**Summer Training at**


**Gulf Medical College Hospital and Research Centre, Ajman, UAE**
**(April 10- June 10, 2014)**

# Report on Turnaround Time on Ultrasonography in Radio Department, Gulf Medical Hospital, Ajman

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**2013-2015**


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# CERTIFICATE

This is to certify that Dr. Deepali Kapahi has undergone her summer training in GMC Hospital and Research Centre, Ajman, UAE from 13th April, 2014 to 7th June, 2014.The candidate herself carried out all the studies related to her summer training. Her approach to the study has been scientific and analytical. This summer training is partial fulfilment of course requirement is recommended for the award of post graduate diploma in hospital management.

I wish her success in all her future endeavours.

Dr. Ashok Kaushik

Dean (Academic & Student Affairs)

IIHMR Jaipur

Dr. Suresh Joshi

Professor

IIHMR Jaipur

مستشفى جي إم سي
GMC HOSPITAL
"Healing through knowledge and wisdom"

ثومبي
THUMBAY

8th June, 2014

**To Whom It May Concern**

This is to certify that **Ms. Deepali Kapahi** holder of Indian Passport Number H 2801008 has undergone training from 13th April 2014 to 7th June 2014 as a part of summer training program. She has completed the assigned project.

We wish her all the best.

For **GMC Hospital and Research Centre, Ajman**

**THUMBAY MOIDEEN**
**President**

ACCREDITATIONS & MEMBERSHIPS

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We also express our sincere gratitude towards Dr.Manvir Singh, Director Administrative Services for his support and guidance during my visit to GMCHRC, which was my first insight to the functioning of a international hospital and Dr.Manvir explained and gave me and insight into the qualities and responsibilities of a hospital administrator and introduced me to the world of international healthcare.

Dr.Tarik, head of radiology department for his insight into the real time process that are followed in Radiology Department of GMCHRC, he helped me understand it is very important to keep in mind what i have studied in books but it is much more important to learn on the job, accept responsibility and to be aware of your surroundings.

I would like to thank Mr. Akbar Director Healthcare Thumbay Group, for giving me the opportunity to work in one of the most reputed healthcare organizations in UAE.

I would also like to thank my family, my seniors for believing in me and discussing what I have learnt during my days in the hospital, which helped me to refresh my observations and identify areas where improvements can be made.

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**Dr.DeepaliKapahi**

**Gulf Medical College Hospital Research Centre**

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**Acronyms/Abbreviation**

| | Description |
|---|---|
| GMCHRC | Gulf Medical College Hospital & Research Centre |
| CSSD | Central Sterile Supply Department |
| HRD | Human Resource Department |
| ICU | Intensive Care Unit |
| CCU | Cardiac Care Unit |
| OT | Operation Theatre |
| IPD | Inpatient Department |
| OPD | Out Patient Department |
| HIMS | Hospital Information Management System |
| HOD | Head of Department |
| QA | Quality Assurance |
| TAT | Turn Around Time |
| PACS | Picture Archiving and Communication System |
| PAD | Patient Affairs Department |
| JCI | Joint Commission International |
| CABRI | Centre for Advanced Biomedical Research & Innovation |
| SPC | Statistical Process Control Charting |
| | |
| | |
| | |
| | |

## INTRODUCTION

### OVERVIEW

As a major Health Care Service Provider within the Gulf, GMC Hospital has taken great measures to improve all its services and procedures with the introduction of the International Medical and Health Care Tourism unit of the Hospital. We provide our clients excellent Health care services world class recovery measures as well as recreational therapy and Spa services.

Our aim in GMC Hospital is to target a great volume of Medical Tourists travelling from all over the world with a great need for excellent and affordable medical health care services.

Our enquiries come from all over the world from various hospitals, medical practitioners, personal contacts and enquiry portals seeking our needs and services.

GMC Hospital has special schemes to provide affordable medical care to the economically weaker sections of the society. Our mission is to provide affordable healthcare that doesn't compromise on quality. It is towards this end that we have established quality systems and controls that meet international standards of excellence in healthcare.

GMC Hospital brings together highly skilled professional and the latest advancements in medical technology. Our goal is to build lasting relationship with people. We believe that the healing process is as much about personal care as medical attention. It's this conviction that drives us at Ajman's first ever private hospital.

With Hospitals and Medical Centre in Ajman, Fujairah, Sharjah and Dubai, GMC Chain of Hospitals is one of the largest health care providers in the region. The group focuses on three pillars Education, Healthcare and Research.

**VISION**

- The vision of GMC Hospital and Research Centre is to be recognized as a leading Academic Healthcare Centre providing a high quality of patient centric specialty healthcare services to the community integrated with medical research and clinical training.

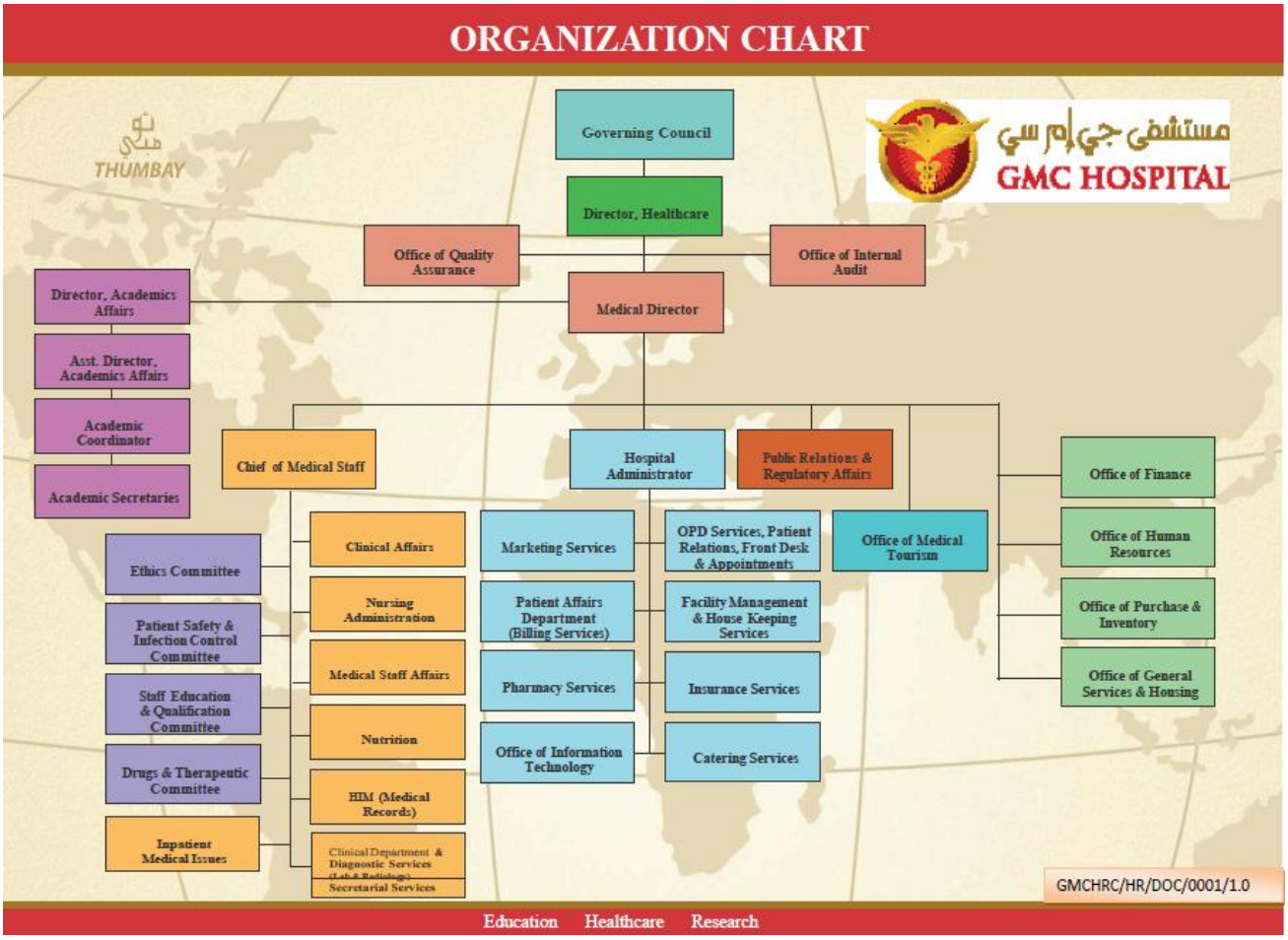
**MISSION**

- GMC Hospital and Research Centre is committed to provide ethical patient care focused on patient safety, high quality care and cost effective services.
- GMC Hospital and Research Centre is committed to integrate latest trends in education to produce competent healthcare professionals who are sensitive to the cultural values of the clients they serve.
- GMC Hospital and Research Centre will strive to attain the highest of quality and accreditation standards .GMC Hospital and Research Centre is committed to promote ethical clinical research that will enhance outcomes of clinical care.

**CORE VALUES**

- **Excellence:** Provide clients with a consistently high level of service through benchmarking and continual improvement.
- **Trust:** Ensure trust, compassion, dignity and mutual respect for colleagues and clients through open communication and dialogue.
- **Client centred:** Always be guided by the needs of our patients and clients.
- **Ethics:** Always follow ethical practices that emphasize honesty, fairness, dignity and respect for the individual.
- **Continuous learning: a**lways keeping abreast with new technologies and evidence based clinical practice.
- **Teamwork:** Always working together as a team and drawing strength from our diversity to serve the community.
- **Integrity:** Committed to personal and institutional integrity, make honest commitments and work consistently to honour them.

## ORGANIZATION CHART




## ACCREDITATIONS AND MEMBERSHIPS

- Ministry of Health UAE (MOH License No: 3077-2-11-27-11-14)
- Joint Commission International (JCI)
- AAHC-GMC Hospitals- Best and Affordable Hospital in UAE
- Association of Academic Health Centres International
- MTA-GMC Hospitals- Best and Affordable Hospital in UAE
- Medical Tourism Association

- IHF-GMC Hospitals- Best and Affordable Hospital in UAE
- International Hospital Federation
- AHF-GMC Hospitals- Best and Affordable Hospital in UAE
- Asian Hospital Federation
- IBMS-GMC Hospitals- Best and Affordable Hospital in UAE
- International Board of Medicine and Surgery

**CLINICAL DEPARTMENTS**

**1. Medical (12)**

- Internal Medicine ,Cardiology ,Dermatology ,Gastroenterology ,Psychiatry ,Nephrology, Neurology ,Family Medicine ,Accident & Emergency, Paediatrics and Neonatology ,Critical care units (ICU, CCU),Physiotherapy**.**

**2. Surgical (8)**

- General Surgery, Urology, Orthopaedics, Obstetrics&Gynaecology Ophthalmology, Otorhinolaryngology (ENT), Anaesthesiology,Dental super specialities.

**3. Ancillary Departments (15)**

- Radiology ,Laboratory - Pathology , Haematology ,Microbiology ,Blood Storage Centre ,Pharmacy & Drug Information Centre ,Patients Affairs ,Nutrition and Diet ,Patient Education ,Catering, Biomedical Engineering ,Insurance ,Hospital Informatics ,CSSD ,House Keeping**.**

**SPECIAL FEATURES**

- Wide ranging tertiary care services
- Separate IP & OPD blocks
- Private rooms & deluxe Facilities
- State of the art laboratory service **(Centre for Advanced Biomedical Research & Innovation CABRI)**

- Diagnostic imaging services providing CT and MRI.
- 24 Hour emergency
- ICU- CCU &Labour Rooms
- Day care facility
- New generation medical electronics
- Traditional architecture with modern facilities
- Doctor on call facility.

**MODE OF DATA COLLECTION**

Personnel Observation, interviews with the patient care providers, brain storming sessions with nurses, medical secretary, radiologist and quality assurance team and data was collected using the data collection tool for ultrasound examination

**DEPARTMENT WISE AND PROGRAM WISE LEARNING**

**A. Insurance Department**

There are 5 main sections in insurance department which are as follows:

**1.** Approval: inpatient and outpatient
**2.** Verification
**3.** Processing
**4.** Reconciliation
**5.** Supportive

**1. Approval**

- In case of inpatient approval is required and that too written
- In case of emergency patients approval is required verbally
- In case of outpatient either written or verbal approach is required
- Verbal approach is different from one insurance company to another

2. **Verification**

- **Inpatient:**In the in-patient department verification is required for the surgical procedures, the patient stay, pharmacy supplies and other additional charges which are involved in patient care process in insurance department.
- **Outpatient:** We have 2 types of verification
    - **First verification**: It is done within 24 hrs. Primarily for maternity and dental. It requires approach for everything and final is done within 30 days. All is updated in the system and follow up is important.
    - **Final verification**: It constitutes check claim form, laboratory investigation and radiology procedure. There is a written approval attached with claim form and then account department submits it to the insurance department.

3. **Processing**

Prepare all the claim form for verification.

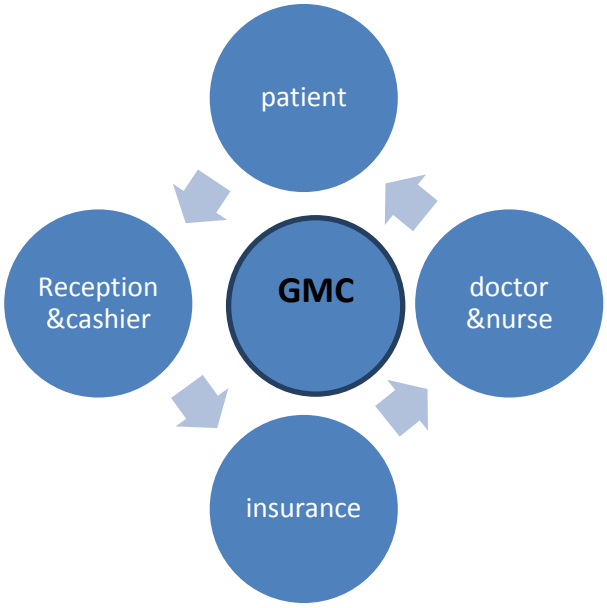
4. **Reconciliation**

Claim form is submitted to the account department and then insurance company. If there is doubt for something they are returned back as rejection and that they are coming for reconciliation.

5. **Supportive**

Office boy collect all the claim form from all the hospital and bring it in insurance department, separate maternity and dental forms and is given to the various sections.

**GMC covers 43 insurance companies**




**Procedure followed in the insurance department**

- Patient has an insurance card whose is covered in GMC
- Receptionist takes this card and checks whether insurance covered or not. If insurance covered for referral then claims form is given by receptionist to the patient and then send to the doctor.
- After that patient goes to the doctor and he /she writes detail in their file &nurse help the doctor for laboratory investigations,medicine,file stamped or not and whether signed by the doctor.
- If procedure requires approval it goes to the insurance department, if there is limit for approval, then approval is taken. The approval process followed for different departments is as follows:

**Outpatient Department**

- If insurance company requires written verification, then patient is asked to take a written approval from the company.

**Inpatient/elective Department**

- Doctor send request to patient itself and submitted to the insurance company and then call nurse station and tells the details.

**Emergency Department**

- Doctor sends admission request with claim form with the nurse and then we take verbal approval from the insurance company. If the type of room is asked from the insurance company if it is not mentioned on the insurance card of the patient.

**B. Quality Assurance Department**

Quality Assurance Department provides a framework to organize for, communicate about, monitor, and continuously improve all aspects of health care delivery at GMCHRC. The responsibility for the Quality Assurance Department ultimately rests with the Quality Assurance Officer who is supported by three Executives. Quality Assurance Department directly reports to Medical Director.

Primary functions of the Quality Assurance Department are as follows:

- Developing and implementing Quality Plan on an annual Basis.
- Developing and implementing Risk Management Plan.
- Clinical and medical audits of various departments as per JCI standards.
- Identify and focus on processes and outcomes important to GMCHRC patients' needs and expectations.
- Developing, Monitoring and Analysing key performance and quality indicators.
- Investigating the various Incidents reported through the Problem Tracking form (PTF):
- Root cause analysis of sentinel and adverse events reported at GMCHRC using various six sigma tools such as Cause Effect Diagram. Fish bone Analysis, Pareto Chart, five why's. etc.
- Performing gap analysis in accordance with JCI guidelines and standards and implementation of processes to reduce non - compliance areas.
- Preparation of departmental manuals and Standard Operating Procedures as per Joint Commission International and standards.
- Provide training to various staff on all hospital policies and procedures.
- Managing the document control System.
- Training of Medical intern students on various Quality aspects of the hospital.

## C. CSSD (Central Sterile Supply Department)

CSSD is a specialized area responsible for the collecting, decontamination, assembling, packing, sterilization, storing and distribution of sterile goods and equipment to patient care areas within Gulf Medical College Hospital and Research Centre (GMCHRC).

The CSSD in GMCHRC is located in the administrative wing. The CSSD is divided into 5 parts:

- Un-sterile Area
- Packaging Area
- Autoclaving Area
- Sterile Area
- Sterile Dispensing Area

The daily routine of the CSSD is as follows, every morning one person form the CSSD goes for rounds to the various department like ICU, CCU, NICU, OBG, ward areas (left and right wing), etc. The soiled and unsterile equipment's are collected in an unsterile trolley and carried to the CSSD. There are received in the un-sterile area. The room is fitted with a stainless-steel bench and double sinks used for disassembling, cleaning, and processing. The equipment's are then loaded in the washer; this step is carried to remove the visible dirt of soiled instruments. The instruments are loaded in trays (maximum of 12 trays are can be loaded in one cycle) and washed for 15 minutes at 87°c to 88°c.After the washing cycle is completed the instruments are shifted to the dryer and the drying process is carried out for 40 to 50 min at 46°c to 48°c. After the drying process is completed the equipment's are shifted to the packaging area. Before packing the equipment's are cleaned with spirit and they are put in pouches (signal 6 blue or bropule). The OT items are packed in double pouches so as to ensure that the instruments come in direct contact of the environment at the time of surgery. These pouches are wrapped in wrapping sheet and closed with sterilization tapes and are placed into the autoclave machine.

Before starting the first sterilization load of the day, **A Bowie-Dick test** is used in pre-vacuum type (or dynamic air removal) sterilizers. They are used to detect air leaks and inadequate air removal. A commercially available Bowie-Dick-type test sheet should be placed in the centre of the pack. The test pack should be placed horizontally in the front, bottom section of the sterilizer rack, near the door and over the drain, in an otherwise empty chamber and run at 134°C for 3.5 minutes. The test is used each day on the vacuum-type steam sterilizer before the first processed load. Air that is not removed from the chamber will interfere with steam contact. Sterilizer vacuum performance is

acceptable if the sheet inside the test pack shows a uniform colour change. Entrapped air will cause a spot to appear on the test sheet, due to the inability of the steam to reach the chemical indicator. If the sterilizer fails the Bowie-Dick test, is not used the sterilizer until it is inspected and passes the Bowie-Dick test.

**The Biological indicator test (B.I)** is used with each load to check if the sterilization process is effective in eliminating micro-organisms.

(BI test is a process that consists of a standardized population of bacterial spores known to be resistant to the mode of sterilization being monitored. Biological indicators indicate that all the parameters necessary for sterilization were present. Biological sterilization process indicator is a device intended for use by a health care provider to accompany products being sterilized through a sterilization procedure and to monitor adequacy of sterilization. The device consists of a known number of microorganisms, of known resistance to the mode of sterilization, in or on a carrier and enclosed in a protective package. Subsequent growth or failure of the microorganisms to grow under suitable conditions indicates the adequacy of sterilization.)

One cycle of autoclave takes 45-48 min at 20 PSI and at a temperature of 134°c when the load consists of stainless steel items. But if plastic instruments are loaded at 45-48 min at 20 PSI 121°c

Once the sterilization cycle is completed in the autoclave the instruments are shifted to the sterile room. The instruments are dispensed across the entire department from the sterile dispensing area.

**D. Patient Affairs Department**

Patient Affairs Department is one of the most important departments at any hospital. It's a main directory for patient's relatives and visitors to know about their rights and responsibilities. PAD is available 24x7 to assist the patients, family members and friends with any non-medical question or concern relating to their outpatient visit or hospital stay. The purpose of this SOP is to describe how patient affairs department at GMCH will provide and maintain quality inpatient services for the patients and their attendants. This SOP focuses on capturing elements of the quality care with respect to patient expectations. These elements include: the art of care (caring attitude); technical quality of care; accessibility and convenience; finances (ability to pay for services); physical environment; availability; continuity of care; efficacy and outcome of care.

- The list of steps in the process of pre-admission, admission, inpatient services and discharge.

- The standardized procedures that the staff has to follow from the time of admission of the patient till the time of discharge / transfer from the ward.
- The rights and responsibilities of the patient/attendants.
- The standard procedure to address patient complaints.

**A. Pre-admission process**

- Customer or patients are welcomed to the hospital with a formal greeting and are attended quickly.
- The staffs check the validity of the legal documents.
    - Emirates ID of the patient
    - Passport and visa (Patient and spouse)
    - Marriage Certificate (in case of deliveries/ obstetric procedures).
- All patients are given a suitable written estimate and all queries with regard to billing are explained to the patient prior to admission.
- The staff explains types of accommodation available, asks for the preference of thepatient and checks for the availability of the rooms.

**B. Admission process**

- After the pre admission process is completed, the admission form is filled with required information such as:
    - Patient Name, Age, Gender and Nationality.
    - Name of the doctor.
    - Diagnosis.
    - Admission date and time
- Initial advance deposit is collected and the consent of the patient/ relative is taken on the “agreement for settlement of payments” form.
- Once the admission form has been filled, the same is handed over to the care assistant (assisting the patient), to submit at the concerned nursing station for further care & management.

- At the time of admission one Visitors Pass and one Companion pass is given to the patient.
- In the event of non-availability of room desired by the patient,
    - Any available and suitable bed will be offered.
    - Subsequently on availability the patient will be shifted to the desired bed.
- If a hospital bed is not available the patient is referred to the nearest Government/Private hospital. If ambulance service is required the same is provided.
- The patient is handed over a folder which contains
    - Leaflet – Patient's Rights and Responsibilities.
    - In-patient Information sheet.
    - Patients are promptly assisted with wheel chairs or stretchers whenever required.

**Project Report**

## 1. Introduction

This study was carried out in the Radiology department of Gulf Medical College Hospital and Research Centre. The Six Sigma DMAIC (Define, Measure, Analyze, Improve, and Control) methodology is a roadmap for problem solving and process improvement. DMAIC is a data-driven quality strategy used to improve the effectiveness and efficiency of a process. The six sigma approach consists of the five step DMAIC approach. Each step of this process is can be explained as follows:

### I. D: Define Phase (Define the project goals and do a benefit analysis.)

- Define the project goals.
- Define Key input and Key output variables. (KIV's and KOV's)
- Identify the project team members
- Define the duration of the project

### II. M: Measure Phase (Measure the process to determine current performance; quantify the problem.)

- Determine operational definitions for the problem selected.
- Process Mapping of the report turnaround process.
- Develop a measurement tool. For e.g. Standard Operating Procedure
- Develop a data collection tool based on Standard Operating Procedure
- Collect the Data
- Calculate the baseline line results prior to intervention

### III. A: Analyse Phase:(Analyse and determine the root cause(s) of the defects.)

- Identify Value/Non-Value Added Process Steps
- Identify Sources of Variation

- Determine Root Cause(s)

**IV. I:Improve Phase: (Design and implementation of interventions in the process by eliminating defects to improve the performance)**

- Quantify relationships between output and input variables.
- Develop Potential Solutions
- Validate Potential Improvement by implementation of Pilotprojects.
- Start collecting baseline data from improvement actions.

**V. C: Control Phase**: **(Control future process performance)**

- Identify if the interventions are sustainable for future
- Modify the SOP (prepared in the measure phase) to include the interventions made to the process
- Determine the new process capability.

## 2. Rationale

- To calculate the turnaround time (TAT)of patients for the ultrasound examination
- To identify the errors in the process which causes delay and increases turnaround time
- Improve the turnaround time for ultrasound and thus increase patient satisfaction

## 3. Research Question

- How the applicationof six sigma DMAIC approach will help reduce the turnaround time of ultrasound examination in the radiology department at GMCHRC.

## 4. Objectives

### a) General Objective

- The objective of the project was to streamline ultrasound process by application of a five-phase Six Sigma define, measure, analyse, improve, and control (DMAIC) approach and to improve process inefficiencies throughout the ultrasound examination process to reduce variability in turnaround time.

### b) Specific Objective

- To develop process map of the ultrasound examination process.
- To develop a repeatable and reproducible measurement standard operating procedure for discharge time.
- To use the data collection tool for monitoring the Ultrasound examination process.
- Developing a cause effect matrix to gather problems reported by customer and the specific solutions for those problems.

## 5. Mode of data collection

- **Sampling Technique& Sample Size:** Random sampling technique was used; average patient foot fall for the period of February 2014 to March 2014was 925 patients. Thus using a sample size calculator at 95% confidence interval and 5% confidence level the sample size was calculated to be 263.
- **Period of Study:** The study was conducted over a period of 3 weeks ($13^{th}$ April to $4^{th}$ May)
- **Area of Study:** The study was conducted in the Radiology department of GMCHRC.
- **Mode of Data Collection:**Personnel Observation, interviews with the patient care providers, brain storming sessions with nurses, medical secretary, radiologist and quality assurance team anddata was collected using the data collection tool for ultrasound examination. **(Annexure 1)**
- **Data Analysis Tools:** Data was analysed using six sigma DMAIC tools for example Statistical process control (SPC) Charting, Process Mapping and Cause Effect Matrix was used to analyse and develop solutions along with software's such as QI Macros, Microsoft Visio, Microsoft Excel were used.

## Implementation of Six Sigma

### Define Phase

- The primary goal of this study was to improve the patient satisfaction with the ultrasound examination process and address the bottlenecks in the same.
- The key output variables (KOVs) or the study “Y’s” wasidentified as the average Turnaround time of the ultrasound process, which was identified as from when the patient comes to the reception till the patient is given his ultrasound report after the test has been completed.
- The target unit, where the study was conducted was the Radiology Department of GMCHRC. The target completion of the study was 3 weeks.
- The team involved in this study consisted of the nurses, medical secretary, radiologist, resident medical officers and IT officer. The Medical Director was overseeing the project and was updated about the findings on a weekly basis.
- The team was chosen partly because the members had expressed the greatest interest in system improvement and partly to be representative of the main groups of the staff who were involved in the process and would be affected by changes.
- Various other areas were also identified but considered as beyond the scope of the project and a possible subject for a follow on project.

**Measure Phase**

- The first step in this phase was to identify the process of ultrasound examination that existed at GMCHRC prior to any changes that may be suggested after the collection and analysis of data.
- Thus as a first step of the study, an approximate process map of the ultrasound examination process was developed. (Figure 1)
- The next step was to develop a repeatable and reproducible measurement standard operating procedure for calculating ultrasound turnaround time ofappointment, without an appointment and Emergency patients.
- This SOP was prepared with the help of the nursing in charge, billing executive, staff nurses, nursing instructor and the quality assurance team.
- The SOP was aimed at finding the time the patient comes to the reception till the time the patient is given the ultrasound report after the test has been completed and result verified by the radiologist.
- To verify that the procedure was reproducible the quality assurance team conducted an audit to check the compliance of the radiology department staff towards the SOP. The staff showed 85 to 90 % compliance to the SOP that was constructed.
- Using this measurement SOP a sample of 263 patients were monitored to record the TAT of the ultrasound examination. **(Average patient foot fall for the period of February 2014 to March 2014 was 925 patients. Thus using a sample size calculator at 95% confidence interval and 5% confidence level or margin of error the sample size was calculated to be 263. )**
- The TAT times was charted using the individuals moving range control chart method (Montgomery 2004) Figure 2
- The reason we chose individuals chart is that there was no basis for rational sub grouping, because of the irregular nature and small volume of patient involved in our study period.
- In the chart it was observed that there were 6 cases which were out of the upper control limit on the chart. These cases were inspected to find out the reasons for the delay and to identify of these were rare events not of any critical interest.

- The cases were reviewed and no such reasons were identified.
- Thus using the SOP an average TAT of the ultrasound examination for the entire patients combined i.e. Appointment, without an appointment and Emergency patient was calculated to be process was calculatedtobe approximately 89Min prior to any intervention.
- The upper and lower control limits were identified as 181 min60 sec and 5 Min 40 Sec respectively.

**Figure 1**

**PATIENT FLOW FOR ULTRASOUND IN RADIOLOGY DEPARTMENT**

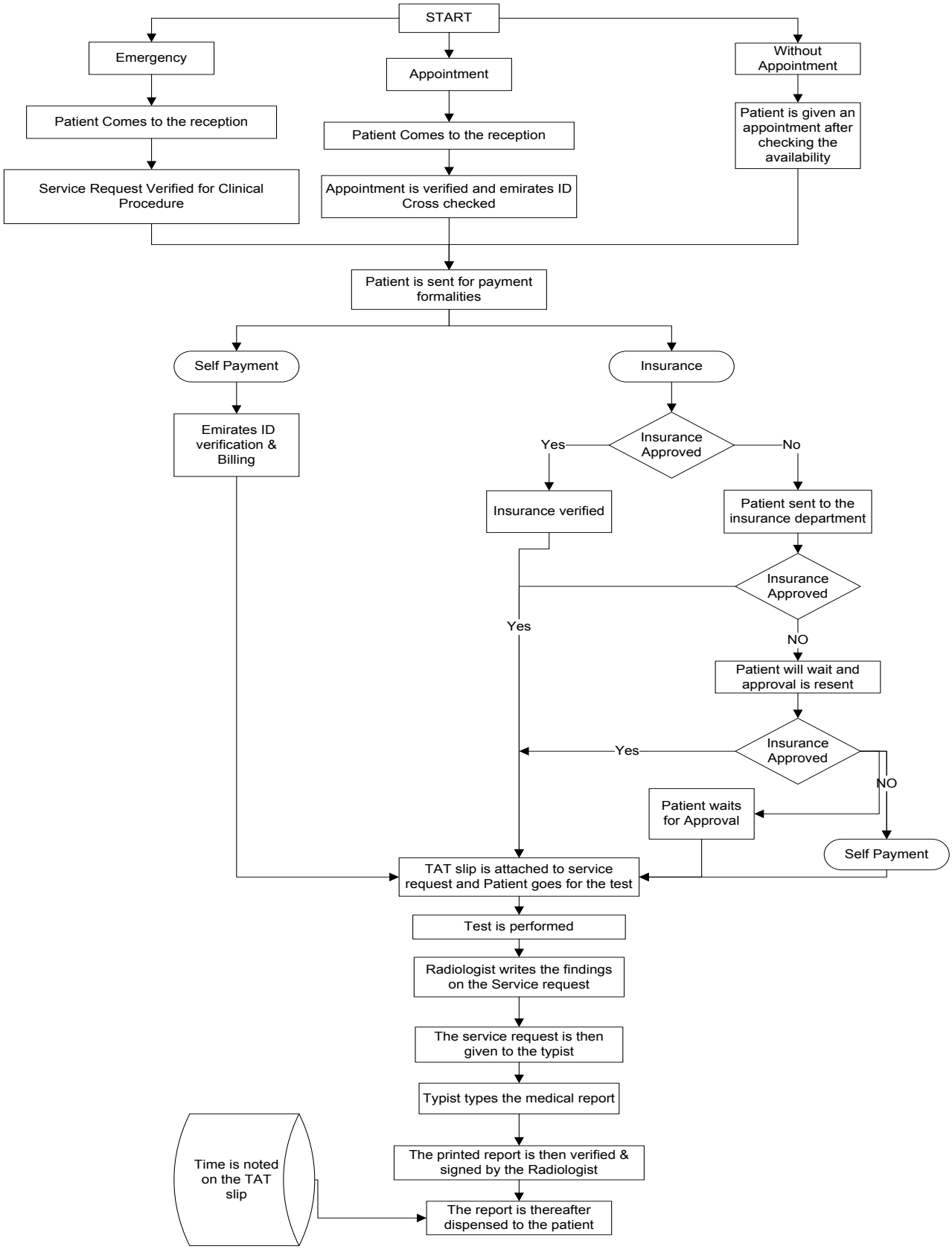
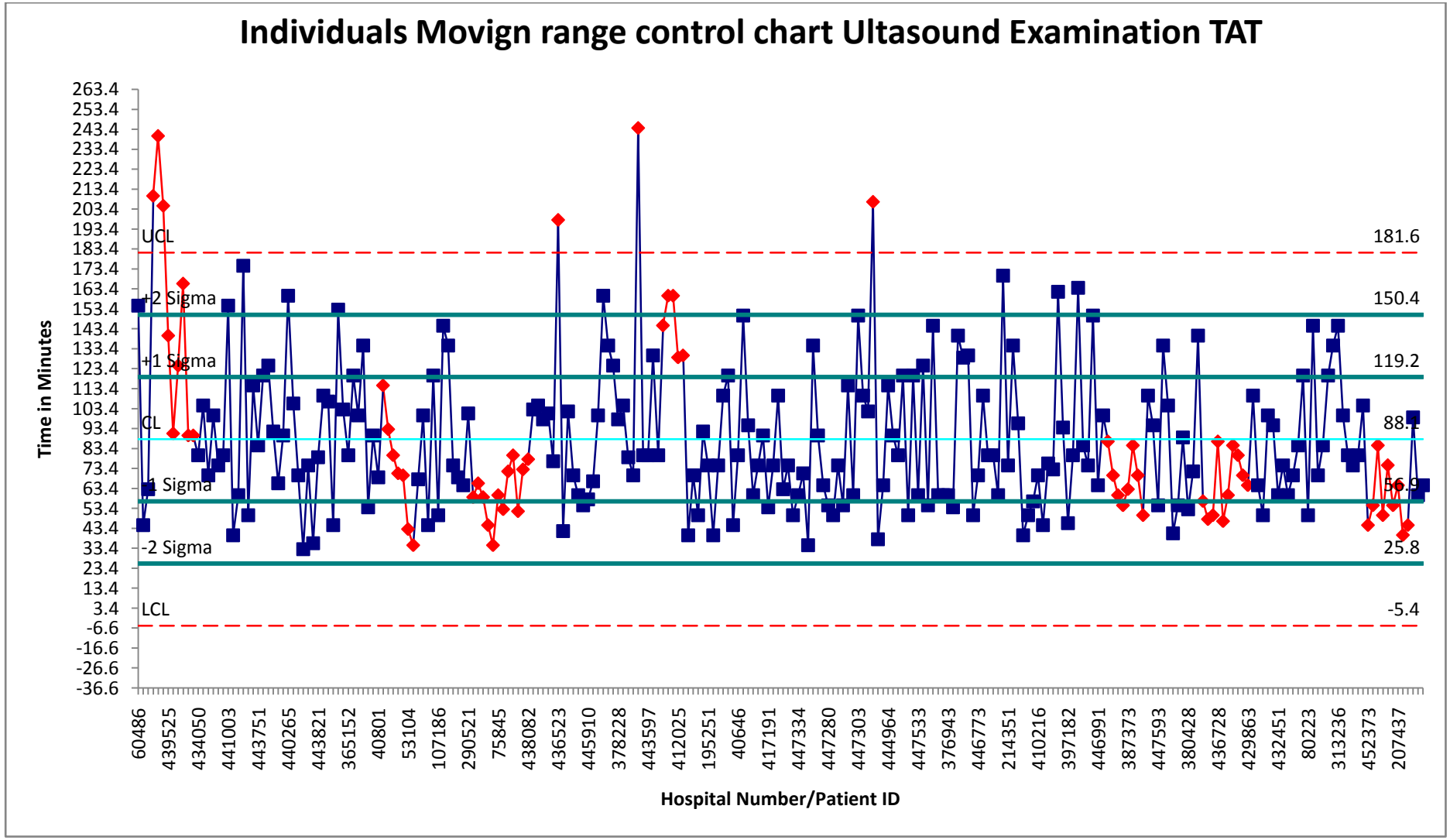


**Figure 2**


Individuals Movign range control chart Ultasound Examination TAT
Time in Minutes
263.4
253.4
243.4
233.4
223.4
213.4
203.4
193.4
183.4
173.4
163.4
153.4
143.4
133.4
123.4
113.4
103.4
93.4
83.4
73.4
63.4
53.4
43.4
33.4
23.4
13.4
3.4
-6.6
-16.6
-26.6
-36.6
UCL
+2 Sigma
+1 Sigma
CL
-1 Sigma
-2 Sigma
LCL
181.6
150.4
119.2
88.1
56.9
25.8
-5.4
60486
439525
434050
441003
443751
440265
443821
365152
40801
53104
107186
290521
75845
438082
436523
445910
378228
443597
412025
195251
40646
417191
447334
447280
447303
444964
447533
376943
446773
214351
410216
397182
446991
387373
447593
380428
436728
429863
432451
80223
313236
452373
207437
Hospital Number/Patient ID

**Analyse Phase (Data analysis, compilation and interpretation)**

- In the define phase, the key output variables (KOVs) were identified as the average Turnaround time of the ultrasound process. Thus the analysis phase involves developing a list of key input variables (KIVs) or project “Xs” on the basis of their relation with the “KOVs”. The “KIV” are selected on the basis of hoe these variables can improve the “KOV”.

- The “KIVs” were selected using a cause-and-effect matrix related to discharge; the C&E matrix was selected as analysis method to open up possibilities for system improvement. It was derived from conversations with nurses, medical secretary, radiologist, resident medical officers, IT officer and Medical Director.

- These individuals were engaged in the ultrasound examination process or were form departments that were indirectly connected to the radiology department. A brainstorming session was held with these care providers to complete the cause effect matrix.

- Lists of possible patient issues were identified and their rate of importance was derived based on a scale of 1–10 (with 10 being highest importance to the patient and 1 being the lowest). After identifying the issues a list of possible system changes or improvements to the issues were identified.

**Cause Effect Matrix**

| S.No | Issues reported are | Rank | Man power resources | proper signage's | Dictaphone & PACS | IT support | Proper use of urgent stamp | Auto emailing ( for physician and patient) |
|---|---|---|---|---|---|---|---|---|
| 1 | Staff at the reception is inadequate | 5 | 8 | 1 | 6 | 3 | 0 | 1 |
| 2 | No proper signage's | 4 | 1 | 9 | 0 | 1 | 0 | 0 |
| 3 | Doctors signing the report takes too long | 8 | 3 | 0 | 8 | 5 | 0 | 5 |
| 4 | Manual labelling of the report | 4 | 1 | 0 | 8 | 4 | 0 | 0 |
| 5 | Actual emergency patients have been left out | 2 | 1 | 0 | 1 | 0 | 8 | 0 |
| 6 | Waiting time for getting reports is very long | 7 | 1 | 0 | 9 | 5 | 0 | 9 |
| 7 | No queuing system | 3 | 1 | 5 | 0 | 8 | 0 | 0 |
| 8 | inadequate staff for taking report for signature | 4 | 3 | 1 | 9 | 5 | 0 | 5 |
| 9 | More experienced staff required | 3 | 7 | 0 | 1 | 5 | 0 | 0 |
| 10 | shortage of doctors | 5 | 8 | 0 | 0 | 0 | 0 | 0 |
| **Total** | | | **157** | **60** | **230** | **171** | **16** | **120** |
| | | | Priority 3 | | Priority 1 | Priority 2 | | Priority 4 |

- In the next step correlations between each of the patient issues and the proposed system change were estimated.
- If perceived that the changes will have a high impact on that issue, a high correlation was assigned. For example, Dictaphones and PACS have a high impact on improving the waiting time for report generation thus ahigher correlationvalue was assigned between them.
- On the other hand, if a change would not affect an issue, low correlations were estimated. For example, properuse of urgent stamp had no impact on the Signage's not being available thus a lower correlation value was between them.
- The factor rating numbers shown in the bottom row of Figure 4 were designed to prioritize the possible system changes based on importance to patients. They are derived from a summation of the products of correlations with importance ratings.

**Improve Phase (Recommendations and conclusion)**

- There is not enough staff to support the services provided in the department. E.g. thetypist as well as the cashier gets involved in other activities which delay the overall process.
- Undue inflow of the patients: Proper signage (Reception and Other Departments) are required, as all the patients consider radiology department as a common reception and come for the query.
- To increase efficiency and decrease overall time -Manual labelling of the patient details in the folders should be replaced by: Computerized details of the patients should be pasted to the report instead of writing each and every detail which increases TAT Time.
- Actual emergency patients have been left out: Overuse of urgent stamp should be avoided.
- The scanned copy of the report can be e-mailed to the patient to fasten up the report delivery process.
- Use of dicta phones and Voice Recognition Software (VRS) should be implemented along with the implementation of PACS (Picture archiving and Communication System)
- To decrease the Patient Queuing load –Implement ETS (Electronic Token System).
- Loyalty Program for Patients- Issuing privilege cards to the patients for services / discounts on future services.

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**Annexure 1**

**1. Data Collection Tool for Monitoring Turnaround time of ultrasound examinations**

| S.No | G | Age | Hospital Number/Patient ID | Date of Appointment (DD/MM/YYYY) | Time of Appointment (HH:MM) | Time Patient Arrived (HH:MM) | Time patient entered for test (HH:MM) | Difference Between (8-7) | Time test was finished | Difference Between (9-8) | Time for typing result HH:MM | Difference Between (10-9) | Time for patient received result HH:MM | Difference Between (11-10) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |
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