principles for Implementing Lean are:

- 1) Involment of the staff and equal respect for all , taking suggestions and feedback from all the staff member - top to bottom.
- 2) Standardization of work for minizing variations.
- 3) Improving the flow of all processes in system.
- 4) Defining what is value and improving according to the described value , making efforts for delivering the same.
- 5) Analyzing data creating change according to the deficiencies

Process of Lean Transformation:



Value Stream Mapping is primarily used for analyzing the current process flow and redesigning the entire process to add more value to system. Therefore, it is a visual representation of each and every process in the material and information flow. The current system was evaluated and studied by mapping both physical and information flows. A critical factor was to combine direct observation and detailed explanations from those who are most close to the process. This technique requires mapping the entire process flow by direct observation and understanding the complex pathways of patient care that occur from the perspectives of all participants, that includes physicians, nurses, technicians, coordinators, and importantly the patients. It helps organizations in identifying and minimizing waste in a process and helps in gaining insight into the decision-making flow apart from the process flow. Ultimately significant improvements in communication, wait times, efficiency of movement across the departments, utilization of resources and quality of service can gradually improve.

Main Areas of focus: -

Improving patient journey as a service model.

Create most value while consuming fewest resources.

Eliminating process that do not add value.

Improve and track performance to reduce lead time.

After designing the value stream Map of Radiology, the Data is Analyzed to identify root causes, identify Areas that need more work. Establish actions to be performed. Implementing the action plan, standardizing and reviewing from time to time.

PROCESS FLOW OF VALUE STREAM MAPPING:

Using Value Stream Mapping allows for the creation of a diagram that makes these areas of waste become readily apparent which helps in process improvement. By mapping out processes, we can identify the root causes of errors, defects and wasted activities. Eliminating those root causes can lead to a significant decrease in occurrence's most important, overarching requirement for a Value Stream Map is that it represents what *actually is happening* in a process. Value Stream Mapping represents the reality of a process. Value Stream Map diagrams in great detail every step of a process, from beginning to end. The diagram should be created from the point of view of customers. The ultimate goal is to create a process that gives them the best product or service available, as well as making the process more efficient.

STEPS IN CREATING A VALUE STREAM MAP:

Step 1 – Understand Value

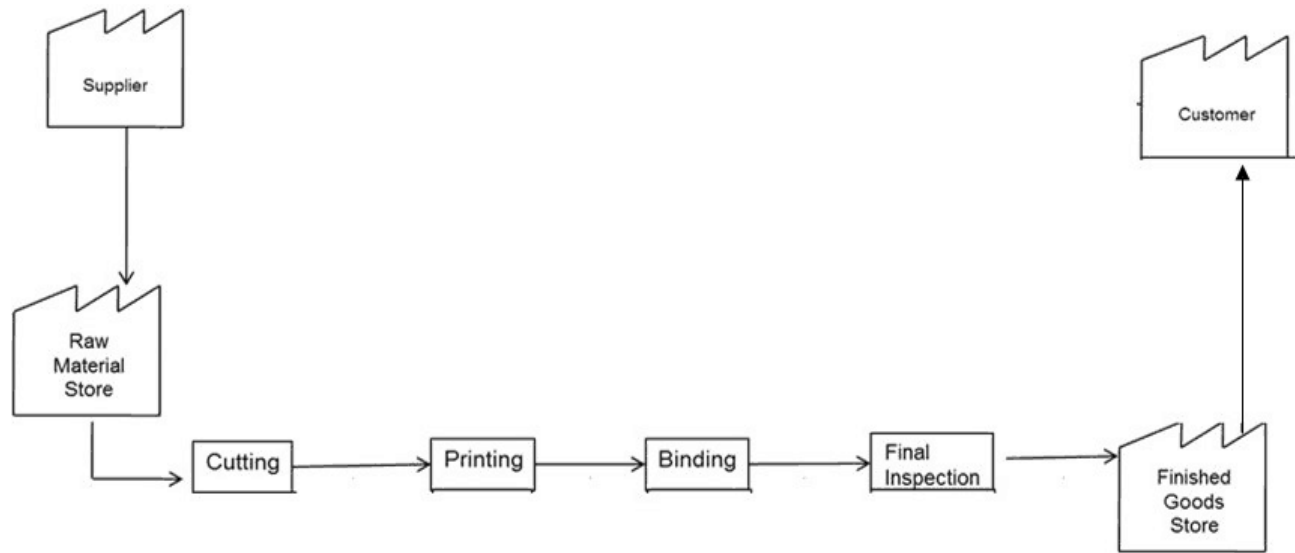
The first while developing a Value Stream Map is to comprehend the concept of “Value-Adding Activities.” There are three criteria for Value Adding Activities, namely:

1. The customer wants you to do it
2. The material or information is being processed or transformed to final products
3. It is done right the first time.

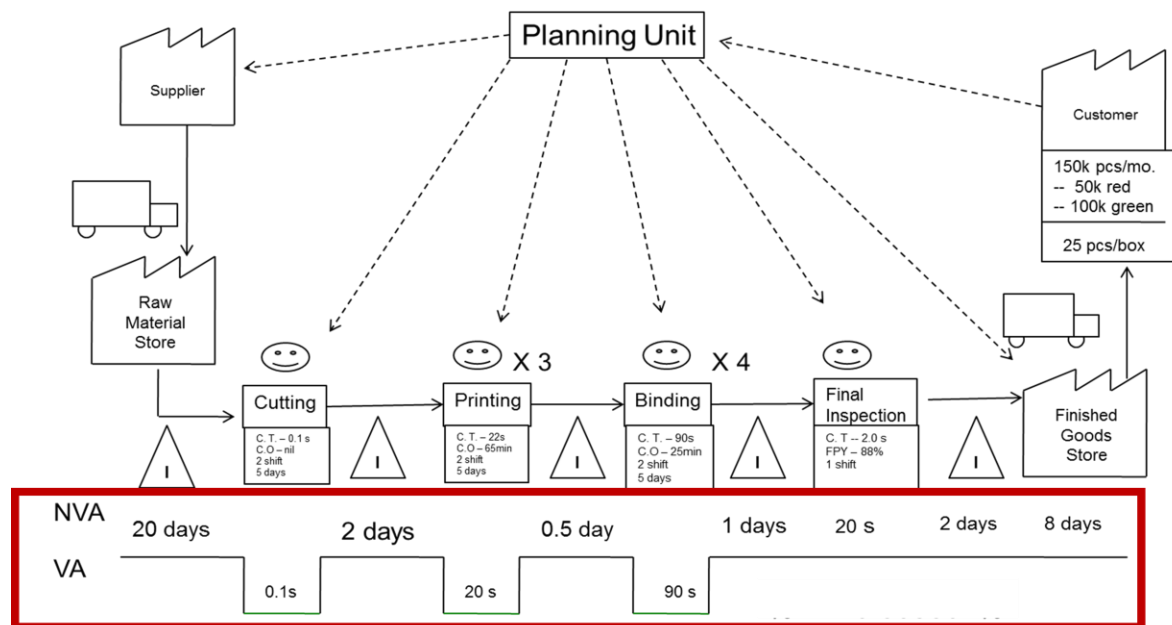
Step 2 – Determine our focus area.

A Value Stream Map tracks a part, service or transaction or a family of parts, services or transactions through the process for e.g. the defined value for the organization as well as understood in the focus. For Radiology department values to customer would be delayed turnaround time for reports leading to increased customer satisfaction.

Step 3- Define basic value stream map.



Step 4 – Define Value added time and Nonvalue added time.



Step 5 – Fill Process Data with critical data.

- Process Cycle Time
- Changeover Time
- Pace / TAKT Time / Rate
- Defects / Problems Per Day
- First Pass Yield
- Batch Size
- Shifts
- Manpower

Value-Added + Non-Value-Added Time that equal the total Process Time.

The % of Value-Added Time is usually <5%. The main objective is to improve and make goals that are achievable and realistic. The other 95%+ of the time is wastage and after some brainstorming, the team can allot the lost time to one or more of the waste time.

1. **Cycle time (C/T):** The time taken to complete all work elements before repeating them. For example: how long to triage a patient in the ED.
- **Value-added time (VAT):** The time of work elements that actually transform the product (patient) in a way the customer is willing to pay for.
- **Non-Value-added time (NVAT):** Waste time that does not add value to a process.
- **Wait Time:** A delay in processing caused by waiting

Finally, the process times and waiting times (inventory lead times) need to be calculated and added to the VSM. These will be put into use for estimation of the total lead time, process time and process efficiency.

Waste is defined as activities described below: -

- **Transport** does not add value to your final product – Steps need to be reduced by involving transport of information and materials that don't add value.
- **Inventory** of inputs and finished products add to costs. Lower inventory levels without stonewalling production helps in minimizing costs.
- **Motion** costs time and it is known that time is money.

- **Waiting:** A bottleneck in a previous process or sub-process is an absolute and waste of valuable resources.
- **Over-processing** can be tough to gauge, but if it is possible to move an item from one process to another in a proper condition with less inputs, it should be done.
- **Overproduction** needs to be avoided. Storing and monitoring extra stock of products till someone purchases it is a waste.

Efforts are made to construct a future state and reduce the waste time that do not add any value to the customer and organization.

Designing the future state:

There are four main techniques for designing a future state:

- ❖ **Eliminate**
- ❖ **Combine**
- ❖ **Simplify**
- ❖ **Sequence**

AIM OF THE STUDY

The Aim of the study is to bring improvements in the process flow and technology to achieve a competitive advantage over its competitors in The Mission Hospital, Durgapur. Involvement of the staff i.e. the technicians, radiologist, nurses and GDA for making it a comprehensive programme determining the suggestions and contributions from all aspects. Also including a feedback from the patients, the major stakeholder for improving the processes. Performing the GAP analysis between the current situation and the expected outcome and finding out loop holes and fulfilling them. Elimination of waste would be a greater challenge so that all sorts of waste should be eliminated that include overproduction, excess activities, errors in reporting which impacted the outcome severely. Generating the results in the specified turnaround time as given in the hospital protocols.

Improving the effective communication in Radiology department was another essential aspect of the study, certain errors were caused due to ineffective communication between the Radiologist and the technicians and between the nursing staff leading to more errors in patient scheduling. Reducing the report writing time in department reducing typing errors was major task that increased the dispatch time for maximum reports.

Implementation of HIS in Radiology because manual reporting leads to increased errors and wastage of time. Improving the Quality of outsourced reports, the outsourced reports are compromised i.e. poor quality and having more reporting errors.

Implementing of Lean Management followed by Six Sigma would be a future AIM of the study.

REVIEW OF LITERATURE:-

Jonathan B krushal, Allen Reddy et al stated in study - **Quality Initiatives: Lean Approach to Improving Performance and Efficiency in a Radiology Department** that *“Implementing a lean approach to improve organizational performance implies never losing sight of what the customer wants, the goal, or the ideal (true north). As is true of all such efforts, regardless of the approach, the lean transformation is a journey that starts with a single step and requires an ongoing commitment by all staff members. The involvement of all is encouraged, and their contributions are respected. We hope our readers will be inspired to take that single step forward and begin working with their own departmental leadership, management, and staff to apply lean principles to improve efficiency, performance, safety, and employee commitment”* (1)

Jonathan Flug and Paul Nagy indicated in *The Lean Concept of Waste in Radiology* that Defects should be minimized defects such as wrong procedures, retakes and misinterpretations i.e. any product and service that does not define the specified standards would be considered a defect. Any excessive body movements are also waste. (2)

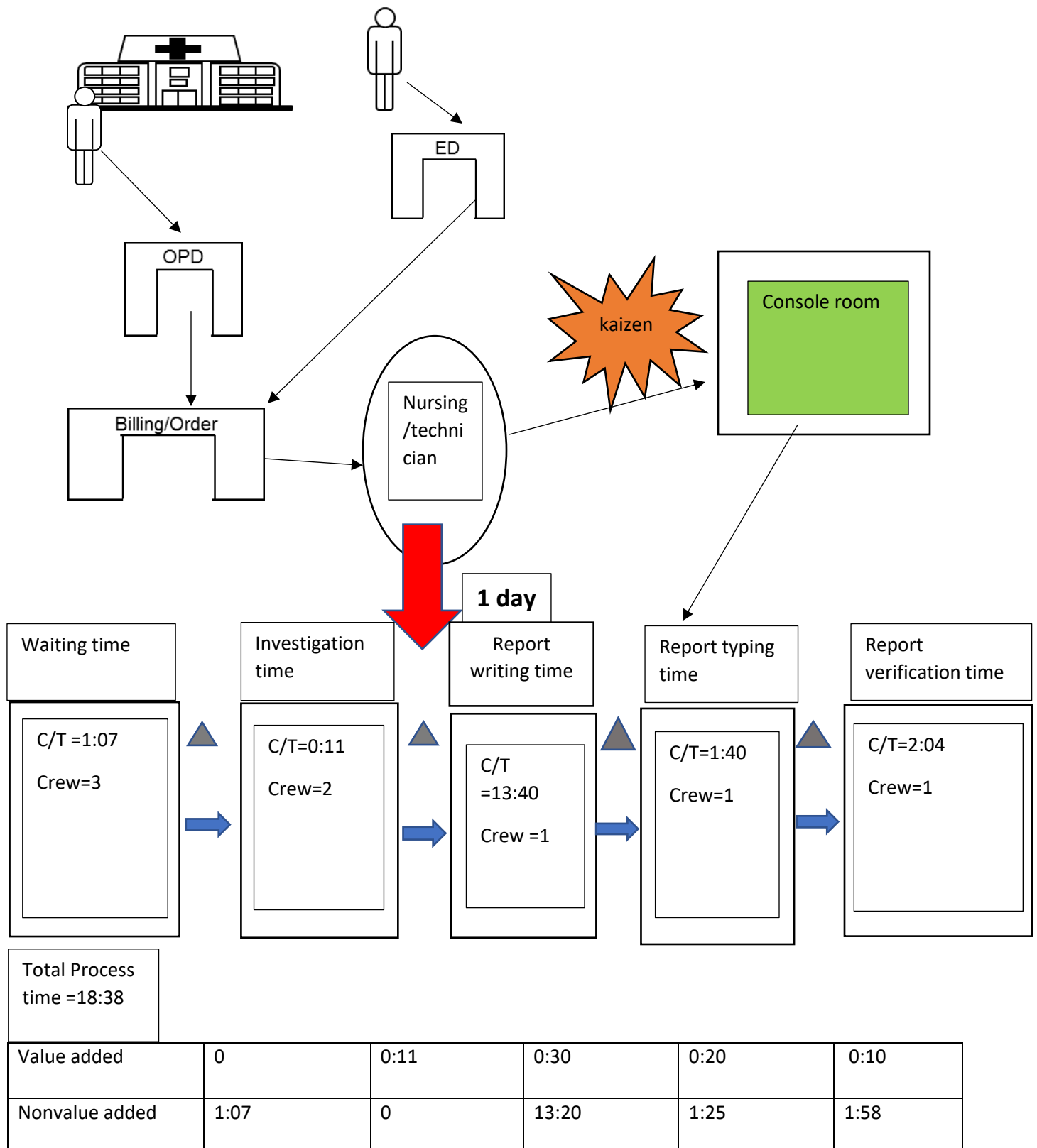
Jens karstoft and Lene Tarp in their study questioned the implementation of Lean whether Lean Management implementable in a department of radiology? stated that Lean was implemented in the department of Radiology in Odense University Hospital which created value for the customer—how to make flow and remove waste, and to make improvement. Using the basic tools such as Kaizen, Value stream mapping and 5 s,” *The specific outcomes of working with Lean were decreasing waiting time for the patients, optimized workflow during the examinations, and an increased number of patients processed during a working day with only a marginal increase in costs. All in all, a higher productivity and more time gained for the staff for education, etc. In addition to the higher productivity, one of the benefits of Lean was a change in looking at how we work. Instead of doing things the way the employees used to, day after day, they started thinking of alternatives, showing more interest and giving thought to how they work”*, Therefore more time was saved for training of the Employees and increasing their interest in enhancing the productivity. The only point of doubt was standardization done could lead to decrease in creativity with time. (3)

Ronald V Bucci and Anne Mustianos stated that A Lean six sigma journey in Radiology conducted a study in Akron Children's Hospital implemented Lean six sigma over the years, "Six sigma improved process outputs by identifying and removing the causes of defects. The processes are improved taking the customer in mind. A concept of "DAILY MANAGEMENT" was introduced in the department of Akron's children hospital management processes are seen across every modality in the form of charts. (4)

Eveline A. Hitti¹, Ghada R. El-Eid², Hani Tamim², Rana Saleh¹, Miriam Saliba¹ and Lena Naffaal stated in their study - Improving Emergency Department radiology transportation time: a successful implementation of lean methodology that , " *Lean methodology was implemented successfully in our setting and improved ED transportation TAT for plain radiography as well as the process reliability. The Kaizen team focused on a process step within the ED control and one that was felt to be a main constraint for throughput of low acuity/discharged patients whose length of stay is not impacted by the inpatient bed bottleneck. Although the intervention was successful, ultimate impact on length of stay was dampened by the increase in preliminary report TAT during the post-intervention period which was beyond the control of the ED team. Expanding the Kaizen team to include radiology physician members could have improved the impact of our overall study TAT by preventing delays related to preliminary reporting. Value focus and use of information system to allow the radiographer to pull patients back for imaging were key components of the success of this intervention. Other Emergency Department managers can easily adopt lean tools specifically kaizen team, value stream mapping, and Kanban system to improve throughput related metrics in their specific settings "*. (5)

Jamie Workman-Germann and Heather (Woodward) Hagg concluded in their study - Implementing Lean Six Sigma Methodologies in the Radiology Department of a Hospital Healthcare System that," *Implementing Lean Six Sigma in healthcare is interesting, challenging, and rewarding. Lean is a process and an integral part of a much larger process all together it is consistent in its tasks or protocols, introducing more variation into the system than needed. This variation is what the customers end up seeing and remembering and so applying Lean Six Sigma methodologies is the best way to make dramatic improvements. The techniques are based on real and relevant data, identified by those most familiar with the process. The data is generated by the process and analyzed to identify inconsistencies and variation. The inputs and outputs of the process are identified and examined, and results are generated which are fact based which finally lead to patient and surgeon satisfaction."* (6)

(CURRENT) VALUE STREAM MAPPING (CT)



Therefore, the Total process time for CT is 18 hours and 38 min. Value added time is defined as the process that adds value to the customer, for which the customer is willing to pay. The Nonvalue added times include the waiting time, move time plus the Inspection time. The generously required to perform an activity is called value added time which is the actual time taken to perform the activity.

For CT,

The value-added time would be =1-hour 11 min

The non-value added = 16 hours and 3 min.

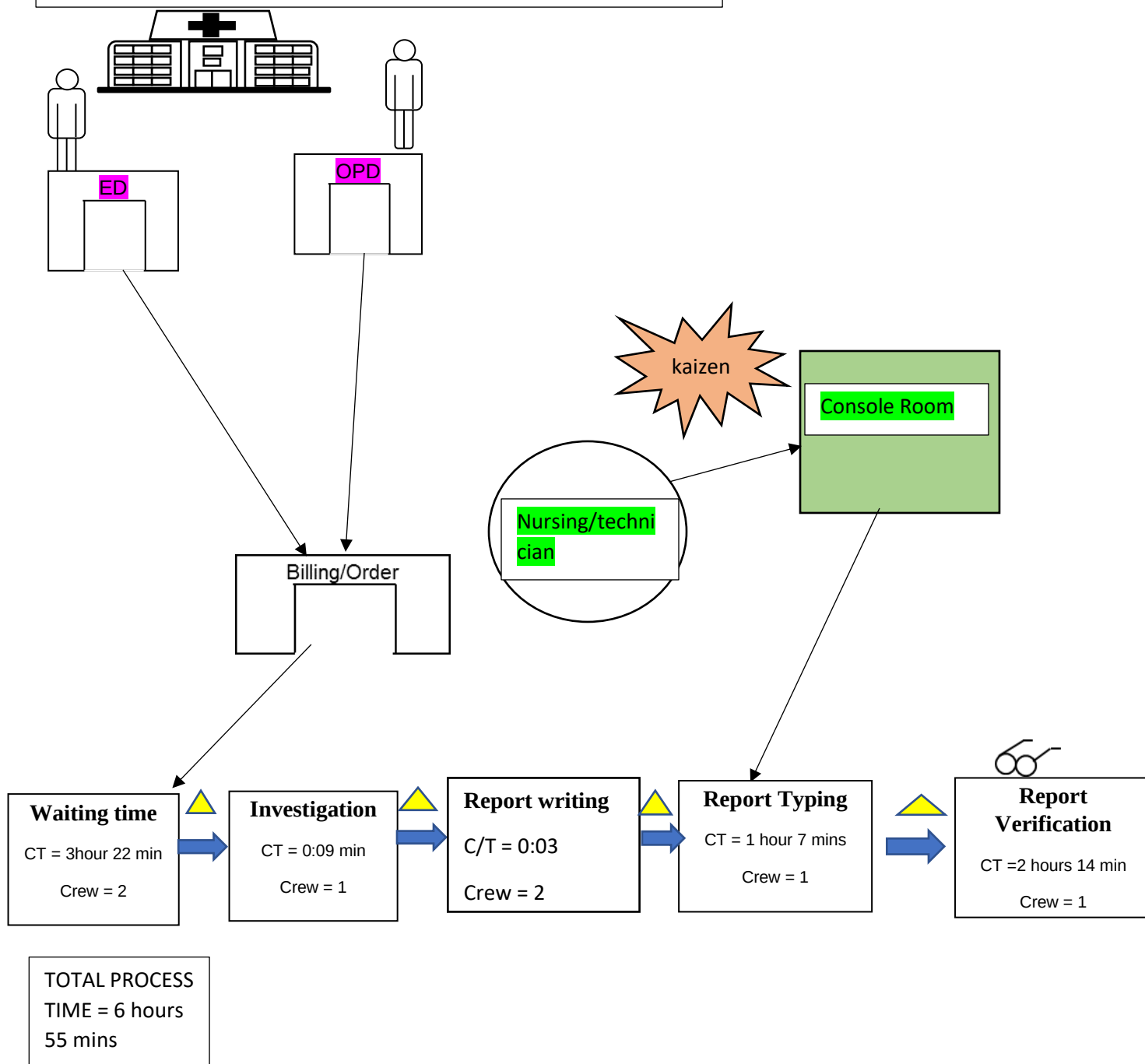
We are excluding the waiting time for Ct as the billing is done earlier at 8 am while the OPD starts at 10:00, these include patients from far off places.

Time is included from the point of arrival of the patient in the department till the reports are generated.

As indicated the Max time taken is after the procedure has been performed, the report writing is done the next day which increases the waiting time for the reports and hence increases the non-value-added time for the activity. The unavailability of the Consultant is major factor, due to manpower deficiencies the consultants are overburdened, for the patients that arrive after 3PM for major cases the reports are delayed as reports are not verified and signed by the Consultants.

The reports lying pending on the nursing table which are not updated would be considered as waste. Over activities by the nursing staff which are not in order is considered waste activities. The reporting errors were majorly under reported in the department no register was maintained therefore it was hard to catch this and minimize them.

Value stream mapping (USG)



NVA	3:22	0	0	0:52	2:00
VA	0	0:09	0:03	0:15	0:14

In case of the USG department the total process time is 7 hours. The Nonvalue added steps are added that includes all the waste steps and activities performed also the waiting times, i.e. 2 hours and 52 min

Value added time is 41 min.

The cycle time is the Average Time taken to perform one activity before shifting to the other it is calculated through the Excel and calculating the time taken for each step. The Value-added time is differentiated from the Non-Value-added time solely done on observation, depends on the Number of crew members and efficiency of the department.

The steps that do not add value is discussed with the members of department waste steps are minimized.

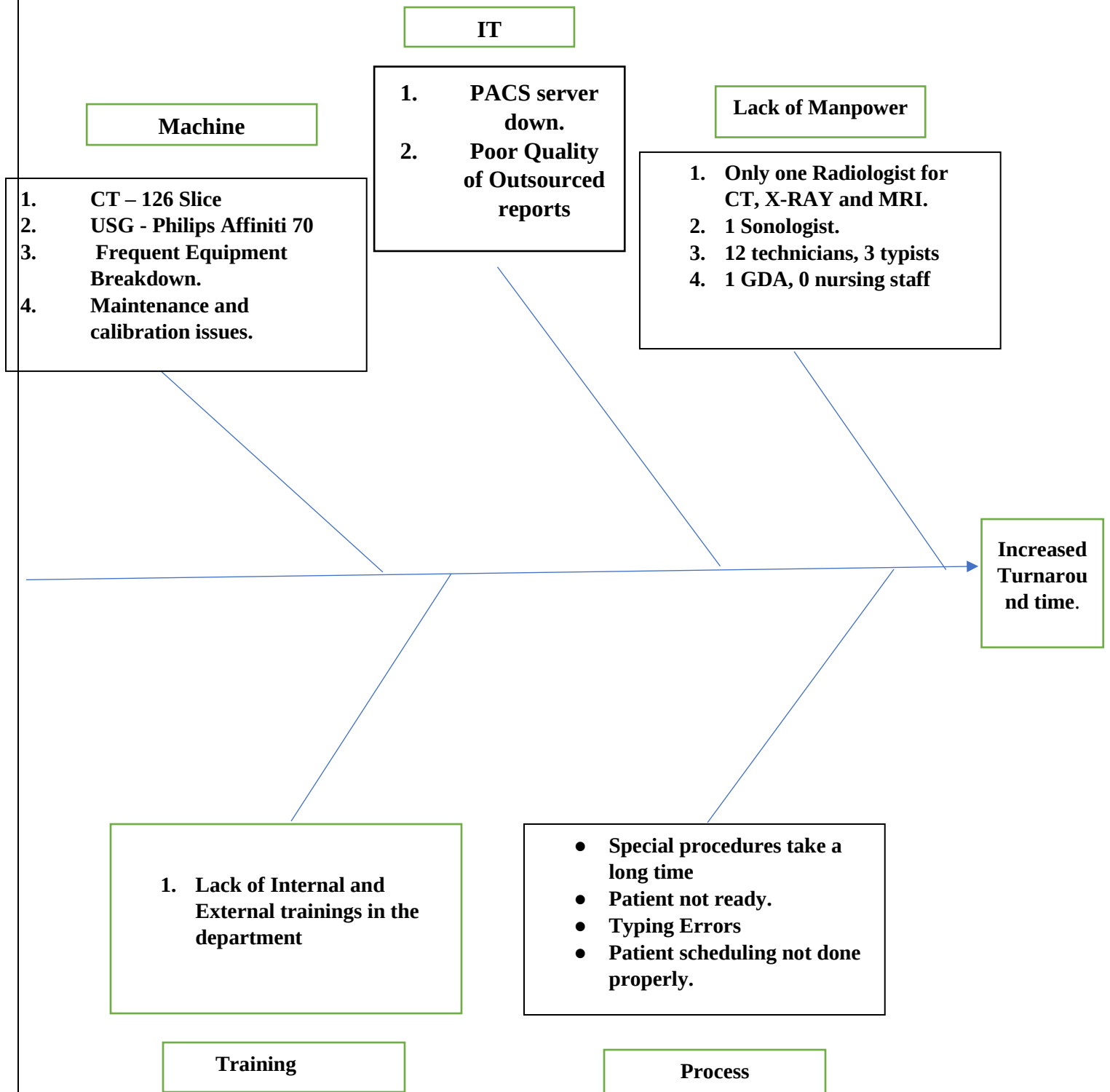
RESEARCH QUESTION:

What are the factors leading to Increased turnaround time in Radiology Department in Mission Hospital, Durgapur?

OBJECTIVES OF THE STUDY

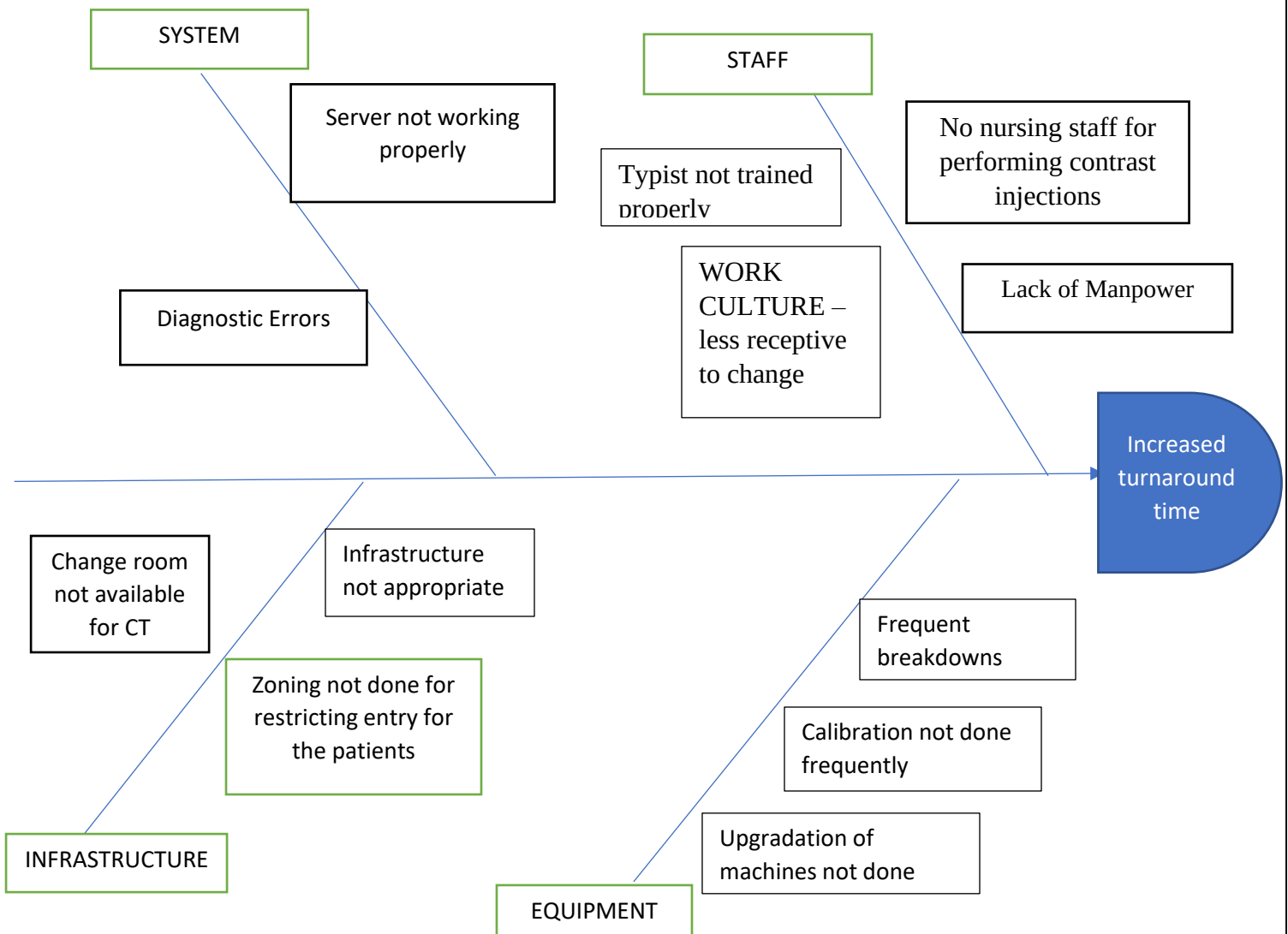
- To ascertain the effect of lean management and Re- Engineering on selected indicators of Quality Assurance in Radiology department.
- To create Value Stream Mapping of the process flow in Radiology Department.
- To Identify the non-value-added time in the process flow from the value stream mapping.

ROOT CAUSE ANALYSIS



PROBLEM STATEMENT

Lack of availability of reports on time in CT and USG has a negative on the hospital clientele , which results in a decrease in customer satisfaction, increased workload leading to staff and technician dissatisfaction , also affecting the revenue generation opportunities, and impacting the patient footfall leading to loss to outpatients to diagnostic centers and other Hospitals in Durgapur.



IMPLICATIONS OF THE STUDY

Lean Transformation was carried out in the department of Radiology in The Mission Hospital with the main objective to enhance efficiency, safety, performance, and commitment of employees. Another objective includes anticipating reforms in healthcare. As of today, many clinical radiology departments are actively adopting “lean transformation.” It is different from other methods in the way that it is, both, a philosophy and an organizational way of life that contributes in continuously transformation of employees into experts in lean and it also helps in keeping one and all on the path of continuous improvement. Some more opportunities where a lean approach can be applied are reducing technical and clinical mistakes and errors, reduction in patient and report waiting times, improvement in patient outcomes, enhancements in productivity of employees, costs minimization, and improvements in employee and customer (both patient and referring clinician) satisfaction.

LIMITATIONS OF STUDY

The study was conducted for a limited time period of three months therefore lot of improvements could have been incorporated. Due to lack of manpower not much efficiency could be seen, it is a gradual process which will take time and cooperation of each and every member of radiology department.

RESEARCH METHODOLOGY

The nature of this study is Observational Crossectional study design that seeks to obtain casual relationships, test hypothesis and determine whether an association exists in the variables. The study aims to identify the causes leading to delay in generation and dispatching of reports i.e. aims to improve the turnaround time in reporting. Analyze the causes of frequent equipment failures and to why such incidences occur. The includes a sample of 300 patients samples collected based on convenient sampling. The study period was 3 months starting from 6 Feb till 30 April the sample was collected after following the patient and the patient reports for each process for the month of Feb till 15 April. Only those patient samples were taken which could be followed at each step.

SAMPLE SIZE – 300.

STUDY PERIOD – Starting from 6 Feb till 15 April 2019.

STUDY DESIGN – Observational crossectional study.

SETTING – Radiology department The Mission Hospital, Durgapur

STUDY POPULATION – Unplanned patients coming in radiology department for CT and USG investigations

INCLUSION – OPD (unplanned) and health checkup(planned) patients coming for Radiology Investigation only the patients that cold be followed at each and every process.

EXCLUSION CRITERIA - IPD patients and the patients that could not be followed.

DATA COLLECTION PROCESS –

The study is Crossectional in nature and the process of data collection is live following the patient and processes for 3 months. The type of sampling technique followed was Convenient sampling as data for those patients was excluded which could not be followed through the entire process. Everyday data collection was done till 15 th April, 8-10 patients were followed every day and the time the procedure was noted. In case the patient could be followed, and the reports were not verified until 5:00 Pm, it was followed until next day and the turnaround time increased accordingly.

TOOL – Predesigned format based on all steps in the process flow.

Evaluation was done on – MS -Excel

FINDINGS:

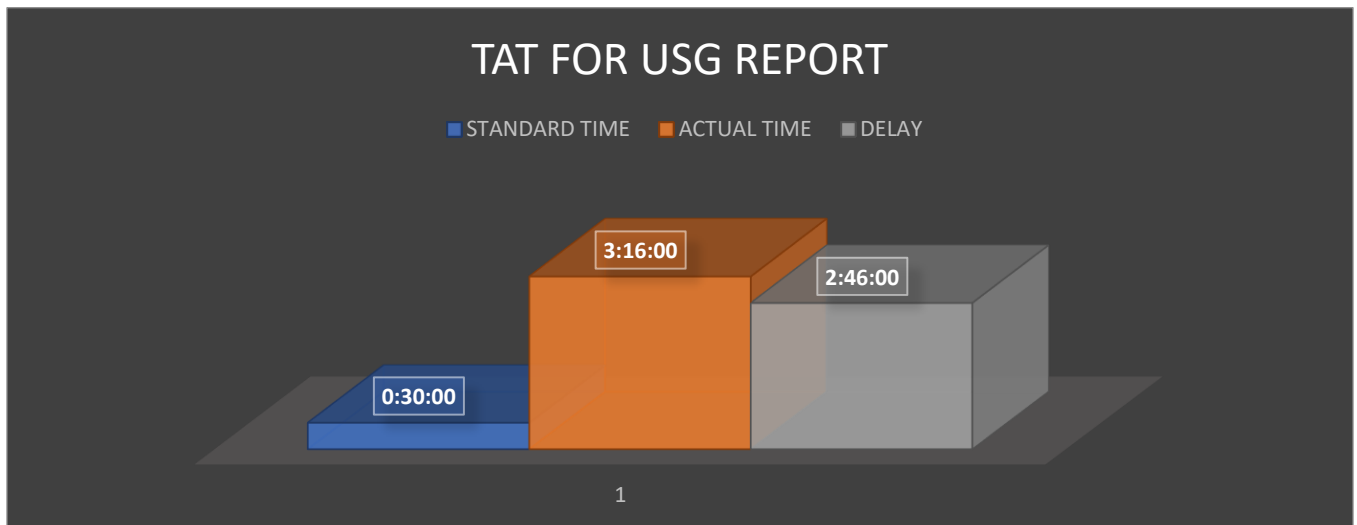


Figure1: - Represents the Turnaround Time for the USG Reports for the month of Feb.

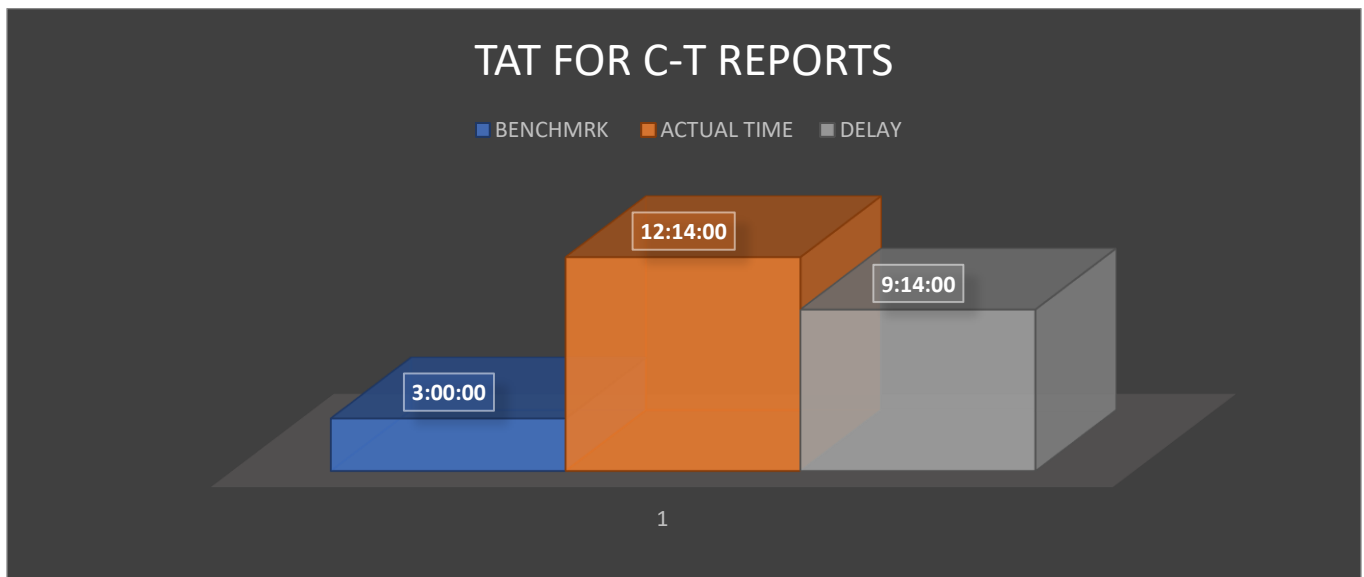


Figure2. Represents the Turnaround time for the CT reports for the month of Feb.

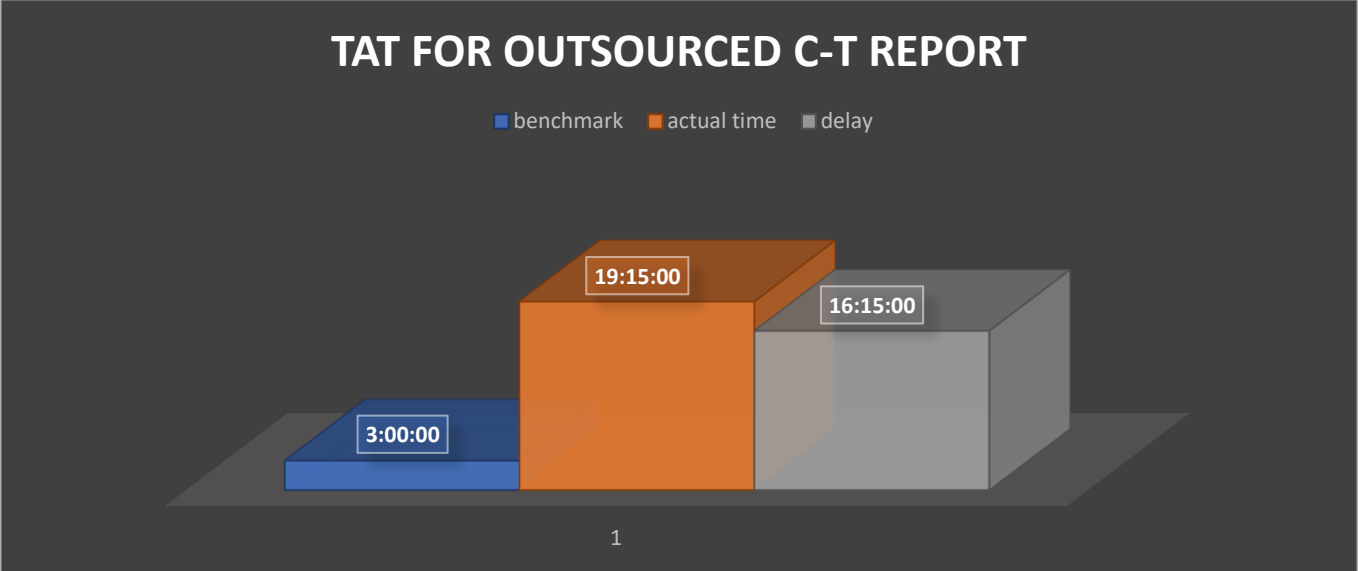


Figure 3. Represents the Turnaround time for CT reports (Outsourced) for the month of March

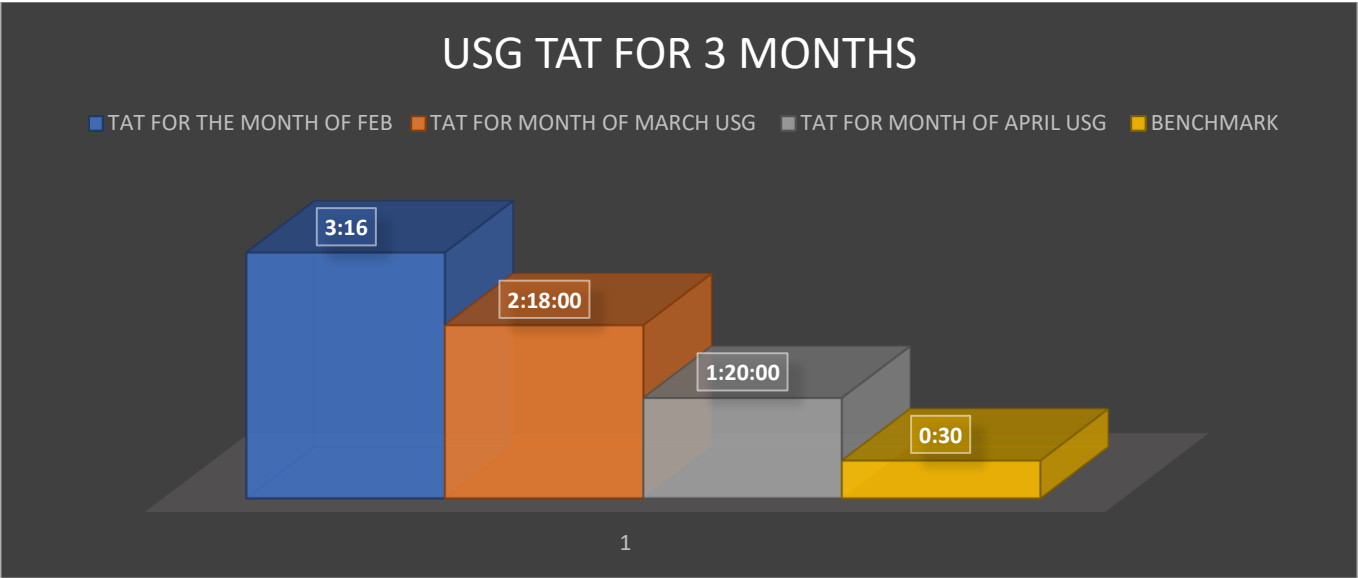


Figure4 . Represents the USG Turnaround time in comparison with the benchmark time.

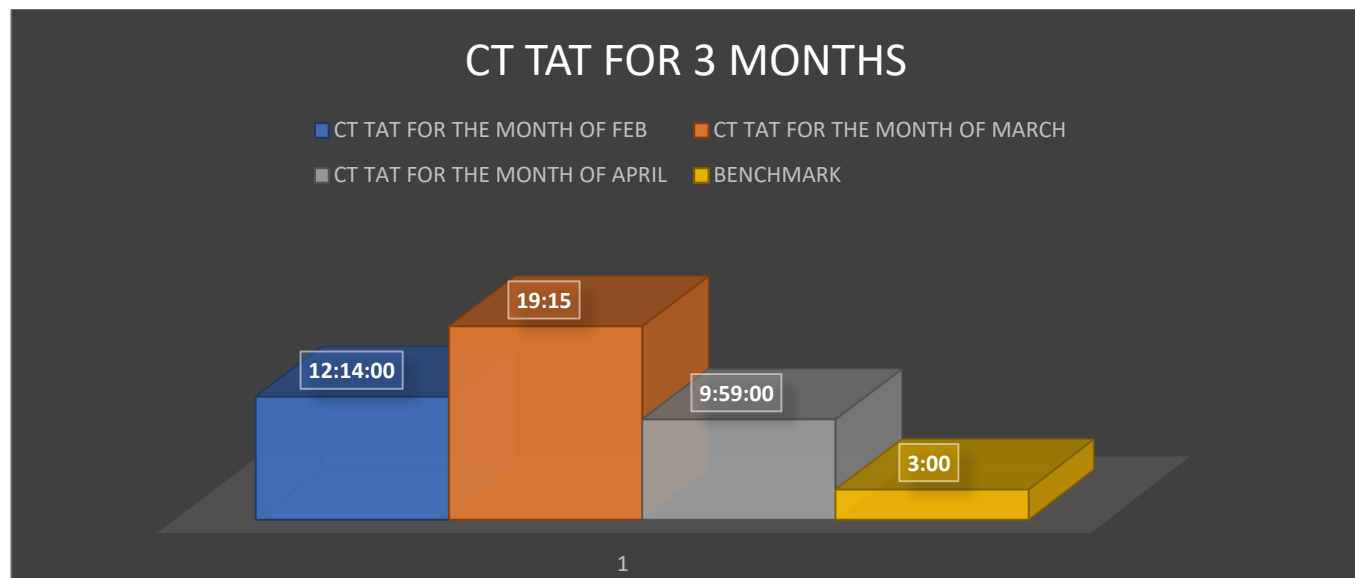


Figure5. Represents the CT TAT for 3 consecutive months in comparison with the benchmark (From Feb till April)

TOTAL PATIENT FOOTFALL AND THE SAMPLE SIZE TAKEN

Department	Month	Total patients	Sample size taken
USG	FEB	614	52
	MARCH	717	81
	APRIL	317	98

Department	Month	Total patients	Sample Size taken
CT	FEB	367	25
	MARCH	377	31
	APRIL	215	13

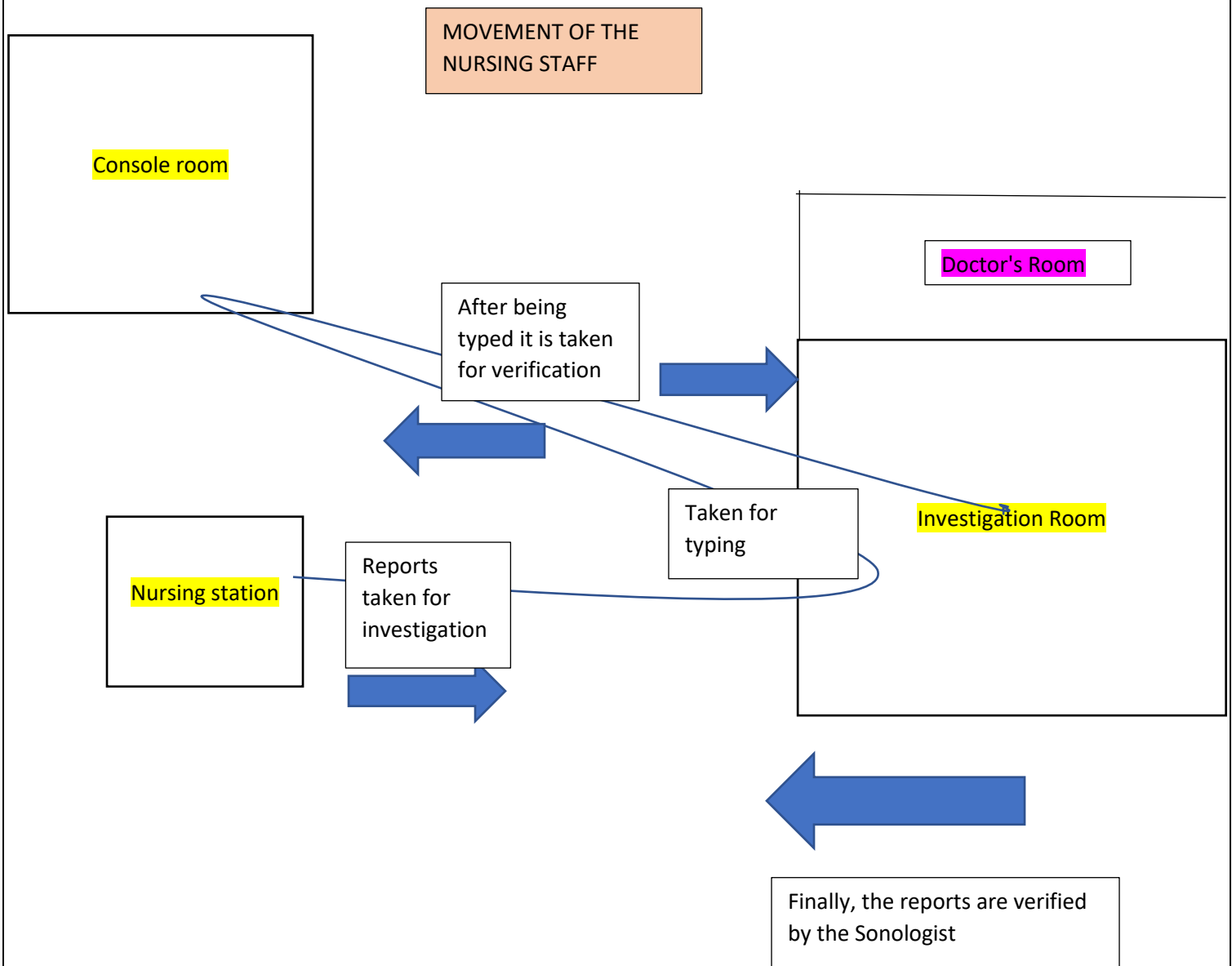
GAP ANALYSIS:**USG**

PROCESS	CURRENT STATE	EXPECTED STATE	FACTORS
WAITING TIME	P/T = 3:32 Minutes	P/T = 20 Minutes	Scheduled Appointment
INVESTIGATION	P/T = 9 Minutes	P/T = 5-8 Minutes	Except special cases, systematic patient preparation.
TRANSCRIPTION	P/T= 3 Minutes	P/T= 2-3 Minutes	Clear verbal orders, efficiency of the nurse to understand the orders of the doctor
TYPING	P/T 1 :07 Minutes	P/T= 10-15 Minutes	Efficiency of the system. Previous pending reports. Manpower
VERIFICATION	P/T = 2:14 Minutes	P/T = 5 Minutes	Less typing errors, availability of doctor, nursing staff handling the reports

Findings for the USG department: -

The Increased Turnaround time for USG was seen due to increased typing errors found in major reports therefore it was decided by the Hospital management to shift the typist in the USG room. Written templates were provided to the typist to avoid errors.

Excess Movement was also reduced by the nursing staff as the reports were directly handed over to the typist and verified directly.



Result for the USG:

It was concluded that the Typing errors seemed to be the major cause of delay in reports for the ultrasound department

Therefore, after shifting the typist in the USG Investigation room this time was reduced. Reporting Errors were reduced, and wastage was also minimized.

There are two technicians available with USG department, streamlining the process flow by allocation of work to each has reduced the Turnaround time in radiology. It was instructed to one of the technicians to transfer the reports to the typist and the other was allocated the work of taking patient consent and registration. Excess activity and waste movements were avoided the clarity of work increased therefore the TAT was reduced from 3 hour to 1 hour.

Later the typist assigned for writing the report was moved to the Sonologist room for live typing and predesigned templates were given to the typist that further reduced the reporting time and the errors.

Future Activity:

It is suggested that Dragon software can be used to decrease the Transcription time and would also reduce the errors in transcription. Therefore, an extra nursing staff utilized for writing the reports can be involved in other activities.

CT

PROCEDURE	CURRENT STATE	EXPECTED STATE	FACTORS
WAITING TIME	1HOUR 7 MIN	20MIN	Scheduled appointments
INVESTIGATION	11MIN	8-10MIN	Time taken for patient dressing, availability of technicians and GDA.
TRANSCRIPTION	1 HOUR	20 MIN	Efficiency of the radiologist, number of radiologists performing the investigations. Efficiency of the machine and clarity of the investigations. Outsourced reports have poor quality.
REPORT TYPING	7-8 HOURS	15-20MIN	Efficiency of the typist and number of typists would directly be affecting the indicator, pending reports.
VERIFICATION	2-3 HOURS	20MIN	Pending reports, availability of radiologist, typing errors by the typist, reports pending at the nursing desk.

Comments on implementation of lean methodology in CT diagnostic sprocedure:

CT TAT could not be reduced effectively to increased Equipment Breakdown. The new Ct machine 128 slice has been purchased; old one is discarded by the management to breakdowns and error in reporting. CT room is currently under construction.

Manpower deficiency is seen in CT. Addition of one more Radiologist would be beneficial to the department for sharing the work load. There is also a requirement of a typist for writing the night reports such that the Turnaround time for CT reports shall reduce from 12 hours to 3 hours. Delay is seen in Transcription of reports; it takes a lot of time for the Radiologist to interpret the reports and forward it to the typist which can account to misinterpretation and handwriting errors.

Availability of only one typist lead to reports pending till one day. Report Verification time is also delayed simultaneously.

In Case of Outsourcing the reports, Quality of the reports were hampered it was seen that the reports had errors and the diagnosis was not correct. Moreover, several times it was seen that the PACS server was not working properly due to sever issues the TAT increased to 19 hours and 32 min. Availability of coordinator was another factor in case the coordinator was not available the reports could not be uploaded timely lead to further delays and patient dissatisfaction.

CONCLUSION:

- The Turn around time for the USG reports was considerably reduced from initially 3 hours 14 mins to 1 hour 50 min.
- In the CT Department there were not many changes seen in turn around time could not be reduced due to construction; due space constraints. New CT 128 slice underwent installation.
- Immediate requirement of the Nursing staff as the contrast injection were administered by the technicians.
- Immediate requirement of typist for writing the night reports that went pending till morning increasing the workload on the typist and simultaneously increasing the turnaround time.
- Outsourcing the reports is not a long-term solution for compensating the manpower deficiencies.
- Lack of calibration / servicing done by the Biomedical department has led to frequent breakdowns and reduced the life of the machine.
- Assigned GDA should be present in the department specially a female GDA for assisting the female patients.

RECOMMENDATIONS: -

- 1) Infrastructure should be improved in the CT room should have a change room for patient privacy especially for female patients.
- 2) There should be proper zoning to avoid any Un – authorized patient from entering the restricted zones to avoid accidents.
- 3) Patient Scheduling should be done. Number of typists should be increased in alternated shifts. At least 1 typist should be added for completing the night reports for investigations conducted at night.
- 4) The hospital faces a deficient manpower with an urgent requirement of a Radiologist at least for reporting of procedures separately, following segregation of work uniformly such that the burden is not a single Radiologist.
- 5) There should be a separate GDA staff for assisting CT and MRI patients separately.
- 6) The department faces a deficiency of a typist for CT, as the department encounters patients from both IPD, OPD and Emergency therefore due to huge number of patient footfall the reports are kept pending for next day.
- 7) Recommendation for using dragon software i.e. speech recognition software that understands the specialty terminology with more than 99% accuracy. Optimizing the workflow with custom configurations that support the unique process of dictation in a radiology setting.
- 8) Recommendation can be given for Digital Pen for avoiding transcription errors and saving time. In mission hospital the radiologist verbally dictates the findings to the nurses which is typed by the typist. This results in huge errors and corrections leading to increased wastage.
- 9) Internal Trainings should be given to the Radiology team, with a brief discussion about the problems faced during the processes to avoid miscommunications and providing effective solution as Lean is a comprehensive process involving all the members of the department.
- 10) Radiology Information System would reduce manual errors. Therefore, it should be properly implemented.

ANNEXURE

PT OP no	Reporting to Radiology	Pt in time	Pt out time	Report writing	Report typing	Report Verification
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