

Summer training
In
Paras Hospital, Gurgaon
(April 7th to June 6th, 2015)

A Report
By
Dr. Archana Singh

Under the esteemed guidance of
Prof. Nirmal Gurbani
(Professor, IIHMR, Jaipur)

MBA in Hospital and Health Management
2014-2016



CERTIFICATE

This is to certify that Dr. Archana Singh, student of MBA Hospital and Health Management from IIHMR University, Jaipur has undergone internship training at Paras Hospital, Gurgaon from 7th April 2015 to 6th June 2015 and has done projects on:

- Pre-requisite for Establishing a Radiation Oncology Department.
- A Training Need Assessment in Paras Hospital
- Time Motion Study in Radiology Department

The Candidate has successfully carried out the study designated to him during internship training and her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfilment of the course requirements.

I wish her all success in all her future endeavours.



Col. (Dr.) Ashok Kaushik

Dean, Academics and Student Affairs

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Prof. Nirmal Gurbani

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PHPL/HR – Comm./2015/753

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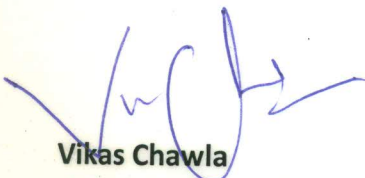
WHOMSOEVER IT MAY CONCERN

This is to certify that **Dr. Archana Singh** has successfully completed her **Summer Training** in the department of **Clinical Operations** from **7th April, 2015** to **6th June, 2015**.

During her training period, she was found to be sincere and dedicated towards her assignment.

We wish her all the best for her future endeavors.

For Paras Hospitals, Gurgaon



Vikas Chawla
Assistant General Manager – HR

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LIST OF ACRONYMS

- AMC-Annual Maintenance Contract
- AHU-Air Handling Unit
- BME- Biomedical Engineering
- CAG-Coronary Angiography
- CCU- Coronary Care Unit
- CGHS-Central Government Health Scheme
- CMO-Casualty Medical Officer
- CSE- Combined Spinal Epidural Anaesthesia
- CTVS ICU- Cardio Thoracic Vascular Unit
- ECHS-Ex-servicemen Contributory Health Scheme
- ERCP-Endoscopic Retrograde Cholangiopancreatography
- FMCG-Fast Consuming Consumer Goods
- GDA- General/Ground Duty Assistants
- HCO-Health Care Officer
- HMIS-Hospital Management Information System
- HSEB-Haryana State Electricity Board
- HVAC-Heat Ventilation Air Conditioning
- JCI-Joint Commission International
- LDR- Labor Delivery Room
- LINAC- Linear Accelerator
- MICU-Medical Intensive Care Unit
- NABH- National Accreditation Board for Hospitals and Healthcare Providers
- NABL- National Accreditation Board for Testing and Calibration Laboratories
- NCV-Nerve Conduction Velocity
- NICU- Neonatal Intensive Care Unit
- NSICU-Neurosurgical Intensive Care Unit
- OTC-Operation Theatre Complex
- PAC- Pre Anesthetic Checkup
- PACU-Post Anesthetic Care Unit

Chapter1-Overview of the Hospital

Paras Hospital Gurgaon is a NABH Accredited 250 bedded super specialty hospital. It was the first hospital in Gurgaon region to get NABH accreditation. Paras is equipped with one of the leading Neurology Sciences centers in the region which boast of all facilities needed for research and surgery in the field of Neurosciences. Besides this it has 55 specialty departments which include medicine, minimal invasive surgery, gynecology, oncology, ophthalmology, dermatology, cosmetic surgery, plastic surgery etc. it has taken a step ahead to start two major projects in state of Bihar, Paras HMRI hospital, Patna has a capacity of 350 beds while Paras global hospital Darbhanga has a capacity of 100 beds. Paras hospital is also renowned globally for its specialized international patient services. Customized treatments and surgery are designed to benefit international patients.

1.1 Vision

- To become preferred healthcare provider for all.
- Partnership in caring and curing.
- Providing excellent medical care to customers through faith in values, integrity, respect, teamwork and innovation to achieve complete patient satisfaction.

1.2 Mission

- To provide competitive, innovative and accessible medical care to the patients.
- To facilitate improving the health of patient by providing quality service through professionals that is affordable and delivered-
 - *Compassionately*
 - *Appropriately*
 - *Responsibly*
 - *Efficient*

1.3 Accreditations

National accreditation board for hospital and healthcare providers (NABH) accreditation- Paras are the first multispecialty hospital in Gurgaon to receive this accreditation. Paras diagnostics is accredited by NABL, India's leading accreditation body pathology services.

Chapter 2- Departmental Profile of Paras Hospital

2.1 Clinical services

2.1.1 Outpatient Department (OPD):

Location: Ground floor

OPD has 6 Counters A to F according to their specialty.

Counter A- Cardiology

Counter A also includes Cardiac Procedure room. The procedures performed in Cardiac Procedure Room and their Turn around time is as follows:

1. ECG-Electrocardiography: 5 min
2. Echocardiography/Color Doppler: 15-20 min
3. Treadmill Test (TMT): 25 min
4. Stress echocardiography: 35 min
5. Transoesophageal Cardiography (TEE): 15 min

Counter B involves following specialties:

- Obstetrics and Gynecology
- Pediatric
- ENT
- Ophthalmology

Counter C- Neurology

This counter caters to patients coming for Neurology Consultation. Neuro Procedure Room also come under this counter where following Neuro procedures are being done.

1. EMG-Electromyography
2. EEG-Electroencephalography
3. NCV-Nerve conduction velocity test.

(Time taken by each procedure-45 min)

Counter D

Counter D caters to patients coming for General and Lap. Surgeon consultation and this is also a Billing Counter for Lab and Neuro procedures bill.

Counter E includes:

- Internal Medicine
- Orthopaedics & Joint Replacement
- Gastroenterologist
- Psychiatry
- Rheumatology

Counter F includes:

- Neurosurgery
- Urology
- Hematology
- Spine clinic
- Psychiatry/Clinical Psychology
- Nephrology

2.1.2 In Patient Department (IPD):

“Inpatient” means that the procedure requires the patient to be admitted to the hospital, primarily so that he or she can be closely monitored during the procedure and afterwards, during recovery.

1) Type of wards:

- Double room ward
- Four bed room ward
- HDU
- Single room ward
- VIP Suite
- Deluxe Ward
- LDR suits

IPD in Paras Hospital Gurgaon is situated on 3rd and 4th floor of the building.

There are total 82 rooms and 250 beds inclusive of ICU among which functional beds are 219 and 58 beds for ICU.

2) Patient Bed Transfer:

Patients are transferred from one Ward to another Ward due to change in the treatment or change in the Consultant. The charges for different categories of rooms are different, so in case patient's room category is changed during transfer, then policy for Billing is as under:

a) Stays up to 8hrs

Half day room rent is applicable

b) Stays more than 8hrs

Full day room rent is applicable

3) Discharge process



Figure 2.1.2.1: Discharge process flowchart

2.1.3 Operation Theatre Complex

Operation Theatre Complex in Paras Hospital is located on 1st floor with the restricted area for outside visitors to minimize the traffic and to maintain the sterility. Nobody is allowed inside the Complex without the Management's or Doctor's permission. It is also necessary to wear shoe-covers before entering the OT Complex.

OT Complex is divided into different areas:

1. PAC Room
2. PACU
3. CTVS ICU
4. Catheterization Lab
5. Female Doctor changing room
6. Changing room for OT Technicians
7. Common Room for Doctors
8. OT pharmacy
9. 7 OTs
10. 2 scrub stations
11. 1 room for flash sterilization
12. Dirty utility room
13. OT Store Rooms

1) PAC Room

PAC Room in OT Complex is meant for Pre-Operative Evaluation of patients on OPD basis by Anaesthetists to check if the patient is fit for surgery. This room is also used by surgeons to examine the OPD patients in case the surgeon is in OT.

2) PACU (Post Anesthetic Care Unit)

This unit accommodates the patients before and after surgery. There are 6 beds in PACU. Patients to be operated are shifted from wards to PACU around 15-30 minutes before.

Nursing staff in this unit check the vitals of the patients and check that the medicines have been given to the patients or not. After the surgery is over, the patient is brought to PACU with the objective to

monitor the patients post-surgery. The patients' vitals are monitored every half an hour and if the patient is found stable based on Aldrete scoring mechanism (score should be more than 12 out of 14), the patient is shifted to the ward after the evaluation by anesthetist. Critical patients are directly shifted from OT to ICU for monitoring. Cardiac and Neurology surgery patients are shifted from OT to CTVS ICU and NSICU respectively.

Manpower in PACU:

1 Area Incharge

3 staff nurse

3) Catheterization Lab

It comes under the cardiology department. Major procedure taking place within the cath lab are CAG and Percutaneous thrombo coronary angioplasty (PTCA). There are overall 24 procedures taking place inside the Cath Lab. Cath Lab is divided into console room, procedure room and store rooms.

4) Operation theatres

There are 7 operation theatres in OT Complex. Based on specialties they are classified as follows:

OT 1&4: General surgery but urology cases are preferred to be done in OT1

OT 2: Dedicated to Orthopedic and Spine cases

OT 3: Ophthalmology

OT 5: Dedicated to Cardiac surgeries

OT 6&7: For Neurosurgery

These OTs differ based on different machines and hence different areas.

Each OT has its own inventory of medicines, injectables, IV fluids, dressing materials, etc. which if used during the surgery, is replaced by the OT Pharmacy.

Outside every OT, there is an alarm called "alarm enunciator" which comprises of four blocks i.e. oxygen, nitrous oxide, medical air, vacuum. If there is any fall in pressure for any of these supplies the alarm goes off. Each gas supply has a different color coding:

- 1) Oxygen: White
- 2) Nitrous oxide: Blue
- 3) Vacuum: Yellow
- 4) Medical Air or compressed air -Black

Each OT has 4 HEPA (High efficiency particulate air) filters and laminar flow is maintained inside the OT. Each OT has uninterrupted Power Supply to support the life saving machines and temperature and humidity monitor to keep track on the required levels in OT. The Normal level for the temperature in OT is 18-22 degree Celsius and humidity is maintained in 45%-55%.

Manpower:

1. Head of Department
2. Anaesthetists-5
3. DNB students-3
4. Nursing staff (assisting surgeons)- 21
5. Technicians (assisting anesthetists)- 15
6. Housekeeping or cleaning staff - 4 (2 inside, 2 outside)
7. GDA- 4 (2 inside, 2 outside)

Sterilization in OT-

- a. After every surgery cleaning of floor is done by sodium hypochlorite and bags of the bins are changed.
- b. Different sets of instruments are there for different surgeries. After the surgery, used instruments are washed with 3M and then after drying them they are wrapped in double sheet and sent to CSSD department for sterilization. TAT for unused instrument is 72 hours. In case of any emergency they are sterilized in autoclave in flash sterilization room. The process for sterilization takes 20-30 minutes.
- c. The Laparoscopic instruments are dipped in Disinfection Soaking Tray containing CIDEX(2% Glutaraldehyde) solution for 20 minutes to sterilize them in case those are needed for the next surgery otherwise they are stored in the Formalin chamber with Formalin tablets.
- d. Once a week fumigation is done with Lonzagard. Microbial sample is collected before fumigation & is sent to lab and same procedure is performed after fumigation has been done & comparison is done to see the effect of it. Usual timings of fumigation is 45min but once in a week OT has been kept closed for a night. One OT is kept operational in case there is an emergency.
- e. Instrument trolleys are carbolized after each surgery.

5) Scrub stations: Each scrub station has three taps, one is to take out 10% Betadiene and the other two are for water supply (one manual elbow tap and one automatic).

6) Utility room: Utility Room is for-

- 1) Washing soiled linen with sodium hypochlorite
- 2) Washing soiled instruments 3M solution

7) OT pharmacy

OT has its separate pharmacy with the total manpower of 4. According to the surgeries pharmacy gets all the required medicines and surgical items ready in a very short period of time. Once the operation is over, the nurse or technician provides the list of instruments and medicines used, which are then added to the patients bills, rest of the medicines are returned.

8) OT billing

After each surgery, OT charge slip is filled by the circulation nurse and at the end of the day, all the slips are sent to the IP Billing Department

2.1.4 Intensive Care Unit

Intensive care units (ICUs) provide intensive care (treatment and monitoring) for people in a critically ill or unstable condition.

Paras Hospital has **7 ICUs**:

1. CTVS ICU: For patients admitted for Cardio Thoracic Vascular Surgeries or critical Cardiac patients.
2. Surgical ICU: For patients who have undergone surgeries or trauma patients.
3. CCU: For patients who are admitted for invasive procedures in Cath Lab.
4. MICU: For patients with Medical conditions
5. NSICU: For Neurology patients
6. PICU: For Pediatric patients
7. NICU: For care of Neonates after delivery.

1) Admission Process in ICU

In ICUs patients get admitted via OPD, IPD or Emergency.

2) Discharge process from ICU

Generally, patient is stepped down to the ward if the condition gets stable and then discharged. In some cases, if patients' relatives want to take the patient against the Doctor's advice, then they are given LAMA (Leave against Medical Advice).

3) Equipments used & care in ICU

Major Equipments used in ICUs:

1. Ventilator
2. Monitor
3. Crash Cart
4. Air beds to prevent Bed Sores
5. BIPAP

In each ICU, Bed Panels are there for each bed through which medical air, oxygen, vacuum for suctioning is supplied. 2 Portable machines are also dedicated for ICUs, mainly for the Chest X-Rays of the bed-ridden patients.

In case of infectious patients, nurse-to-bed ratio is one with separate gown for the Nurse and Doctor who sees that patient. For infected patients with Respiratory diseases, double mask are given to the patients to wear to control the spread of infection to other patients and ICU staff. Identification to Infectious patient is by 'Barrier Nursing' or 'High Risk patient' Tag.

4) Nurse-to-bed ratio

For ventilated patients, nurse to bed ratio is 1:1

For non-ventilated patients, nurse to bed ratio is 1:2 or 1:3

5) Temperature in ICU

In each ICU, temperature is maintained between 22-24 degree Celsius, reason being bacteria and viruses cannot thrive at lower temperatures.

6) Food & beverages

Patients' diet is decided by the doctor by consulting the dietician.

7) Store rooms

Each ICU has store room where medicines, injectables, etc. are kept for the need of the hour. Generally medicines for the patients are called from IP Pharmacy through Drug Requisition in HMIS. On Daily Basis, each Nurse is assigned to check the items of the store for its expiry date.

8)_Manpower

1 Senior Area Incharge

1 Area Incharge

7 staff Nurses

Specific to NSICU:

Neuro Surgical ICU has an isolation room which is mainly for highly infectious patients negative air pressure is maintained in this so that infection does not spread.

Specific to CCU:

Patients in CCU are admitted mainly for the Angioplasty or other Cath Lab Procedures. Before patient is sent to Cath Lab, below mentioned things are looked after:

- Part Preparation of Radial and Femoral site.
- Surgery Billing & Completion of Consent Forms
- Investigations, mainly kidney Investigations are done because the dye given during the Cath Lab Procedure can affect kidney.
- It also records the vitals for upto 72 hours.

Specific to PICU:

Pediatric ICU mainly caters children of age 1 month to 15 years. It is 8-bedded ICU.

Specific to NICU:

NICU mainly caters to the neonates of less than a month. Only low-birth weight babies are treated in NICU for up to 3 months. NICU is divided into 2 areas: One is for outside patients and another is for inside patients. There are total 9 beds in NICU, 3 for the outside patients and 6 for the inside patients.

In NICU, admissions are mainly due to Pre-term, Low Birth Weight.

Patients in NICU are treated according to the Level of care needed:

For Level 1- only patient warmer is used.

For Level 2- patient warmer, monitor, syringe pump & phototherapy is used.

For Level 3- patient warmer, syringe pump, monitor & ventilator is used.

Equipments used in NICU-

- Neonatal warmers-9, which maintains the temperature between 36-37 degree Celsius.
- Phototherapy unit -4
- 3 ventilators- 2 Pediatric and 1 adult
- 6 oxygen hoods- to supply the oxygen to the patient

2.1.5: Emergency Department

Location: Ground floor

It is 24 hour functional & is eight bedded

Different Areas in Emergency:

- Registration & Billing Area
- Waiting Area
- Patient's area (8 beds)
- Store room
- Utility room
- Minor OT
- Plaster & Dressing Room
- Day care unit (8am to 8pm) for the patients under observation

Manpower & Hierarchy: Emergency Department is headed by 2 CMOs with 20 nursing staff.

1) Scope of emergency

- i. ER provides a comprehensive & uniform emergency service/ care to patient (functional 24*7).
- ii. All patients are assessed & triaged by a qualified & experienced medical & paramedical staff & provided appropriate level of care in ER department.
- iii. The ER department provides medical evaluation & treatment (including rapid resuscitation & stabilization) .Patients receive medical referral / transfer (including critically ill patients & or those are not in scope of services of hospital)
- iv. Emergency care services provided include-
 1. Stabilization of life threatening conditions.
 2. Life saving procedures.
 3. Immediate treatment of medical & surgical emergencies.

4. Emergency treatment for minor injury or illness.

2) Admission process flow

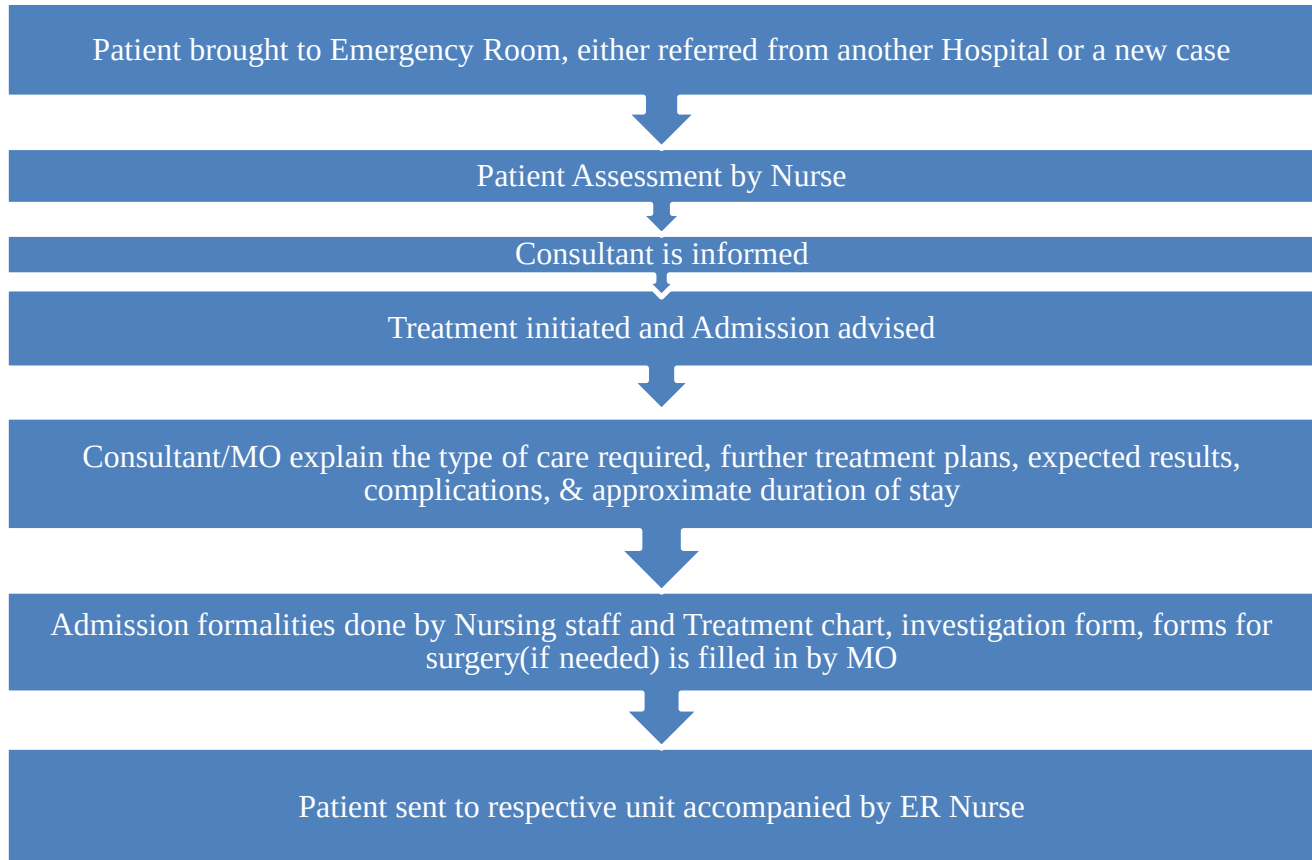


Figure 2.1.5.1: Process Flow showing admission process in Emergency Department

3) MLC cases

It is a case of injury or ailment etc where attending doctor after taking history & doing clinical examination of patient thinks that some investigations by law enforcing agencies are essential so as to fix responsibility regarding the said injury or ailment etc according to law. CMO attending the case, label the case as MLC.

Cases labeled as MLC-

Trauma, burns, electrocution, poisoning, industrial accidents, sexual offences, cases requiring age estimation, criminal abortion, animal or snake bite, cases of coma where cause could not be ascertained, cases of starvation including hunger strike, unclaimed newly born, hanging, strangulation, drowning, suffocation etc, cases brought by police or sent by court for medical

examination, BID, where death certification due to disease or natural cause is not possible being not apparent, result of medical malpractices.

4) Process Flow in Triage

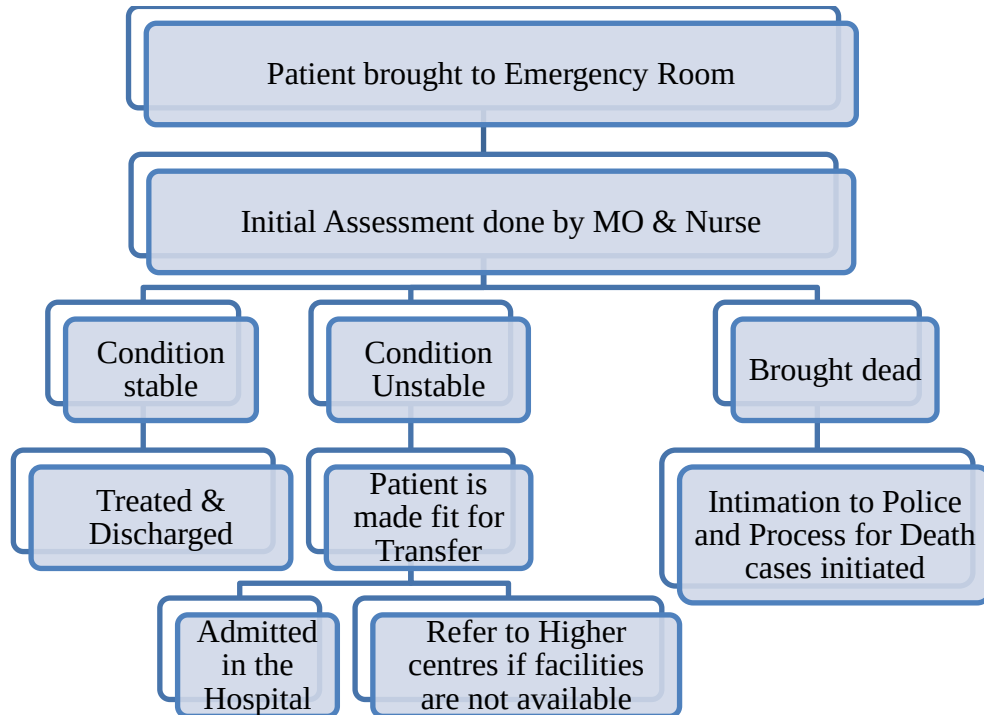


Figure 2.1.5.2: Process Flow in Triage

5) Important medications used in Emergency Department

High alert medications: These are defined as those which could cause an immediate life threatening condition for the patient if an error in administration occurs.

Narcotic drugs & psychotropic substances (NDPS)

These are drugs which required special storage & issue to prevent misuse, pilferage etc

Each person independently compares the label & product contents in hand versus the written order & EMAR (if it is the first dose) or label. Double check of medications prior to administration by 2 registered nurses after reading the label is mandatory.

Hospital has made some policies regarding the use of Narcotic Drugs

Warning labels for all cytotoxic drug containers, as well as shelves.

Medicine Dispatch for IPD patient:

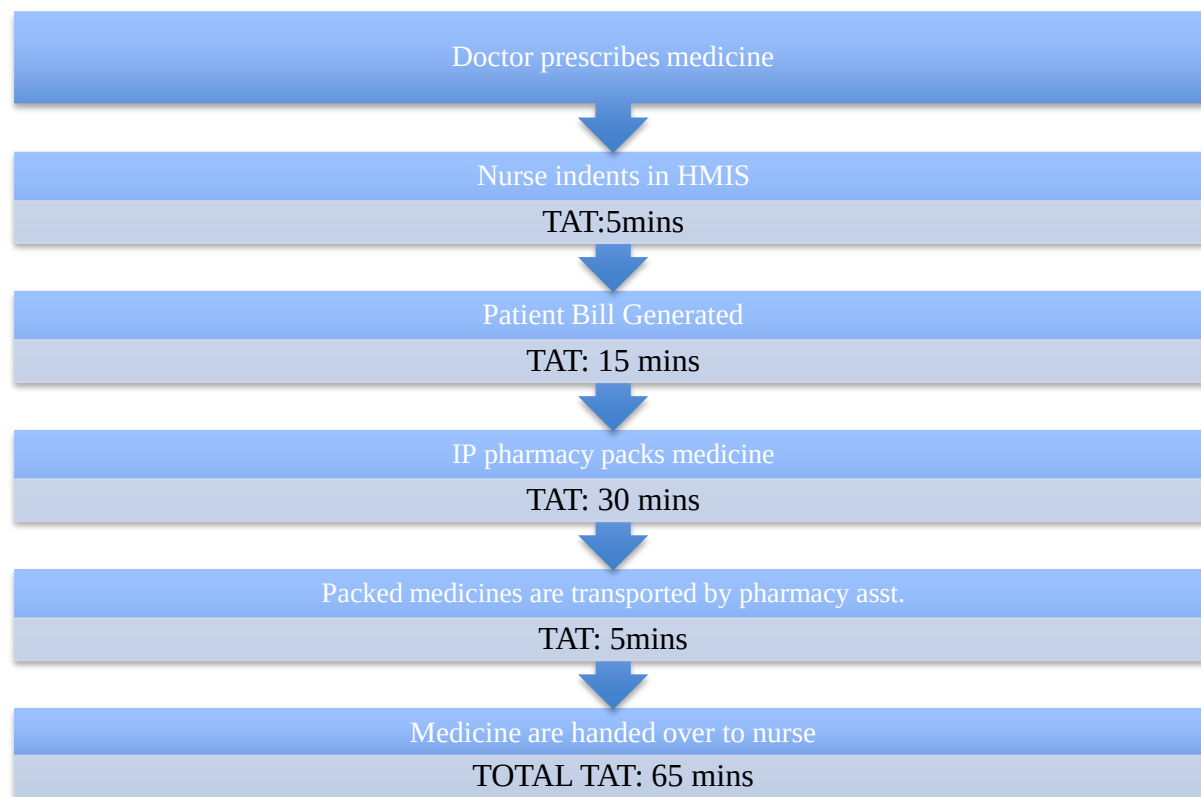


Figure 2.1.5.3: Process flowchart of medicine delivery

The standardized hospital TAT for the above procedure is 40 minutes.

Also medicine is returned against a credit note or cash in the form of cheque from vendor.

2.1.6 Central Sterile Supply Department

It is responsible for providing seamless supply of sterilized instruments and other devices to the required departments for the smooth working of the Hospital along with maintaining the sterility. The aim of CSSD is to reduce hospital acquired infection level to zero.

1) Structure of CSSD

CSSD is divided into 2 areas: **Sterile and Unsterile Area**. Unsterile area is for receiving the unsterile supplies, washing and packing them to proceed for sterilization whereas sterile area is to store the sterile items to avoid any kind of contamination. In the unsterile area, gauze pieces and cotton roll are also made for wards and OT which then is packed and sterilized in the Autoclave. For OT, set of 10 gauze pieces are packed together, whereas in the ward, a set of 4 pieces are packed.

2) Areas where CSSD supplies are required

- OT& ICU
- Nursing counters & OPD

Issuing of sterilized materials are done 2 times a day from the Issue Counter in the sterile area.

For sterilization of metal instruments, firstly Ultrasonic machine is used for disinfecting the instruments with Rapid-multi enzyme cleaner(10 ml/litre) and a chemical-Neadishter Iar (10ml/litre) to prevent the instruments from rusting. This takes 15-20 min. to complete the procedure. After completion of the procedure, instruments are washed in running water and then dried. Then these are packed in sets in a double sheet. Finally the packed sets are autoclaved at a temperature of 132-134 degree Celsius and 15 lb pressure. The process takes 40 to 50 minutes. Autoclave in CSSD has double door with one door opening in the non-sterilized area from where non-sterilized items are moved to the autoclave and another door in the sterile area.

For sterilization of plastic and rubber items, ETO sterilizer is used. It has an inbuilt tray for the items. It uses Ethylene oxide gas for sterilization which comes in the form of 100ml cartridge. A single cycle takes 10 hrs 20 minutes

3) Process flow

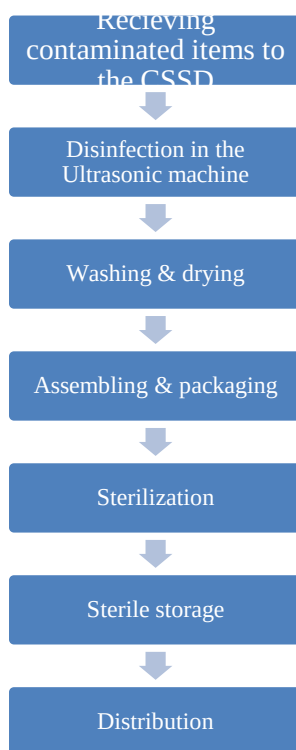


Figure 2.1.6.1: Flowchart of CSSD sterilization

4) Indicators of sterilization

Chemical Indicator is an adhesive tape which is adhered to the packet which after the procedure turns its color indicating the process of sterilization has completed. For Autoclave, Green color turns to Black and for ETO, brown color turns to Green.

Biological Indicator-. Biological indicators are used to confirm autoclave's killing efficiency. A kit containing *Bacillus stearothermophilus* (for steam sterilizer) and *Bacillus Subtilis* (for ETO machine) is kept inside the machines; the machines are run for their actual processing time. Then the kit is sent to the lab to identify if the bacteria died or not. After this, the machine is declared fit to run. This test is performed on weekly basis, every Tuesday. Investigation of this test takes 48 hrs.

Other tests: For every load, **Steam sterilization Integrator** is also used in both Autoclave and ETO which resembles a strip and changes its color indicating the successful procedure. In case of Autoclave, color changes from White to Blue and in ETO, color changes from Yellow to Green.

Bowie-Dick test or DART (*Dynamic air removal test*) is performed every morning before starting any procedure. A strip is placed in the Autoclave for 15-20 minutes, after which its color turns from Blue to Pink. This test is for checking prevacuum autoclave's air removing ability and steam penetration.

Fumigation every week on Monday Night.

6) CSSD Layout

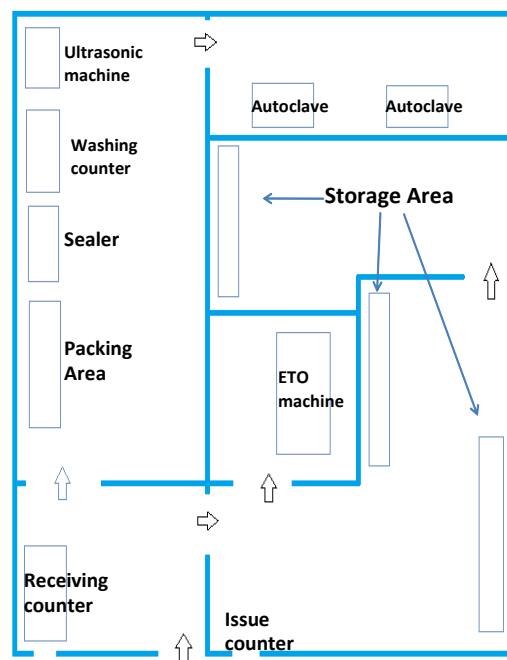


Figure 2.1.6.2: CSSD layout

2.2 Clinical support services:

2.2.1 Blood Bank

Paras Hospital has its own Blood Bank for the need of the hour. Two types of donors come here- one is Voluntary Donors and the other is Donors for Replacement of blood.

Voluntary Donors- Voluntary Donors are those who donate blood according to their own will.

Donors for Replacement of Blood- If a patient, whether OPD or IPD needs blood transfusion then it is to be replaced by a replacement/family donor.

1) Criteria for donor

- A donor can donate blood after every 3 months.
- Age should be between 15-65 years.
- Have minimum of 45 kg of wt.
- Have Hb count of 12.5 gm%
- Should not be on any regular medication.
- Should not have consumed alcohol in 24 hrs.

2) Legal bindings for blood bank

- Drug Controllers are authorized to issue the licenses (validity-5 years) for Blood Banks
- It shall be consisting of a room each for –
 1. Registration and medical examination
 2. Blood collection
 3. Blood component preparation (maintain Temperature between 20° c to 25° c)
 4. Laboratory for blood group serology.
 5. Laboratory for blood transmissible diseases
 6. Sterilization & store room

From here blood is issued to the IPD or OPD patients after following the concept of 'First In First Out'.

Blood is collected in single bag, double bag and triple bag depending upon the requirement of component. Blood collecting bags have an anticoagulant –CPDA (Citrate Phosphate Dextrose Adenine) to prevent blood coagulation

Quantity of blood taken per donation:

- Single Bag- 350ml

- Double Bag- 450ml
- Triple Bag-450ml

If collected blood is infected, it is discarded after injecting 5ml hypochlorite into it, then autoclaving it for 20 min., discarded into red bag and sent to BMW for incineration.

After collection of blood and platelets, post-donation tests are performed:

- HIV
- HBsAg
- HCV
- VDRL
- MP

Sterilization Room

In this room, one autoclave and oven is kept.

This room is specifically to discard the Reactive and unused blood.

Process for discarding the Reactive blood-

10ml of 5% hypo. is injected into the bag and Kept for half an hour. After that autoclave for 20 min.

And then Discarded to BMW (Red Bag)

For the unused or expired blood, process is same except 5ml of 5% hypochlorite is injected into the bag and stored for 5-10 min before autoclaving.

3) Manpower

1 Blood Bank Incharge

1 CTO- Chief Technical Officer

1 Male Nurse

9 technicians

2 GDA

1 Housekeeping staff

4) Expiry and shortage of Blood Components

Expiry of Blood components is checked on daily basis and before 7-10 days of expiry.

2.2.2 Radiology unit:

Location: Ground floor

Radiology unit includes Digital X-Ray, CT scan, MRI Scan, and Ultrasound.

X-Ray

There are 4 X-Ray machines:

1 in radiology unit-500 MA

1 in PHC -300 MA

MRI

Currently 1.5 Tesla MRI is being used in Paras Hospital. If MRI is needed for an ICU patient MRI comfortable Pulse Oxymeter, ventilator and O2 cylinder is used. MRI room is kept at a temp. Of 16°- 22° Celsius.

CT Scan

16 slices CT is being used by Paras Hospital. Required temperature is same as of MRI.

For both CT and X-Ray, lead screen and lead apron is used by the technicians for shielding.

Ultrasound

There are 3 Ultrasound machines in the Hospital:

2 in Radiology

1 in PHC

There is separate billing counter for radiology department.

2.2.3: Dialysis unit

Dialysis unit has 5 dialysis machines and 1 dialyzer reprocessor. Dialysis takes 3-4 hours to complete the process. It works in 4 shifts as given below. Patient appointments are scheduled accordingly:

- Morning 8-12
- Afternoon 12-4
- Evening 4-8
- Night- 8-12

Manpower:

- 3 staff nurse
- 3 technicians
- 1 GDA
- 1 housekeeping personnel

2.2.4: Endoscopy suite:

The Endoscopy unit consists of procedure room, pre- & post-procedure room and cleaning area.

The procedures done at hospital Endoscopy units are :

1. Colonoscopy
2. Endoscopy
3. Sigmoidoscopy
4. ERCP (done in OT)

TAT for the procedures:

Usually each procedure performed by Endoscopes, Siegmoidoscopes, and ERCP takes 10-15 min. If pre-care, post-care and reporting is added TAT for the it takes 30 minutes. The TAT Only colonoscopy requires 30 min. (only for the procedure)

Manpower:

- 1Doctor
- 1 Female nurse
- 1 Technician
- 1 GDA

2.2.5: In Patient billing and TPA (Third Party Administrator) Department

Location: Basement one

1) TPA:

TPA are separate entities which work as a mediator between the insurance companies and the insurance receiver. As public sector undertakings (PSU), there are four general insurance companies:

1. Oriental Insurance
2. New India Insurance

3. United India Insurance
4. National Insurance

In recent years, a lot of private sector insurance companies such as Bajaj Allianz, ICICI Lombard, and TATA AIG etc. have entered the insurance market. The PSU together formed Raksha TPA and also came up with GIPSA (General Insurance Public Sector Association), which standardized the price of 42 general procedures so as to control the increase in price of such procedures.

There are 4 types of files:

1. OPD file
2. IPD file
3. ESI file: File where no claim is required, permission gets reviewed every seven days.
4. Corporate file

2) Manpower (shift from 8am to 8pm) of TPA:

- TPA incharge-1
- Senior executive-1
- Executive-2

Manpower in dispatch (shift from 9am to 6pm) department:

- Senior executive-1
- Executive-2

Manpower in Recovery Department:

- Manager
- Executives-3 (For TPA-2 & for CGHS/ECHS-1)

3) Empanelment:

The hospital has tariff version 7. 32 TPA are empanelled and 84 corporate have tie ups. Corporate tie ups are majorly useful in terms of cash billing discount which does not go beyond 10%.

4) Facility extended by the hospital to insurance beneficiary: The hospital provides credit billing to the patient after taking the following documents from the patient and a cash deposit of Rs 5000.

1. TPA name and ID card
2. Name of the insurance company
3. Photo ID proof of patient
4. Doctors prescription for advice admission or surgery
5. Previous year policy papers(for exclusion of policy)
6. Investigation reports to support diagnosis.
7. MLC/FIR copy if the patient is an MLC.

5) General Turn around Time fixed as per department

1. Pre-authorization form is supposed to be signed and sent within 6 hours. Else it would be rejected.
2. Discharge process 4hours
3. Query is to be answered in 2 hours
4. Dispatch files should be submitted within 7 days to the TPA otherwise the payment gets delayed.
5. TAT for dispatch department to get the file ready and handle it over to recovery is 3 days

Final Check List with patient information and TPA signature which is used for assembling the dispatch files:

1. Covering letter
2. Authorization Letter
3. Pre-authorization Letter
4. I-Card/ID Proof
5. Claim Form
6. Payment Receipt
7. Bill Summary and detail
8. Discharge Summary
9. All diagnostic report & Film
10. Laboratory Report
11. CAG/PTCA and THR/TKR Sticker
12. MLC report photocopy
13. Blood sugar charting photocopy
14. N/P and other deduction test

6) CGHS and ECHS Billing Department:

This department consists of 2 senior executives and 1 Assistant Manager.

CGHS stands for Central Government Health Scheme, which is the insurance facility given to central government employees.

ECHS stands for Ex-serviceman Contributory Health Scheme, which is the insurance, extended to ex serviceman from the defense services.

Patient under both the schemes are admitted based on the referral letter which they receive from their respective polyclinic.

7) Set of documents to be sent:

1. Covering letter mentioning the follows:
 - a. UTI TSL (UTI technology and service Ltd) ID
 - b. Bill ID
 - c. Particular of ESM (Ex-servicemen)
 - d. Date of admission & discharge
 - e. Date of uploading to UTI TSL
2. Referral Form
3. Copy of Membership receipt/card self attestation
4. Summary of bill
5. Prior approval if applicable
6. Discharge Summary
7. Drug certificate (if price is above 2000 for CGHS patient or above 1500 for ECHS, then a certificate has to generated from the pharmacy based on norms)
8. Invoice and outer pouch for implant/stents if applicable
9. Investigation reports

After discharge only ECHS patients are given 7 days of medicine in advance. The department is supposed to forward the documents online within 10days in case of an inpatient and within a month for outpatient.

8) In Patients Billing:

The work of IP Billing is twofold. It updates the bills of each patient during the course of stay and also generates the final bill for the patient. This department is responsible for the final settlement every day

the patient's attendant is updated based on the amount due. Also for people who do cash billing have to pay their final amount at the IP billing desk.

Manpower: Billing Manager-1

Assistant Manager-1

Senior Executive-1

Executive-6

9) Cash Billing is done in the following way:

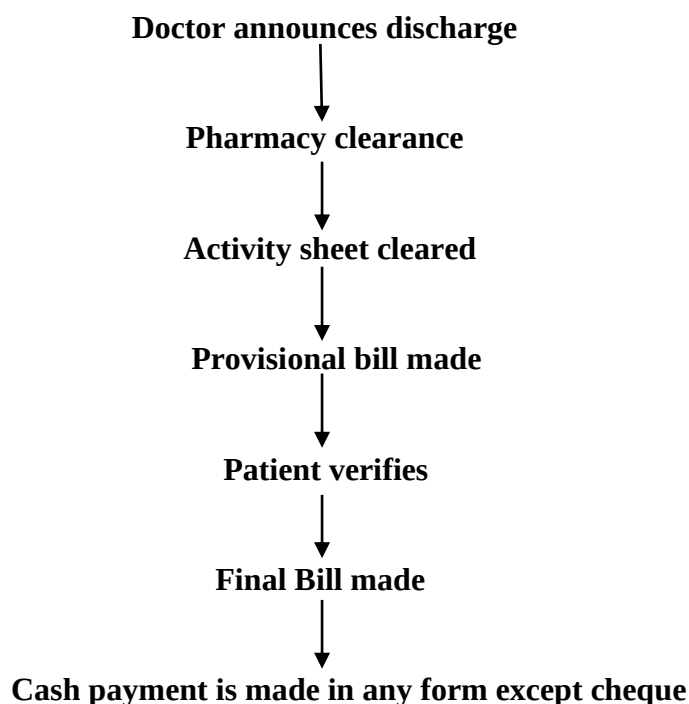


Figure 2.2.6.1: Discharge billing process flowchart

10) In case of emergency:

CGHS or ECHS patients will be given a different rate. If the patient is admitted then referral letter will be required the next day. Also cashless billing is allowed to pensioners and ex servicemen alone.

Service man will be asked to pay at CGHS rate.

ESI patients need not pay any amount. Cashless billing is given to such people.

In case of corporate generally patient comes with credit letters based on which money can be reimbursed from the company itself.

2.2.6 Front Office

Location: Ground floor

1) Introduction

Front Office is the First Interactive Point for a patient coming to a Hospital. Front Office executives do multiple tasks right from taking multiple incoming telephone calls from patients who want to schedule appointments, registration, billing, admission, replying to queries of the patients, dispatching of reports, preparing individual patient file to entering records in HIS

Some of the emergency codes are mentioned below:

Emergency codes (dial *111)	
Codes	Meaning
Blue	Cardiac arrest
Violet	Violent people
Red	Fire
Yellow	Bio hazard
Pink	Child abduction or person lost
Black	Bomb threat

Table 2.3.2.1: Emergency codes

These codes are announced by the call center amongst the staff initially so that the staff can take immediate action . After proper action is taken, an incident sheet is filed based on the incident which is then discussed with the top management.

2.3 Utility Services:

2.3.1 Biomedical Waste Management

The biomedical waste is collected by the housekeeping staff in the evening and morning, so that it can be given to the municipal van for final disposal of the waste. During the collection, the area, person disposing and shift is mentioned. The area, where all the BMW is assembled, is divided into 4 separate blocks namely red, blue, yellow and black.

Ideally the blue bin should be used for unbroken glass. A sky blue bin with a white color lid should be used to dispose off used needles and other sharp objects. Once this bin is closed, it cannot be open. This bin is puncture proof and is directly sent for incineration.

Additionally a “C” labeled dustbin is specially made for contaminated medicine and chemo drugs.

Also a separate type of green garbage collection bag should be kept to collect kitchen waste. This bag is biodegradable and can be used in the form of compost pit.

Color Coding	Type of waste	Disposal
Red	Used plastic items, catheters etc.	Autoclave Thashed Melted (no reuse)
Yellow	Body part or anatomical waste Ex. used gauze pieces	Incineration
Blue	Glass items, sharp instruments	Melted and reusable
Black	General waste	Dumped or incinerated

Table 2.3.3.1: Color coding for biomedical waste

Type of Spills

There are two types of liquid spills for which a spill team has been made:

1. Minor spill (less than 30ml)
2. Major Spill (more than 30ml)

In case of minor spill a personal protection kit (PPE kit) is used. The kit includes:

1. Tissue paper
2. Spatula
3. Yellow garbage collector
4. Trash newspapers
5. Hypochlorite

In case of major spill, which can be of body fluids, chemo drugs etc. A separate set of advanced kit called HAZMAT kit is used.

This kit includes a lot of different instruments and chemicals. To name a few:

1. Gumboots

2. Goggles
3. Chemical suit
4. Full face mask
5. Absorption pad
6. Spatulas
7. Fiber broom
8. 3kg sand(To make a boundary around the liquid, preventing it from further spreading)
9. Dust pan
10. Old newspaper
11. Yellow Garbage
12. Different chemical set (boric acid, citric acid, Hypochlorite)
13. Steel container

Without the Hazmat team, a hospital cannot get any NABH or JCI accreditation.

The hospital has a separate code for the spill team. The team should ideally include Nursing supervisor, Housekeeping supervisor, Infection control nursing team and housekeeping cleaners. The housekeeping is also responsible for pest control and horticulture for which separate AMCs are given.

2.3.2: Linen & Laundry:

As the name suggests the work of this department is to look after the cleanliness of the hospital. This department maintains 2.25 PAR for bed sheets and 2.1 PAR for patient dresses, which ideally should be between 3 to 4 (1 in use, 1 in laundry, 1 in inventory and 1 as back up) depending upon the location. The ICU should have a higher par in terms of stocking. The laundry service is outsourced to “Royal and bhushan” and the morning load is given back in the evening and the evening load in the next morning. Cost of towel is Rs5 and bed sheet is Rs4.75. Everyday a morning briefing is given to the staff and also the staff is trained in terms of making beds. There is a separate laundry for OT linen which works hand in hand with the CSSD.

2) Turnaround time:

The turnaround time (TAT) for getting a single room ready is 30 minutes and for a double rooms 20 minutes. Every floor has its own linen room from where linen is dispensed to the floor. Bed sheets are changed three times a day. Before the room is handed over to the patient, a checklist is signed by the floor coordinator to make sure everything is as per standards. Near the end of every month a physical counting is done.

PROJECT 1:

Prerequisite Of Establishing a Radiation Oncology Department

1) Introduction:

Cancer is a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. This is the second most common disease after cardiovascular disorders for maximum deaths in the world ⁽¹⁾. According to cancer researcher Robert A. Weinberg, "If we lived long enough, sooner or later we all would get cancer"⁽²⁾. The GLOBOCAN project of IARC, estimated that 14 million new cases were recorded in the world in 2012. The world's population is expected to be 7.5 billion by 2020 and approximations predict that about 15.0 million new cancer cases will be diagnosed; with deaths of about 12.0 million cancer patients. It is predicted that by the end 2020, over 10 million people would die globally each year because of cancer with 70% deaths from the developing countries ⁽³⁾. About 8 million people died of cancer in 2012, of which nearly 700,000 were in India. So, India has 17% of the world's population and about 8% of its cancer patients. In 2008, approximately 12.7 million cancers were diagnosed (excluding non-melanoma skin cancers and other non-invasive cancers),^[4] and in 2010 nearly 7.98 million people died. [2] With approximately 14 million new cases and 8.2 million cancer related deaths in 2012 ⁽⁵⁾. Prevalence of cancer in India is estimated to be around 2.5 million, with about 8, 00,000 new cases and 5,50,000 deaths per annum⁽⁶⁾. It is believed that in near future the number of cancer patients will increase in the developing countries, which may rise up to 70%⁽⁷⁾. Joseph Nicholas, CEO of Cancer Treatment Services International (CTSI), said, India was an underserved market for cancer care. It had a large number of cancer patients and a small number of cancer hospitals. There are only about 1,000 trained oncologists in the country and the ratio of oncologists to cancer patients is about 1:2,000. By comparison, the US has a ratio of about 1:100⁽⁸⁾. This is a mismatch between the number of patients with cancer and specialized doctors in this field has hit the expansion plans of corporate hospitals trying to foray cancer centers in the pipeline ⁽⁹⁾. Research reports suggest for those aged between 25 and 69 years, cancer is the fourth-leading cause of death in India (after cardiovascular diseases, respiratory diseases and tuberculosis). The Indian healthcare sector has spent the last decade or two focusing on diabetes and cardiovascular diseases, but it is now shifting its attention to cancer. Says Nicholas: "There is an opportunity to provide good cancer care by standardizing treatment." Approx. 65% of cancer patients need radiotherapy. The existing radiotherapy facilities available in the country for cancer treatment during the year 2007 There were 347 Teletherapy units (Telecobalt 258 units, Telecesium 4 units, Accelerator 85 units) and 240 Brachytherapy installations (Remote Brachytherapy 137; Manual Brachytherapy 103) in 237 centers across the country during the year 2007⁽¹¹⁾. The actual requirement of radio-therapy installations has been worked out for the country level from 2006 till 2016 based on the WHO recommendations that one cobalt unit is required for one million populations.

2) Literature Review:

The global cancer incidence is predicted to double between now and the year

2020 at which time there will be over 200,00,000 new cases diagnosed each year. Majority of these will be in the developing countries. Of these, 12,000,000 deaths will result. WHO estimates that if these trends continue, cancer will be the leading cause of death everywhere except in sub Saharan Africa and most victims will be in the 50-60 year age group.⁽¹⁰⁾

Radiotherapy is one of the major modalities of cancer treatment and every alternate cancer patient will require radiation during the course of treatment. By 2020, 70% of the global need for radiotherapy will be in the currently defined developing world.⁽¹⁰⁾

3) **Rationale:**

About more than 60% of the newly diagnosed cases will require radiotherapy for their treatment.

There are only 300+ cancer centers in India while as 600 more required to meet the demand. About 400 radiotherapy machines are available and 1200 more are required to cover the cancer population adequately.

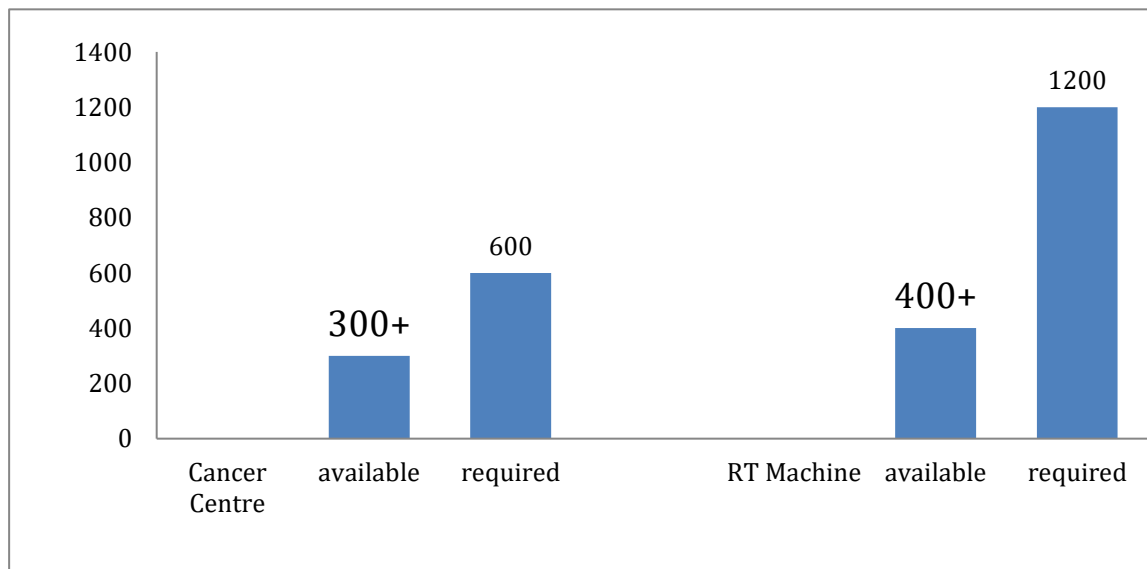


Fig.1. 3.1 Demand of Cancer centre & Radiotherapy machine

4) **Aim:**

Prerequisite of establishing a radiation oncology department.

5) **Objective:**

- To provide prerequisite of radiation oncology department
- Comparative study of radiation oncology department of various hospitals in Delhi/NCR

6) **Methodology:**

- Type of Study: Descriptive
- Location of Study: Delhi/NCR

- Duration of Study: 20 April 2015 to 20 May 2015
- Study Subject: Radiation oncology department of hospitals in Delhi/NCR
- Data collection Tool: Observation
- Data Analysis: MS Excel

7) Data analysis & interpretation:

Last 6 month data of oncology department of Paras hospital was analysed & out of which 545 are new cases & 270 cases are follow up.

Total cases	New cases	Follow up
815	545	270

Table 1.3.7.1 number of new cases & follow up in medical oncology department

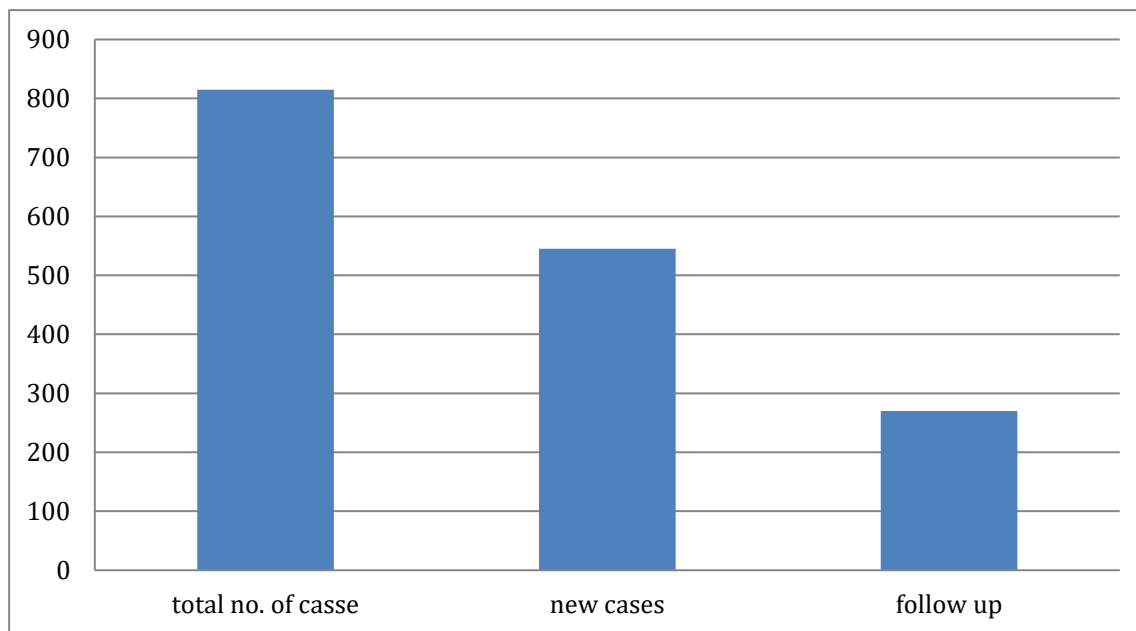


Fig. 1.7.1 Number of new cases & follow up in medical oncology department

Estimated radiotherapy cases – 60% of total no. of cases

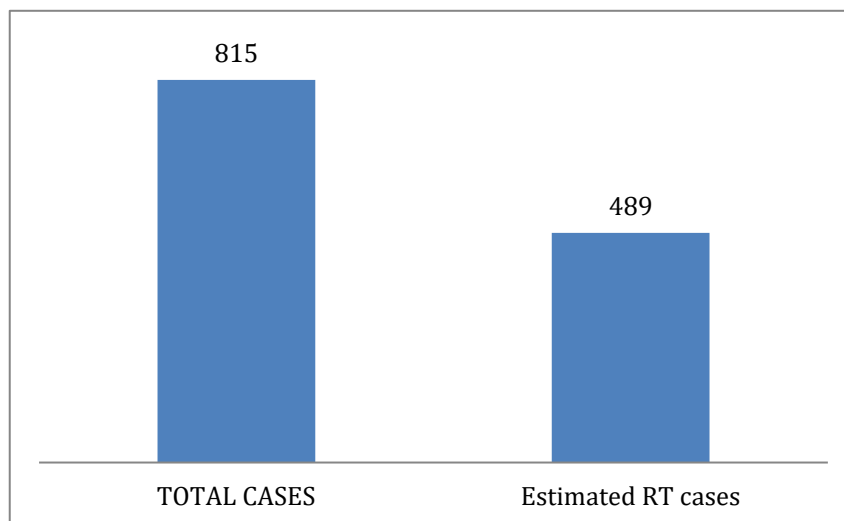


Fig. 1.7.2 Estimated Radiotherapy cases in oncology department

8) Radiation oncology:

Radiation therapy uses high-energy radiation to kill cancer cells. X –rays, γ rays & charged particles are types of radiation used for treatment. Machine which is used to emit x rays as well as γ rays is known as LINAC (linear accelerator)

Types – External beam radiation therapy(EBRT)

Internal radiation therapy

- 9) **External beam radiation therapy** is most often delivered in the form of photon beams (either x rays or gamma rays) .It is given with a distance from source to skin is greater than 5 cm.

EBRT treatment with conventional fractionation is done once a day with 1.8-2.0 Gy, 5 times a week and lasts for about 5-7 weeks. Majority of the tumors require EBRT doses in the range of 50-70 Gy. It is a painless and noninvasive procedure.⁽¹⁶⁾

Methods includes 3D-CRT (3 dimensional conformal radiation therapy) IMRT(intensity modulated radiation therapy),IGRT(image guided radiation therapy),Tomotherapy, Stereotactic surgery (SRS),Stereotactic body radiation therapy (SBRT).

IMRT uses hundreds of tiny radiation beam-shaping devices, called collimators and allows different areas of a tumor or nearby tissues to receive different doses of radiation. Bone cancer, Brain tumors, Breast cancer, Gastrointestinal cancer, Gynecologic cancer, Head and neck cancer, Lung cancer, Prostate cancer, Spinal cord cancer can be treated with the help of IMRT Technique.

3D-CRT is a technique where the beams of radiation used in treatment are shaped to match the tumor.

IGRT, repeated imaging scans (CT, MRI, or PET) are performed during treatment, which are used to identify changes in a tumor's size and location due to treatment.

Tomotherapy is image-guided IMRT. It can capture CT images of the patient's tumor immediately before treatment.

SRS uses extremely accurate image-guided tumor targeting and patient positioning So that a high dose of radiation can be given without excess damage to normal tissue. Small tumors can be treated with well-defined edges.

SBRT delivers radiation therapy in fewer sessions, using smaller radiation fields and higher doses than 3D-CRT.

10) AERB Guidelines for installation:

- **Sitting of the installation** - it shall be located in the hospital at a place where occupancy is the minimum.
- **Layout of installation**- treatment associated operations such as installation, source loading commissioning, patient treatment and decommissioning can be performed within the area with ease and safety.
- **Shielding** - The shielding for the radiation therapy installation shall be arrived at, taking into account the patient workload. The entry to the treatment room shall be of indirect type.
- **Safety interlocks & lights** - The treatment room in the case of Teletherapy and remote after-loading brachytherapy equipment shall have appropriate door interlock and warning light at/or near the entrance to the treatment room.
- **Zone monitor**- A radiation zone monitor shall be provided at a location near the entrance to the treatment room of telegamma and brachytherapy facilities to monitor radiation level.
- **Patient monitoring** - An appropriate patient viewing facility shall be provided between these rooms. Closed circuit TV system is provided to view the patient during treatment, Two-way communication system shall be provided between the patient and the treatment control panel.
- **Ventilation & air conditioning**- it shall have adequate ventilation & air conditioning.
- **Radiation symbol**- it shall be posted at the treatment room entrance and at the entrance of the controlled and supervised areas.
- **Temperature & humidity**: The unit shall be capable of being stored continuously in ambient temperature of 0-50 deg C and relative humidity of 15-90%
- The unit shall be capable of operating in ambient temperature of 20-30° c and relative humidity of less than 70%

11) LINAC:

The location of the teletherapy installation should be so chosen that it is close to the associated facilities. The associated facilities include Simulator room, Minor Operation Theatre, Mould room,

Treatment Planning System room, Physicist room, Radiation Oncologist room, Patient waiting area etc.

Associated facilities-Bunkers consist of the entrance (which may have a neutron door), a maze, a primary and a secondary barrier.

12) CT simulation :

Simulation is acquisition of scan (Ct scan CT/PET scan). These scans are used by oncologist to identify areas which needed to be radiated & tissue that need to be protected. It sets the teletherapy fields to the location of the tumor. Patient spend from 15 min to 45 min under this unit for treatment positioning.

Simulation Layout:

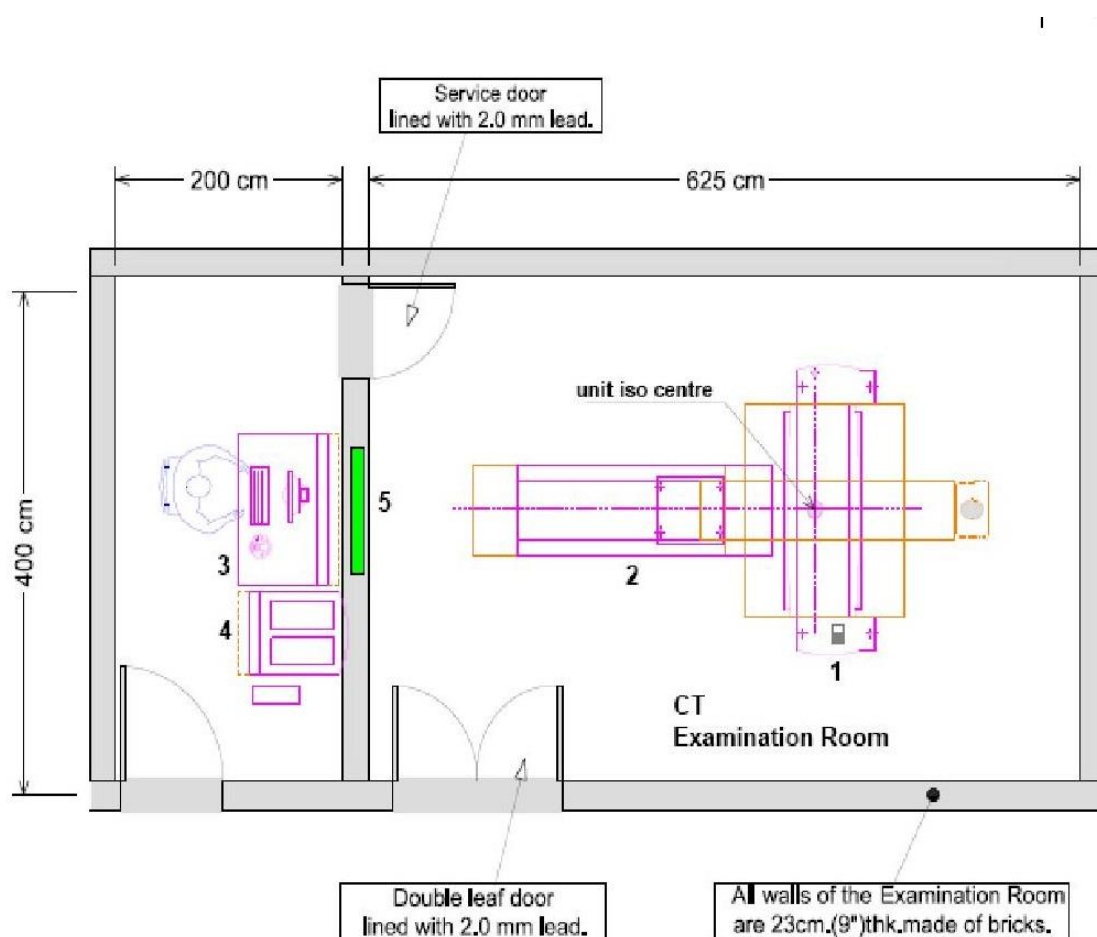


Fig. 1.12 Layout of CT - Simulation

- All walls of the examination room are 23 cm thick
- Service door & double leaf door are lined with 2mm lead

13) Mould room:

- In this room immobilization devices are used to insure the patient will be in exactly same position during the treatment or imaging. The unit must have special dosimetric and QA equipments for dynamic wedge dosimetry and QA tests.
- Equipments used for immobilization are Molds, head mask (thermoplastic material), vac. Lock (nylon urethane material) with Essential accessories as Shielding Block Holder: A detachable set of screwed shielding blocks and tray.
- **Shielding Blocks and Trays:** A set of screwed shielding blocks and tray.
- **Wedge Filters:** A motorized wedge system for variable wedge angles. The hard wedges for 15, 30, 45 and 60 degree also are provided.
- Accessory for Patient set up - A mechanism to support the patients hands.
- **Laser Localizer lights**-Laser Alignment System (4 cross laser system) All lasers will be diode green lasers.
- **Other accessories** includes Styrofoam cutter, water bath machine (temp: 60°C), hotpot.

14) Bunkers:

Bunkers are designed to prevent unintentional exposure of staff, patients & the public. It is designed typically with single entry point. Ideally room that adjoins the bunker room should be of minimal use except for console room. Air exchanges within bunker room should be at least 6times/hr. It consists of Neutron door, Primary barrier, Secondary barrier, and maze.

- Barriers are designed to attenuate almost all of the radiation produced by the linear accelerator. Barrier thickness is dependent on the position of the barrier relative to the linear accelerator gantry.
- **Primary barrier-** It is designed to prevent the primary beam radiation produced by linear accelerator typically 10 MV, 18 MV or 20 MV depending on the model. For 18 MV, a barrier thickness of 260 cm of concrete is sufficient.
- **Secondary barrier-** It is designed to prevent the scattered radiation from primary beam & leakage from treatment head.
The secondary barrier thickness is typically half of the primary barrier thickness.
- **Maze-**Maze is designed to prevent scattered photons from exiting the bunker directly. It reduces the amount of radiation that escapes from the bunker. The exception to this is when neutrons are generated through photodisintegration (photon energies over 10 MV).
- **Neutron door-**It is used to prevent the scattered neutrons. Neutrons doors should contain a 12 cm panel of boranated polyethylene which is a good neutron absorber. Sometimes photons may be released through the neutron absorption therefore an additional lead barrier of 2.5 cm thickness should be added on the outer side of the door to prevent the photons.

15) Layout of LINAC (6MV):

Walls made up of Concrete of density of 2.35 gm/cc

Area- 6m* 7m

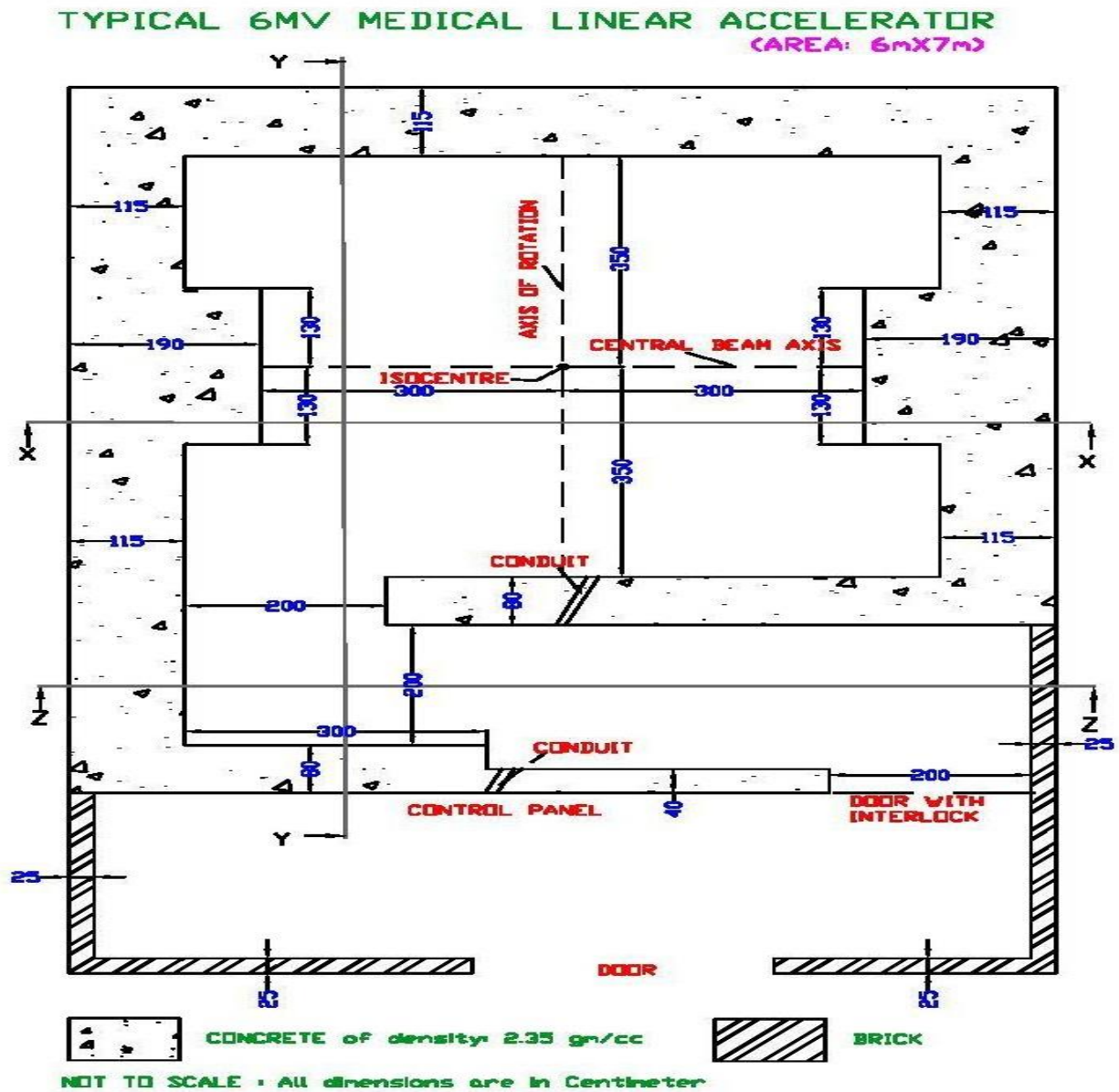
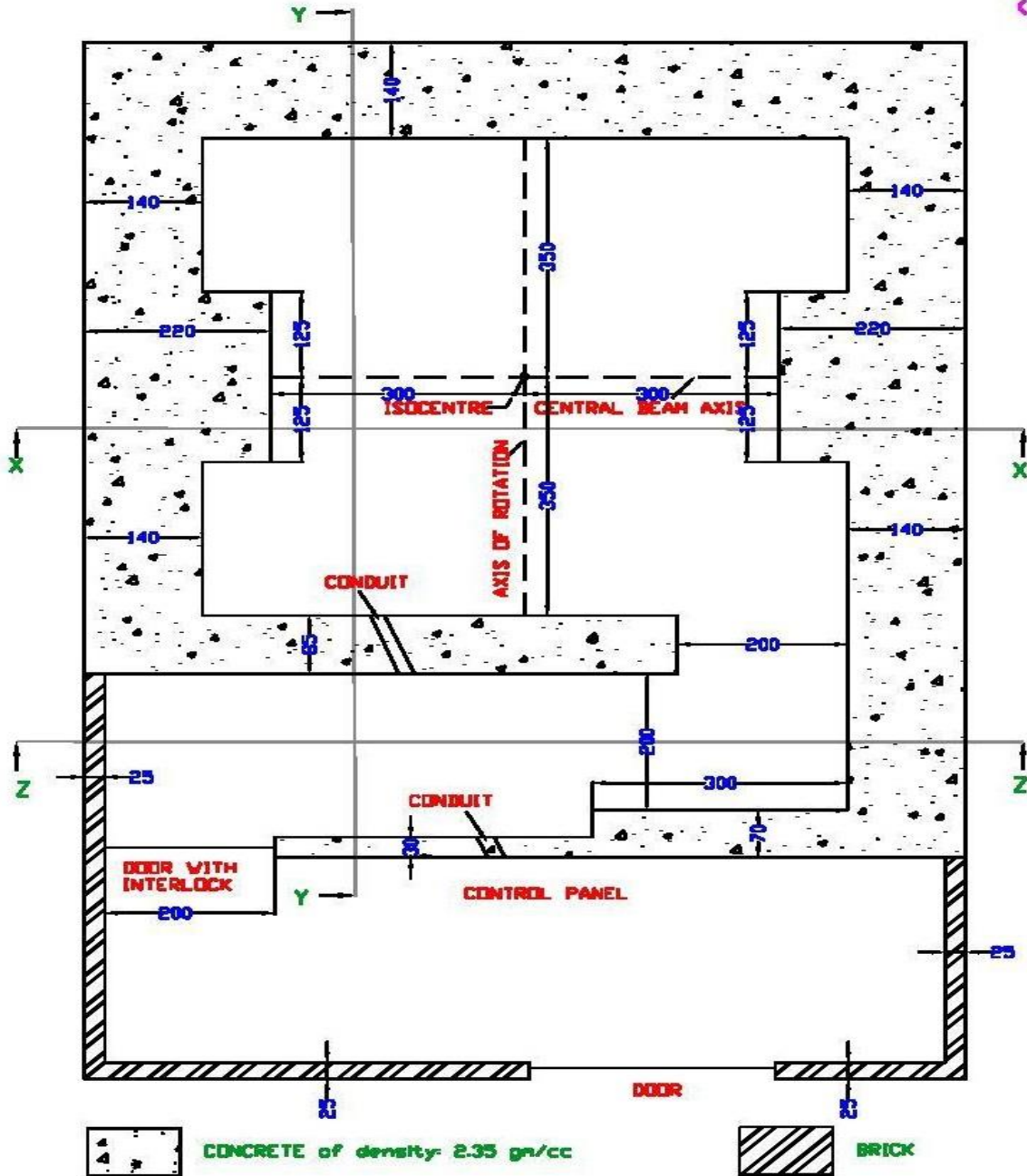


Fig. 1.15.1 Layout of Linear Accelerator room (6MV)

Layout of LINAC (15MV):

TYPICAL LAYOUT OF 15MV MEDICAL LINEAR ACCELERATOR

(AREA: 6m x 7m)



NOT TO SCALE : All dimensions are in Centimeter

Fig.1.15.2 Layout of Linear Accelerator room (15MV)

- The main components of a teletherapy machine are: Radioactive source, Source housing, including beam collimator and source movement mechanism, Gantry and stand, Patient support assembly, Machine control console.
- They are most often mounted isocentrically with SAD of 80 cm or 100 cm.

16) Internal radiation therapy (brachytherapy): Branch of radiation therapy which relates to the uses of sealed sources for: implants and intra-cavitary insertions, external mould/surface applications, in which the source to skin distance is not more than 5 cm. On the basis of dose rate brachytherapy has been categorized in 3 categories-

Low dose rate (LDR; 0.4-2 Gy/h) , Medium dose rate (MDR; 2-12 Gy/h)

High dose rate (HDR; >12 Gy/h) .

The usual treatment with low dose rate (LDR) brachytherapy takes about 3 days & requires one or more fractions. On the other hand HDR brachytherapy treatment is delivered in minutes but multiple fractions (ave. 3-7 fractions) are required.⁽¹⁶⁾

Layout of Brachytherapy:

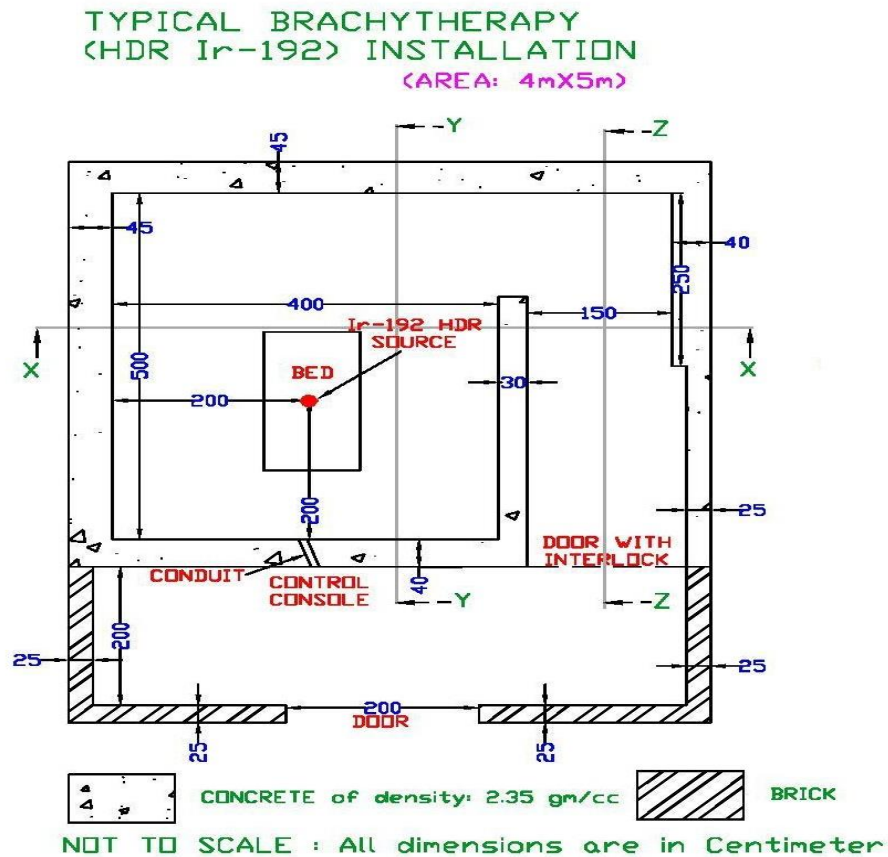


Fig. 1.16 Layout of Brachytherapy room

- **Intra-cavity radiation:** Here the radioactive sources are placed in a holder and inserted into the body organ, such as the uterus.
- **Interstitial therapy:** Here rods, ribbons, or wires are directly inserted into the soft tissues of the body and placed right into the tumor for example carcinoma of the tongue.

16) Radiation leakage:

X-ray absorbed dose due to leakage radiation (excluding neutrons) outside useful beam but inside a plane circular area of radius 2 m centered around and perpendicular to central axis at normal treatment distance. to avoid radiation leakage radiation oncology dept. should have Collimator transmission, Neutron dose inside the treatment area and outside the treatment area ,High Voltage Protection, anti collision system, emergency cut-offs,all the interlocks & indicators.

17)Quality assurance tools:

One flat bed films scanner with appropriate software shall be provided to check flatness and symmetry of beams at gantry angles 90^0 , 180^0 and 270^0 . A reliable and precise D20/D10 phantom for Quality Index verification.

One latest, most precise and reliable Ionization Chamber based survey meter shall be supplied. The survey meter should be sensitive to gamma and X-ray of energy from 20keV to 20MeV with micro resolution. Operating range should be at least 0.0 $\mu\text{R/hr}$ to 5 $\mu\text{R/hr}$. It shall have digital readout and indication for Low Battery, Mode and peak hold and it shall be capable to measure dose rate and dose simultaneously with capability to record peak dose rate. Case shall be light weight and made up of high strength material and shall be sealed against moisture.

- **Quality Assurance Test:** A list of daily weekly, monthly and yearly QA test must be provided.

18)Radiation protection: For radiation protection dose limit should be as follows-

Part of the body	Occupational Exposure	Public Exposure
Whole body	20 mSv/year averaged over 1 mSv/y 5 consecutive years; 30 mSv in any single year	1 mSv/y
Lens of eyes	150 mSv in a year	15 mSv/y
Skin	500 mSv in a year	50 mSv/y
Extremities Hands and Feet	500 v in a year	-

Table 1.3.18.1 dose limit for parts of body

19) Radiation protection signage's : Signage's should be –



Fig.1.19.1 Basic radiation Tri-Foil sign
Radiation Symbol for Radioactive packages



Fig.1.19.2 Radiation Warning sign to put on the radiation installation.
High radiation area (isotopes)



Fig.1.19.3 Radiation warning sign for radiation workers awareness not for the public display.

20) Radiation protection gadgets:

- Radiation can be measured and quantified its level in our environment by radiation monitors and sensors. Most of the area radiation survey meters are based on gas ionization process.
- Radiation detectors used for personal monitoring for the record of radiation dose received by particular individuals are generally based on the thermo luminescence process.

21) Manpower:

- Radiation Oncologists – minimum one per unit
- Medical Physicists – minimum one per unit

- Radiological Safety Officer – (nominate Medical Physicist, if eligible, to perform additional responsibility)
- Radiotherapy Technologists – minimum two per unit.

22) Procurement of instruments:

Personnel Monitoring Badges & pocket dosimeters from the agency recognized by AERB for the radiation workers. Appropriate Monitoring equipment (survey meter, contamination monitor, gamma zone monitor), Measuring equipment (RFA, SSD with thimble /parallel plate/well type chamber etc.) other instruments includes TPS, CT- Simulator, Beam modifier, Moulds, QA Tools.

Procurement of other associated equipment:

- TPS, CT- Simulator, Beam modifier, Moulds, QA Tools

Authorization to procure radiation sources:

Authorization from RSD, AERB for procurement of sources.

Issued based on availability of

- adequate no. of qualified manpower
- personnel monitoring badges for staff
- approved and constructed room for source
- radiation monitoring equipments
- dosimetric equipments
- minimum required QA tools

23) Requirement of consent form:

Requirement of consent form for the approval of siting, design, construction, commissioning, decommissioning, sealed sources, radiation generating equipment, Equipment containing radioactive sources, package design for transport, shipment approval for radioactive consignments.

24) Periodic performance/ status report:

Performance tests of the unit, check of the sources, check of the installations to be carried out periodically. Submission of annual safety status report by the end of each calendar year. Reporting incidents or accidents within 24 hrs. Lodge written complaint with police in case of loss or theft of radioactive sources, if not traced within 24 hours. Transport of sources as per the transport regulation for radioactive material.

25) Study of radiation oncology department in corporate hospitals of Delhi & NCR:

Parameters	MAX Hospital, Patparganj	Asian Institute Of Medical Sciences, Faridabad	Artemis Hospital, Gurgaon
Accreditation	NABH &NABL Accredited	NABH & NABL accredited	JCI , NABH & NABL Accredited
Location	Basement 3	Basement 2	Basement 1
Surrounding Departments	• RO room • UPS LT room • Security room • IT	• Nuclear medicine • HR • Marketing • IPD Billing • IPD Pharmacy • IT • Laundry • Staff canteen	• Nuclear medicine • Ophthalmology department • Dialysis • CSSD • Linen & laundry • Lab • Store room
Department Above	• Linen room • Biomedical room • Training room	• Emergency department • MRD • Parking	• OPD
Mould Room	• Masks (thermoplastic material) • Water bath machine • Vac. Lock • Styrofoam cutter • Laser machine • Head & neck rest	• Masks (thermoplastic material) • Water bath machine • Vac. Lock • Styrofoam cutter • Laser machine • Head & neck rest	• Masks (Thermoplastic materials) • water bath machine • laser machine • Head & neck rest

Brachytherapy room	• Brachytherapy machine (Nucletron) • 18 channeled • Area monitor • Oxygen outlet • Ir192 isotope • transfer cables Support area- • Console room • Equipments of minor OT	• Brachytherapy machine (Nucletron) • 24 channeled • Area monitor • Oxygen outlet • Ir192 isotope • transfer cables Support area- • Console room • Equipments of minor OT	• Brachytherapy machine (Nucletron) • 18 Channeled • area monitor • Ir192 isotope is used • transfer cables Support area- • Console room
LINAC Room	• LINAC machine (Varian) • MeV – 6-15 • width of Primary wall- 5-5.5 m • Width of maze- 2- 2.5 m Other equipments- • Storage cart • Stand for total skin therapy • Oxygen outlet	• LINAC machine – (Varian) • MeV – 6-15 Other equipments- • Storage cart • Oxygen outlet	• Linear accelerator machine – (Elekta) • MeV – 6-15 • Width of maze is 1m • Width of primary wall is 2- 2.5 m. • Neutron door in t/t room Other equipments- • Storage cart • Oxygen outlet
CT Simulator Room	• CT Machine (Siemens) • Laser lights • Oxygen Outlet • Crash cart		

Total Patients Breakup	• New cases-40-45 pt/month • Brachytherapy- 9-10 Pt/ month • Teletherapy-45-50 pt/ day • Palliative care-5-6 pt/day	• New cases- 15-20 pt/month • Teletherapy -4-5pt/day • Brachytherapy – 6-7 pt/month	• New cases-20-25pt/month • Teletherapy- 30-35 pt/day • Brachytherapy – 10 pt/month
Manpower	• Consultant – 8 • Medical physicist- 4 • Technician- 7 • Nurses- 3	• Consultant – 1 • Medical Physicist – 2 • Technologist –3 • Nurses- 3	• Consultant- 5 • Medical physicist 4 • Technician- 9 • Nurses- 5
Treatment package	• IMRT-154500 • IGRT-213200 • 3D-CRT-94750 • Adjuvant radiation- 69000 • Palliative radiation (single)- 43250 • Palliative radiation (multiple)- 43250 • Whole body electrons- 135950 • Intracavity brachytherapy- 15450 • Intraluminal brachytherapy- 12350 • Electron boost- 20600 • Interstitial brachytherapy- 61800	• IMRT- Planning- 20,000t/t Procedure-1,45,000 • IGRT- Planning-20,000 t/t procedure-1,95,000 • 3D-CRT- Planning- 20,000 t/t procedure- 1,05,000 • Intracavity brachytherapy- 30,000 • Intraluminal brachytherapy- 20,000	• IMRT – 1,53,817 • IGRT – 2,11,553 • 3DCRT- 1,30,000 • Simple Palliative- 53,098 • Complex Palliative – 79,000 • Brachytherapy Sorbo- 25,000

Treatment Package :

INCLUDE	EXCLUDE
MOULD	INVESTIGATIONS
CT SCAN	MEDICINES,CONSUMABLES,DRESSINGS
RADIATION PLANNING	HOSPITALIZATION
RADIATION SITTING	

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15. RADIATION THERAPY IN THE MANAGEMENT OF CANCER:G K Rath

Project 2: A Study on Training Needs Assessment:

2.1 Introduction:

Training is a learning experience that seeks a relatively permanent change in an individual that will improve his ability to perform on the job.

Training plays an important role in manpower development. Employees need training to perform their duties effectively, eliminate wastage and reduce accident.

Advantage of the organization:

- It improves the job knowledge and skills at all levels of the organization.
- It improves the morale of the workforce and helps people to identify with organizational goals.
- It leads to improved profitability.
- It helps in developing leadership skill, motivation, loyalty and better attitudes.
- It helps to improve corporate image & reduce outside consulting cost.

To the employees:

- Encourages self-development and self-confidence.
- Facilitate employees to handle stress, tension & conflict.
- Helps in better decision making and problem solving.
- Improves leadership skills, communication & attitude
- Enhances group cohesiveness.
- Increases job satisfaction, reduce labor turnover & absenteeism

Linkage of Training with organizational Goal

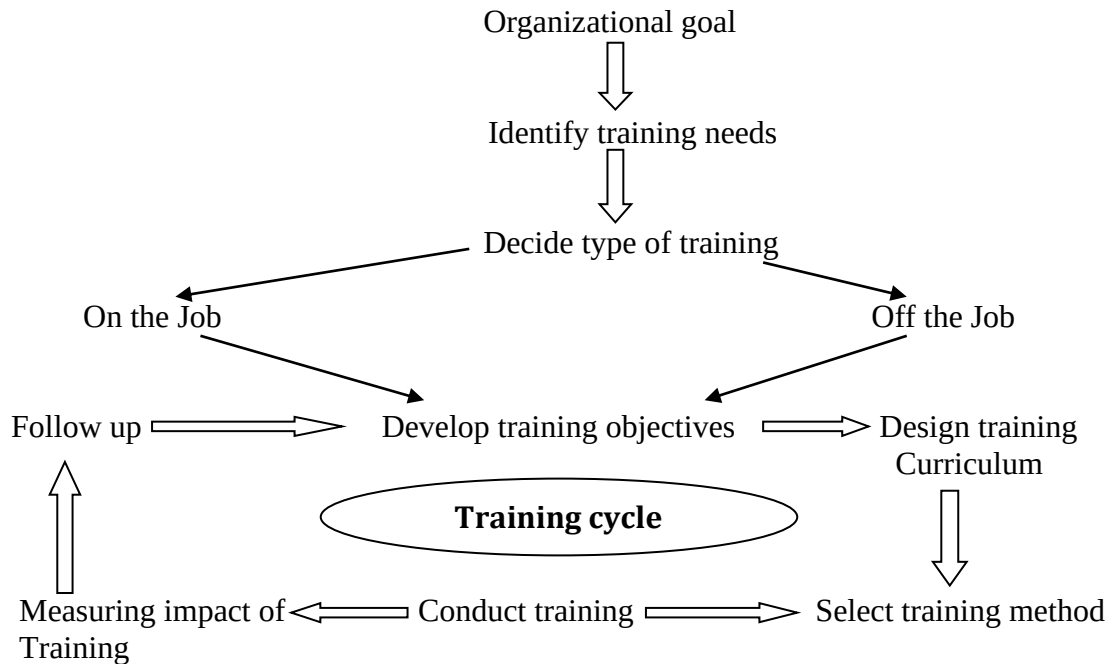


Fig.2.1.1: Linkage of Training with organizational Goal

Identification of Training Needs/Training Need Analysis:

- The need for training should be considered when
- New methods or work procedures are introduced.
- Employees lack a sense of purpose and commitment to the company.
- Cost of operations is increasing without apparent reasons.
- Accidents are increasing.
- Pride in the job and company is missing.
- Complaints and grievances are excess.
- High turnover and absenteeism are prevalent.

Training methods:

- Class room lectures
- Conferences/seminars
- Group discussions/case study analysis
- Role playing/games
- Audio-visual/film shows
- Simulation

2.2 Literature review:

The Training Need Analysis is a significant first step in the successful designing and implementation of training programmes. TNA is a primary phase in the designing and development of training programmes (Dierdoff & Surface, 2008). Conducting systematic needs assessment can significantly impact the overall effectiveness and quality of training programmes (McGehee & Thayer, 1961).⁽¹⁾

Identification of training needs, design and implementation of training programmes, transfer of training, and evaluation of programme benefits are key activities (Krishnaveni & Sriprabaa, 2008) in addition to studying general training variables such as types of training, selection of trainees, selection criteria, evaluation instruments, etc.⁽²⁾

2.3 Aim: Identify the training need of nursing department**2.4 Objectives:**

- To identify the training need in various training programme
- To categorized the staff for further training programme

2.5 Research methodology:

- Department involve: Nursing
- Type of study: Analytic study
- Duration of study: 15 May- 30 May 2015
- Sample size: 35 people for each training programme

- Sample selection: Convenient sampling
- Method of Data collection: Primary data collection from the questionnaire prepared
- Data analysis : Bar diagram is use to represent analysis
- Questionnaire type: Fill in the blank, yes & no type and open ended
- Topics on which training is been given:
 - Goal setting
 - Professional etiquette
 - Work place etiquette
 - Time management
 - Empathy
- Training method: Questionnaires are filled by the staff before and after the training session that is called Pre test & post-test. The difference between the score of post test and pre-test is called learning index.

$$\text{Post test score} - \text{pre-test score} = \text{Learning Index}$$

Based on learning index we can measure the training need of particular staff.

Type of training need:

- Advance training
- Regular training
- Basic training

2.6 Data Interpretation & Analysis:

Goal Setting:(Annexure 1)

	Test score	Pre	Post
Goal setting	>3	14	0
	3to 5	18	0
	5 to 7	1	2
	>7	0	33

Table: 2.6.1: Goal setting

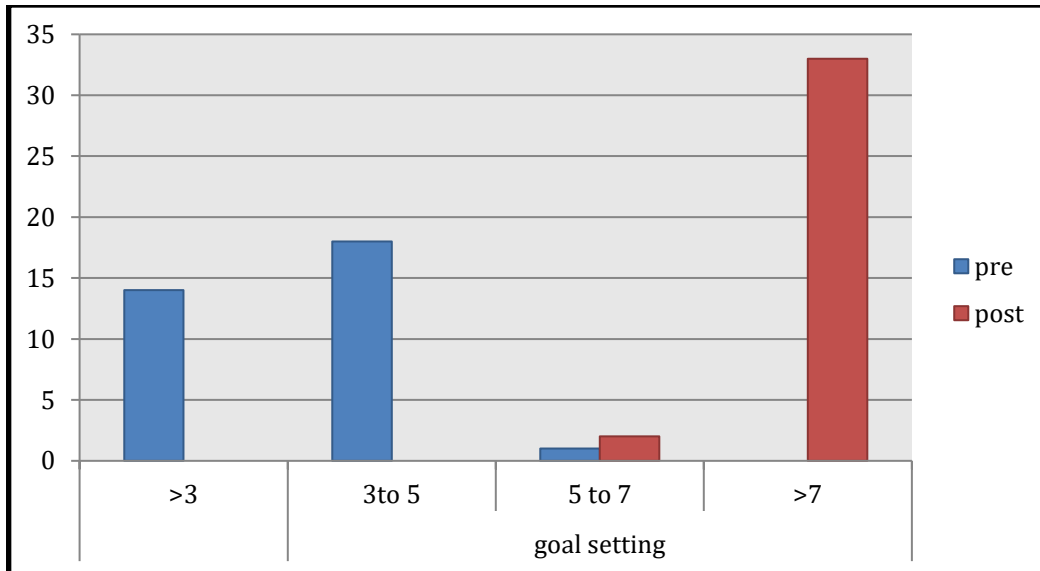


Fig: 2.6.1: Goal setting

Work Place Etiquette: (Annexure 2)

Work etiquette	place	Test score	pre	post
		>3	5	0
		3to 5	3	0
		5 to 7	13	7
		>7	14	28

Table: 2.6.2: Work place etiquette



Fig: 2.6.2: Work place etiquette

Professional Etiquette: (Annexure 3)

Professional etiquette	Test score	pre	post
	>3	1	0
	3to 5	7	0
	5 to 7	23	2
	>7	4	33

Table: 2.6.3: Professional Etiquette

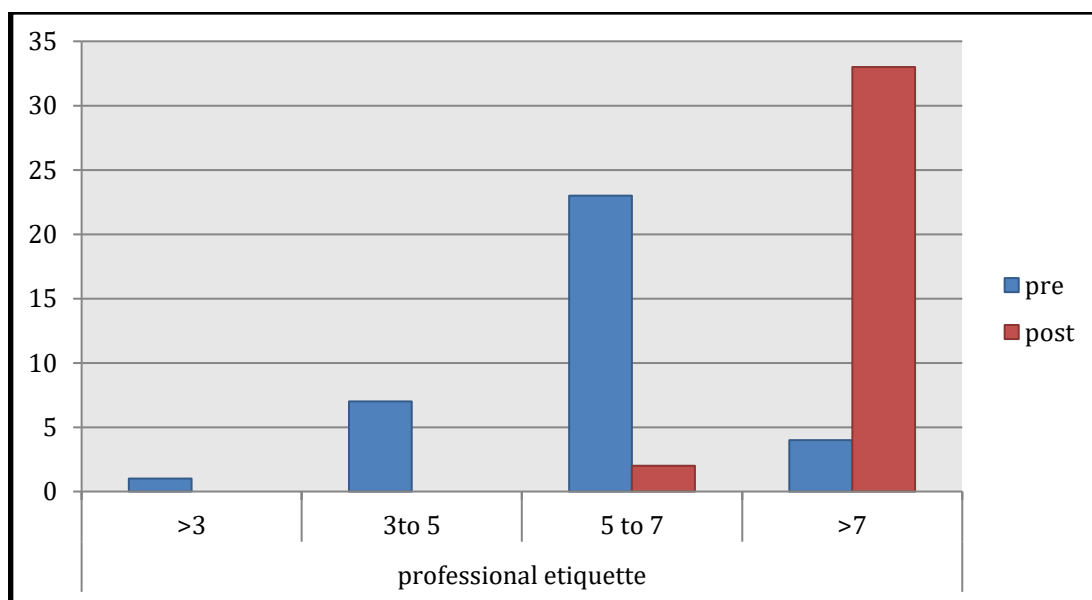


Fig: 2.6.3: Professional Etiquette

Empathy: (Annexure 4)

Empathy	Test score	pre	post
	>3	10	0
	3to 5	20	1
	5 to 7	5	1
	>7	0	33

Table: 2.6.4: Empathy

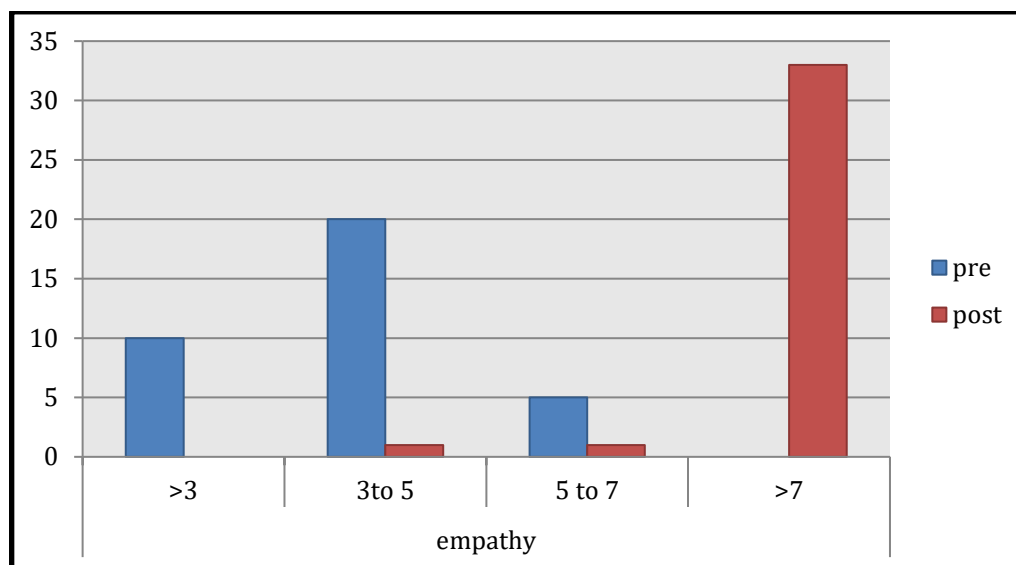


Fig. 2.6.4: Empathy

Time management: (Annexure 5)

Time management	Test score	pre	post
	>3	16	0
	3to 5	19	0
	5 to 7	0	8
	>7	0	27

Table: 2.6.5: Time management

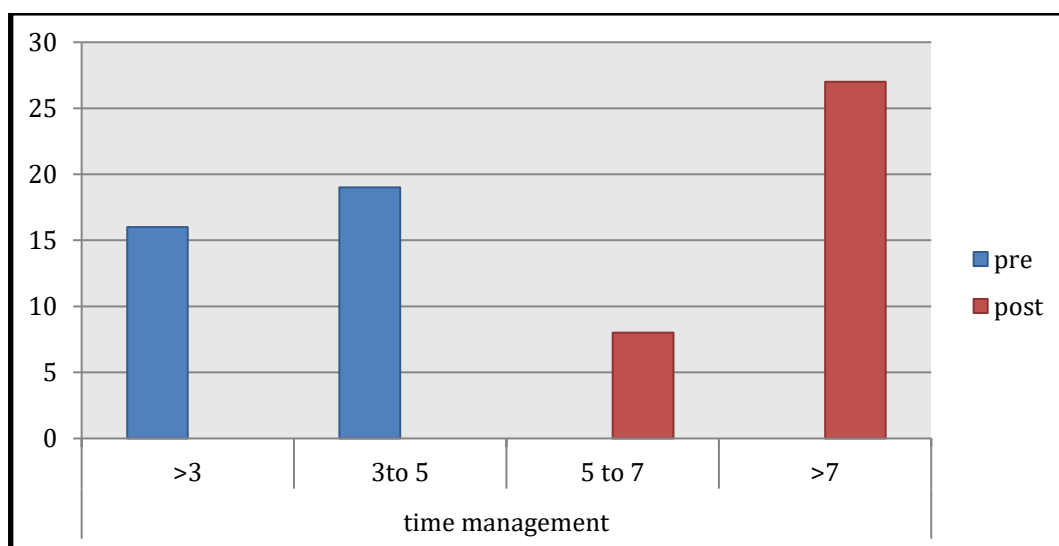


Fig. 2.6.5: Time management

Learning index:

	Workplace etiquette	Empathy	Time management	Professional etiquette	Goal setting
pre test (avg.)	5.9	3.4	2.3	5.3	2.6
post test(avg.)	8.9	8.7	8.3	9.5	9.2
Learning index(avg.)	3	5.3	6	4.2	6.6

Table: 2.6.6: Learning index

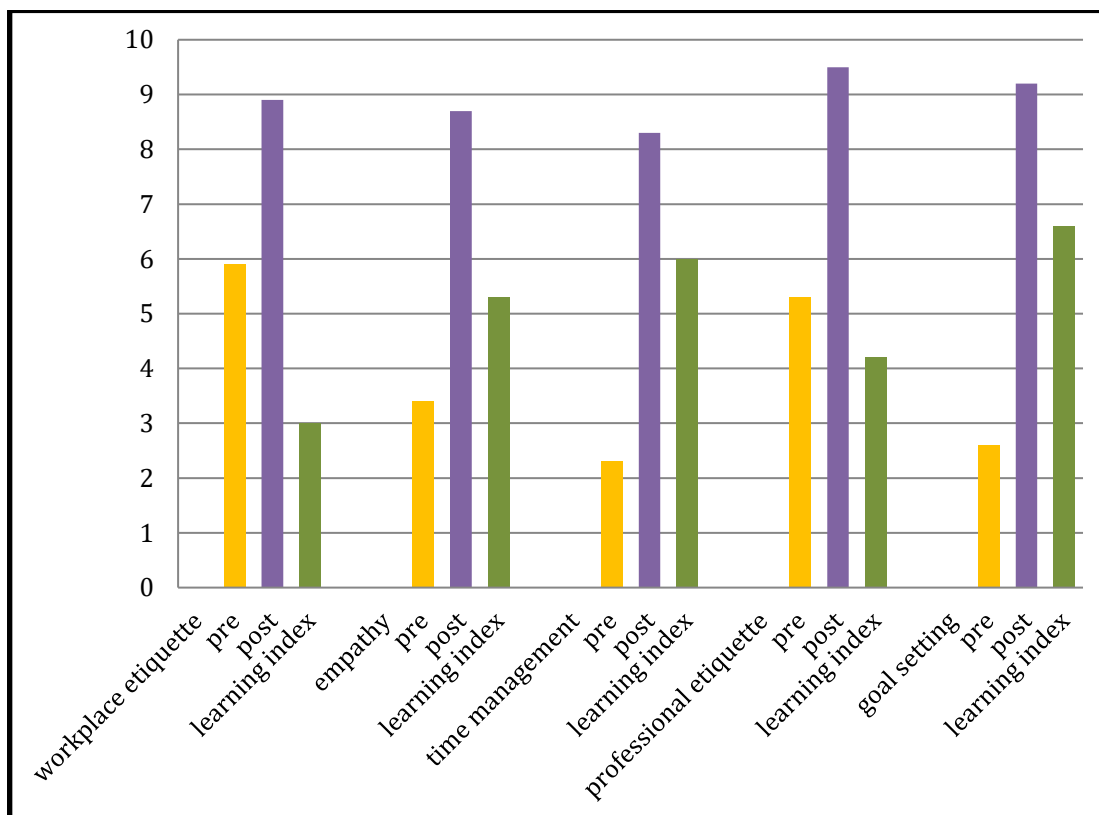


Fig: 2.6.6: Learning index

The graph above shows that post the training session, the employees' performance improved by a great margin.

The difference in the heights of the graphs depicts that people performed better in the post-training test of empathy, goal setting and time management whereas the short range of the graph of the post-

training test of professional etiquette and workplace etiquette shows that most people were already aware of the etiquettes on the workplace.

Hence, the learning index was high for goal setting, empathy and time management.

People score more than 7 in post test– (Superior)

These people have good learning capacity, they actively participate in training session, eager to learn and want to improve their profession skill.

Recommendation- They require advance level of training.

People score 3 - 5 and 5 - 7 marks in post test- (Good)

These people have average learning capacity.

Recommendations- They require regular training session.

People score less than 3 marks in post test- (Average)

These people may have less learning capacity due to low level of confidence, language barrier, high level of hesitation.

Recommendation- these people required more of basic training session, personal interview, counseling, language training to reduce the hesitation level, improve understanding. A special task can be given to them and followed by incharge to check the improvement level.

2.7 Recommendation:

- Provide training sessions to the people according to their potential.
- It can help in the retention of superior employees and for below average employees it helps to improve their working capability which overall improves the growth of the organization.

2.8 Conclusion:

- As we have done this training need assessment in nursing department, staff of the any department of the hospital can be trained in same way.
- With the help of the given training assessment, we can reduce the attrition of employees and the biasness at the time of appraisal.

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2.10 Annexure:

Annexure – 1 (Questionnaire) Goal setting

1. _____Prevents individuals from achieving their best.
(Low goal setting)
2. Goal setting is the skill which can make the difference between_____and
_____Performance. (Superior and average)
3. Goal setting is about writing down wants and setting deadline to achieve (True/False)
(True)
4. The power of goal often excites the achiever to face the future with anticipation of achieving
(True/ False) (True)
5. It is about setting well-defined goals and the advantage of self motivation (True/False)
(True)
6. Smart goal are S_____,M_____,A _____,R _____ ,and T_____.
(Smart, Measurable, Achievable, Relevant and Time bound)
7. There are two type of goal and these are 1._____Goals & _____goal.
(Long term, Short term)
8. Long term goals are generally from_____ year to _____year.
(1, 10)
9. Short term goals are generally from _____day to _____year.
(1, 5)
10. A goal with no plan is just a wish. (True/false).
(True)

Annexure – 2 (Questionnaire)

Work Place Etiquette

1. A professional should dress appropriately at work place. (True/False)
(True)
2. A professional should always be punctual at workplace. (True/False)
(True)
3. To become a superior professional one should maintain good communication with internal and external customers. (True/False)
(True)
4. A professional should always work to remain self motivated.(True/False)
(True)
5. _____ Is an attitude of respect towards other people and what they are attempting to express. (Listening)
6. Listen = _____ (Silent)
7. To become a superior professional one should be respectful and courteous to fellow co-workers.(True/False) (True)
8. To become a superior professional one should participate in inappropriate conversation. (True/False) (True)
9. To become a superior professional one should arrive at workplace unprepared. (True/False)
(False)
10. To become a superior professional one should engage in non-work related activities. (True/False) (False)

Annexure – 3 (Questionnaire)

Professional etiquette

1. Use _____ to meet with clients or vendors, when reprimanding a junior or a for personal call.
(Conference room or meeting room)
2. Seek _____ by knocking or establishing eye contact before entering a cubical or room.
(Permission)
3. In case of overhear some confidential information, pretend you did _____ hear and do not spread _____.
(Not, gossip)
4. Use your _____ voice when speaking in a cubical or room.
(Library)
5. 4A's of complain handling are 1. _____ 2. Acknowledge 3. _____ 4. _____
Action (Attitude, Apology)
6. Answer the phone within _____ rings.
(3 ring)
7. Put your _____ on silent or vibration mode when in cubical, room or with patient
(Mobile or Phone)
8. Personal grooming (eg. Neat & combed hair, clean shaven, clean & ironed uniform Etc.) is not an integral part of customer service excellence.(True / False)
(False)
9. Having short neat and tidy hair is an integral part of grooming in customer service
(True/False)
(True)
10. Do talk too loudly over phone while moving in a lift or lift. Do set loud ring tone in your mobile phone (True/ False)
(False)

Annexure – 4 (Questionnaire)

Empathy

1. Empathy in customer service is _____
(Putting yourself in other people shoe.)
2. Acknowledge your customer means using words like _____
3. Our customers are very important to us. Make them feel that. (True/False)
(true)
4. Treat our customers the way we want us to be treated. (True/False)
(true)

5. The easiest way to separate sympathy from empathy is to remember :

Empathy is about _____ , while sympathy is about _____
(Feeling & action, action)

6. If any customer likes our services & praises, the empathetic statements can be
_____ (thank you)

7. If a customer criticizes , the empathetic statement can be _____
(sorry)

8. The four power words in customer service are (a) _____
(B) _____ (c) _____ (d) _____
(wonderful, absolutely, great, that's good to hear)

- 9) The four listener feedback words are (a) _____
(b) _____ (c) _____ (d) _____
(Alright, I see, Ok, I understand)

- 10) The four empathy statements are (a) _____
(b) _____
(c) _____
(d) _____

Annexure – 5 (Questionnaire)

Time management

1. What are the time wasters (any four)

(a. Lack of discipline b. Worrying c. Too much socializing d. not finding resources)

2. What is the the way to deal with time wasters?(any Three)

(a. Reading books b. Planning c. Think about your goal)

3. Time management is about organizing your competing priorities in the limited time available
(True/False) (True)

4. Time management has very little to do with time. (True/False) (True)

5. You must educate your friend and, family member & colleagues to respect your work space & time (True/ False) (True)

6. The quadrant of necessities has ____importance and____urgency tasks.
(High, High)

7. The Quadrant of quality has____importance and____urgency tasks.
(High, Low)

8. The quadrant of deception has ____importance and ____urgency tasks.
(Low, High)

9. The quadrant of waste has ____importance & ____urgency Tasks.
(Low, Low)

10.What is pareto principle in time management?

(80% of success comes from 20% of right efforts.)

Annexure: 6 Data Sheet

[illegible]

Project 3:

A Time Motion Study On Radiology department

3.1 Introduction:

The department of radiology provides a full range of imaging services for every age group right from the infant to the old age person at Paras hospital, Gurgaon. Patients visit to radiology department for various reasons, like to get their diseases diagnosed & for further treatment and consultation, not only for treatment but also as a preventive measure in case of preventive health measure.

Scope of services of radiology department:

The imaging centre at paras hospital is equipped with the following-

- ✓ Digital X ray including portable x-ray machine
- ✓ Ultrasound
- ✓ CT scan
- ✓ MRI
- ✓ Mammography
- ✓ DEXA & BMD procedures

Function of radiology department:

- To conduct the radiological investigations as per mentioned scope of services.
- To provide quality services based on quality assurance system.
- To ensure staff safety while conducting the radiological procedures & follow the defined safety parameters.
- To deliver the reports within defined TAT for every test.
- To ensure calibration status of all the equipments are updated.

X-Ray and Ultrasound procedure:

Purpose:

To diagnose medical conditions like structural, pathological & functional abnormalities.

Process flow of X-ray:

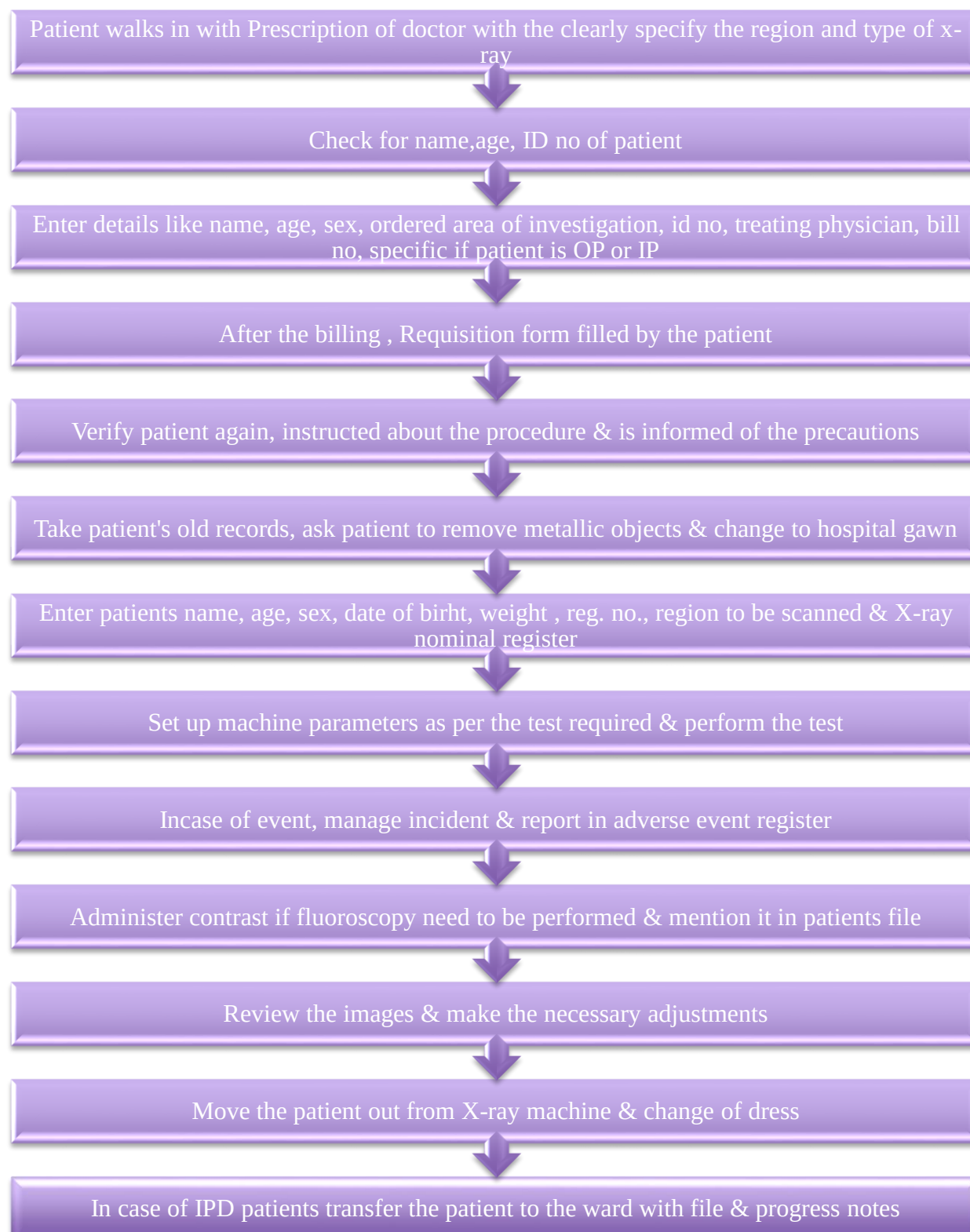


Fig: 3.1.1: Process flow of X-RAY

Ultrasound process flow:

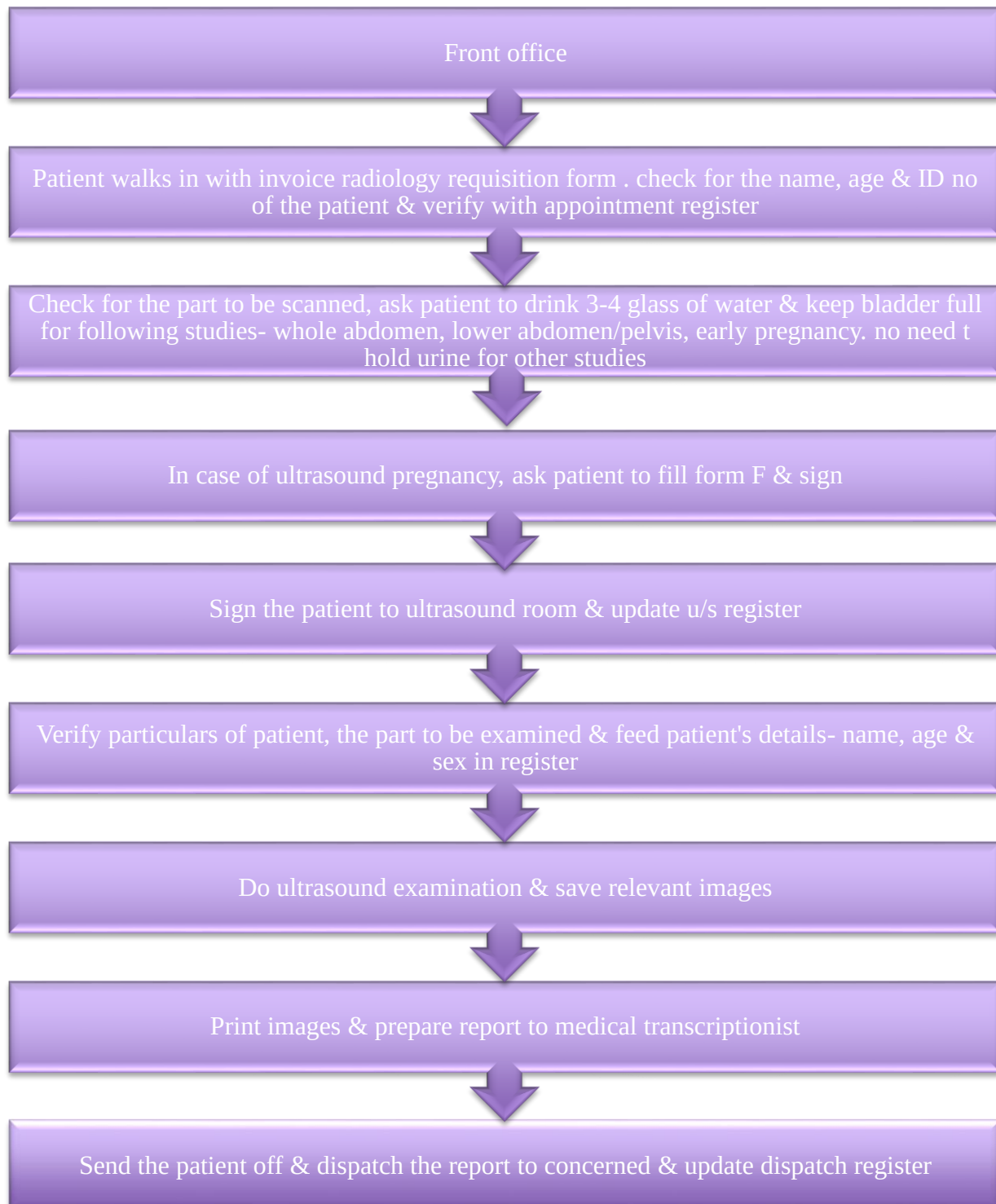


Fig: 3.1.2: Process flow of ultrasound

Turnaround time (TAT):

Time when patients arrives till the time patient enters in the procedure room.

The standard TAT for appointment patients is 15min.

3.2 Literature review:

Health care processes are difficult to define because of their complexity [1]. Assessing time definitions in clinical processes can help to analyse workflows in hospital information systems (HIS) and to identify weak points [2]. Due to increasing costs in health care it is important to improve the efficiency of clinical workflows

In January 2010, the Hurley FAHC, in collaboration with North Shore-LIJ Health System, implemented a process improvement project to reduce patient turnaround time (TAT) and improve quality in the internal medicine residency clinic.

The premise of this project was that decreased patient wait-times in the internal medicine clinic would increase overall patient satisfaction (3)

3.3 Aim:

- Study the TAT of X-Ray and ultrasound in radiology department.

3.4 Objective:

- To study the TAT for X-Ray & Ultrasound procedure in radiology department.
- To identify the problem in the processes & service delivery system from patient's perspective leading to delay.
- To analyze the collected information & suggested recommendations for the same.

3.5 Research methodology:

- Study Design: analytical study
- Study Area: Paras Hospitals, Gurgaon
- Study duration: 10 April 2015 to 25 April 2015
- Study subjects: Patients coming in radiology department to get the X-Ray & Ultrasound done.
- Sample size: 93 patients out of which 35 patients of ultrasound & 58 patients of X-ray.
- Sampling technique- simple random sampling

- Study time- 9am – 4pm
- Inclusion criteria- patients who have come for ultrasound & X-Ray both OPD & IPD patients.
- Data collection methods-

Primary data- by observation of patients

3.6 Data analysis & interpretation:

For Ultrasound:

USG	
Waiting time	No. of patients
>15 min.	10
15-30 min.	13
<30 min	12

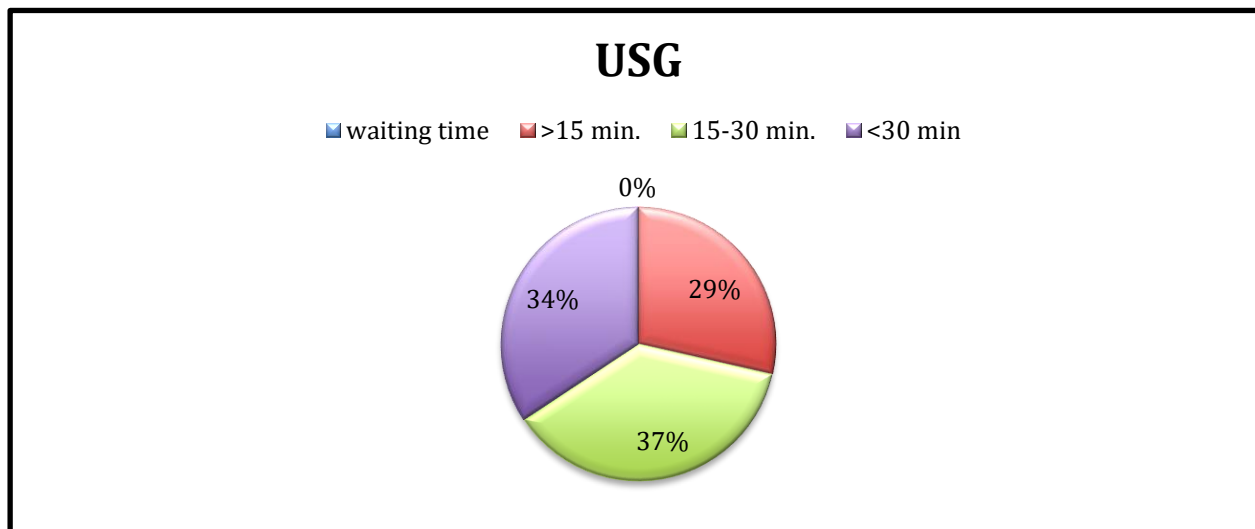


Fig: 3.6.1: Pie chart depicting waiting time for Ultrasound procedure

Out of 35 patients 34% has to wait for more than 30 minutes , 37% patients get the procedure done within the 15to 30 minutes & 29% patients has to wait for less than 15 minutes.

For X-Ray:

X-RAY	
Waiting time	No. of patients
>15 min.	18
15-30 min.	29
<30 min	11

Table: 3.6.2: TAT for X-RAY

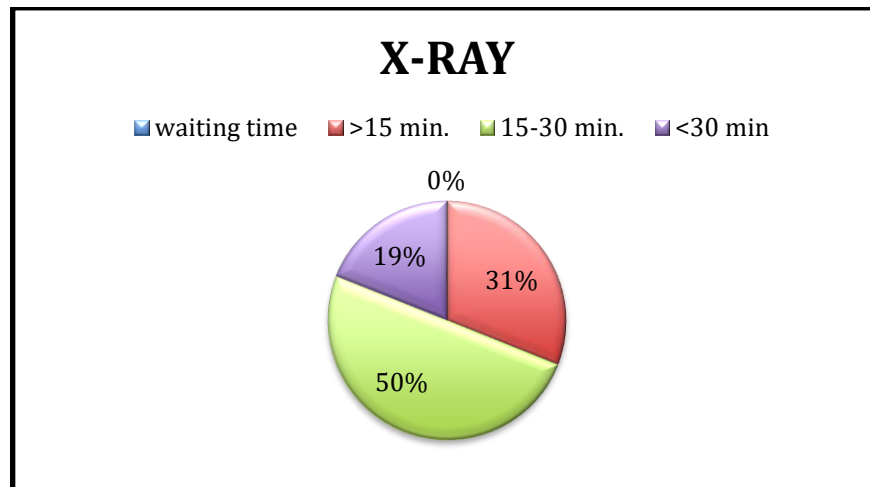


Fig: 3.6.2: Pie chart showing waiting time for X-ray

Out of 58 patients 19% patients have to wait for more than 30 minutes, 50% has to wait for 15-30 minutes & 31% patients have to wait for less than 15 minutes.

Findings:

- Communication gap between front desk staff & staff inside X-Ray & ultrasound room.
- No crosscheck of appointments.
- Patients are not being counseled regarding fasting, number of bottles to be taken per oral, holding of urine.
- Patients need to have other investigations done.
- Only one common changing room which is common for all four radiological procedure.
- Only one cassette reading & digitizer machine for X-ray (both portable and fixed) & mammography.
- Shortage of radio technician and GDA staff.
- Human resource management is not done properly.
- Common counter for registration, billing and report dispatch of radiology department.

3.7 Recommendations:

- Counseling of patients should be done in terms of-
 - ✓ Hours of fasting prior to the procedure.
 - ✓ Specify number of bottles to be taken per oral.

- ✓ Holding of urine as per requirement of the test.
- ✓ If any investigation has to be done prior.
- Crosscheck of appointments should be done so that walk in patients could be adjusted.
- Counter for report dispatch should be separate.
- Changing room should be inside the X-ray room.

3.8 Conclusion:

Healthcare is a process of many handoffs. Reducing turnaround time (TAT) at any one of those handoffs speeds the entire process and puts critical information in the hands of clinicians when they need it most, increase patient satisfaction and it helps to improve the revenue also.

3.9 References:

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3. Improving Process Turnaround Time in an Outpatient Clinic www.isixsigma.com › Industries › Healthcare

3.10 Annexure-1 (Data Sheet)

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