Internship Training

At

100 BEDDED MULTISPECIALITY HOSPITAL

(Feb 3-April 30, 2014)

"GAP ANALYSIS of OPERATION THEATRE INFRASTRUCTUTE,UTILISATION and MANPOWER"

By

Dr.Harpreet Kaur Bambra (P.T)

Under the guidance of

Dr. Preetha GS

Post Graduate Diploma in Hospital and Health Management
Year 2012-2014

International Institute of Health Management Research

BENSUPS Hospital
Healing Touch
Cygnus Super Speciality Centre
PATIENT CARE WITH UTMOST CARE

BCH-HR-11/09.04.2014

TO WHOM SO EVER IT MAY CONCERN

This is to certify that **Dr. Harpreet Bambra(PT),** a student at international institute for Health Management Research, has undergone an 8 week learning and dissertation placement in the OT department, commencing from 5th Feb.'2014 to 10th April'2014.

During her training, Dr. Harpreet exhibited a high level of professionalism and a tremendous just for learning.

We wish him good luck in his future career.

With Best Wishes,

Puneet Khanna
Head HR

24 Hr General Helpline +91 88 00 128080
24 Hr Medical Helpline +91 88 00 148080

BENSUPS Avenue, Sector 12, Dwarka Sub-City, New Delhi 110075 India
T +91 (011) 455 50000 | F +91 (011) 455 50002
www.bensupshospital.com

TO WHOMSOEVER MAY CONCERN

This is to certify that **Dr.Harpreet Kaur Bambra(PT)** student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from International Institute of Health Management Research, New Delhi has undergone internship training at **100 Bedded Multispecialty Hospital**
From **Feb, 2014** to **April, 2014**.

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

27/5/2014

Dr. A.K. Agarwal
Dean, Academics and Student Affairs
IIHMR, New Delhi

Dr.Preetha GS
Asstt. Dean, Research
IIHMR, New Delhi

Certificate of Approval

The following dissertation titled **"GAP ANALYSIS of OPERATION THEATRE INFRASTRUCTUTE,UTILISATION and MANPOWER"** at **"100 Bedded Multispeciality Hospital"** is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **Post Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation.

Name	Signature
Keerthi Udaya	Keerthi Udaya
Preethi KS	

Page 4

Certificate from Dissertation Advisory Committee

This is to certify that **Dr. Harpreet Kaur Bambra (PT),** a graduate student of the **Post-Graduate Diploma in Health and Hospital Management** has worked under our guidance and supervision. He/ She is submitting this dissertation titled **"GAP ANALYSIS of OPERATION THEATRE INFRASTRUCTUTE,UTILISATION and MANPOWER"** at **"100 Bedded Multispecialty Hospital"** in partial fulfilment of the requirements for the award of the **Post- Graduate Diploma in Health and Hospital Management.**

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Institute Mentor Name,

Dr.PREETHA GS
Asstt. Dean, Research
IIHMR, New Delhi

Organization Mentor

Dr. MOUSUMI C. SARMAH
Dy. Medical Superintendent
BENSUPS HOSPITAL, Dwarka, New Delhi

Dr. MOUSUMI C. SARMAH
Regd. No.: 30021(DMC)
Dy Medical Superintendent
BENSUPS HOSPITAL
Sector-12, Dwarka, New Delhi-75

INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH, NEW DELHI

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "**GAP ANALYSIS of OPERATION THEATRE INFRASTRUCTUTE,UTILISATION and MANPOWER**"

and submitted by **Dr.Harpreet Kaur Bambabra(PT)** Enrollment No. PG/12/033

under the supervision of …**Dr.Preetha GS**…

for award of Postgraduate Diploma in Hospital and Health Management of the Institute carried out during the period from **Feb,2014** to **April,2012**

embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Signature Harpreet

Page 6

FEEDBACK FORM

Name of the Student: Dr. Harpreet Bambra (P.T)

Dissertation Organisation: Bensups Hospital

Area of Dissertation: Operation Theatre Department

Attendance: 891.

Objectives achieved: • Understanding of the OT dept. functioning specifically pertaining to administrative process, utilisation of OT and resources earmarked for dept.

Deliverables: 1. Understanding the nuances of OT processes,
2. Identifying bottlenecks and gaps in optimum utilisation of OT
3. Suggest measures for improvement.

Strengths:
1. Excellent knowledge of OT functioning
2. Good observation techniques
3. Maturity in interaction with staff, having good communication skills.

Suggestions for Improvement:
Need to orient and focus her thought process in economising resources

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

Date: 9.4.14.
Place: Dwarka, New Delhi

9/4/14

Dr. MOUSUMI C. SARMAH
Regd. No.: 30021(DMC)
Dy Medical Superintendent
BENSUPS HOSPITAL
Sector-12, Dwarka, New Delhi-75

ACKNOWLEDGEMENT

"It is not possible to prepare a project report without the assistance & encouragement of other people. This one is certainly no exception."

On the very outset of this report, I would like to extend my sincere & heartfelt obligation towards all the personages who have helped me in this endeavour. Without their active guidance, help, cooperation & encouragement, I would not have made headway in the project.

I am ineffably indebted to my mentor **Dr.Maushmi** for conscientious guidance and encouragement to accomplish this project. I express my sincere gratitude to **Dr.Sudhir Gupta** whose valuable guidance and suggestions proved very fruitful.

I am extremely thankful and pay my gratitude to my faculty guide **Dr.Preetha GS (Assistant Dean Resesrch, IIHMR, New Delhi)** for valuable guidance and support on completion of this project in its presently

I extend my gratitude to my college **IIHMR, New Delhi** for giving me this opportunity.

I also acknowledge with a deep sense of reverence, my gratitude towards my parents and member of my family, who has always supported me morally as well as economically.

Any omission in this brief acknowledgement does not mean lack of gratitude.

.

Thanking You

Dr.Harpreet Kaur Bambra

Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVATIONS

BMW - Biomedical Waste

CCU - Critical Care Unit

HK - Housekeeping

HR - Human Resource

IPD - In Patient Department

IT - Information Technology

NICU - Neonatal Intensive Care Unit

OPD - Out Patient Department

OT - Operation Theatre

1. ORGANIZATION PROFILE

It is a multi speciality hospital which endeavours to redefine & bring healthcare within the reach of every individual at an affordable cost. Our motto 'Healing Touch' is the guiding principal for the entire hospital family. Today this hospital is a multi-specialty hospital, with focus on specialization with perfection.

A diligent team of professionals and highly qualified doctors renowned in their respective fields of specialty are a part of the family. It is located as a pioneer group in Dwarka Sub-city. Their aim is to provide a seamless healthcare delivery system encompassing tertiary, secondary and primary care.
This Hospital is a 100-bedded hospital. 14 beds are reserved for economically weaker section. It consists of 5 critical beds and 9 non critical beds.

Hospital has created a niche for itself in a short span of time both within the medical fraternity and patients. It has been set up as a multi-specialty hospital with tremendous latitude of growing into a super-specialty hospital & as a major centre to cater to affordability of various economic segments.

DETAILS OF HOSPITAL DEPARTMENTS

House Keeping

General Introduction:

Unlike many other hospitals, housekeeping in this Hospital is not outsourced. A total staff of 50 including Ward boys (WB), Ayahs, and Housekeepers (HK) have been employed, which work in two shifts of 12 hours each (8 am to 8 pm and 8 pm to 8 am). The House Keeping In-Charge has three supervisors under him who supervise the functioning of above mentioned housekeeping staff. The House Keeping In-Charge in turn reports to the Medical Director.

Employment of Staff: The housekeeping staff is employed in following manner:-

		WB	Ayah	HK	Total
1.1.1.	**Morning Shift**	9	9	10	28
1.1.2.	**Evening Shift**	5	6	6	17
1.1.3.	**Relievers**	5 including all trades			

Functions:

The role of housekeeping dept in a hospital is to create a clean, infection free and pleasant, homely atmosphere in the hospital to ensure speedy recovery of the patient. The functions are as follows:-

- Cleaning of hospital, including infection control, sanitation.
- Linen management including laundry.
- Waste management and pest control.
- Inventory management of items entrusted with housekeeping.
- Assisting engineering dept in maintenance of the wards by timely intimation of any breakdowns/ repair requirements.
- Administration of housekeeping staff.

Observations:

Twelve hour shift with minimum relievers leads to some housekeeping staff doing two or at times three shifts continuously. This leads to fatigue and inefficiency in the staff.

Training of the staff gets overlooked which is a very important aspect especially when there is attrition of staff and sometimes raw hands get employed in emergency.

A strong administration and good man management has enabled the hospital to manage housekeeping with minimal staff and save on expenditure.

Human Resource Department

General Introduction:

The HR Dept comprises of an HR Head and two HR Executives. However, for quite some duration the dept has only one executive after resignation by one of them. The HR Head is also entrusted with additional responsibility of looking after the general administration of the hospital, which includes engineering aspects, security, purchases etc.

Functions: The main role of HR Dept is to provide the organisation with structure and the ability to meet business needs through managing the hospital's most valuable resources -- its employees. Keeping this in view the main functions of the HR Dept are as follows:-

- Determining the Job Description and Job Analysis for all the designation in the hospital.
- Determining wages and salaries of the employees.
- Selection and recruitment.
- Training and development.
- Performance Appraisal.

- Employees' welfare and motivation.
- Addressing employees' grievances.
- Implementing organisational policies.
- Dismissal and redundancy.

Additional Responsibilities:

- Maintenance of Hospital building, assets and infrastructure including engineering aspects.
- Purchases.
- Security.

Observations:

The HR Dept is entrusted with additional responsibilities which are being undertaken in a professional manner.

Being a small hospital with comparatively less number of staff (about 225) it is prudent to assign additional responsibility to HR Dept.

IT Department

General Introduction:

IT Dept of Hospital comprises of two IT Executives. However, as the hospital is upgrading to a better IT software (Shivam HIS) four software engineers from the IT Company are also working in the for the implementation of the new software. The new software is Cloud based and can work on/off line. The hospital has about 30 desktop employed at various important work stations and four laptops are being used by the top management. The IT Dept is also responsible for maintaining internal communication and CCTV network for security.

Functions:

- Implement and manage health information management system.
- Ensuring safety, security and confidentiality of all medical records are maintained.
- Ensuring back up of the data.
- Formulate policies in consultation with higher management regarding storage, retrieval and sharing of medical data in the hospital and implementation of the same.
- Maintaining internal communications.
- Maintaining CCTV network in the hospital.

Observations:

The full potential of the HIS is still not likely to be exploited as some important features like bed management' by HK staff is still not being utilized since there is no dedicated system for them.

The hospital can improve its efficiency manifold if an automatic SMS system can also be incorporated with the new IT software giving instant alerts to all concerned whenever an important event takes place eg, admission/ discharge of a patient.

Inpatient Department

General:

The patients admitted in the hospital for more than 24 hours are referred to as IPD patients. The hospital has 100 beds including 14 beds for EWS. The ICU,NICU and CCU are located on first floor and have a total of 30 beds. Other IPD patients are housed on second, third and fourth floors. The hospital has deluxe rooms, single rooms, twin-sharing, semi-private and rooms with four and six patients. This department works under the Medical Director and is supported by all departments, consultants, residents and Nursing staff.

Functions:

The IPD is the most important department of the hospital as the treatment of patients is undertaken in wards under the physicians, ably supported by the Nursing staff. The primary functions of IPD include:-

- Accommodate the patients in rooms/wards for treatment as per his needs.
- Provide treatment till his full recovery or transfer to another facility.
- Provide all life saving treatment and support systems to include monitors, bed, piped gases and diagnostic procedures.
- Provide safe, secure and infection-free environment to the patient and attendants.
- Low cost of treatment.

Staffing:

Each patient is treated by a consultant and his team as per the diagnosis. Each ward has adequate number of nurses as per protocol. The wards other than ICU, NICU and CCU have a nursing station suitably located on each floor and all ultra-modern facilities have been

provided to carry out nursing care. During day, there are four nurses on duty at each ward/floor to look after a maximum of 19 patients. In addition, housekeeping staff is provided for support. Consultants visit their patients twice or more as per the need and are available on call. Five RMOs are available in the hospital 24x7 to provide the necessary medical care and attend to emergency situations in IPD.

Ward Facilities All facilities to include Nursing station, treatment room, doctors room, ward pantry, ward store, male and female staff changing room are provided.

Observations:

The bed occupancy rate in the hospital is 70-80% which is good. Following points were observed during the training:-

(a) The nurses were allotted to patients and were responsible for all aspects of nursing care. However, it was noticed that all nurses were involved in administrative duties in case there were a number of discharges. Discharge coordinator can be nominated to carry this duty to relieve the nurses for their primary role.

(b) Majority of the discharges are ordered during morning leading to extra load on the system which can be streamlined by ordering discharge in the evenings.

(c) It was observed that all types of patients are admitted on each floor except Maternity cases (third floor) which may not be economical. The floors can be specifically allotted to departments/ specialties leading to economy in manpower, equipment and stores.

Outpatient Department (OPD)

General:

The OPD is the first impression of the hospital. It provides primary as well as comprehensive healthcare for patients who come for diagnostic, treatment or follow-up care. Hospital OPD is located on the ground floor. There is a well lit comfortable lobby/waiting area which is used to accommodate patients, their family and friends.

Functions:

The main functions of the OPD include:-

- Ideal for early diagnosis.
- Provides ambulatory care.
- Route to inpatient admission.
- Care & rehabilitation after discharge.
- Preventive activities, Health promotion activities and epidemiological research.

Layout and Staffing:

The OPD is located on the ground floor which is easily accessible from outside. There are eight consultant rooms and a nurse room for basic parameters to be recorded. The helpdesk, reception and billing are ideally located near the entrance with easy view of the complete lobby and all consultant rooms. Each consultation room is self contained with all facilities needed for examinations. The pharmacy is conveniently located near the OPD. The helpdesk and reception/registration is manned by two/three executives to cater for the load and assist the patients. Wheelchairs, stretchers and adequate staff is available to help the patients and attendants.

Facilities Available:

The OPD provides following facilities for the convenience of patients and attendants:-

- Seating arrangements, drinking water and toilets.
- Guidance to diagnostics, specialists, lab and TPA office.
- Reception and information desk, Registration counter.
- Heath checkup room, health education room.
- Display racks for promotion and educational materials.
- It shares Emergency, Diagnostic services, Medical Imaging, Laboratory, and Pharmacy with all other departments.

Observations:

The OPD is controlled by the Operations Manager through OPD manager. There is crowding at the Reception desk during peak time in the morning when more than five patients are waiting in the queue as is next to the entrance of the OPD. More and better signage will

patients to guide them to various places in the hospital. IPD billing and OPD reception are located at different places and hence certain resources have to be duplicated.

Emergency Department

General:

The Emergency department is located on the ground floor of the building and has good access from outside. The entry to emergency is controlled and the ward has good connectivity to all important facilities.

Functions:

The Emergency department is one of the most important links in the healthcare. The main functions are as follows:-

- Prompt receptions for all emergency cases and assessment of their clinical conditions.
- Immediate resuscitation and other life support treatment.
- Investigations and treatment.
- Admitting the patient.
- Providing Ambulance services.
- Filing FIR and calling the police in Medico-legal cases.
- Briefing the patient/relatives.
- Maintaining records.
- Research, education and training of the medical and paramedical staff.
- Management of Mass Casualties.

Layout and Staffing:

The Emergency department is manned by one Medical officer (24X7), two/three nurses and other HK staff for efficient functioning. There are six beds for treatment and examination with all life support equipment. Security staff is posted at the entrance for crowd control and maintenance of peace. All requisites medical instruments, monitors and facilities have been provided. All specialists and anaesthesiogist are on call to attend to emergency cases.

Facilities Available:

The hospital provides all facilities which are required for smooth functioning of Emergency department. These include Ambulatory services, beds, diagnostics, lab services, life saving and support services and drugs, medication and communications. Adequate privacy is ensured for the patients.

Observations:

Major observations are as given below:-

(a) The entry to emergency room is through a narrow corridor and is common with OPD. There is less space for attendants near the emergency room.

(b) The reception desk/billing department cannot see the emergency department and hence have to be notified by Emergency. There are chances of patients leaving the premises without paying bills.

Intensive Care Unit

General: Make critical care process more effective and efficient for the benefit of patients and integrate processes by making it more agile and adaptable

Functions:

- It caters to patients with the most severe and life threatening illnesses and injuries, which requires constant, close monitoring.
- Patients get support from specialist equipment and medications in order to ensure normal bodily functions
- ICU receives patients from both Medicine and post-op surgical units

Staff:

- Anaesthesiologist: HOD runs the department
- Housekeeping : one housekeeping staff , three helper
- Head Nurse : 16 nurses works in different shifts

Location:

ICU is located on the first floor of the hospital

2. INTRODUCTION

Hospitals are the most prominent aspect of healthcare industry. All its departments' clinical, medical, administrative or supportive; are equally important. However, in any hospital the operation theatre (OT) is said to be primary source of revenue generation with around 50-60 revenue is earned just by this area. OT complex in a hospital also represents an area of considerable expenditure in a hospital budget with requirement of latest technology, skilled manpower, most suitable design, nil infection and many more aspects for its betterment, improvement, up gradation that is very much essential. As healthcare organizations look for ways to gain new efficiencies and reduce costs, they are examining surgical services with a critical eye.

Establishment of operating room rules and regulations, strict adherence to and enforcement of approved policies and procedures along with continuous monitoring are said to be the essential ingredient for the efficient OT management. "Operating time is money and it is to be emphasized that efficiency in the operating room is encouraged".

There is a certainty that the demand for surgical services is growing, but then its margins are not and requires maximum utilisation to ensure optimum cost benefit. On the surface, it may appear that OR suites are fully utilized and that processes are running smoothly, but when organizations dig deeper, they may see substantial rifts—gaps in organizational data, lack of consistent standards in care and resource use, and ineffective use of personnel and other resources —all of which negatively affect the bottom line. Reason for these inefficiencies can be directly tied to the lack of an enterprise wide care delivery system that integrates the data and processes of the many functional areas that feed into the OR

To successfully achieve system integration with in the OR, it is necessary to explore the need for integration, define its component and ultimately show its benefits the integration of resources management activities within and across the enterprise allows organisation to gain many advantages such as (i) improved profits, (ii) performance management improvement, (iii) maximize resource utilisation.

Today hospitals are keen on utilising OT's better by streamlining key area which lies in manpower, scheduling and layout and designing.

The key element which leads to efficient use of operating theatres are

(i) Effective management, good communication, trained staff, appropriate facilities, equipment and operational layout.
(ii) Good utilisation depends on a complex interaction between the availability of a personnel and resources and on the attitudes and practices of all the staff involved.
(iii) Efficiency in theatre is inevitably influenced by a huge range of surrounding resources such as pre operative room planning and assessment room, beds, TSSU and staffing level in other disciplines.

(iv) A good system of planning and scheduling in theatre will enable more work, including emergencies to be carried out at a reasonable time.

3. RATIONALE

Gap analysis of operation theatre complex is the study of structure, process and outcome of surgical care, carried out to measure whether the set objectives have been attained and thus the quality of healthcare delivery. The hospital operation theatre complex is a costly component of hospital budget expenditure. This area of hospital requires maximum utilisation to ensure optimum cost benefit. To achieve high level utilisation in the OT, it is necessary to efficiently coordinate a number of activities and personnel. OT complex design should be such that it serves the need.

Hence, this dissertation titled "Gap analysis of operation theatre infrastructure, process and manpower" is on the track of exploring all scopes of improvement and implementing higher quality care standards in surgical suite of hospital

Study will be conducted on three major parameters of the Operation Theatre and accordingly gap analysis of all the parameters will be done. Those parameters are:

1. Design & Layout

2. Manpower

3. Utilization Pattern with respect to time

Gap analysis will be done by comparing the present prevailing standards at operation theatre of Hospital with that of standards suggested by the leading authors/books.

4. REVIEW OF LITERATURE

Gap analysis is the process used to determine where you are and where you want to be. In other words, this is when you reveal desired state of performance and compare it with the current state of performance. The discrepancy between how your business wishes to perform and how it actually performs is known as performance gap. For performing gap analysis information on both desired and current operational results are gathered [1].

The Operation Theatre: Basic architecture

The design and location of OT complex is one of the most important components of OT asepsis. OT complex is located away from the inpatient area, often in a blind wing or on the top or bottom floor. It is a scientifically planned barrier system, such that it keeps the flow of traffic from clean areas to dirty ones and never vice versa. It consists of 4 zones:

A. Outer zone: Areas for receiving patient's relatives, toilets, administrative function.

B. Restricted Zone : Consist of (i) Changing room (ii) Patient transfer area (iii) Stores room (iv)Nursing staff room (v) Anaesthetist room (vi) Recovery room

C. Aseptic Zone: Area for (i) Scrub area (ii) Preparation room (iii) Operation theatre (iv) Area used for instrument packing and sterilization.

D. Disposal Zone: Area where used equipments are cleaned and bio-hazardous waste is disposed.

Marble or polished stone flooring is the preferred type with glazed tile walls. No false ceiling is permissible. The OT needs to be well ventilated such that it prevents any deposition of dust particles. Air circulation with a laminar air flow system through High efficiency particulate air filter (HEPA) (0.3µm) serves the best purpose. As per US Public Health services minimum requirements for OT air are 25 changes per hour, positive pressure compared with corridors, temperature between 18 & 24º C and humidity of 50 to 55%.[2]

OR utilization is defined by Donham and colleagues as the quotient of hours of OR time actually used during elective resource hours and the total number of elective resource hours available for use [3] As an example, if the average "patient in to patient out" time for a herniorrhaphy is 45 min and the average turnover time is 15 min, then 10 herniorrhaphy cases can be performed in a 10-h period in that OR, for an OR utilization of 100%. With this definition, if cases extend beyond the scheduled end of the day, the time used after the scheduled end of the day is counted as utilization, even though the hospital may be paying overtime to provide the staffing.

Strum et al. defined the concepts "overutilization" and "underutilization. Underutilization is defined as time during the scheduled hours of operation that is not used, and overutilization is defined as the time used by scheduled cases past the end of the scheduled time". With these concepts we can estimate the economic efficiency of an OR suite .The standard definition

produces the actual utilization—the time that is actually used, Because it is necessary to know the actual case times to perform the calculation, utilization can never be known in advance[4] .

O.T. utilization is sum total of Anaesthesia induction time, Positioning time, Procedure time and Reversal of Anaesthesia time as a percentage of total actual theatre time.

Methods of O.T./OR utilization

O.T. utilization can be calculated on the basis of various parameters. These are

1. Total O.T. utilization Time

2. Raw utilization

3. Adjusted utilization

Total O.T. Utilization Time is sum total of Anaesthesia induction time, Positioning time, Procedure time and Reversal of Anaesthesia Time. *Total O.T. utilization for anaesthesia* is sum total of Anaesthesia induction time and Reversal of Anaesthesia Time. *Total O.T. utilization for cleaning the O.T.* is sum total of time from patient out of room to room clean-up finished and next case taken.

Raw utilization is the total minutes of elective cases performed within OR time divided by the minutes of allocated block time.

Raw Utilization **=** total minutes of cases performed ÷ total minutes of OR time allocated

Raw Utilization = Total O.T. utilization in Percentage (Routine Cases)

Adjusted utilization uses the total minutes of elective cases performed within OR block time, including "credit" for the turnover times necessary to set up and clean up ORs.

Adjusted Utilization is sum total of Pre Op waiting in OT , Anaesthesia induction time , Positioning time ,Procedure time, Reversal of Anaesthesia Time ,Shifting to recovery Room, OT clean time and Post Op waiting in OT (last three come under credit time)

*Adjusted Utilization***=** [total minutes of cases + "credit time"] ÷ total minutes of OR time allocated

Donald C. Tyler et al conducted study Determining Optimum Operating Room Utilization at Department of Anaesthesiology and Critical Care Medicine, The Children's Hospital of Philadelphia. They suggested that Economic consideration is desirable to keep operating rooms fully used when staffed, but the optimum utilization of an operating room (OR) is not known. They created a simulation of an OR to define optimum utilization set operational goals of having cases start within 15 min of the scheduled time and of having the cases end no more than 15 min past the scheduled end of the day. Within these goals, a utilization of 85% to 90% is the highest that can be achieved without delay or running late. Increasing the

variability of case duration decreases the utilization that can be achieved within these targets[5].

Staffing of OT, senior nurse of the cadre of ward sister to be responsible for the smooth and efficient functioning of each operating theatre, this nurse who should rarely double up as a scrub nurse is responsible for management of the theatre including care of facilities, instruments and equipments, replenishment of consumables and drugs, deployment of staff maximising utilisation of theatre time and minimizing downtime between surgeries. Besides head nurse, three nurses are required per theatre – a scrub nurse, circulating nurse and record nurse. One anaesthesia technician is required per theatre. A theatre assistant or nursing aide may be additionally provided for every two theatre to assist in patient transfer, patient positioning and messengering. For the recovery, it is necessary to have nurse patient ratio of 1:1 and so the nursing complement will depend on the throughput and time patients remain in the immediate post anaesthetic recovery unit [6].

The operating theatre are the perfect example of team work , under the dedicated team leadership of the head of the department of surgery and a devoted head sister OT and technicians who are responsible for the functioning of the theatre . it is organised around five groups of staff:

i. Surgeons
ii. Anaesthesiologists
iii. Nurses
iv. Technicians
v. Attendants of OT[7]

Staffing of OT in a District Hospital (51-100 beds) [8]

Sr.No	Staff	General OT
1.	Staff nurse	1
2.	OT assistant (circulator + helper)	2
3.	Sweeper	1

4. OBJECTIVE

General:

The aim of this study is to understand the functioning and identify the gaps existing for the effective management of operation theatre services

Specific:

1. To study the design, manpower, utilization pattern, processes & systems
2. To identify the bottle neck, if any, in proper and efficient utilization of Operation Theatre
3. To give away measures to be implemented in operation theatre for effective utilization

5. METHODOLOGY

The study was carried out in a 100 bedded Multi-speciality hospital

Type of study :

A cross sectional study was conducted in 100 bedded Multi-speciality hospital of Delhi. The study on "Gap analysis of operation theatre infrastructure, process and manpower" is on the track of exploring all scopes of variance amongst the current practices of the OT.

Sampling Method

A convenient sampling was adopted done to identify the sample size for primary data.

Sample size

Out of total (24) personnel of OT 12 people were interviewed (primary database) for analysis.

Data collection tool & techniques:

Primary data consists of facility audit with help of checklist and interview with personnel of OT of different group of staff. Secondary Data is collected from the OT registers. It was collected from 1st Feb '14 to 1st April '14 from the operation theatre department of the hospital.

Study period

This study was conducted over a period of two months

6. LIMITATIONS

- The study is subjected to the understanding, bias and prejudices of the respondent.
- Due to the busy schedule or unavailability of OT staff detailed information could not be obtained for analysis.
- Response of patients / patient party is not taken for the study
- Study was conducted for two months period and only 306 operations could be studied from which only 282 (elective surgeries) were taken , which may not adequately represent results for the department of surgery

7. DATA ANALYSIS

An operating theatre is a room with in a hospital where surgical operations are carried out. It needs to be designed in such a way that it (i) Promotes high degree of asepsis (ii) Ensure maximum safety to patients & staff (iii) Ensure maximum utilisation of OT (iv) Provide complete environmental control and (v) promotes flexibility in usage of operating suites

Keeping the above parameters in mind, OT facility was thoroughly observed. Following are the observations:

Physical Infrastructure – Operation Theatre		
FEATURES	**SPECIFICS**	**REMARKS**
1)LOCATION **2)ENTRANCE**	Visibility Reception	Fair Not available
	Transfer area	Not Available
	Waiting area	Available but inadequate
	Changing area	Available
3) PRE-ANAESTHETIC EXAMINATION ROOM	Availability	Available
4) OPERATION ROOM	walls	Tiled walls
	Floor	Marble
	Ceiling	False ceiling
	Piped gas system	Available
	Gas scavenging system	Not Available
	Door width	Adequate with two leaves
5) ZONING	Protective Zone	Available
	Clean Zone	Not Available
	Sterile Zone	Available
	Disposal Zone	Not Available (follows protective zone path to dispose)
6)DOORS	Clear width	Adequate

	Self Closure	Available wherever necessary
7) LIGHTING	Natural	Inadequate
	Artificial	Halogens Lamp in OT suites
8)SCRUB AREA	walls	Tiled walls
	Floor	Marble
	Ceiling	False ceiling
	Taps	Hand Operated
9)POST-OPERATIVE WARD	Availability	Not Available
10) SIGNAGE	Fire dept. norm exit signs	Not Available
	Fire dept. norm exit maps with current location	Not Available
	Direction Signage	Not Available
11)NOISE, WASTE MANAGEMENT, HYGIENE & CLEANLINESS	Exterior noise penetration	Low
	Coloured bin	Available(waste segregation is not compiled by staff)
	Coloured bags	Available
	Sharp cutters	Available
12)FIRE SAFETY	Fire alarm system	Available
	Fire sprinklers	Not Available
	Fire extinguishers	Available
	Fire hose	Not Available
	Fire Exit	Not Available
13)SECURITY	Electronic surveillance	Not Available
	Manual surveillance	Not Available
14)POWER BACKUP	Generator set	Available
	UPS	Available
	Emergency lights	Available

Table No.1 Physical Infrastructure

Utilisation:

Operating theatre is an integral part of every hospital. Surgeries in last few decades have grown by leaps and bounds through successive stages to the miraculous procedures of modern age. With the advances in surgical procedures and safer anaesthetic techniques , clinical condition, which were earlier considered inoperable , have now come within the scope of surgical treatment . New surgical Skills and development can only be taken full advantage if operation theatre is properly scheduled and utilised.

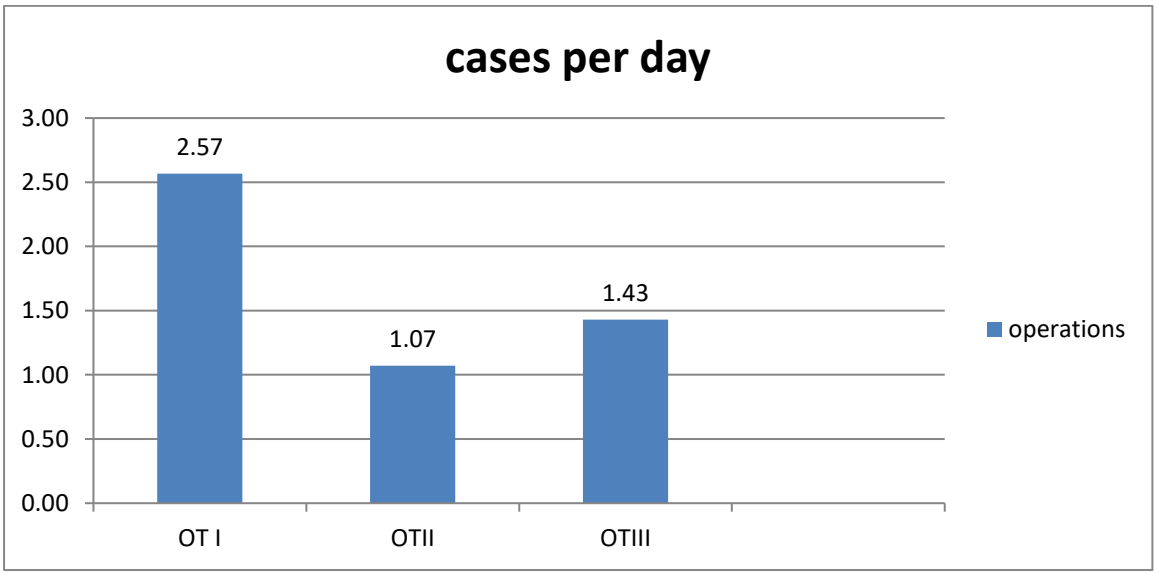


Fig 1.1 average number of cases per day per OT (inclusive of Sunday and after 8 surgeries)

Study shows average number of cases per operation theatre per day varies in all the three OT per day. Maximum number operated in single OT in a day was 2.57 which is allocated for obstetrics & gynaecology. While OT 1 has least number of cases i.e. 1.07.

OT 3 records for 1.43, in this OT mostly orthopaedic cases are conducted which last for as long as 4 hours as well.

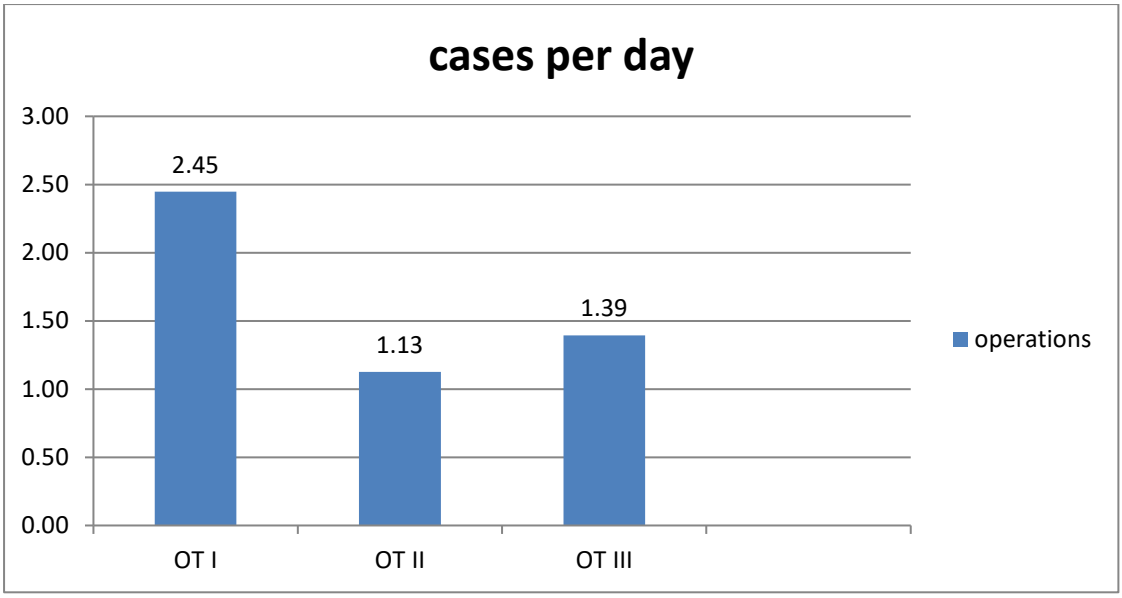


Fig 1.2 average number of cases per day (8 to 8)

These are the surgeries which were conducted during the regular working hour of OT i.e. 8 a.m. to 8 p.m. Study shows average number of cases per operation theatre per day varies in all the three OT per day. Maximum number operated in single OT in a day was 2.45 which is allocated for obstetrics & gynaecology. While OT 1 has least number of cases i.e. 1.13. OT 3 records for 1.39, in this OT mostly orthopaedic cases are conducted which last for as long as 4 hours as well.

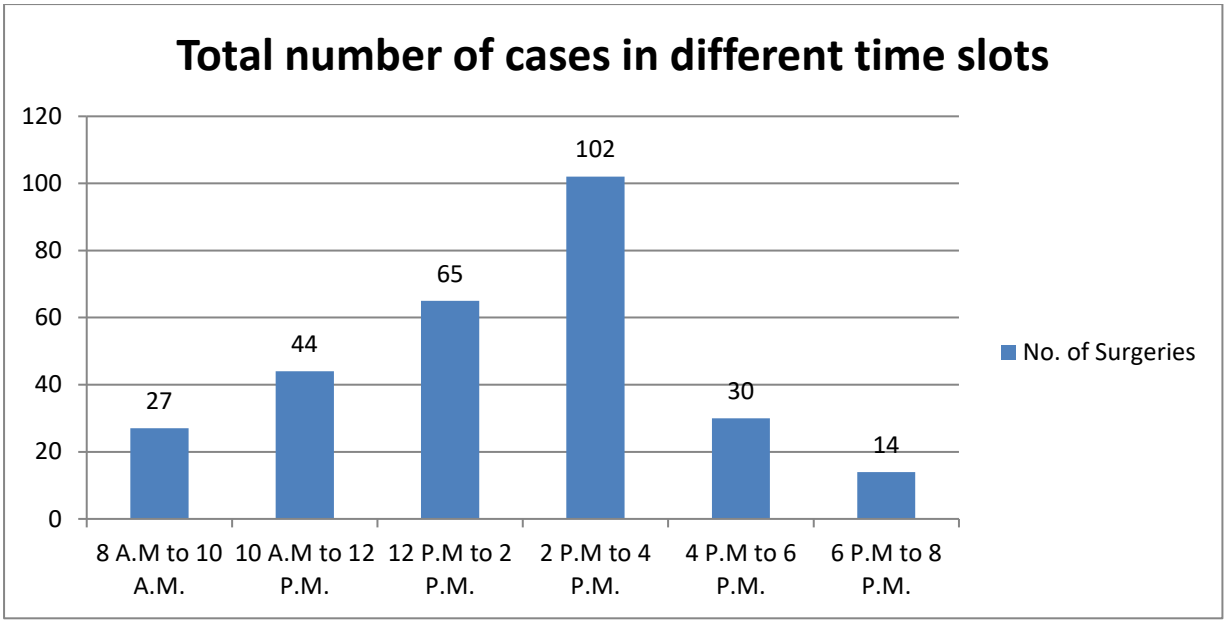


Fig 1.3 average number of cases performed in different time slots (8 to 8)

Maximum number of cases happened between 2 p.m. to 4 p.m. i.e. 102 of total cases. While between 8 a.m. to 10 a.m. only 27 cases happened. Second most populated slot is 12 p.m. to 2 p.m. by observing the above statistics it is clearly understandable that OT is not occupied in morning slots as much as it happens post noon.

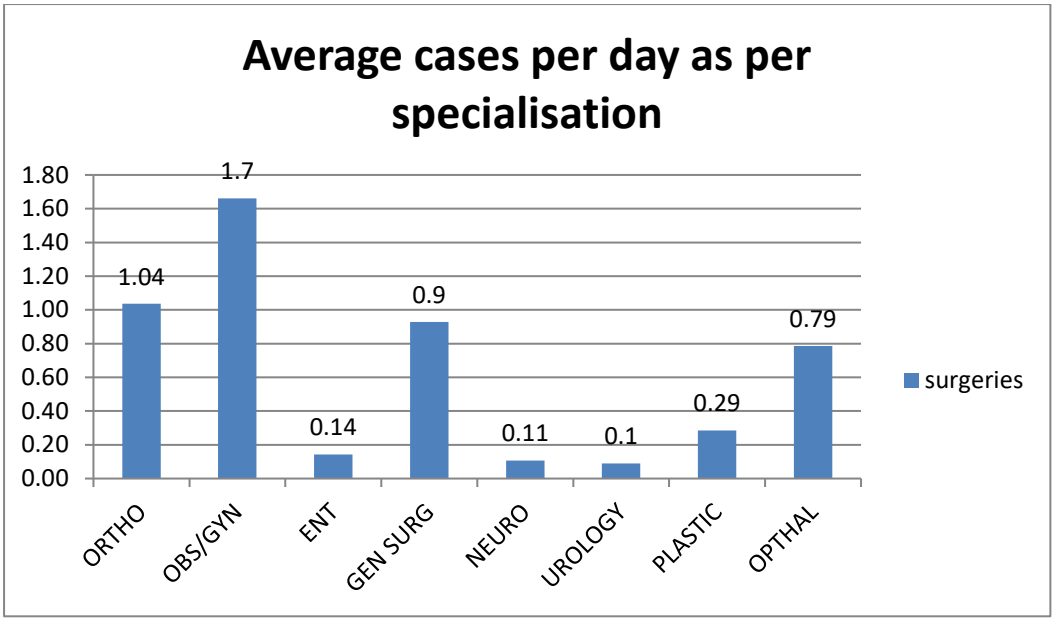


Fig 1.4 Average no. of cases performed as per specialisation per day (8 to 8)

It shows Obstetrics & gynaecology department (1.7) accounts for highest number of surgeries per day followed by orthopaedic (1.04) and general surgery (.90). On the other hand department of Neurosurgery (.11), Urology (.1) and ENT (.14) has least number of cases to its share.

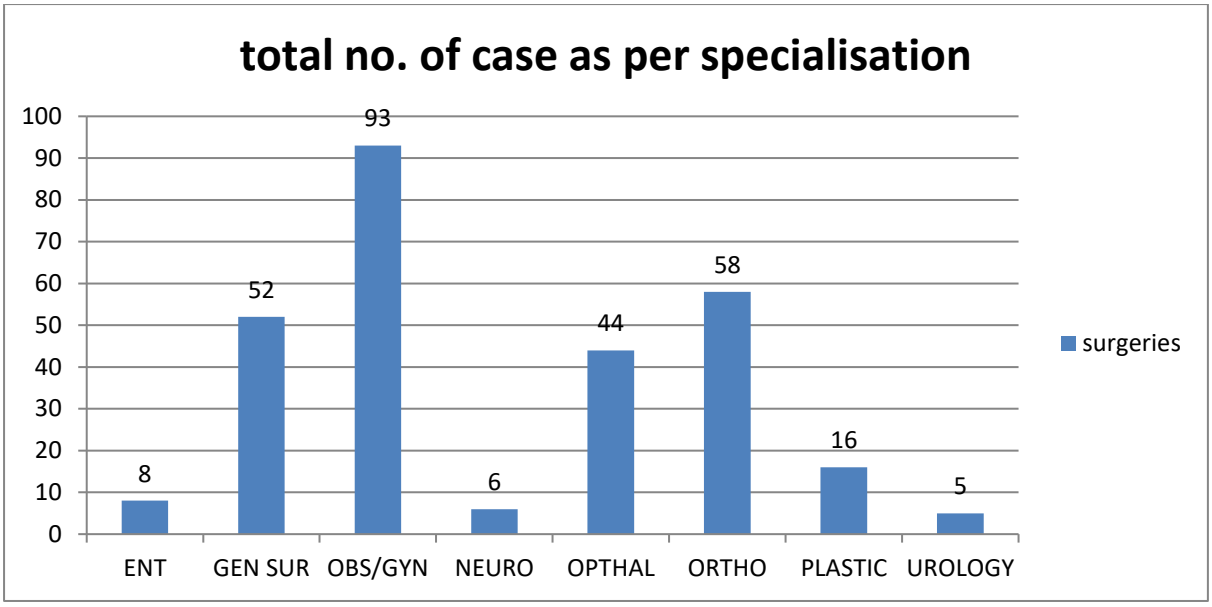


Fig 1.5 Total no. of cases performed as per specialisation per day (8 to 8)

The graph shows that maximum surgeries being done are from obstetrics & gynaecology, general surgery, Orthopaedics and Ophthalmology departments. Hence it is necessary to involve these departments surgeon to prevent delay in surgeries.

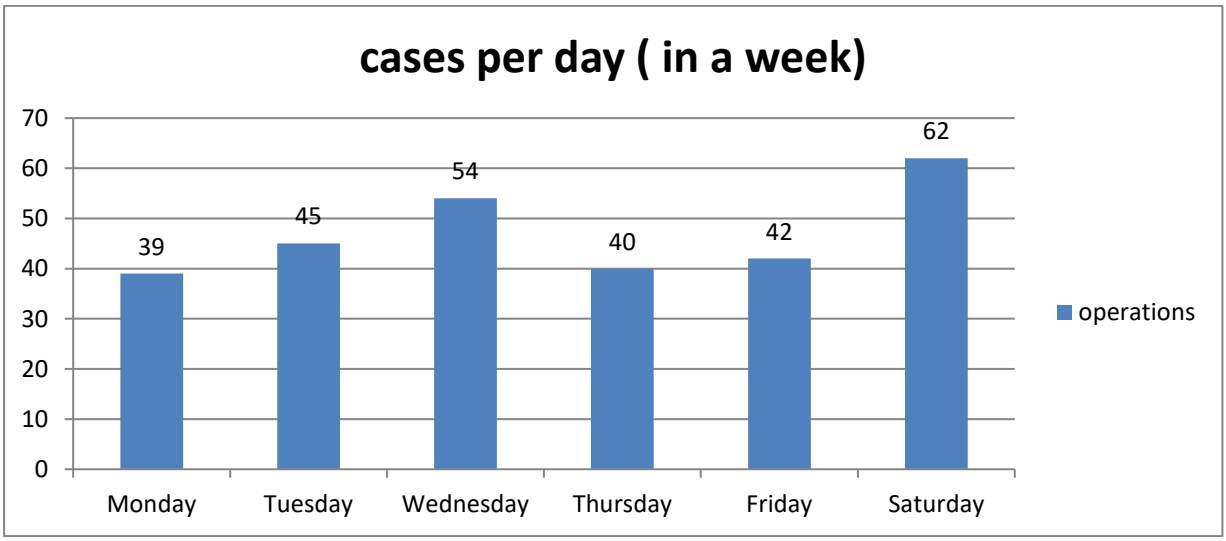


Fig 1.6 cases performed on different days of the week (8 to 8)

Although the spread of cases throughout the week is nearly in same range, however it can observed that maximum number of cases are performed on Saturday i.e. 62 and least are performed on Monday i.e. 39. Ophthalmology cases are performed on Wednesday, so Wednesday accounts for second highest number of cases.

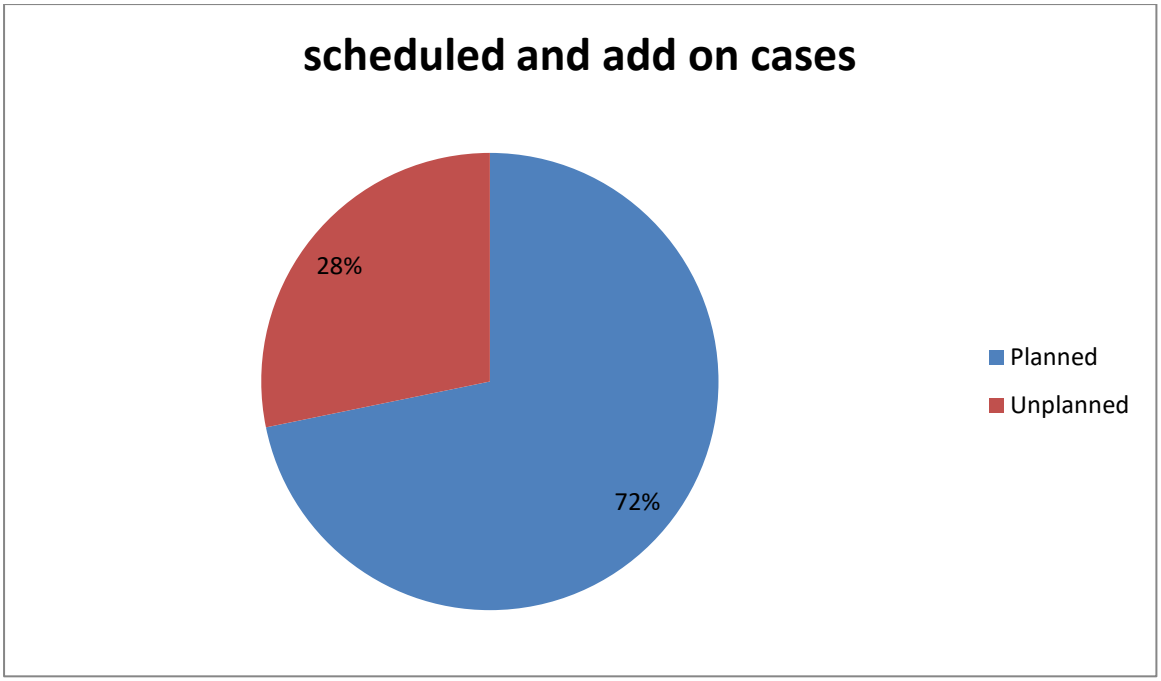


Fig 1.7 planned cases and adds on cases (8 to 8)

28% of cases are the add on cases which are operated during the scheduled time of operation theatre

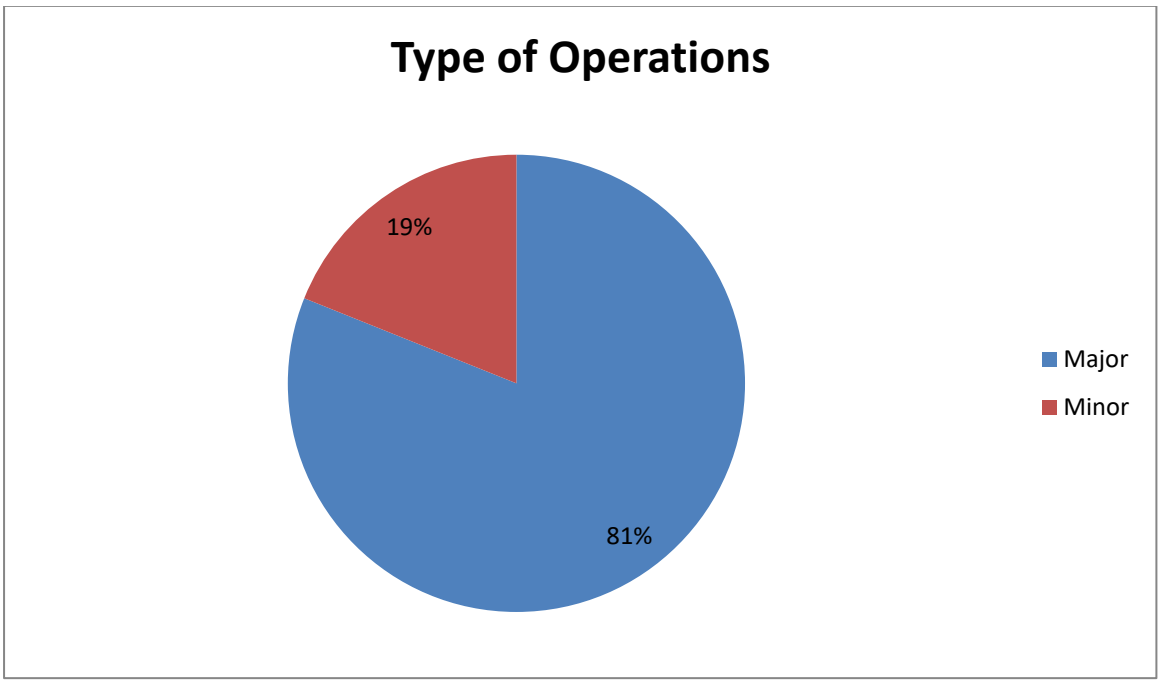


Fig 1.8 Type of operation performed in OT (8 to 8)

In this hospital major surgery accounts for higher portion of its share while minor is only 19% of total.

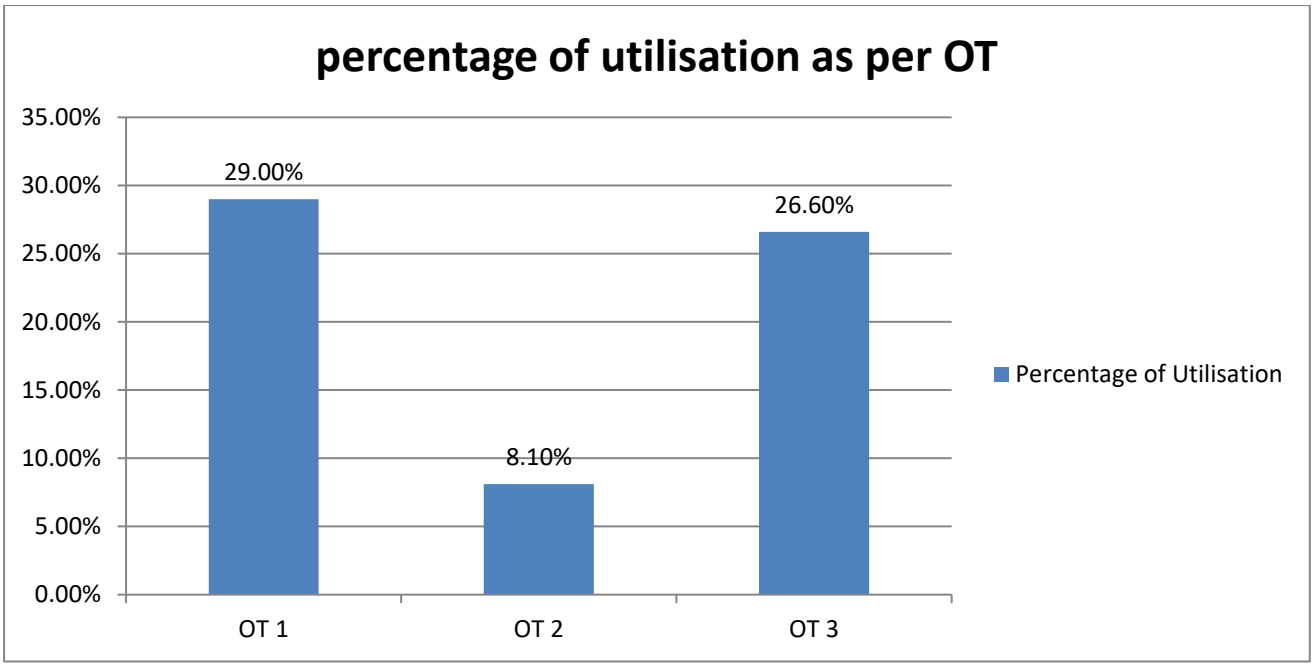


Fig 1.9 percentage of Utilisation of each operation theatre (8 to 8)

Result shows that the utilisation of all the operation theatre put together is very low. This result includes operation theatre time and time for supportive services

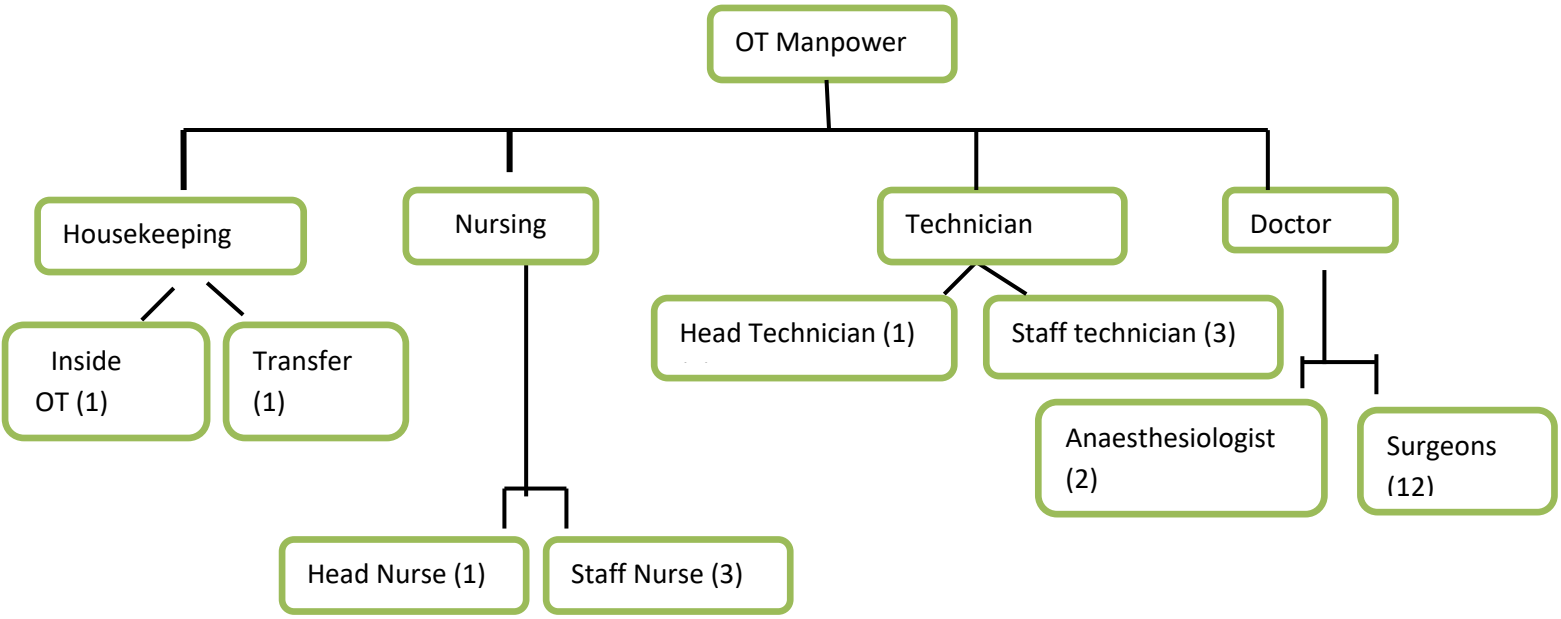
In this study total time utilised by the surgery also includes cleaning time.

OT1 has highest utilisation when compared with other two OTs, OT 1 gets Gynaecology & obstetrics cases. At time it also gets cases from other specialities such as General surgery & urology.

OT 2 receives cases from ophthalmology department & some others like general surgery but it accounts for least amount of utilisation for the fact ophthalmology surgeries that are performed in this hospital are of lesser duration i.e. 20 minutes

OT 3 only serves for orthopaedic surgeries but its utilisation is high because of longer durations of surgeries that are performed in OT 3.

Manpower Pattern of Operation Theatre



Manpower is need based. There can be just as many variations. The best way to develop a staffing plan is to build it systematically based on department needs. It depends on issues like:

1. Number of rooms

2. Hours each room is available for surgery

3. Number of staff per room

4. Additional staff for certain situations such as monitoring patients, having IV sedation etc.

5. Covering for benefit time, such as breaks and vacations

6. Number of private scrub persons, if used

Surgery department typically have two lines of authority – physicians and nurses – and an administrative staff

After analysing the secondary data from the OT registers, OT staff was interviewed regarding the planning & infrastructure, utilisation, communication and area of improvement aspect as per them to identify the gaps.

Most common issues that were highlighted are:

(i) **Planning & Infrastructure** : Absence of Zoning , Pre-op & Post-op room , Not in close proximity to Post-op ICU , located closely to BMW area.

(ii) Utilisation : Manpower crunch (Nursing & Housekeeping Staff) , Shortage of essential equipments and instruments

(iii) Communication: Message communication between HOD of OT and consultants is smooth , loop in communication Between surgeons and nursing staff

(iv) Area of improvement: Recruitment of Nursing & housekeeping staff , To have pre-op & post-op room and training of 4^{th} grade staff

OT Staff	Planning & Infrastructure	Utilisation	Communication	Area of Improvement
1) Head Nurse	• No signage • No Zoning • One way Entrance & Exit	• Staff is not punctual • Housekeeping staff is not trained • Unavailability of housekeeping staff	• During case scheduling time of the surgery is never specified • Do not get timely information about the cases	• To have more nurses & housekeeping staff on board
2) Staff Nurse	• No sterile store room • No laundry room • No staff room • Washing area for instrument is not there	• Not optimally utilised because of the divided shifts	• Loop in communication between ward & OT	• Manpower
3) Staff Nurse	• No Zoning • One way Entrance & Exit • It is closer to bio medical waste disposal area	• Equipment and instruments shortage in OT • Staff crunch	• Do not get timely information about the cases • Cancellation of case is also not informed	• Right guidance & trainings for housekeeping staff
4) Technician	• Rightly located • Well equipped • No zoning	• Shortage of manpower , technician are	• Communication is prompt and direct	• Recruit more manpower

		made to do nurses job	from HOD's end	
5) Head Technician	• Absence of pre anaesthetic room • Closer to BMW disposal • One way exit & entrance	• Staff is not punctual • Unavailability of housekeeping staff on the floor	• Do not get timely information about the cases	• Compromised manpower need to work on that
6) Anaesthesiologist	• Not on same floor as post op area • No zoning • No bay area for trolleys • Absence of signage	• Due to lack of full time consultants • Manpower crunch	• Message is communicated well	• Proper training Is required from ground to upper level
7) Surgeon 1	• No pre op & post op room • Absence of dampeners • No zoning • One exit and entrance	• Improper scheduling of cases • Divided shifts of nurses	• Communication from patients end delays	• Computerisation and centralisation of documents
8) Surgeon 2	• Space crunch • No pre op & post op room • TSSU receives equipments of other department in OT Complex	• Mismatch scheduling of OPD and surgeries which leads to delay	• Planning of cases and booking is not apt from pt. side hence the message communicated to nursing staff gets delayed	• TSSU should not be used by other department for its services
9) Surgeon 3	• No zoning • One exit and entrance • Tiled walls with gaps (not hygienic) • No Laminar flow	• No GDA available on floor • Lack of nursing staff • Lack of equipments in OT	• Message is communicated well	• To have post op & pre op area • Recruitment of housekeeping staff
10) Surgeon 4	• Washing area is next to OT suite	• Unavailability of	• Message is communicate	• Require more of

	• Urinal is within nursing area • Only one lift available • Not closer to post op ICU	housekeeping staff in OT • Manpower crunch of nursing and housekeeping staff	d well	housekeeping and nursing manpower
11) Surgeon 5	• No Zoning • Location is not apt • No recovery area	• OT equip suffice only for two OTs	• Message is communicated well	• Training at all levels
12) Surgeon 6	• No pre anaesthetic room • No post surgery recovery room • TSSU receives material from all over the hospital	• Patient transfer & TPA procedure takes long • Unavailability of 4th class staff in OT and floor	• Message is communicated well	• Recruitment of nursing staff

Table 2: Most common issues

8. DISCUSSION

- The first major category of gap analysis study is planning & infrastructure of an Operation Theatre. Discussing the present major factors of the design of study area, gaps identified and were compared to the present prevailing standards at operation theatre of Hospital with that of standards suggested by the leading authors/books.

- It was observed that there is no pre-operative holding area, pre anaesthesia room, Post-Op area and minor operation theatre. All the minor and day care surgeries were also performed in the Major OTs. Since the percentage of minor operation is very less so it doesn't affect the workflow of major surgeries.

- Operation Theatre complex has same exit and entrance for the movement of machine, People and waste. It doesn't practice the zoning principle

- Since there is only one lift available for the operation theatre which is used for the other purposes as well. So , it reduces the movement of patient to and fro from OT and wards

- OT is not in close proximity to the post-op ICU and its walls and floor which are made of tiles and marble has crevices in it, it leads to the dust accumulation and acts as the environment which facilitates growth of micro organisms.

- TSSU has no washing area; instruments are washed in the scrub area. It also receives instruments from the other departments of the hospitals.

- OT has 3 staff nurses, while head nurse only manages the administrative work. As per traditional requirement there has to be one circulating nurse, one scrub nurse and one record nurse which is not maintained here. Nurses are called on three different shifts i.e. from 8 a.m. to 4 p.m., 10 a.m. to 6 p.m. and 12 p.m. to 8 p.m. Post noon all three staff nurses are available on the floor. Hence, the utilisation of OT is more after 12 p.m.

- Mismatching of OPD & Surgery time also leads in delay for the surgery which affects the utilisation of the OT

- Loop in communication between the nurses and the surgeons; hence the OT is not prepared for the surgery at the right time or the other resources such as equipments are not available for certain surgeries and surgeries had to be delayed.

- Since there are only two housekeeping staff and one lift for OT which is also being utilised by the other department for it results in delay in patient transfer two and fro from OT & the wards

- Only one housekeeping staff carries out the transfer procedure which results in delay of patient transfer

- Since there is no pre-op & post-op room so patients have to wait in the bay area for before and after the surgeries.

- The causes cited for low OT utilization were varied. Surgeons felt that non availability of anaesthetic services was major reason, whereas anaesthetist felt that wrong
  Scheduling of cases or lack of punctuality of the surgeon was the prime cause.

- However, all the OT users agreed that non availability of nursing orderlies for shifting the patients and sweepers for cleaning of OR after completion of the surgery was most annoying cause for delay between cases and subsequent underutilisation of the OT services.

- According to the National Audit Office study, only 50% to 60% of the total time was utilized in performing surgery[9]. In this study utilisation has come far less than the average

- Study also found out that the cases were not allotted as per schedule given and operation rooms were not allotted as per department mentioned, it was more on need and availability basis

9. RECOMMENDATION

- To have the nurses scheduled for the morning time so all the three OTs can be utilised from 8 a.m. itself

- More effective use of theatre time is possible if maximum cases are occupied during morning shift , hence more cases can be booked for the OT

- One day prior intimation to be given to the head nurse regarding the booking and cancellation of the cases. This way time can be allotted to other surgeon hence lead to optimum utilisation

- Schedule the major OTs in morning hours so that more minor cases can be accommodated for the later time of the day

- Recruit more nurses and Housekeeping staff so that it puts less physical and mental burden for the current staff

- Special emphasis to be given on gynaecology and orthopaedic cases

- To use the available back entrance for the movement of dirty utility

- To utilise the available 4 beds for the pre-op & post-op area for the patients

- Records to be maintained for the delay and cancellation of the cases hence further measures can be taken for the same.

10. REFERENCES:

1. Performance Gap Analysis: Tips, Tools, and Intelligence for Trainers by Maren Franklin

2. Sehulster LM. Chinn RYW, Arduino MJ, Carpenter J, Donlan R, Ashford D, et al Guidelines for environmental refection control in health care facilities. Recommendations from CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) November 2003.

3. Donham RT, Mazzei WJ, Jones RL. Procedural times glossary. Am Anesthesiol 1996:23 (suppl):5.

4. OR Manager May 1996, 12:9-10.

5. Determining Optimum Operating Room Utilization ,Donald C. Tyler, MD, MBA*, Caroline A. Pasquariello, MD*, and Chun-Hung Chen, PhD†;Department of Anaesthesiology and Critical Care Medicine, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania; and †Department of Systems Engineering & Operations Research, George Mason University, Fairfax, Virginia , anesth analg economics , education and health system research tyler et al 2003;96:1114_21

6. CM francis , Mario c de souza, Hospital planning and Administration , third edition :2000 , page 178

7. Hospitals- planning, designing and management – G D Kundars et al : p. 176

8. Indian Public Health Standards (IPHS) Guidelines for Sub-District/Sub-Divisional Hospitals (31 to 100 Bedded); Directorate General of Health Services , Ministry of Health & Family Welfare; Government of India; Revised 2012; http://health.bih.nic.in/Docs/Guidelines/Guidelines-SD-&-SDH-(Revised)-2012.pdf

9. National Audit Office. Use of operating theatres in the National Health Service. London: HMSO, 1987 (Report 143).