Summer Training at
MAX Super Specialty Hospital
(April 1–May 31, 2014)

Effectiveness of Biomedical Engineering Programs to Reduce High Cost in Hospital

By
Pooja Mehta

Under the guidance of
Dr. Alok Kumar Mathur

MBA- Hospital & Health Management (MBA-HM)
2013-2015

The IIHMR University, Jaipur
2014

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CERTIFICATE

This is to certify that **Dr.Pooja Mehta** has undergone her summer training at **MAX HOSPITAL,DELHI** from 1st April, 2014 to 31st May, 2014.

The candidate has successfully carried out the project **"A study on Effectiveness of Biomedical Engineering Programs to Reduce High Cost in Hospital"** assigned to her during summer training and her approach to the study has been scientific and analytical.

The summer training is partial fulfilment of the course requirement.

I wish her success in all her future endeavours.

Mr.Alok Mathur
Associate Professor
IIHMR Jaipur

Col. (Dr.) Ashok Kaushik
Dean (Academic & Student Affairs)
IIHMR Jaipur

MAX HEALTHCARE
Care for life

CERTIFICATE OF COMPLETION

This is to certify that

POOJA MEHTA

has been associated as an

INTERN

with the department of

HOSPITAL ADMINISTRATION

for a period of

1st April 2014 To 31st May 2014

at

Max Super Speciality Hospital
Saket, New Delhi

"The Internship course is a Max certified course not affiliated to any National/International society".

Head of the Department

Dr. SAHAR QURESHI
Assistant General Manger-Operations
Max Super Speciality Hospital-East Block
2, Press Enclave Road, Saket,
New Delhi-110 017

for Dr. Shubnum Singh
Dean – Nursing, Allied Health, & Wellness Programs
Max Healthcare, New Delhi

ACKNOWLEDGEMENT

For a MANAGEMENT student, the power of knowledge is unattainable unless an element of practical observation and practical performance is not added. I consider myself to be fortunate for having been provided an opportunity to undergo summer training at **MAX SUPER SPECIALITY HOSPITAL, SAKET, DELHI.** It is a great pleasure to express my sincere gratitude to **Mr. Anil Vinayak (Head Sales and Marketing)** and **Dr. Sahar Qureshi (Assistant General Manager)** for providing me an opportunity to undergo training in this highly esteemed organization.

I am highly obliged to **Dr. Sandeep Mor (Assistant Medical Superintendent)** for his keen interest, encouraging appreciation and solemn advice throughout the project.

My special thanks to **Mr. Yudhveer Singh (Head of department-Biomedical)** for helping me with his valuable suggestions in completion of my report. He has been a constant guiding light and source of illumination for me. It entirely goes to his credit that this report has attained its final shape.

I would also like to thank the **Team of biomedical Department** for clearing my doubts regarding my topic and providing the necessary details whenever was required I acknowledge them for sparing time out of their hectic schedules and helping me in completion of my report.

Lastly I want to express my gratitude to all those people who took time out from their busy schedules and cleared my queries. I would like to thank my family and friends for being a constant source of inspiration to me.

Dr. Sahar Qureshi (Assistant General Manager)

DR. SAHAR QURESHI
Assistant General Manger-Operations
Max Super Speciality Hospital-East Block
2, Press Enclave Road, Saket,
New Delhi-110 017

Dr. Sandeep Mor (Assistant Medical superintendent)

Mr. Yudhveer Singh (Department Head- Biomedical)

Dept. of Biomedical Engineering
Max Healthcare Institute Ltd.
Saket, New Delhi-110 017

ACKNOWLEDGEMENTS:

It is indeed a privilege to have got the opportunity to work in a prestigious organization such as Max hospital, Saket (New Delhi). My two month training has been nothing short of extensive learning of the co-ordinated working of a hospital. The exposure I have got on the functioning of various clinical and non clinical departments has been tremendous and has left me with an urge to learn more.

I would like to take the opportunity to thank **Dr. Sahar qureshi**, **assistant general manager, Max hospital** for giving me the chance to do my internship at Max Hospital, Saket. . I would also like to thank Dr**. Sandeep Mor, assistant medical superintendent medical quality**, for believing in my capabilities and pushing me to the next level.

Mr. Yudhveer singh Head Of Department Bio-Medical Engineering Services, Max Hospital for being my mentor and project guide for the entire period of my training, for helping me improve the quality of my work and for helping me identify areas where I lack.

Dr. Shihad Khader, Program Manager, **Oncology Department, Max hospital** , for being my mentor for my projects in the Oncology Department.

Dr. Alok Mathur, my mentor at IIHMR Jaipur, for his support and guidance, without which this training would not have been possible.

Dr. Ashok Kaushik, Dean, Academic and Student Affairs, for his invaluable inputs and guidance for my projects, as they helped me to develop a line of thought for how to shape my project.

Dr. Vijay Pratap Raghuvanshi, IIHMR Jaipur, for his helpful inputs, which helped improve the quality of my work.

My colleague, Dr. aparna yadav, PGDHM 18 at IIHMR Jaipur, for her constant support throughout my training.

TABLE OF CONTENTS:

1. ABBREVIATIONS:

AMC:	-Annual maintenance contract
CMC:	-Comprehensive maintenance contract
Capex:	-Capital expenditures
Opex	-Operational expenditures
TPA	-Third Party Administrator
PET CT	- Positron emission tomography
SPECT CT	- Single-photon emission computerized tomography
LINAC	-Linear accelerator
MMS	-Multimedia system

2. OBSERVATIONAL LEARNING:

2. A. Introduction:

The summer training is an integral part of the course curriculum of PGDHM at IIHMR Jaipur. As part of the course, students at the end of their first year are required to undergo training of two months to get an in-depth exposure to the various departments in the organization, as well as take up projects as per the requirements of the organization where the students get training. What is most crucial is to build a base of knowledge about the structure and functioning of the hospital, which can be used to understand and apply concepts in the subsequent study tenure at IIHMR Jaipur.

During my summer at Max super specialty hospital, saket there were numerous learning experiences. These were enhanced due to the projects undertaken at the hospital, which are listed as follows:

- Cost effectiveness in biomedical equipments in a hospital through quality approach
- Formulation of marketing strategies to promote healthcare services for oncology department in a hospital

A brief report of the training of two months is presented below with the details of tasks undertaken and lessons learnt during the training.

2. B. Organization Profile:

INTRODUCTION TO MAX HOSPITAL, SAKET

MAX AT A GALANCE

Caring for you... for life

Max Super Speciality Hospital, Saket is located in South Delhi is one of the premier names in health care domain in the world. It is designed by internationally renowned architect Mr. Richard Wood and constructed in accordance with globally-accepted standards for hospitals.

Max Super Specialty Hospital is a 540 bedded Hospital and is a part of Max India Limited which is a public limited company founded in 1985 by its current chairman, Analjit Singh. Its major shareholders include Singh and the private equity firm Warburg Pincus. Max Super Specialty Hospital under the name Max Healthcare commenced operations in 2001 with the intention to provide comprehensive and world-class healthcare services in India. Max Super Specialty Hospital is the country's first comprehensive provider of standardized, seamless and world-class healthcare services. It is committed to the highest standards of medical and service excellence, patient care, scientific and medical education. Max Super Specialty Hospital is located in serene

environment of South Delhi, 15 km away from New Delhi railway station and 12 km from domestic airport. It is also easily reachable from satellite town of NCT, Delhi.

Awards and accreditations:


NABH


NABL


ISO 9001


ISO 14001


FICCI Healthcare Excellence Awards

I. Max Healthcare is **ISO 9001:2000 & ISO 14001:2004** certified organization.

II. Medical Quality Performance Standards Surpassed International Benchmarks in **Nosocomial infection**.

III. India's first fellowship in Emergency Medicine Established in conjunction with **George Washington University**.

IV. American Heart Association recognizes MHC as a training centre.

V. –**Best Managed Healthcare Program**" awarded at the National level at Express Healthcare Excellence Award.

VI. Max Institute of Minimal Access recognized as Centre of Excellence in APAC.

VII. FICC Award for operational Excellence in Healthcare delivery.
FICC Healthcare awards.

VIII. NABH accreditation for Transfusion Medicine Department.

IX. NABH accredited hospital.

X. DL Shah National Awards on –Economics of Quality".

Objectives:

- Satisfying customer needs
- Enhancement of quality systems
- Effective performance measurement & compliance systems
- Continuous Improvement loop
- Engage every employee in quality drive

Hospital Specialties:

- Aesthetic & Reconstructive Surgery
- Audiology & Speech Therapy
- Cardiac Sciences
- Dental Care
- Dermatology
- Ear Nose Throat
- Endocrinology & Diabetes
- Eye Care
- Gastroenterology & Endoscopy
- General Surgery
- Internal Medicine
- IVF
- Mental Health and Behavioural Sciences
- MAMBS (Minimal Access, Metabolic & Bariatric Surgery}
- Nephrology
- Neurosciences
- Nutrition & Dietetics
- Obstetrics & Gynaecology
- Oncology (Cancer Care)
- Orthopaedics and Joint Replacement
- Paediatrics
- Physiotherapy & Rehabilitation
- Podiatry
- Pulmonology
- Uroloy

Hospital services and amenities:

- Blood bank
- 24*7 Max pharmacy
- Regional translators
- Cafeteria
- Waiting lounge
- Prayer room
- Bank/ATM
- Business associates
- TPAs
- Alliance partners

2. C. Data Collection

- With permission from the Assistant General Manager Dr. Sahar qureshi, we created a schedule, which we have followed in order to observe and learn the functioning of all the departments of the hospital.
- After permission was secured and a schedule was made to observe the various departments of the hospital, we went and sought appointments from the concerned personnel in the various departments.
- Once these permissions were obtained, we got the details of personnel who would guide us in these departments.
- The schedule of our rotation is attached as Annexure 1.

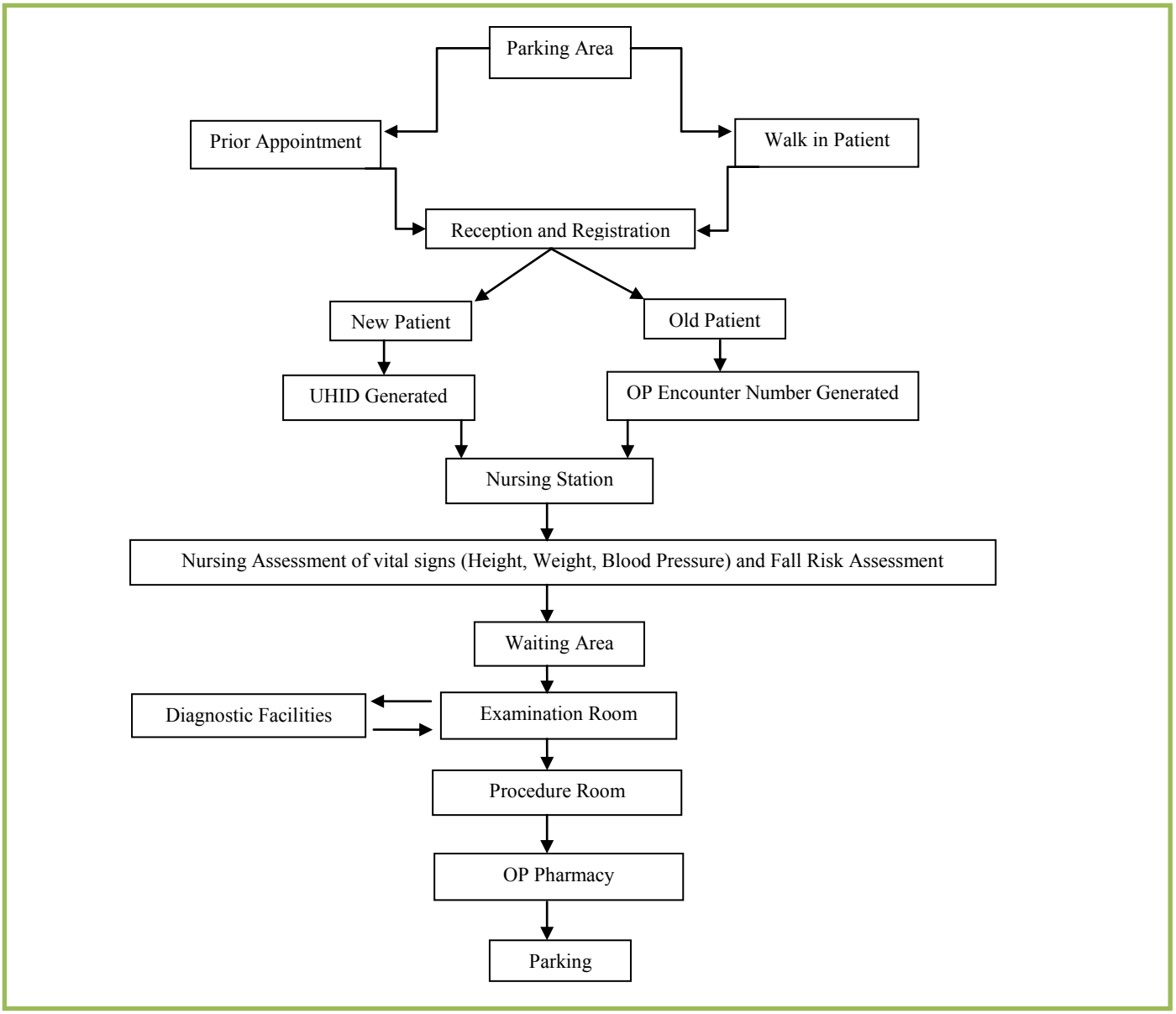
2. D. General Findings

I will attempt to present my general findings in the form of process flow sheets, in the order of my visit to the departments.

1) OUT-PATIENT DEPARTMENT

- Each INSTITUTE of Max saket hospital has its own OPD area as well as IPD area / day-care area wherever applicable.
- Every OPD has a procedure room and its own Front Desk.
- Appointments are centralized and are recorded on the Hospital Information Management System. As soon as appointments are fixed, a text message is sent to the patient confirming the appointment, and a reminder message is sent on the day before the appointment. No walk-in patient is turned away, and the staffs try to accommodate these patients between the appointments already scheduled for the day.
- Each OPD waiting area has the capacity to handle 70-100 patients waiting.
- For Chairpersons and senior doctors, a junior doctor does the initial assessment of the patient, which not only reduces the workload of the senior doctors (whose slots are always overbooked), but it also gives the junior doctors an opportunity to learn from the best brains in the industry.

The general process flow that is followed in all the OPDs is as follows:



2) IN-PATIENT DEPARTMENT (IPD)

- IPD is distributed over five floors (2^{nd}-6^{th}) in the east wing of Max hospital including a total number of 201 beds.
- Every bedside has:
    - Details of Consultant, Nurse and Mentor written at the top of every bed
    - Room equipment checklist – side rails, Oxygen, Suction
    - Important Instructions
- The rooms available in IPD have the following structure of beds per room:
    - 6 in 1
    - 4 in 1
    - 2 in 1
    - Single Deluxe
    - VIP suite
- Every floor has a central nursing station with
    - Information Board covering:
        - Designation & Contact numbers of
            - Duty doctor
            - Administration Staff
            - Support Staff
        - Nurses' names with shift timing and designation
    - Crash Cart parked next to the nursing station
    - Computer on wheels (COW) - 4
    - Cupboards with forms- down time form, investigation track sheet, blood request form, PAC sheet, informed consent, inventory files and registers
    - Medication rooms - 2
    - Pantry – 1
    - Records room
    - Biomedical Waste Disposal
- Process for admission & discharge of new patient to IPD:
- IPD receives intimation call from the department from where patient is referred
- Duty doctor is informed
- Room is assigned by the floor mentor
- Patient is admitted and vitals are checked by the nursing staff
- Physical assessment is done
- History is taken
- Concerned doctor is informed and medications & instructions are entered in Computerized Patient Record System (CPRS), reviewed by IPD Pharmacy
- Patient bill is consolidated at IPD billing
- Discharge intimation given by doctor and processed by Nursing staff
- Clearance from pharmacy required
- Discharge process TAT = 30 minutes for cash payment patient
- Nurse to bed ratio = 1:4 or 1:6
- General Duty Assistants (GDAs) = 2-3 in every shift

- Average Length of Stay (ALOS) for normal Laparoscopic surgeries = 2-3 days
- Quality Indicators are:
    - Patient Fall, Hypoglycaemia, Needle stick Injury

3) EMERGENCY DEPARTMENT

Due to the unplanned nature of patient attendance, this department provide initial treatment for a broad spectrum of illnesses and injuries, some of which may be life-threatening and require immediate attention, except for major burns. It is located at the ground floor with its own dedicated entrance and operates for 24 hours a day.

Ambulance- 2 ACLS (with CCTV camera for telemedicine) and 4 BCLS

Patients are either transferred to other departments or are discharged within 4 hours. Max Super Speciality Hospital, Saket had made a world record for management of MI patient in emergency department from entrance to the balloon time in cath lab, in less than 35 minutes.

Response time:

- EMO response time <1 min
- Consultant response time <60 min
- Code blue response time<3min
- Ambulance response time<10 min

Infrastructure:

- Total 16 bedded triage
- Resuscitation suite -1 bed
- Urgent care area – 4 beds
- Observation area – 9 beds
- Clinical decision unit – 2 beds
- Doctors work station-is located in the centre of the urgent care area
- Store room- is located behind the reception. Medications are filled twice a day and stock of two days is kept in advance for Sunday. Narcotics are also available and kept in safe.
- Hospital information system and CPRS
- COWS(computer on wheels)
- Waiting area for patient's attendants is outside the department.

Staffing:

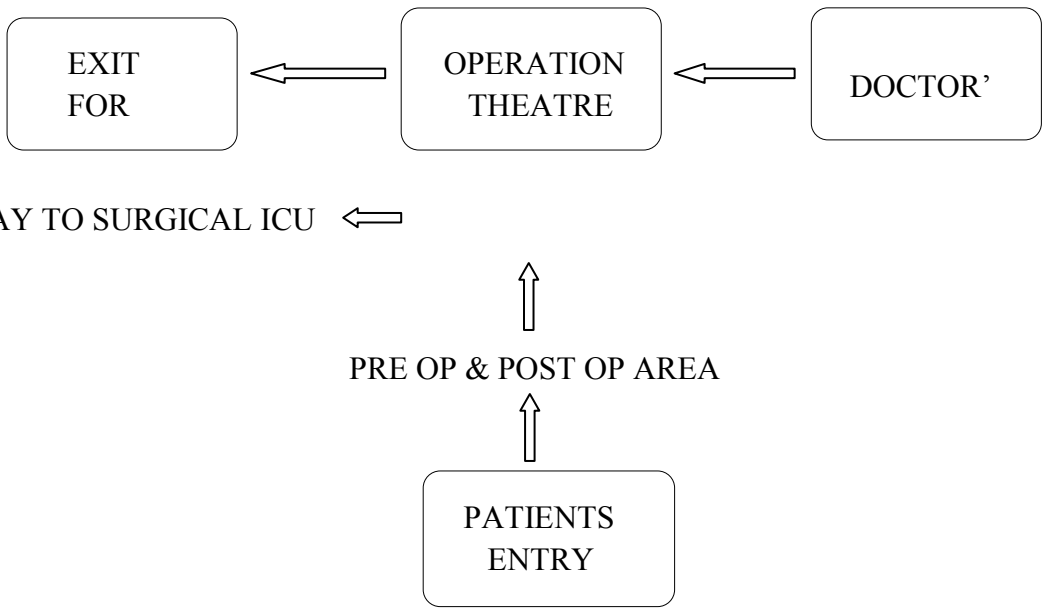
1. Senior consultant (Emergency medical officer)
2. Team leader
3. Emergency physicians - 3
4. Nurses : Male- 4 to 5
   Female- 2 to 3
5. 2 personnel at reception
6. Paramedical staff for ambulance
7. 2 GDA

Outsourced staff : security personnel

4) OPERATION THEATRE

There are 20 Operation Theatres in Max, Saket. West Block comprises of 1OT complex which has 7OTs on 1st Floor and 1 Labour OT on 3rd Floor. East Block has 12 OTs. West Block OT caters to the specialities like Neurology, Orthopaedics, Paediatrics, Urology, Laproscopy, Gyanaecology, Eye and ENT. East Block OTs caters to the specialities like Cardiology, Minimal Access Metabolic Bariatric Surgery, Plastic Surgery and Oncology. For neurology there is a special OT Brain Suite with Installed MRI Machine.

OT LAYOUT**:**



Process flow for Planned Surgery:

DOCTOR RECOMMENDS SURGERY

⇩

INFORM CO-ORDINATOR

⇩

NEXT DAY SCHEDULE PREPARATION

On the day of surgery : CO-ORDINATOR

⇩

IP WARD FOR PATIENT PREPARATION

(Like surgical site marking, prophylactic antibiotics)

⇩

20 minutes before surgery

PATIENT FETCH SERVICES TEAM

⇩

PATIENT BROUGHT TO OT COMPLEX (on OT trolley)

⇩

DOCUMENT VERIFICATION

(Patient Identification, nursing assessment, CPRS notes)

⇩

PRE OP AREA

⇩

ANAESTHESIA INDUCTION

⇩

SURGICAL SAFETY CHECKLIST VERIFICATION

⇩

SIGN-IN in OT

⇩

SURGERY

⇩

TIME OUT BEFORE ANAESTHESIA

⇩

SIGN-OUT of OT

⇩

POST OP AREA (45min)

⇩

SHIFT OUT FROM OT COMPLEX

Disinfection of OT:

- In between 2 cases (20 minutes)
- End of Day
- Weekly
- 6 Months
- Annually

Culture Swabs are collected weekly to keep a check on OT sterilisation.
There is also a BONE BANK and a Mini Pantry within the OT Complex.

Instrument sterilization**:** After surgery, preliminary washing of instruments is done by nurses and the instruments are sent to CSSD. Sterile instruments are supplied from CSSD to Sterilization room in OT complex. There is also 1 TSSU (Theatre sterile supply unit) which has 2 autoclaves and in case of emergency sterilization is done in there.
Material management**:** The OT Complex has an individual material store for OT consumables.
Training – conducted weekly for nursing staff, GDAs.

5) INTENSIVE CARE UNIT

There are 99 beds for ICU in East and South wing and 77 beds in West wing. Every ICU is specialized like CTVS Adult-17 beds, ACC-16 beds, CTVS pediatric- 9beds, Medical ICU, Surgical ICU, Oncology Medical ICU and Surgical ICU, Respiratory ICU, Pediatric ICU, Neonatal ICU.

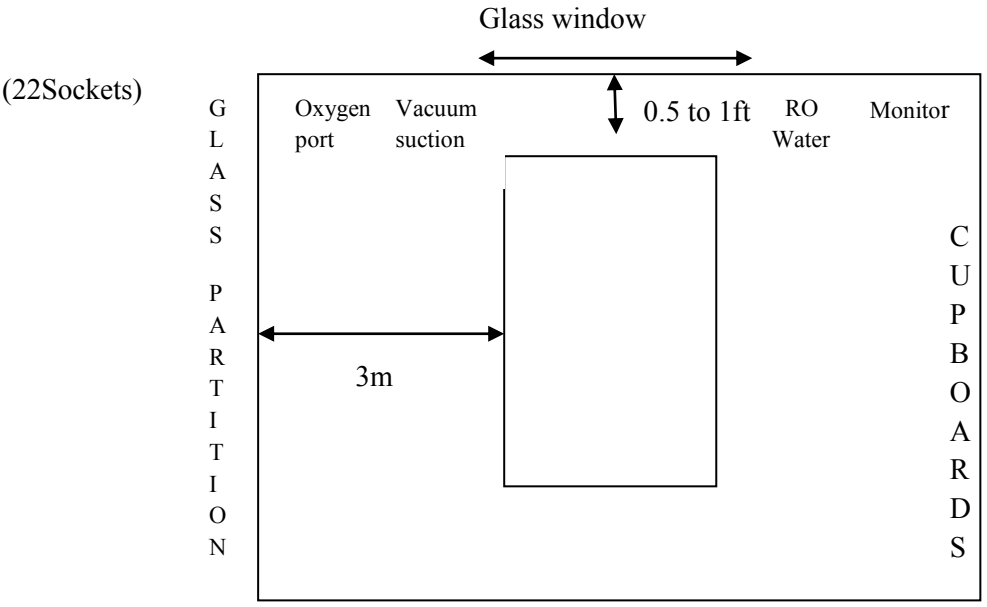
Every ICU has an Isolation Room apart from onco medical ICU. The beds types include alpha beds, nimbus beds, excel beds and normal beds. Every cubicle has a monitor, oxygen pipelines, vacuum line, a Computer on Wheels (COW) and 22 electric sockets. Ventilators are available on demand. The ICUs have syringe pumps.

Areas: Nursing Station, dirty utility room , medication storage room, washroom, clean utility room and pantry.

Nurse: Bed Ratio is maintained as 1:2 normally and 1:1 for critically ill and ventilator supported patients. 2 duty doctors are available in each shift. Visits by consultants and physiotherapists are made as per requirement.

The material is managed by 2 rounds per day by the ICU GDA to and from CSSD.

Layout of ICU Cubicle :



6) CENTRAL STERILE SUPPLY DEPARTMENT

The department is centralized for the hospital and situated in an area of 1500 sq. feet in basement 1 of east wing. The aim is to achieve microbial count in range of 10^{6} to 10^{-6} to ensure sterilization.

Process flow: Dirty trays are dismantled ⟶ mechanical cleaning done ⟶ ultrasonic washing in washers for 1 hour ⟶ rinsing ⟶ thermal disinfection (hot water wash) ⟶ packaging done with different materials (medical grade paper, linen, SMS paper) in the clean area ⟶ materials are differentiated ⟶ transferred to sterile area (with positive pressure) ⟶ sent to issue area.

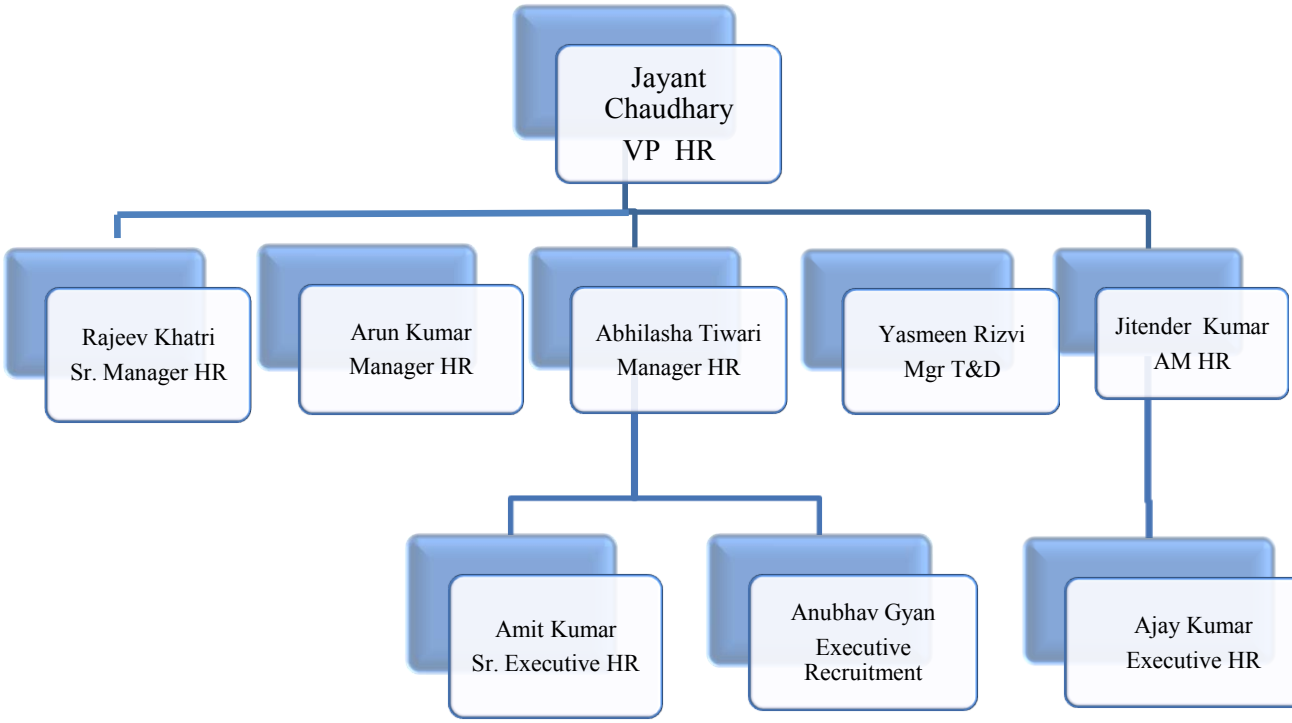
CSSD has a plasma sterilizer. There was no software or IT involvement for counting of instruments. Bowie Dick Test batch monitoring is followed.

7) HUMAN RESOURCE MANAGEMENT

Human resource management (**HRM** or simply **HR**) is a function in designed to maximize employee performance in service of their employer's strategic objectives. HR is primarily concerned with how people are managed within organizations, focusing on policies and systems.

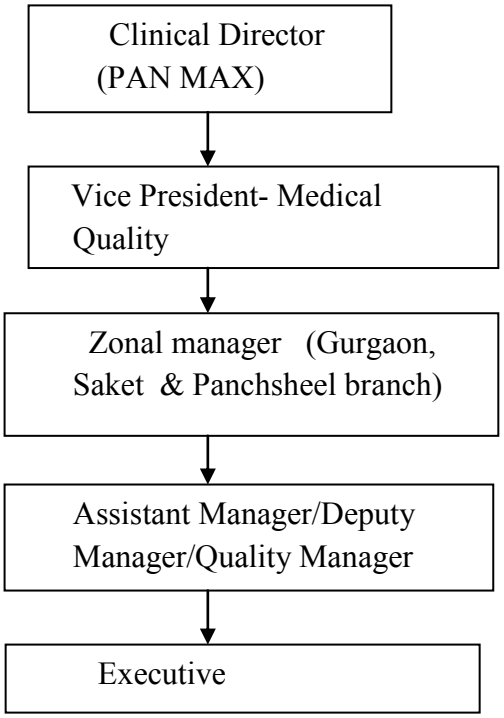
Following are the policies undertaken by the Human Resource Management Department:-

- Human Resource Planning Policy.
- Job Profile Format.
- Recruitment policy.
- Training and development policy.
- Induction and Orientation policy.
- Performance appraisal Policy.
- Complaint & Grievances Redressal Policy.
- Disciplinary Policy.
- Medical Discount Policy.
- Annual Medical Check-up Policy.
- Clinical credentialing and privileging Policy.
- Nursing Credentialing and Privileging Policy.
- **HR Structure**

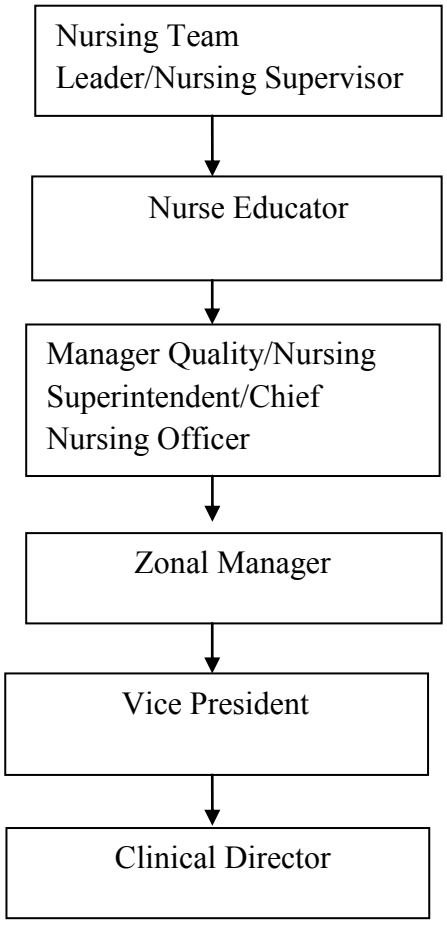


8) MEDICAL QUALITY DEPARTMENT

Organogram of the department



Flow of reporting in the Quality Team:-



The different **indicators of medical quality** are:-

1. Falls
2. Nosocomial infections
3. Phlebitis
4. Medication errors
5. Near miss(incident might have occurred)
6. Needle stick injury
7. Pressure sores
8. Hypoglycemia
9. Adverse drug reactions
10. Blood transfusion related errors
11. Infection outbreak
12. Notifiable diseases
13. Sentinel events-wrong patient, wrong surgery, wrong side, foreign body left inside cavity.
14. Code blue-Rapid Response Team(RRT)
15. Mortality- data categorized by area, speciality,age
16. Other adverse events
17. Readmission within 14 days of discharge/Return to Emergency within 7 days
18. Return to OT within 7 days
19. Return to ICU within 7 days.

9) NURSING QUALITY DEPARTMENT

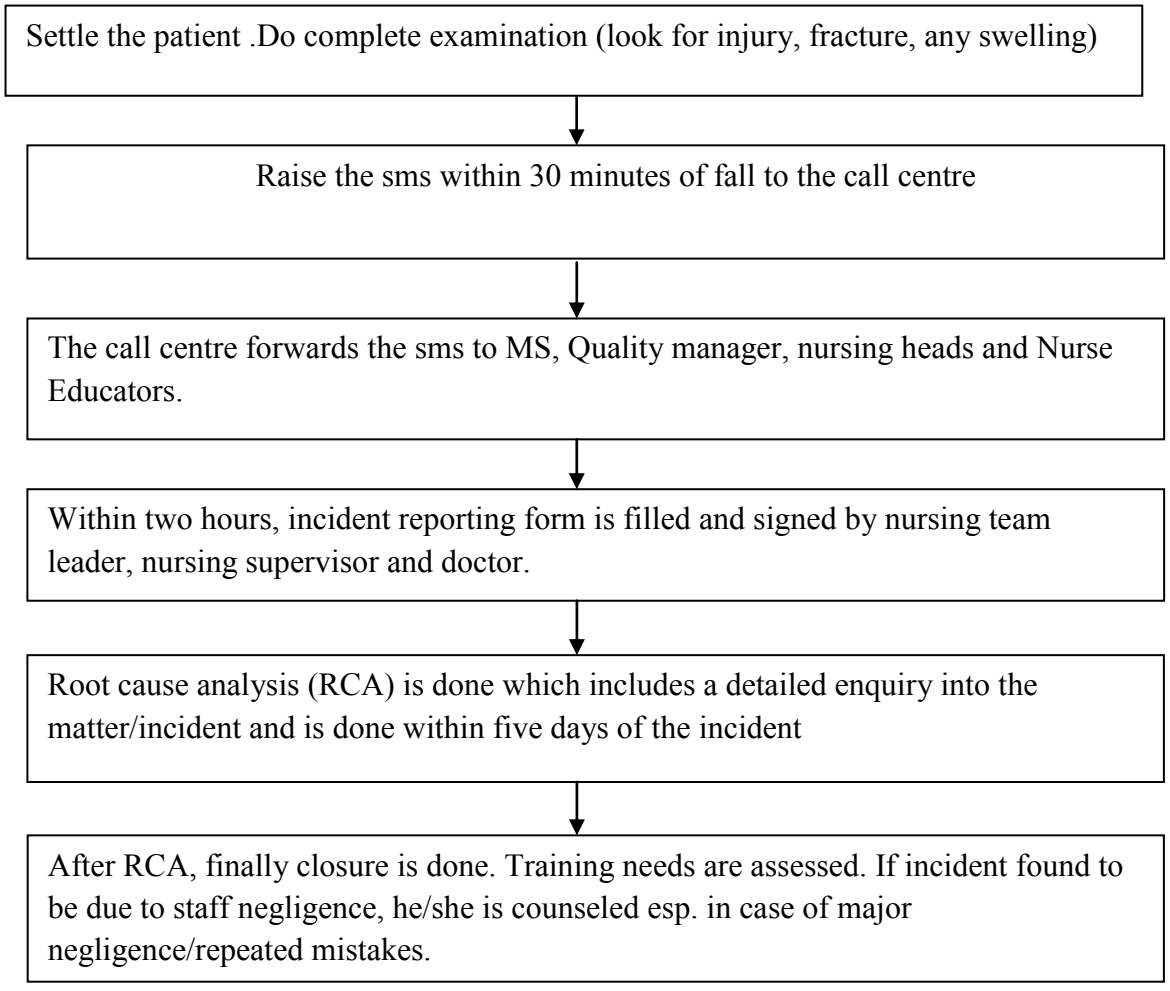
There are a total of **seven indicators** of nursing quality:-

1. Patient falls
2. Medication errors:-is of four types:-
    - Prescription error-mistake of doctors
    - Dispensing error-mistake of pharmacist
    - Administration error-mistake of nurses
    - Documentation error-mistake of nurses where they fail to document after administration of medicines.
3. Pressure sores: - outside/inside pressure sores

Outside pressure sores means those acquired before admission while inside pressure sores means those acquired post admission. There are special wound care nurses who look after pressure sore dressings and work jointly with plastic surgeon's team.

4. Hypoglycemia-Random blood sugar level falling below 60mg/dl has to be informed. It is called negligence if nurse doesn't inform doctor or fails to recheck the blood sugar.
5. Needle stick injury
6. Health care associated infection is of four types:-
   - CAUTI-Catheter Associated Urinary Tract Infection
   - CLABSI-Central Line Associated Blood Stream Infection
   - VAP-Ventilator Associated Pneumonia
   - SSI-Surgical Site Infection
7. Phlebitis-It is defined as inflammation of vein which has different signs and symptoms like redness, swelling, pain and inflammation. A phlebitis checklist is maintained.

Flow of reporting an adverse event (e.g. falls)



10) CATH LAB

Catheterization laboratory or cath lab is an examination room with diagnostic imaging equipment used to visualize the arteries of the heart and the chambers of the heart and treat any stenosis or abnormality found.

Diagnostic procedures performed here are:

- Angiography
- Electrophysiology study
- Cath study

Out of these 3 angiography and cath study is done in cath lab 1 and EPS is done in cath lab 2.

Other procedures are:

- Percutaneous Transluminal Coronary Angioplasty
- Peripheral Transluminal Angioplasty
- Radio Frequency Ablation
- Permanent Pacemaker Implantation
- Intra Cardiac Defibrillation
- Cardiac Resynchronisation Therapy Defibrillator Device
- Cardiac Resynchronisation Therapy Pacemaker
- Left and right sided pressure studies
- Closure of some congenital heart defect

Units of cath lab:

1. Cath lab 1
2. Cath lab 2
3. Technical room
4. Observation area
5. Technician room
6. Store room and utility room
7. Observation area
8. Instrument washroom

Location: Cath lab is located on the first floor with the vicinity areas as

- Emergency department
- Operation theatre
- Cath recovery
- Coronary care
- CTVS OT
- SICU
- PICU
- MICU

Staffing:

- 9 interventional cardiologists
- 19 nurses
- 9 technicians
- 1 person from store

11) INTERNATIONAL PATIENT SERVICES (IPS) DEPARTMENT

It takes a lot to be a world-class health care services provider and as per patient registration data, over 11 lac overseas patients have been helped to get back to their normal lifestyle. This department, situated in East wing, is exclusively dedicated for the services of international patients.

Contact Procedure:

- Patient sends a query and/or reports
- IPS Team consults the relevant consultant and provides diagnosis, proposed treatment and estimate
- If required, a telephonic meeting may also be arranged
- Patient confirms if he wants to have treatment at Max Healthcare to provide Visa Facilitation Letter
- Patient confirms the arrival date and time
- IPS Team, in the meantime, books room, OT etc. for the patient
- Patient is received at the Airport and then, brought to the Hospital/Guest House/Hotel

Also, another contact procedure is as follows:

- Max hospital conducts free outreach OPDs in other countries, at least 1-2 per year
- Max hospital also has tie ups with different hospitals in these countries

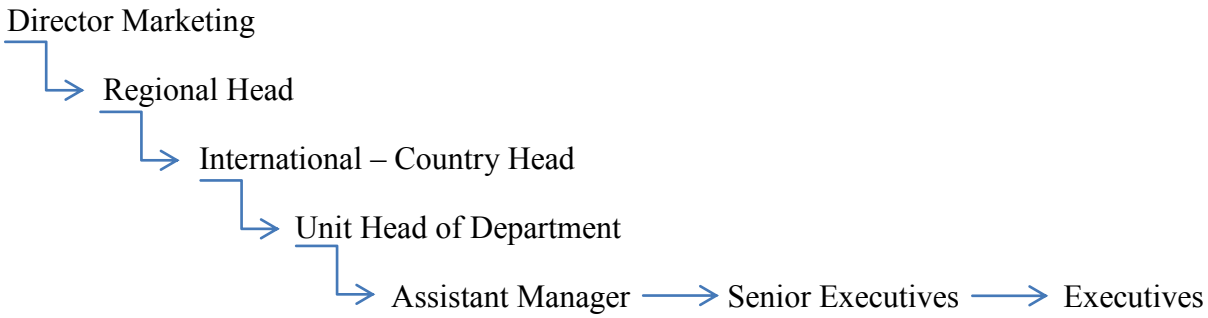
International patients avail treatment in India mainly because these facilities or treatments are not available in their respective countries, and are available at a much cheaper price in India than other countries such as US, UK or European countries. The countries from where patients come to seek treatment most commonly are Iraq, African countries (Nigeria, Congo), Oman, Uzbekistan, Afghanistan, Nepal, and Bangladesh.

The hospital provides:

- Various Regional Translators such as Arabic, Persian, Iraqi, Bangladeshi and Russian (In house interpreter).
- Assistance in ground transportation such as finding a shuttle, hiring a car or choosing any other mode of transportation within the city.

- Relationship Managers, who closely work with over 50 Diplomatic Missions and numerous Expat bodies to ensure that international patients have a comfortable and memorable stay in India.

Staffing:



12) BLOOD BANK

Max super specialty hospital has its own blood bank. All blood groups are available. But it is preferred that patient arranges blood through his relatives or any friend and should give replacement.

Blood bank consist of

1. Sample collection area / reception area: In reception area a form is given to the attendant of the patient regarding their details before he/ she donates the blood.
2. Apheresis area: blood have several components including red blood cells platelets and plasma. Donor aphaeresis is a special type of blood donation in which a specific component platelet, plasma is withdrawn from donor
3. Component room: In component room the whole blood is separated into packed cells FFP and platelets.
4. TTI room: it is to diagnose transfusion transmitted infections. If donor is detected positive for TTI status it means donor have the potential to transmit the infection to their partner and children.
5. Issue room: This room is to issue the screened blood bags.

Staff of blood bank consists of 1 HOD, 2 blood bank officer, 1 technician supervisor, 16 technicians, 2 staff nurse, 2 computer executives, 4 GDA.

13) PHARMACY

Max pharmacy is self-owned with Central Pharmacy situated at corporate office, Okhla. There are 2 In-patient pharmacy stores and 2 Out-patient stores in the hospital.

PURCHASE

Auto purchase requisition is given to central purchasing team which is forwarded to vendor (outsourced). For purchasing the items ABC method is followed. Weekly requisition is done and vendors take minimum 3 days for delivery of drugs to hospital.

STORING OF DRUGS

Medicines are arranged according to VISTA (e-care) in Client patient record system via generic name in alphabetic order in racks, shelves, cupboards and drawers. Oral, parenteral and topical items are stored separately. Near expiry (expiry within 3 months) is stored in separate designated area to expedite the consumptions.

INDENT AND DISPENSE OF MEDICATIONS.

In patient pharmacy-

In CPRS, Medication orders posted by the clinicians is verified by pharmacist on PUTTY System labelled with (patient info, SSN no., drug name,) then the medications are dispatched after Billing via HIS (Hospital information system) and finally handover to GDA to dispense medicines. The Stat orders required immediately are dispensed within 30 minutes. The normal order is dispensed within 1 hour and routine order is delivered by 1 round per day.

NARCOTICS DRUGS

They are in kept in double lock and key system. Documentation of narcotic drugs is appropriately maintained.

Narcotics drugs under statutory regulation being used in max hospitals includes: injection and transdermal patch of Fentanyl and injection and tab. of Morphine.

LOOK ALIKE AND SOUND ALIKE DRUGS

Look alike and sound alike medications have high medication error due to similarities in nomenclature and packaging.

In the main pharmacy stores, (SALA Medications) are stored separately in 2 adjacent racks with blue coloured sound alike and pink coloured look alike medications warning stickers to avoid confusion while dispensing.

Medication Recall: If a drug is found to be defective, it is reported to the Okhla office where the records for that particular series of drugs dispensed is checked and verified for medication recall.

Licences acquired by Max hospital pharmacy -

1) Pharmacist License

2) Narcotics License

INVENTORY MANAGEMENT PARAMETERS

I. ABC Class
   - A Items: 7 days
   - B Items: 10 days
   - C Items: 15 days

II. EOQ - (economic order quantity)

III. LEAD TIME – Time from ordering to delivery of drugs

IV. VED – Vital Essential Desirable (According To move of drugs)

V. BULK MEDICINE.

14) DEPARTMENT OF LAB SERVICES

INTRODUCTION-

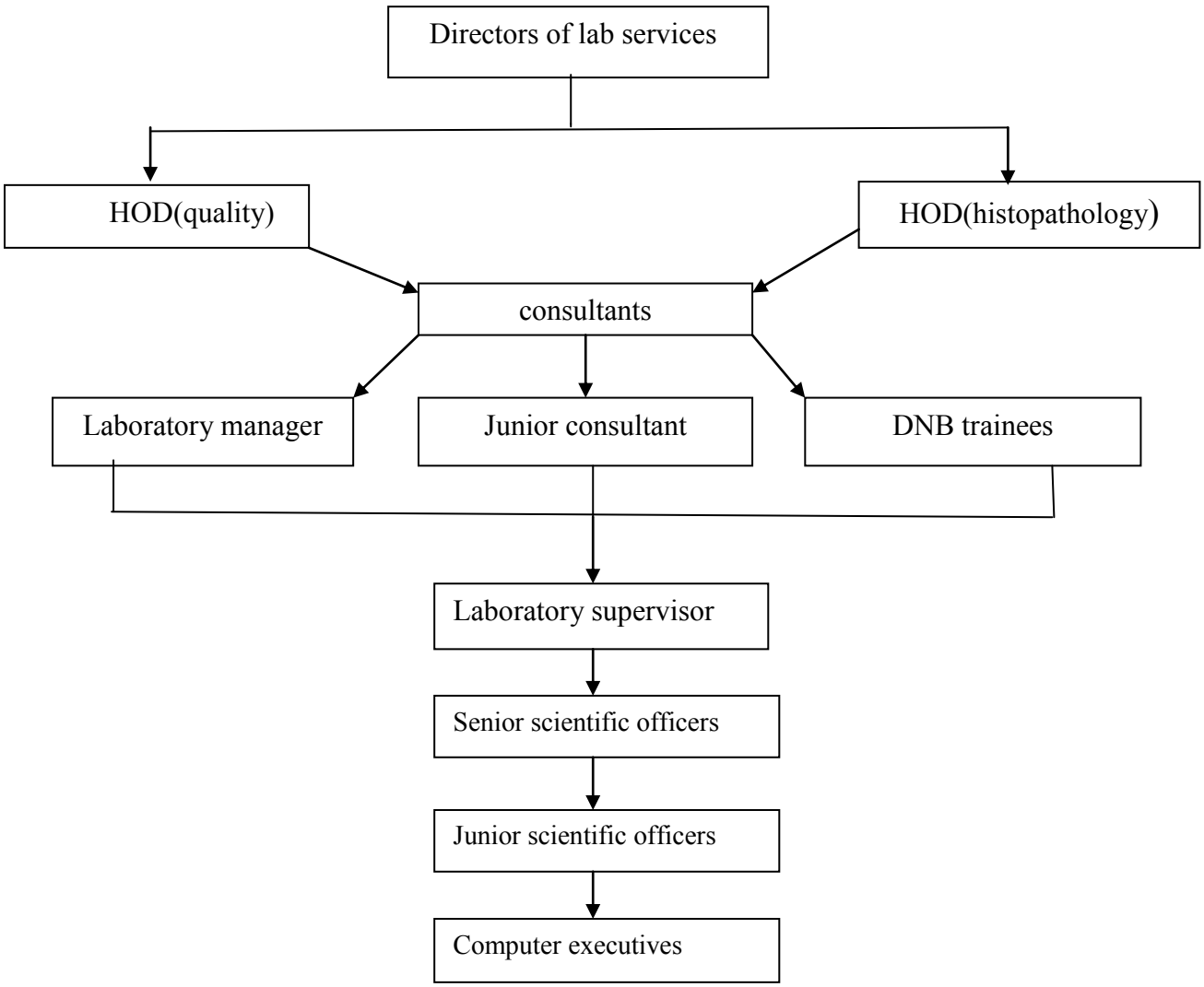
An ISO 9001:200 certified lab, it is open 24 hrs a day.It's a high-tech lab with fully automated instrument which are directly interfaced with **hospital information system** and **laboratory information system**.Facility of stat tests (emergency) and sample collection from home is also available.

LABORATORY COMPRISES OF THE FOLLOWING DEPARTMENTS-

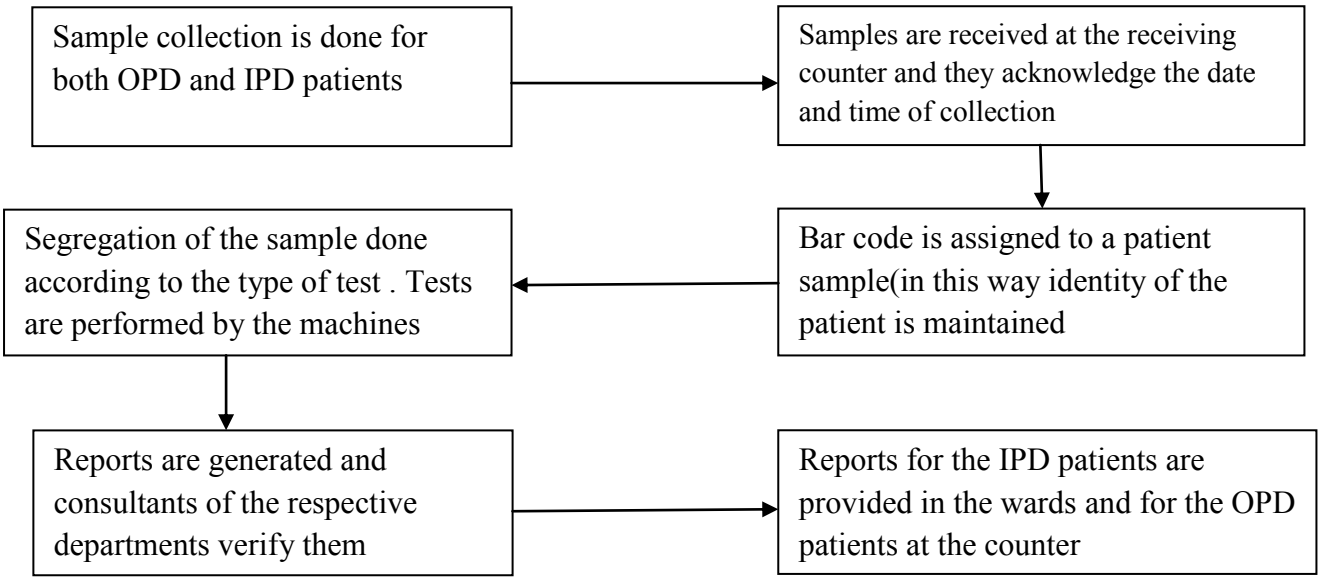
- Biochemistry
- Haematology
- Immunoassay
- Histopathology
- Clinical pathology
- Serology
- Microbiology

HIERARCHY- The Department Of Lab Is Broadly Divided In Two Departments

- Lab medicine
- Histopathology



PROCESS FLOW-



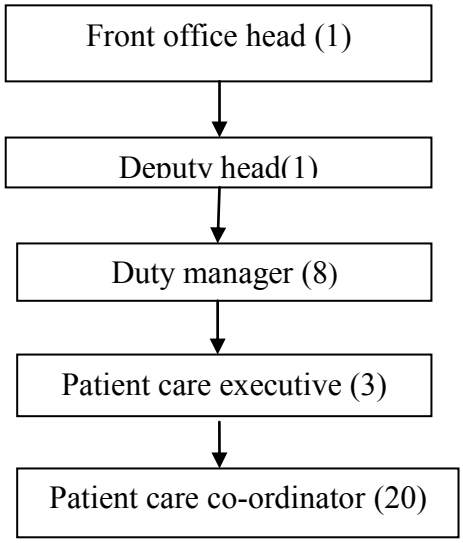
LABORATORY INFORMATION SYSTEM- It is connected with with hospital information system

- Sample received-red color
- Samples acknowledged-yellow color
- Test done-blue color
- Result verified-green color
- Billing done-pink color

15) FRONT OFFICE

Front office is the first point of contact between the hospital and its customer.

Organization chart of the dept.



Services provided by front office

1) Inpatient and Outpatient registration.

2) IP admission and discharge

3) Medical alert details

4) Appointment scheduling

5) Doctors schedule summary

6) Patient billing (IPD, OPD)

7) Insurance management

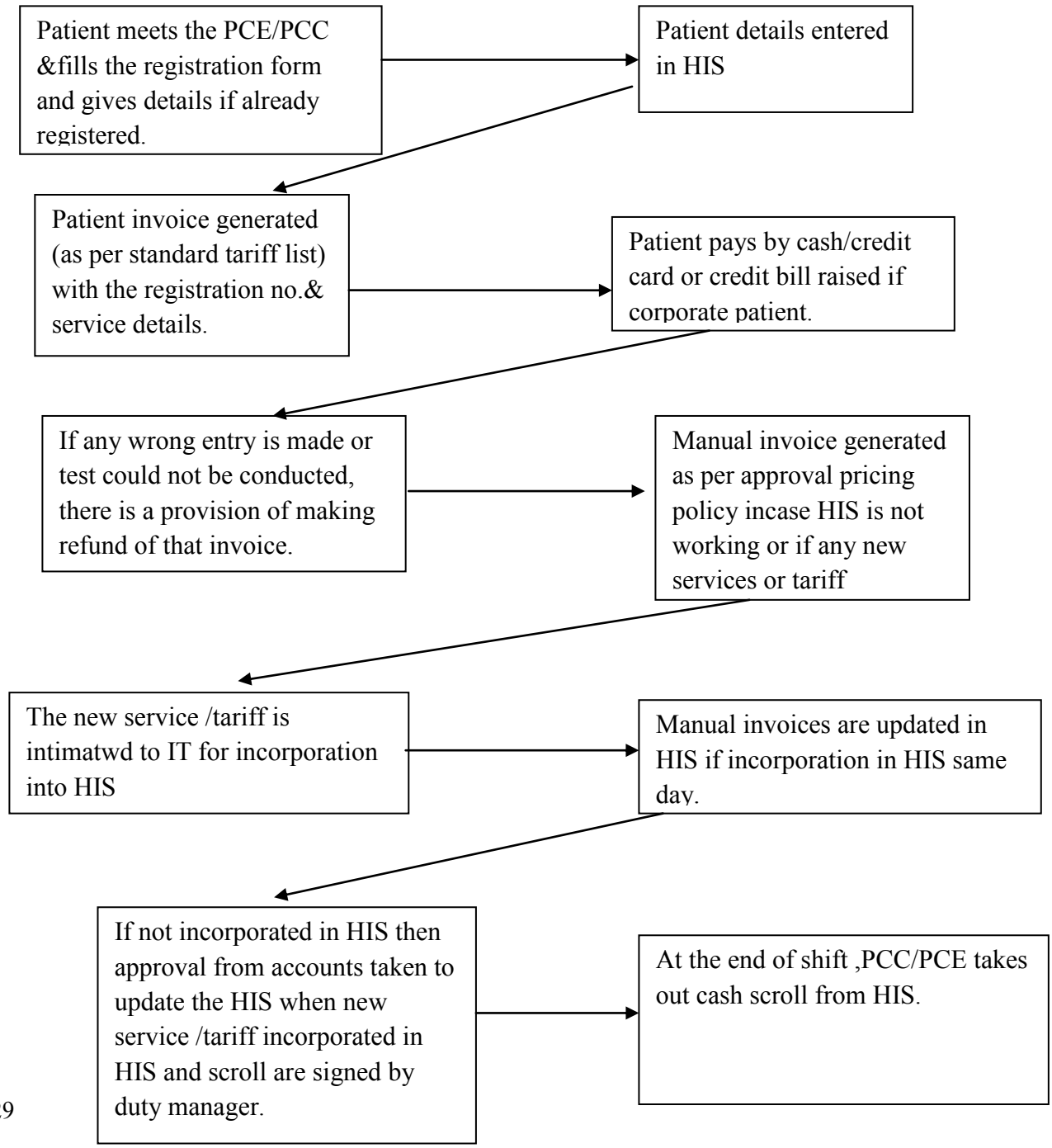
8) Patient visit history

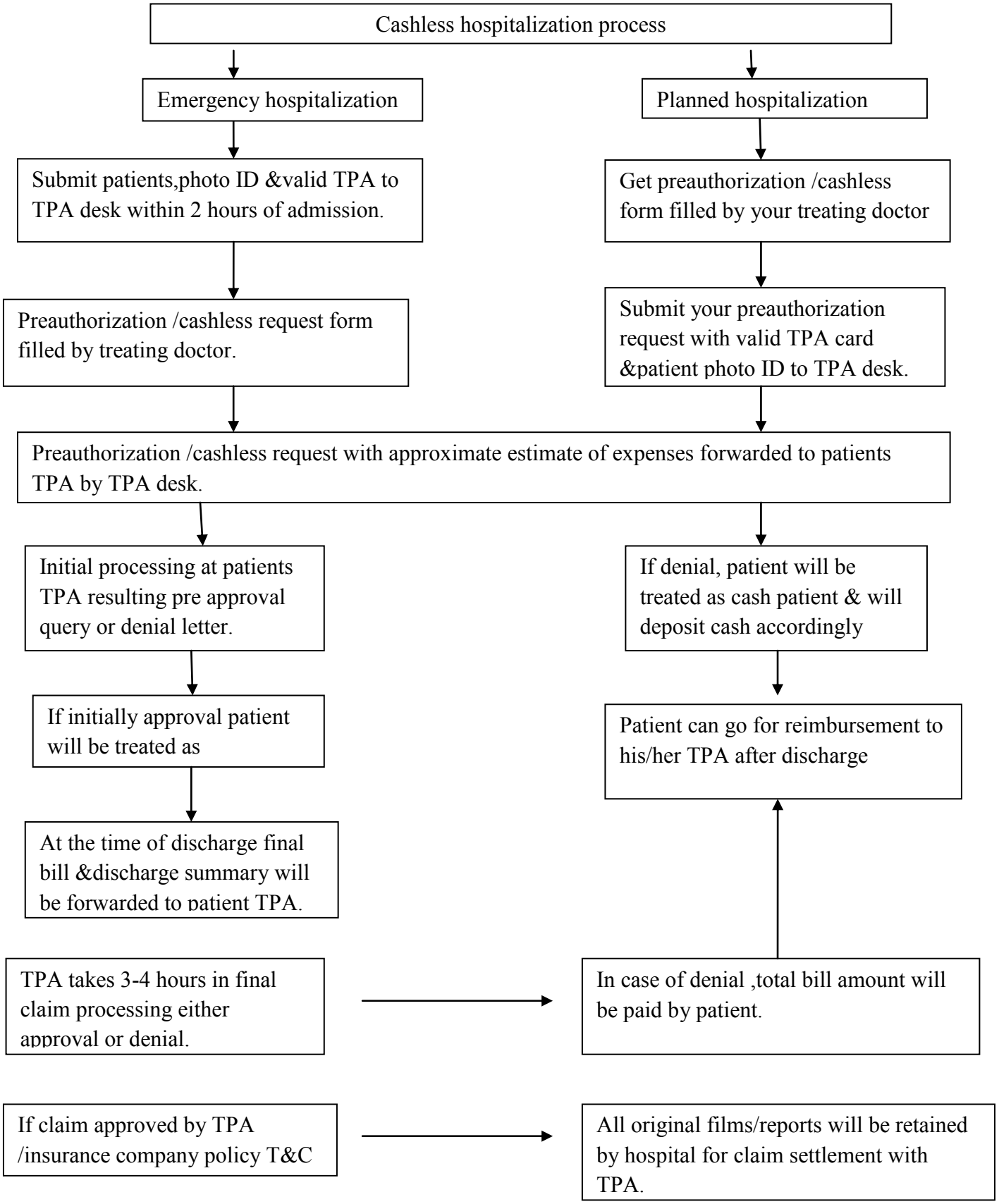
9) Medical records movements

10) Appointment for diagnostic tests

11)preventive health program registration and scheduling.

Patient registration process




Cashless hospitalization process
Emergency hospitalization
Planned hospitalization
Submit patients,photo ID &valid TPA to TPA desk within 2 hours of admission.
Get preauthorization /cashless form filled by your treating doctor
Preauthorization /cashless request form filled by treating doctor.
Submit your preauthorization request with valid TPA card &patient photo ID to TPA desk.
Preauthorization /cashless request with approximate estimate of expenses forwarded to patients TPA by TPA desk.
Initial processing at patients TPA resulting pre approval query or denial letter.
If denial, patient will be treated as cash patient & will deposit cash accordingly
If initially approval patient will be treated as
Patient can go for reimbursement to his/her TPA after discharge
At the time of discharge final bill &discharge summary will be forwarded to patient TPA.
TPA takes 3-4 hours in final claim processing either approval or denial.
In case of denial ,total bill amount will be paid by patient.
If claim approved by TPA /insurance company policy T&C
All original films/reports will be retained by hospital for claim settlement with TPA.

16) RADIOLOGY

The radiology department is divided into 2 sections:

1. One section has a reception counter, 4 ultrasound rooms, 1 mammography room, 1 bone densitometry room, reporting room and conference room.

- The reporting room has computer systems for the doctors to study images and reports are hand-written by the radiologists in the reporting room. These reports are then sent to the typists and final printed reports are delivered to the patients from the dispatch window. The reports for an x-ray done in morning till 12pm are dispatched in evening and those done in afternoon are delivered next day morning.

2. Second section has reception counter, X-ray room, MRI room along with a change room and waiting area, interventional radiological suite, fluoroscopy room and CT Scan room.There are 2 MRI machines – 1.5 Tesla and 3 Tesla and 2 fixed and 2 portable X-ray machines.

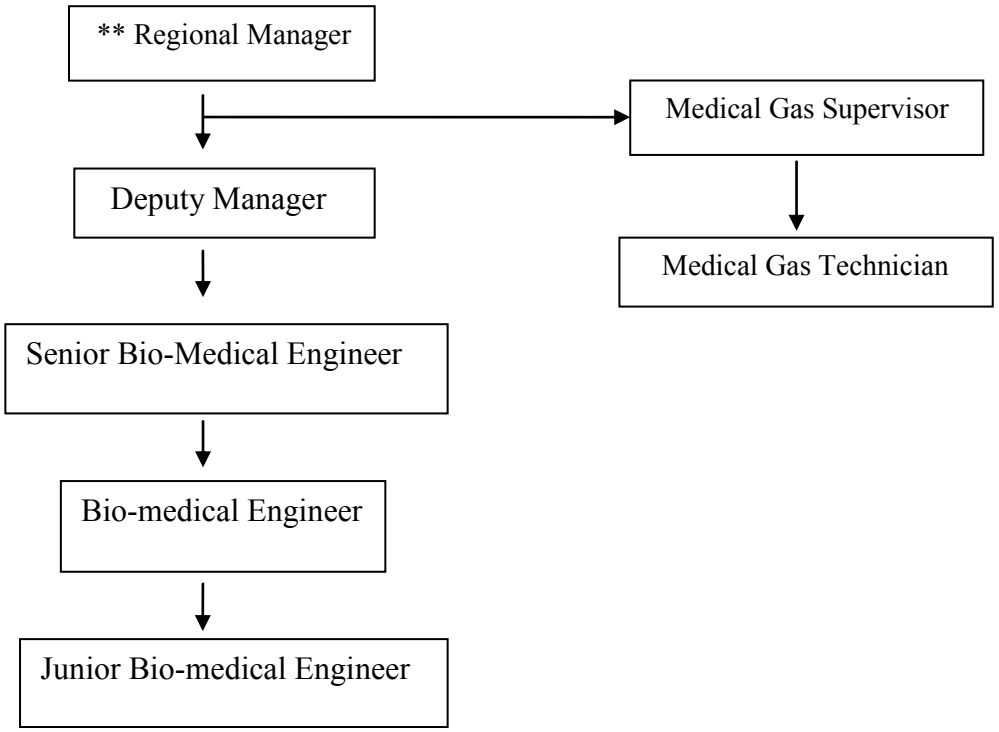
17) BIOMEDICAL ENGINEERING

- The department of biomedical engineering deals with the purchase, installation & commissioning, training on operating, handling and maintenance of all the medical equipments in all the areas and departments of the hospital.
- Also deals with the in-house calibration of equipments.
- Gas manifolds are also handled by the biomedical department.
  The areas included are:
- All wards
- All operation theatres
- All ICUs
- Patient rooms
- Radiology
- Triage
- Blood Bank
- Nuclear medicine
- Cardiac non invasive diagnostics
- Medical Gases
- Medical Furniture
- LINAC

Objectives:

- To maintain assets list
- To conduct preventive maintenance for biomedical equipments.
- To ensure timely repair of biomedical equipments medical furniture.
- To conduct calibration/validation of biomedical equipments.
- Preventive maintenance for Medical Gas equipments.

Organizational chart



**showing – Department head

18) CALL CENTRE

Call centre of Max hospital, saket operates at 24*7. It is centralized patient contact centre for saket.It can be used as an information centre for all customers.

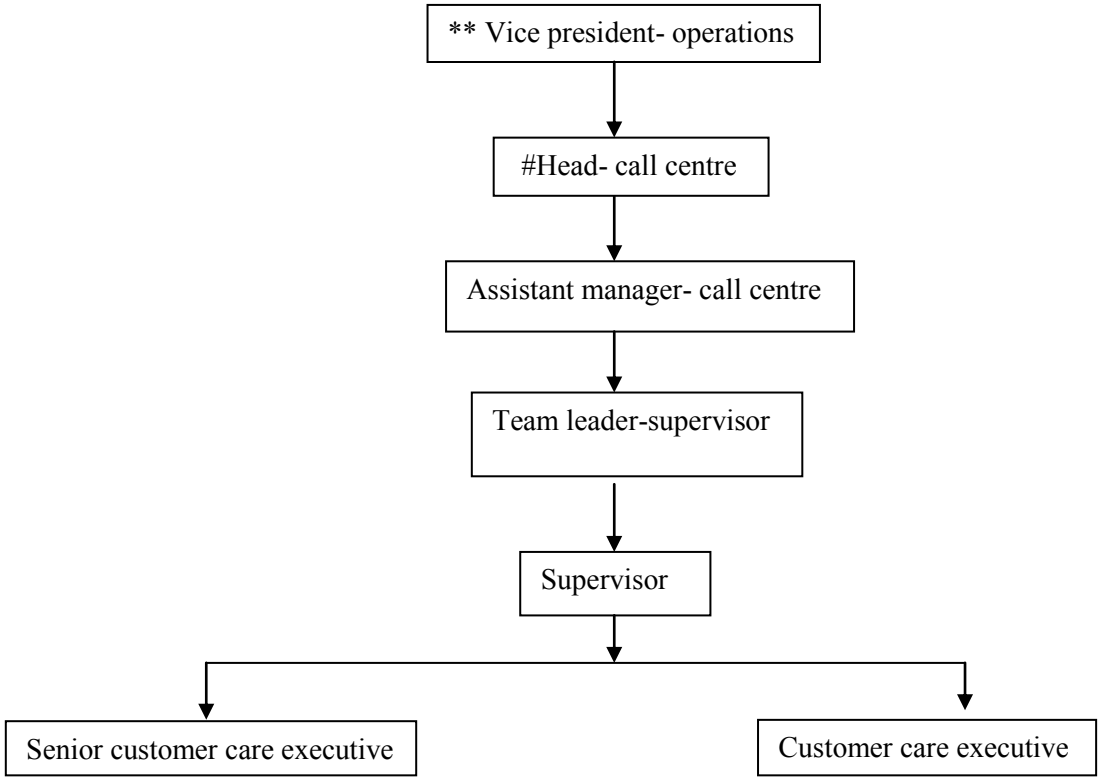
Call centre deals with:

- Doctor's appointment
- Health check ups
- Radiology and diagnostic appointments

- Patient's information
- Doctor's information
- Employee's information
- Speciality information
- Other department information
- It handles internal emergency e.g. Blue code

Main board line number is: 26515050

Organization chart:



** indicates administrative head

#indicates functional head

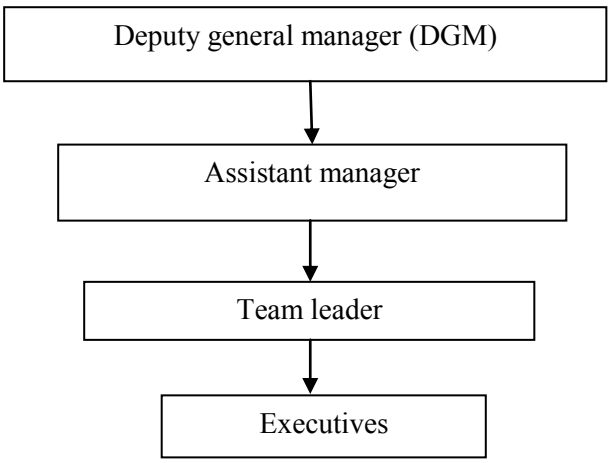
19) FOOD AND BEVERAGES

Introduction

Food and beverages department deals with supply of food to the patients sometimes to the patients attendant and during the various conferences and meeting in the organization.

Although food and beverages dept at the max healthcare centre is outsourced to the sodexo food services but controlling power is with **max employee**.

Organization chart



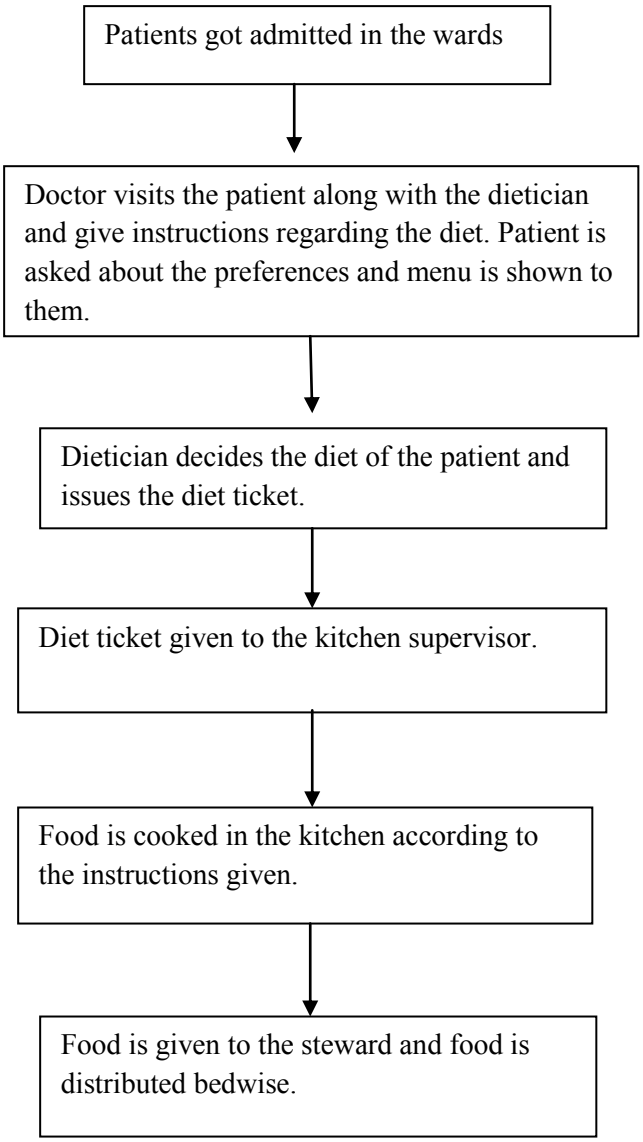
- The department consist of one head chef from Max , 26 chefs are from sodexo,72 stewards from sodexo.
- Dietician -25 of Max.
- Max chef keeps check on quality of food provided to the patients.
- The task of the sodexo is to provide food to ipd patients , max staff and visitors.
- Other then sodexo there are various food outlets which are as follows

- Sagar ratna
- Café coffee day
- Subway
- Quality express

Royalties are being charged from these outlets.

Process flow

Supply of food to the patients



Time table for the diet of the patient

7-8AM	Breakfast
10:30-11:30AM	Soup/Beverages
1-2PM	Lunch
4-5PM	Evening tea
6-7PM	Soup
8-9PM	Dinner

- Dinner of the same day,breakfast and lunch of the next day are decided prior in the evening and diet tickets are issued by the dietician and given to the chef.
- Apart from these if patients wants to have something extra ,those can be provided to the patient after consulting dietician ,but for an extra charges.

Different menu offered are –

- Indian menu
- Afgani menu for middle east patients.
- Continental menu
- No onion and no garlic menu for jain patients

20) HOUSE KEEPING

The manpower in housekeeping is outsourced with a number of 230, of which 6 are in-house employees. Service level agreement is followed i.e. the out sourcing company charges the hospital for per square feet of area. The department has a nerve centre, which is a centralized system for complaints concerning housekeeping. Any patient complaint is closed within 15 minutes. If it is not possible to solve the complaint within this time, the patient is communicated about the delay.

21) SECURITY DEPARTMENT

The security department is an eye and ear of every organization acting as a liaison between management and staff. The control room of Security Department is located on B1 (basement) of East Wing, Max Saket.

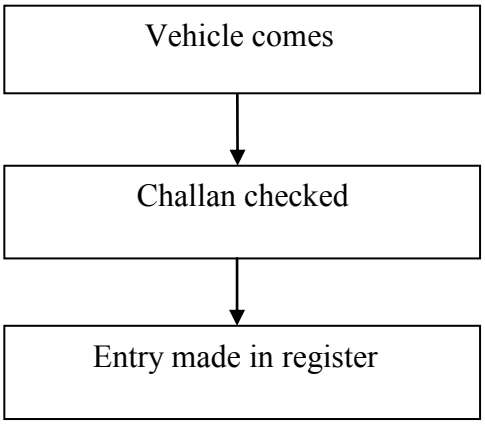
Functions of Security Department:-The security department performs four main functions as discussed below.

1. Security management:-

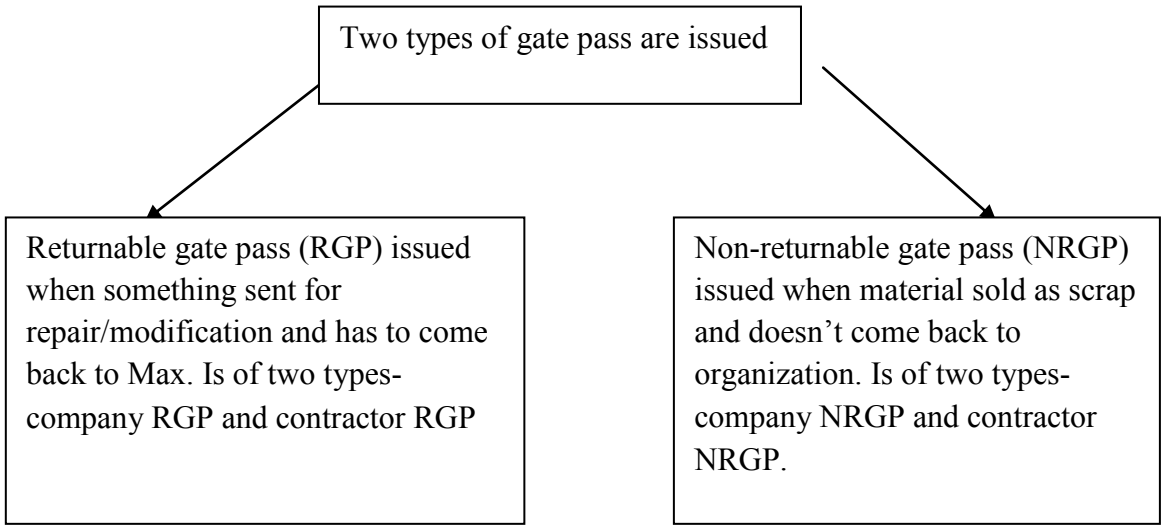
- Selection of people(guards and supervisors)
- Deploying of security staff to different floors and departments
- Checking of people entering hospital
- Turnout and grooming of security staff
- Training of security staff
- MLC handling
- Dispute handling

2. Material management:-It includes management of both incoming and outgoing materials.

a. Flow for incoming materials:-The incoming materials are received either from a company or a contractor to Max.The process flow is as under:-



b. Flow for outgoing materials



3. Disaster management:-

There are six emergency codes:-

1. Red- Fire

2. Black- Bomb threat

3. Blue-Cardiac arrest

4. Yellow- External disaster like earthquake

5. Violet-Violent patient

6. Pink- Missing patient

The SOP's and disaster management plans are prepared by the Security Department. Fire management system includes smoke detectors, sprinklers fitted on ceiling and fire shafts in all corridors.

Walkie talkies are an important source of communication.

Other disasters include floods, water logging, terrorist attacks.

4. Valet management:-

- Helps to optimally utilize the parking space.
- Within a time frame of maximum 7 minutes, vehicle is handed over to customer when asked for in porch.

PROJECT-I

Effectiveness Of Biomedical Engineering Programs To Reduce The High Cost In A Hospital

A. BACKGROUND:

Today's delivery of health care depends in an ever increasing manner on the developments made in medical technology. There is not one health-care providing department within the hospital that has not felt the impact of electrical, electronic, or mechanical instrumentation in its daily routine. The recent growth in the biomedical equipment technology field has been rapid, producing a proliferation of increasing complex medical devices. As a result of this growth, there exists an increasing degree of direct interface between patient and equipment.

Innovations, in the past ten years, have subsequently led to a new generation of sophisticated medical equipment which have their dedicated protocols for maintenance and also require specialized repair at times. Advancing technology, while supporting medical developments, created a demand for even further sophisticated instrumentation. The consequence of this trend was an increasing complexity of medical equipment and dependence on a technology. [(1)]

In today's high technology environment with a proliferation of advanced & complex medical equipment, biomedical engineering has assumed great significance. The aim of biomedical engineering programme is to provide technical expertise & management support to hospital administration, engineering department & the medical staff. Biomedical engineering is one of the latest & most dynamic programmes in hospital. The survey presented in a paper shows that for 19 large hospitals the average ratio of equipment repair costs to acquisition cost was 7.4%. This is one reason for the divergent cost data reported by the various hospitals. These costs should be considered particularly for comparisons between in-house service costs and other sources of service. [(2)]

B. INTRODUCTION:

Biomedical Engineering is the application of engineering principles and techniques to the medical field. It combines the design and problem solving skills of engineering with medical and biological sciences to help improve patient health care and the quality of life of individuals.

This department ensures that technology is used appropriately and safely, performs properly, and is managed cost-effectively. Biomedical Engineering caters to improve and develop devices and instrumentation for health care delivery and to assist others at Partners who are working toward the same objectives. Biomedical Engineering is committed to supporting quality and compassionate care to patients. [3]

The ratio of equipment repair cost to acquisition value may be useful as a tool to predict future costs of a given hospital's medical equipment maintenance. This tool may also be useful as a measurement of the effectiveness of a change in a hospital's approach to biomedical equipment maintenance. [4]

Expenditure on biomedical equipments

Expenses are added to one of these two main categories: Capital expenditures (CAPEX), Operational expenditures (OPEX) [5]

Capex:

A capital expenditure (Capex) is money invested by a company to acquire fixed, physical, non-consumable assets, such as buildings, equipment or a new system.

There are two types of Capex –

- That are invested in to maintain existing levels of operation within a company
- That is invested in something new to foster future growth.

Opex:

An operational expenditure (Opex) is the money a company spends on an ongoing, day-to-day basis in order to run a business or system.

Opex includes cost of:

- Repair and maintenance
- Calibration of equipments
- Maintenance contract
- Consumables

Repair and maintenance-

Repair:

Work performed on a piece of equipment to restore it to proper operating condition. The work is usually furnished on an unscheduled basis following a request from the equipment operator or user.

Maintenance:

Proper maintenance of medical equipment is essential to obtain sustained benefits and to preserve capital investment. Medical equipment must be maintained in working order and periodically calibrated for effectiveness and accuracy of the results. Schedule, checklist sand records of preventive maintenance should be maintained.
The Maintenance consists of:

A. Planned Preventive Maintenance
B. Breakdown Maintenance

A. Planned preventive maintenance:

Planned Preventive Maintenance involves maintenance performed to extend the life of the equipment and prevent its failure. It is usually scheduled at specific intervals and includes specific maintenance activities such as lubrication, calibration, cleaning (e.g. filters) or

replacing parts that are expected to wear (e.g. bearings) or which have a finite life (e.g. tubing).

Planned Preventive maintenance will be a statutory requirement for most of the medical equipments. It will enhance the efficiency, effectiveness and reliability of medical equipment and must be carried out at appropriate frequency as suggested by the manufacturer/service provider.

Table showing few examples of basic frequency of Planned Preventive Maintenance of some of the equipments is given below:

S.N.	Equipment Name	Frequency*
1.	CT Scanner (Complete System)	Quarterly
2.	Autoclave	Quarterly
3.	Echocardiography Machine	Half Yearly
4.	Patient Monitor	Half Yearly
5.	ECG Machine	Half Yearly
6.	OT Table	Half Yearly
7.	Ultrasound Machine	Half Yearly
8.	Defibrillator	Half Yearly
9.	Anaesthesia Machine	Half Yearly
10.	Ventilator	Half Yearly

* These are broad guidelines. However, frequency can be altered depending upon Manufacturer's guidelines

B. Breakdown Maintenance:

It is a task performed to identify, isolate, and rectify a fault so that the out of order equipment, machine, or system can be restored to an operational condition. All medical equipment in use should be free from any fault or defect and all repair work should be carried out to accepted standards by competent person(s).

Calibration: [6]

Calibration is the activity of checking, by comparison with a standard, the accuracy of a measuring instrument of given type. It may also include adjustment of the instrument to bring it into alignment with the standard.

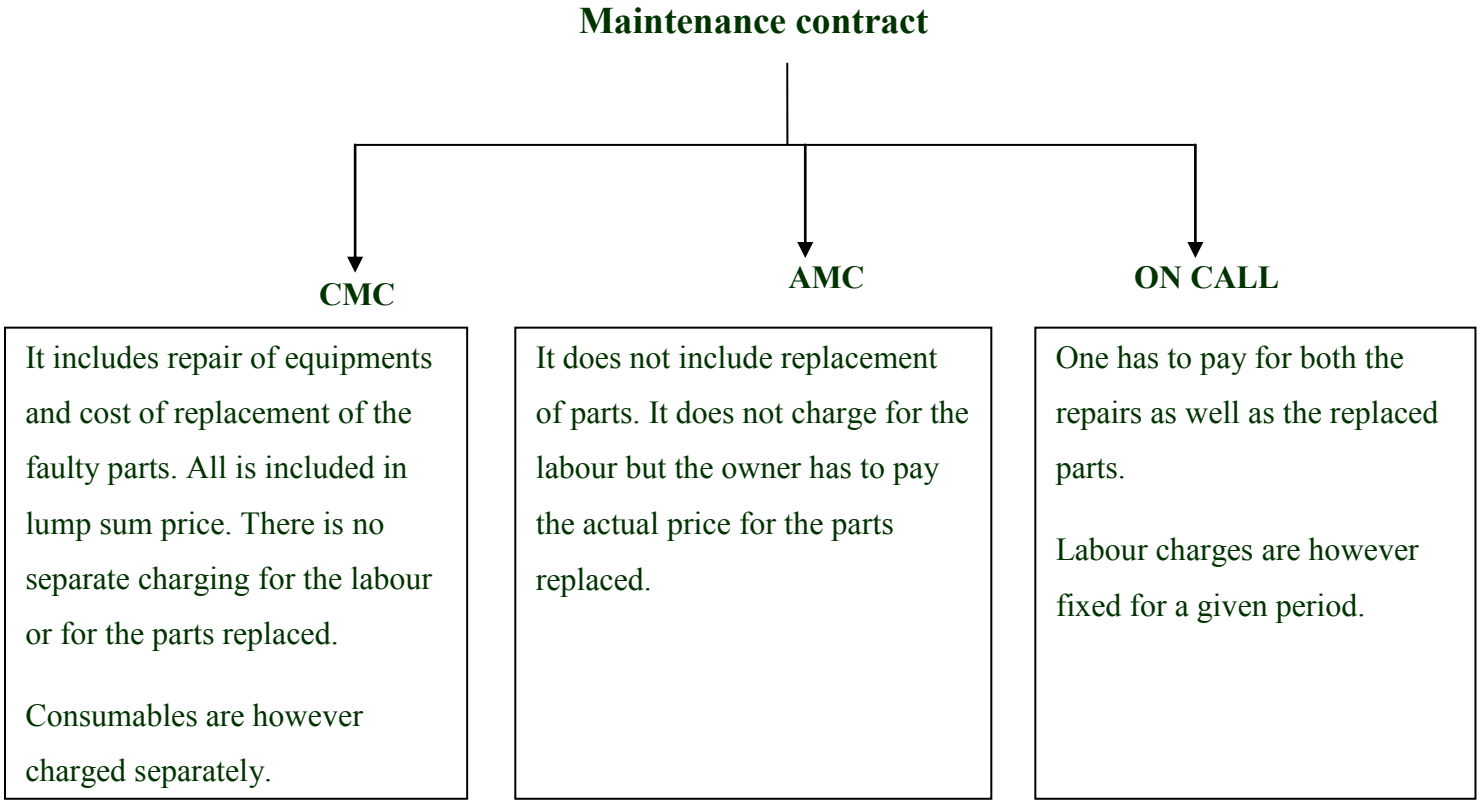
Calibration is done by checking the instrument against known reference standards that have themselves been calibrated in a chain of measurements that can be traced back to agreed International Standards.

Maintenance contract:

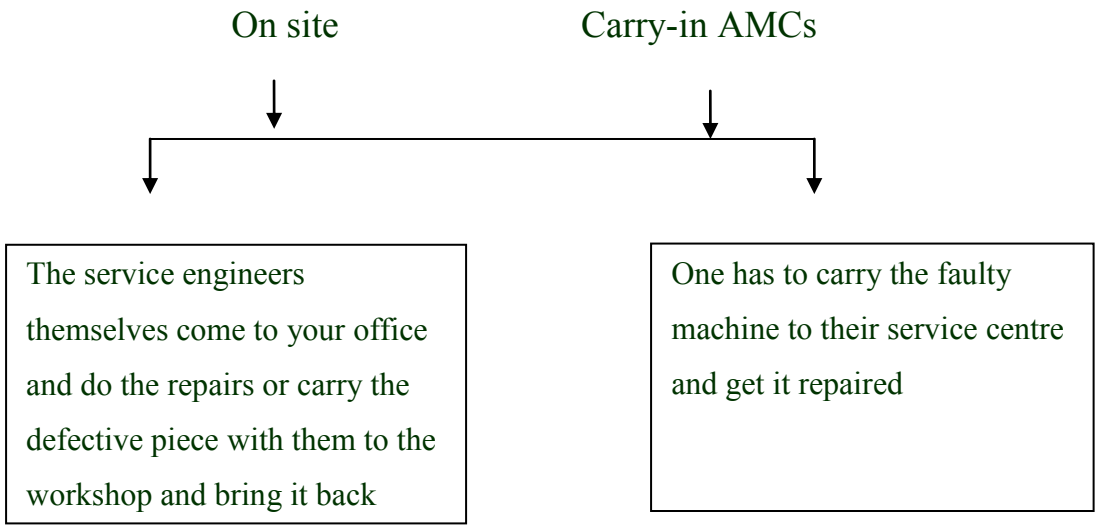
A maintenance contract is the written document that sets forth the terms of an agreement between a client and a maintenance service provider. The overall purpose for a maintenance contract is to have regular availability of the service provider over random or emergency calls.

Medical equipments can be contracted out on maintenance contract.

Types of an annual maintenance contract services:



AMCs can also be divided into:



Consumables:

Consumables are goods that require recurrent replacement because they are used up or transformed in their use. Many **consumables** are disposable in nature. In a hospital consumables can be needles, gloves, bandages, and tubing etc.

C. RATIONALE:

Effective biomedical engineering programs can help healthcare organizations in reducing the high cost of acquiring and maintaining biomedical equipments like-

- Central negotiation at the time of purchase of any equipment.
  (Elaborated purchase order for: Warranty, exclusion& inclusion, AMC charges and up gradation of equipments)
- Component level repairing or repairing of equipment by third party
- In-house setup for repair and maintenance of biomedical equipments and calibration of equipments

D. RESEARCH QUESTION:

How effective are the Biomedical engineering programs to reduce the high cost of acquiring and maintaining patient care equipments in a healthcare organization?

E. OBJECTIVES:

- To find out cost of acquiring and maintaining major biomedical equipments.
- To identify key components in biomedical equipments for cost effective biomedical programs and negotiation for central purchases in a hospital.
- Learn cost effective methods for biomedical equipments in their purchase, repair and maintenance and their calibration.

Major biomedical equipments:

PET CT: (positron emission tomography) [7]

PET-CT scan is a diagnostic tool used to detect cancer and find out the cancer's stage (a way of describing where the cancer is located, if or where it has spread, and whether it is affecting the functions of other organs in the body). It helps the doctor to decide what kind of treatment is best and helps in predicting prognosis (a patient's chance of recovery).

The scan can also be used to locate an area for a biopsy (the removal of a small amount of tissue for examination under a microscope to determine whether cancer is present) or to evaluate the effectiveness of cancer treatments, such as chemotherapy or radiation therapy. In addition, the CT portion of this scan is often used for treatment planning of radiation therapy.

SPECT CT: (Single-photon emission computerized tomography) [8]

A SPECT scan is a type of nuclear imaging test, which means it uses a radioactive substance and a special camera to create 3-D pictures

SPECT scan produces images that show how organs work. For instance, a SPECT scan can show how blood flows to your heart or what areas of your brain are more active or less active.

SPECT CT has advantages as it can be used in:

- Better localisation of lesions deep inside the human body.
- Much improved spatial resolution: detectable lesions <1cm.
- More precise topographical mapping of organs and physical structures and
- Easier comparison with other sectional imaging techniques (e.g. CT, MRI)

LINAC (Linear accelerator): [9]

These are a powerful radio surgery system that offers a versatile combination of advanced technologies for the treatment of tumours and other anatomical targets .It provides non-invasive treatment for a wide range of malignancies and other potentially debilitating conditions, without harming nearby healthy tissue and without involving traditional surgery.

CT simulator:

CT simulation transmits X-rays through tissue to create a graphic display of the tumour and surrounding normal tissue .A CT Simulator allows for precise treatment planning by demonstrating the relationship between the target tumour and healthy tissues while the patient is in treatment position.

Echocardiogram:

An echocardiogram is a test in which ultrasound is used to examine the heart. It is capable of displaying a cross-sectional "slice" of the beating heart, including the chambers, valves and the major blood vessels that exit from the left and right ventricle.

CT scan:

A computed tomography (CT) scan uses X-rays to make detailed pictures of structures inside of the body.

A CT scan can be used to study all parts of your body, such as the chest, belly, pelvis, or an arm or leg, blood vessels, bones, and the spinal cord. It can take pictures of body organs, such as the liver, pancreas, intestines, kidneys, bladder, adrenal glands, lungs, and heart.

Ultrasonography:

An ultrasound machine creates images that allow various organs in the body to be examined. Ultrasound-based diagnostic medical imaging is used to visualize muscles, tendons, and many internal organs, to capture their size, structure and any pathological lesions with real time tomography images.

OT Table:

It is the table on which the patient lies during a surgical operation.

Sternal saw:

A sternal saw is a bone cutter used to perform median sternotomy, opening the patient's chest by splitting the breastbone or sternum.

Sterilizer: (Autoclave)

A device for heating substances above their boiling point; used to manufacture chemicals or to sterilize surgical instruments.

Cost of acquiring and maintaining major biomedical equipments:

Equipment & (Company name)	Year of purchase	Cost of acquiring the equipment (in crores) (approx.) (A)	Cost of maintenance at present (In 2014) (in lakhs) (approx.) (B)	Total Cost (A)+(B)
PET CT (WIPRO- G)	2009	8.85	24.0	9.09
SPECT CT (WIPRO -G)	2009	9.5	18.0	9.68
UNIQUE (VARIAN)	2011	7.2	30.4	7.50
NOVALIS Tx (VARIAN)	2008	12	40.4	12.40
CT simulator - (Radiation oncology) (SIEMENS)	2009	1.8	24.3	2.04
Echo machine IE 33 (PHILLIPS)	2008	0.5	3.0	0.53
CT SCAN (PHILLIPS) 64 slices	2006	2.5	1.4	2.51
Steriliser (GETTINGE)	2006	0.40	1.0	0.41
Ultrasound (WIPRO-G)	2009	0.36	2.3	0.38
OT Table (ALM)	2004	0.19	1.20	0.20
Sternum saw (TARUMO)	2004	0.027	0.4	0.03

*This information regarding cost of acquiring and maintenance of major equipments was collected by interviewing senior person of the department.

F.RESEARCH METHODOLOGY:

PROJECT DESIGN:

To learn cost effective methods for biomedical equipments, it is required to first identify the key components in which cost effective methods can be used.

For that a sample is taken –

Study design: Cross – sectional study

Study area: In Biomedical engineering department in MAX Hospital, Saket.

Sampling: Non probability sampling

Sample size: One year (2013-2014)

Duration of study: 4 Weeks (1.05.14 to 31.05.14)

Inclusion criteria: All equipments in which cost effective method can be used for their repair and maintenance, calibration or in central negotiation at the time of purchase of an equipment.

Exclusion criteria: Equipments in which intervention in current procedures used for their repair, maintenance, calibration and negotiation are not feasible.

Mode of data collection:

- Senior personnel of the department was interviewed in detail to know about the cost involved in different procedures like repair and maintenance, calibration and annual maintenance and comprehensive maintenance cost at present as well as about the alternative cost effective ways for these procedures.
- For exact cost of these procedures information was also collected from Expenses tracker/records of the department.

Identifying key components in major equipments for cost effective biomedical programs and in central purchase negotiation in a hospital:

(For the given sample)

PET CT SCAN:

At the time of equipment purchase negotiation can be done for **PET CT TUBE**. So that it can be included in CMC.

MONITOR:

- Central negotiation can be done at the time of purchase, for equipment as well as for its attachments like- ECG lead, spO_2 probe, trunk cable, NIBP cuff and other accessories.
- Repair of parts like MMS can be done in house.

STERNAL SAW:

- Central negotiation can be done for equipment at the time of purchase.
- Repair of sternal saw cable can be done in house.

OT TABLE:

- Central negotiation can be done at the time of purchase of equipment.
- Repair of OT table cable and remote can be done in house.

Apart from these key components for cost effective biomedical programs; negotiation can be done at the time of purchasing of a new equipment for better AMC/CMC offers, extended warranty, better discounts etc.

Data Analysis, Compilation and Interpretation

S.N.	Item description	Qty.	Expense involved (in lakhs)	Time involved in days (approx)	Alternate procedure	Expense involved in lakhs in alternate procedure (approx.)	Time involved in days (approx)	Difference in expense (in lakhs)
1.	PET CT TUBE + Cost of procedures could have been done in down time of PET CT	1	34.6 27.6 (15*23000*8) 62.2	10	To cover it under CMC	29.65 + 14.8 44.4	2	17.8
2.	Repair of sternal saw cable	2	0.33	30	In house repair by using gear assembly only	0.01	2	0.32
3.	Repair of old MMS	3	3.45	100	In house Repair of faulty MMS only	1.45	10	2.0

4.	Repair of ALM OT table cable	1	0.13	20	In house repair by using Lan-cable connector only	0.0001	2	0.13
5.	Repair of old MMS	2	3.24	10	In-house repair	0.74	10	2.50
	Total		**69.35 Lakhs**	**170**		**46.6 Lakhs**	**26 days**	**22.75lakhs ~23 lakhs + 144 days**

* Details of cost involved in repair and maintenance of equipments in year April 2013-March 2014 is attached with annexure 1.

NOTE: (For PET CT)

- At present CMC is paid **24 lakhs** in which PET CT Tube is not included.
  But **if PET CT tube is covered under CMC**, they will have to pay 53.65 lakhs in a year. (29.6 lakhs more)

- 53.65 lakhs = 24 lakhs + 29.6 lakhs
  (Presently paying CMC) (Includes replacement of PET CT tube And detector)
- Purchase of new PET CT tube costs **34.6 lakhs** and a new detector costs **32 lakhs**.
- PET CT tube is replaced after every 18 months.
- If not included under CMC, equipment down time is for approx. 10 days (under CMC coverage down time is 2 days) that also causes loss; as explained:

Cost of procedure	No. of procedures in a day	Effective down time of PET CT	Total loss when equipment is not working
23000	15	8	27.6 lakhs

- So, **in case of not including PET CT under CMC**; actual cost is **62.2 lakhs** i.e. (**34.6lakhs**; cost of new tube + **27.6 lakhs**; cost of procedures which could have been done in down time of equipment)
- But **if included** it will cost **44.4lakhs** i.e. CMC for 18 months.
  (29.6; amount of CMC in a year + 14.8 for 6 months)

Calibration of equipments:

Expenditure involved on calibration of equipments in a year(approx.)	**Alternate procedure**	**Expenditure involved in alternate procedure per year (approx.)**	**Difference in expenses (approx.)**
2.5 lakhs	In house calibration Of equipments for branches of max hospital in NCR region	1.22 lakhs	**1.28 lakhs**

- 1.28 lakhs Rs. can be saved per year (Approx.10700/- per month) on calibration.

For in house set up for calibration of equipments requires:

Tool kits required for calibration	Purchase charges (One time investment) (Rs.)	Calibration charges (per year) (Rs.)	Salary for technician (per year) (approx.) (Rs.)
Weighing scale tool kit	5000	1000	
Pressure gauge tool kit	1500	1000	
Total	**6500** **It will be recovered within one month only**	2000	1*12*10,000 = 1,20,000

- At the time of in-house set up for calibration of equipments **first time expense** will be **1.285 lakhs**. Then from next year onwards expense will be **1.22 lakhs**. It will **save 1.28 lakhs in a year** as compare to present scenario.

CONCLUSION

1) It is been concluded that cost effective Biomedical engineering programs/procedures are able to reduce the high cost of acquiring and maintaining biomedical equipments in a healthcare organization. For a successful biomedical engineering programmes it is essential to first identify the key components in which cost effective measures can be used.

   These biomedical engineering programmes are:

- In house repair and maintenance set up
- In house set up for calibration set up
- Central negotiation at the time of purchase of equipments

2) In the selected sample cost effective procedure can save:

- **23 lakhs Rs.** And **144 days (Approx. 5 months) time** in **repair and maintenance by using alternate procedures.**
- **1.28 lakhs** in **calibration** of biomedical equipments
- **Central negotiation** at the time of purchase of equipments can also be a cost effective procedure / economies of scale.

SUGGESTIONS

- Include PET CT tube under CMC, which can save cost in terms of money and time. It will improve quality as well; as the equipment (PET CT) will be working eight more days as compare to present scenario.

- Calibrations for some equipment (measuring weight and pressure) can be done in house which is cost effective in terms of money and time as well.

- Training to Bio medical engineers for regular maintenance.

- Training to all technicians for regular preventive maintenance. (to reduce number of events of breakdown)

- Tie up with other facilities so that patients will not suffer or get dissatisfied during breakdown period.

ANNEXURES

Annexure 1

Cost involved in repair and maintenance in year April 2013-March 2014:

S.N.	Item description	Qty	Vender details	Purchase order no.	P.O. Date	P.O. value (Rs.)	Month
1.	PET CT TUBE	1	Wipro GE Healthcare	MMSL/SAKET/CG/	11.06.13	34,65,000.00	13-06-2013
2.	Repair of sternal saw cable	2	Corona Healthcare	DDF/SKT/MSC/297	27.06.13	33258.56	13-06-2013
3.	MS_x1 5ld w/o p/t-eng hwc P/n451261013041 against buy back of old mms	3	Philips Electronics	DDF/SKT/MSC/325	08.07.13	345933	13-07-2013
4.	Repair of OT table cable	1	The Techies	DDF/SKT/MISC/432	22.08.13	13483.2	13-08-2013
5.	Ms_x1 5LD W P/T ENG HWC MMS	2	Philips Electronics	696	08.11.13	324783	13-11-2013

Total= **482457.76/-**

Annexure 2:

Max branches in NCR	**Expense on calibration per year (Approx.) (Rs.)**
Max, saket	80,000
Panchsheel	10,000
Patparganj	80,000
Pitampura	10,000
Shalimar bagh	50,000
Gurgaon	10,000
Noida	10,000
TOTAL	**2, 50,000**

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(7) cancer.net

(8) Mayo clinic.net

(9) UCLA (university of California) Department of Radiation Oncology

PROJECT –II

FORMULATION OF MARKETING STRATEGIES TO PROMOTE HEALTHCARE SERVICES FOR ONCOLOGY DEPARTMENT IN MAX HOSPITAL – SHALIMAR BAGH

INTRODUCTION:

Max Shalimar Bagh - one of the branches of max healthcare, consolidated its position in north-west Delhi & NCR ever since its start of 300 bedded facility in November 2011**.** Covering over 2 lakh 98 sq. ft. area and standing 12 floors tall is a leading multi-super Speciality Hospital providing the high level of professional expertise with an underutilized oncology facility. (www.maxhealthcare.in)

Today, it is an essential part of oncological care to provide patient's psychosocial dimension of health in addition to mainstream cancer care.

Cancer care today often provides state-of-the-science biomedical treatment, but somehow falls short to address the psychological and social problems, part and parcel of illness. This failure can compromise the effectiveness of health care and thereby adversely affect the health of cancer patients. Hereby we need to work upon and extend the variety of services to help patients and their families manage the psychosocial aspects of cancer in a better way.

Health care institutions have started promoting themselves more aggressively in the recent past as compared to a few years back. It seems like several health care institutions have adopted a more social marketing approach. Health care marketers use advertising in its many forms to sell their products and services. Various pamphlets, leaflets, flash cards, brochures, and other advertising literature can be powerful sales tools for a health care company when provided to customers and potential customers

Marketing strategy includes all basic and long-term activities in the field of marketing that deal with the analysis of the strategic initial situation of a hospital and the formulation, evaluation and selection of market-oriented strategies and therefore contributes to the goals of a hospital and its marketing objectives.

It involves careful and precise scanning of the internal and external environments. Internal environmental factors include the marketing mix and performance analysis and strategic constraints. External environmental factors include customer analysis, competitor analysis, target market analysis, as well as evaluation of any elements of the technological, economic, cultural or political/legal environment likely to impact success.

A key component of marketing strategy is often to keep marketing in line with a hospitals overarching mission statement.

(http://www.healthleadersmedia.com/supplemental/7297_browse.pdf)

RATIONALE:

MAX Shalimar bagh hospital a leading branch of Max health care has underutilized oncology facilities with minimal number of patient footfall in oncology department. Subsequently to increase the daily average number of patients it is necessary to develop marketing strategies to promote and inflate oncology department.

OBJECTIVES:

1. To analyze the requirement of marketing strategies in oncology department of hospital
2. To build awareness for cancer treatment and recognition of oncology dept.
3. To design marketing materials for oncology department of hospital as per their requirement.

MARKETING STRATEGIES

1. To analyse the requirement of marketing strategies in oncology department of hospital

- ✓ In India, 0.95 million new cancer cases (948 thousand cases, Males -430 thousand cases, Females -518 thousand cases) and 0.63 million cancer deaths (633 thousand cases, Males-321 thousand, Females-312 thousand) occurred (Globocan, 2008; IARC, 2010).
- ✓ The latest figures published in the British medical journal The Lancet show that around one million new cancer cases are being diagnosed in India each year, projected

to nearly double to 1.7 million new cases in 2035,around 700,000 people are dying from cancer in India annually, projected to rise to around 1.2 million deaths in 2035. (http://www.apocpcontrol.org/)

- ✓ In Delhi nearly 29,580 more cases of cancer were reported in 2013, an increase of 2.79 per cent from previous year, with the killer disease claiming around 4.78 lakh lives in the same year.. (www.indiancancersocietydelhi.in)

Cancer incidence will continue to grow in the country in the future as a result of increase in life expectancy , increase in the proportion of elderly population, size of population and due to absence of any mass screening programmes in the country Max Shalimar Bagh hospital situated in North West Delhi has well-established ICU, Emergency and trauma room, cardiac centre, neurology and orthopaedic centre with tertiary care facilities can be an immense resourceful help in bringing down these new cancer cases in Delhi along with full laid cancer centre in other parts of Delhi like in South Delhi max Saket, East Delhi Max Patparganj.

- ✓ Max Shalimar bagh is surrounded by well-established 164 bedded Rajiv Gandhi cancer institute within a range of 6.4 km AND IS THE BIGGEST DIRECT COMPETITOR. Cancer patients usually go to different hospitals for 2nd opinion as it's a chronic frightful condition, Thus Max Shalimar bagh offers a help of second opinion for cancer patients which is highly needed.

2. To build awareness for cancer treatment and recognition of oncology department

- ❖ **OUTSTATION OPD CENTRES**- A health care facility usually operated under the auspices of a large institution but situated in a location some distance from the larger health centre is an outstation OPD centre.

Max Healthcare introduces clinic concept to better serve the needs of individuals and families of cancer patients in Sonipat, Panipat and Karnal dist. Of Haryana (WITHIN 100 KM of max Shalimar bagh) state by bringing the most frequently used services

of the Cancer Centre closer to the communities where they live. And in case of referral, patients can be brought back to Max Shalimar bagh HOSPITAL.

- **TALKS** can be arranged IN Colleges REGARDING risk factors and early diagnosis of Head & Neck cancer.
- **TALKS** can be arranged in **fitness centres and in malls** regarding techniques of self-examining Breast cancer.
- As per our findings in max saket cancer (out- patient department) centre nearby
  - 25%OF PATIENTS were diagnosed by breast cancer
  - 12%-15% of patients were diagnosed by Head& Neck cancer

So targeting these segments, **Screening camps** for these two highly prevalent cancers are planned.

- Statistics show that the - the Head and Neck cancers and breast cancer – can be easily detected at an early stage. Like Oral cancers show up in the form of white patches (leucoplakia), red patches (erythroplakia), Submucous fibrosis and difficulty in fully opening the mouth. These can be easily detected during an oral examination.
- A firm lump, small changes or discharge from the nipples are early signs of breast tumour.

The screening consists of examination by our panel of doctors **including a surgeon, a physician, and a gynaecologist**. We will be offering consultation with minimum diagnostic services. Initially, the camps will be organized at factory premises, the idea being to reach out to people with a perceived high risk. THEN they will be held in **nearby banks, grade 1 employees of mills and factories and industrial areas, residential colonies and colleges.**

- Max Shalimar bagh in northwest Delhi and in vicinity (100 Km) lies well laid cities like Panipat and Sonipat with total population of 442,277 and 292,339 respectively with estimated Cancer Incidence 276 per lakh population. The absence of any major cancer centre and high incidence opens window for opportunity to create awareness and recognition by skilful management of our max Oncology unit. A dedicated oncology team comprising of 3 surgical oncologist +1 medical oncologist+1 radiation oncologist visits Max Shalimar bagh twice a week.
- Max Shalimar Bagh hospital with upcoming cancer department is situated in North West Delhi has well-established ICU, Emergency and trauma room, cardiac centre, neurology and orthopaedic centre with tertiary care facilities can be an immense

resourceful help in bringing down these new cancer cases in Delhi along with full laid cancer centre in other parts of Delhi like in South Delhi -Max Saket, East Delhi -Max Patparganj.

MAX CANCER CARE APP

According to IDC (International Data Corporation), the India Smartphone market grew by 229% year-on-year to 12.8 million smart phones in Q3 of 2013, compared to 3.8 million units in year-ago period. Smartphone sales grew 28% in Q3 of 2013 compared to April-June 2013 (10.02 million)

India witnessed the highest rate of growth — over 186 per cent — in Smartphone sales in Asia Pacific region during January-March 2014, outshining countries like China.

Ten years from now everyone from teens to the elderly will be carrying a Smartphone, and these mobile devices will be exponentially smarter than they are today. In addition to being location aware, the Smartphone of the future will be situationally and contextually aware. This will allow it to present information directly to you when you need it, revolutionizing the way patients are engaged by the healthcare system.

These new capabilities coupled with the explosive growth in digital health apps – the market for mobile health apps is expected to quadruple to $400 million by 2016, according to ABI Research – promise to radically change the way health care is delivered and accessed.

Here are three ways digital Max cancer care app will transform healthcare delivery:

- **Improved access to care*:***

In a digital age, the requirement for patients and doctors to be in the same location is eliminated. Patients suffering from chronic diseases like cancer that live in tier II cities or otherwise have limited access to doctors will be able to ―visit" with primary care physicians or specialists located in the next major city or a half a world away. s

- **Improved patient engagement:**

Many aspects of healthcare discourage patient engagement – long lines, complexity, lack of transparency of cost and quality. Much of this is unnecessary. One could easily be notified via text that your physician is running late. Apps can also eliminate complexity

- **Improved Patient Safety:**

Digital apps will make health care safer by giving patients tools to manage their own health. Today, patients leave the hospital with a stack of papers and very little memory of what they're supposed to do when they arrive home. If all the information needed for a safe and healthy recovery were handed on an app, ONE could tend to the most urgent tasks and the one or two items most important to remember – and the app would take care of the rest. Apps can remind the patients to take medicines, monitor side effects and transfer the knowledge to their provider. This would be a huge advance for patient safety.

In the future, everything that can be done digitally will be done digitally. Digital health apps will schedule appointments, tell you the doctor is running late, help monitor medications' side effects, and help you follow your care plan accurately. These changes will engage patients with their health and healthcare in new ways. It will also radically reform healthcare delivery. wwws.nap.edu

PROJECT DESCRIPTION

Max cancer care app strives to provide its patients with the highest quality and most compassionate care. This useful cancer care app is one fetching piece of the comprehensive care, Max health care group offers at their Cancer Centres in Shalimar bagh, Saket and Patparganj, New Delhi. The app gives patients the ease of tracking their treatment, managing their care team, and keeping connected and entertained throughout their journey.

Cancer patients diagnosed usually have long treatment duration. Most of the patients are treated in 3 modalities-

I. Medical /palliative cancer care – involves chemotherapy

II. Surgical cancer care – involves biopsy.

III. Radiation cancer care –using high energy x-rays.

These modalities have different cycles which patients have to keep follow up with their consultants in their long span of life. From now on it's essential to develop a cancer care app to provide immense need to the desired patients.

Key functionality of Max cancer app-

- **Track your treatment** – user-friendly pain tracker and treatment tracker to analyze progress
- **My care team** – select and save a custom profile of your care team
- **Patient network** – connect with other cancer patients and patient support groups; share stories, ask questions and offer support
- **Lab results** – securely enter your information to receive lab results
- **Virtual wig gallery –** upload your photo and try on wigs; resize to fit your face

- And much more!

3. To design marketing materials for oncology department of hospital as per their requirement

Designing of marketing material:

Marketing materials designed are-

- Radiation oncology department Standee
- Chemotherapy information leaflet
- Preventive oncology information Leaflet
- Head &Neck cancer information Leaflet
- Breast cancer information Leaflet

OPERATIONAL DEFINITIONS

Marketing strategy

Is defined a process that can allow an organization to concentrate its resources on the optimal opportunities with the goals of increasing sales and achieving a sustainable competitive advantage(http://en.wikipedia.org/wiki/Marketing_strategy)

Standee:

It's a large self-standing display promoting a product or event. Standees have previously been available only in large quantities; recent advances in digital photography and print on demand technology have made them available to the public (http://en.wikipedia.org/wiki/Standee)

Patient information leaflets (PILs)

These leaflets contain specific information about medical conditions, side effects and precautionary measures to give the user information about the disease. (http://en.wikipedia.org/wiki/Patient_information_leaflet)

RESEARCH METHODOLOGY:

Study design: Cross- sectional qualitative descriptive study

Study area : Oncology Department (GROUND Floor, South Block) in MAX Hospital, Saket and (GROUND Floor) in max Shalimar bagh hospital.

Duration of study: 2 Weeks (19.05.14 to 31.06.14)

Mode of data collection: Primary data was collected by interviewing senior personnel of the department for designing patient information leaflets and radiation oncology standee. Secondary data was collected from records of oncology department and retailed internet sources.

CONCLUSION

One word that is even more daunting than the death itself and eats up a person from the inside is cancer. Every year, about 1 million new cancer patients get registered with the National Cancer Registry Programme in India. This shows that cancer is one of the major health problems in India at present. Cancer is not just one disease but many diseases. There are more than 100 different types of cancer.

Even though heredity plays its role in causing cancer, it accounts for just five per cent of cancer cases. This means that the rest of the percentage is caused by non-heredity factors such as lifestyle, food we eat, level of physical activity, personal hygiene, etc.

Also from epidemiological studies, it is clear that 70-90% reasons of developing cancer are environmental and related to the lifestyle of a person and so, to a great extent, it is preventable. (http://www.ncbi.nlm.nih.gov/books/NBK4015/)

The cancer incidence results show an urgent need for strengthening and augmenting the existing diagnostic/treatment facilities, which are inadequate even to tackle the present load. So here by in Max Shalimar bagh our single watchword of developing marketing strategies is to incorporate mass scale screening, diagnosing and treating the cancer patients both humanely and scientifically

Marketing in a hospital environment has unique challenges that are not found in most other organizations. The product is variable, the customer is not usually a willing buyer, and there is not a true price−value exchange.

If you are not meeting regularly with the people who have day-to-day contact with your patients and consumers, you cannot possibly know how effective your services are.

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