SUMMER PLACEMENT

IN

MEDICA SUPER SPECIALTY HOSPITAL KOLKATA

(APRIL 7 TO MAY 31ST, 2015)

PROJECT REPORT

SUBMITTED BY:-

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MBA IN HOSPITAL AND HEALTH MANAGEMENT

2014-2016

INSTITUTE OF HEALTH
MANAGEMENT RESEARCH
(WHO Collaborating Centre for District Health System Based on Primary Health Care)

IIHMR UNIVERSITY

CERTIFICATE

This is to certify that the project work titled ' A study on utilization patterns of CT Scanner' has been done entirely and submitted by Mr.Neelak Mukherjee, a student of Masters of Business Administration in Hospital and Health Management-19th Batch from IIHMR University, Jaipur.

The study project was prepared during the internship period from April 07th 2015 – May 31st, 2015 at Medica Superspeciality Hospital ,Kolkata. This is his original work.

I wish him all success for his future endeavors.

Kaushik

Col. (Dr) Ashok Kaushik

Dean (Academics & Student Affairs)

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MHPL/HR-Communication/2015/06/0245 **2nd June, 2015**

TO WHOM IT MAY CONCERN

This is to certify that **Mr. Neelak Mukherjee**, a student of M.B.A. from **Institute of Health Management Research, Jaipur,** has successfully completed practical training at **Medica Superspecialty Hospital**, **Kolkata**, from **9th April 2015** to **1st June 2015**, as per his academic requirement.

Mr. Mukherjee prepared a project report on **"Utilization Study of CT Scanner in a Superspeciality Hospital"** and has been exposed to the functioning of Biomedical and Engineering Department.

We wish him all the best for his future endeavors.

Madhumita Roy

Madhumita Roy
AGM-Human Resources

Mr. Abhijit Roy Choudhary
Deputy Manager- Biomedical & Engineering

Re

Acknowledgements:

With immense pleasure I express my heartful gratitude to the Director of IIHMR Jaipur, Dr.S.D.Gupta, and Dean, Dr. Col. Ashok Kaushik and my mentor Prof. Laxman Swarup Sharma for having given me this opportunity to undergo training.

I am indebted to all the professionals at Medica Super speciality Hospital (MSH, Kolkata) for sharing generously their knowledge and precious time which inspired me to do best during summer training .I owe a great debt to Group President, Mr Udayan Lahiri and VP (Ops) Mr Komal Dashora and VP(HR) Mr. Sudhangshu Roy for providing me an opportunity to work as a trainee in their organization. I would like to thank Mr. Tapas Chowdhury (HOD, Biomedical) ,Mr. Abhijit Roy Chowdhury my guide for the summer training in MSH, Kolkata, without whose help it would not have been possible for me to understand the hospital to the extent as I have now. I am highly grateful to all the staff of the imaging department for their cooperation which enabled me to complete my special assignment in their department.

I am also grateful to all the other department heads and staffs for giving me time in spite of their hectic schedule .Without their active cooperation and participation it would not have been possible for me to complete my task in the given short time.

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Introduction:

About Medica Superspeciality Hospital Kolkata

- Medica Superspeciality Hospital – a unit of MHPL has been commisioned in association with Eastern India Healthcare Foundation, a Not for profit Charitable Trust.
- The foundation stone was laid on 20th February 2006.
- The hospital was inaugurated on 14th April 2010.
- It is a Superspeciality hospital spread across 3.76 acres on EM Bypass ,Kolkata.
- Medica Superspeciality Hospital focuses on the following super specialities
    - Orthopedics
    - Gastroenterology & GI surgery
    - Cardiology & Cardiac Surgery
    - Neurology & Neurosurgery
    - Nephrology & Urology
    - Critical Care
    - ENT
    - Oncology & Breast Surgery
- Medica Superspeciality Hospital is well supported by an excellent Radiological & Laboratory Department (NABL accredited) and Inpatient and Outpatient Pharmacy.
- Medica Superspeciality Hospital is equipped with
    - Ten state of art operation theatres
    - Latest cardiac Catheterization Lab
    - Comprehensive Intensive Care Unit
    - Energy efficient building /sunlight in all rooms
    - Inhouse kitchen & laundry services
    - Out patient Department
        - Fully equipped consultation rooms
        - Fully equipped Imaging department

- Facilities for Sample Collection
- Facilities for preventive Health check ups
- Child care and breast feeding facilities for newborns

Vision:

“Committed to bring the best in Healthcare”

Mission:

“ We deliver excellent clinical outcome with superior patient care in a transparent manner within a safe environment”

Logo:

The even number of symbols in the logo ,signifying people ,represents:

- Balance
- Knowledge
- Team
- People

- The different colours symbolize the diverse backgrounds and varying origins of the team members ,who have joined hands to create a “Rainbow of Knowledge”.
- All these people encompass a Plus sign which represents and suggests the incubation of healthcare.Its shape is such that it denotes dynamism in its design ,further indicating innovation and the forward looking of Medica Synergie.

STUDY OF THE ENDOSCOPY DEPARTMENT

Endoscopy:

Endoscopy is a nonsurgical procedure used to examine a person's digestive tract. Using an endoscope, a flexible tube with a light and camera attached to it, your doctor can view pictures of ones digestive tract on a color TV monitor.

During an upper endoscopy, an endoscope is easily passed through the mouth and throat and into the esophagus allowing the doctor to view the esophagus, stomach, and upper part of the small intestine. Similarly, endoscopes can be passed into the large intestine (colon) through the rectum to examine this area of the intestine.

This is called sigmoidoscopy or colonoscopy depending on how far up the colon is examined. A special form of endoscopy called endoscopic retrograde cholangiopancreaticography, or ERCP, allows pictures of the pancreas,gallbladder, and related structures to be taken.Endoscopic ultrasound or EUS combines upper endoscopy and ultrasound examination to obtain images and information about various parts of the digestive tract.

Indications:

- Stomach pain
- Ulcers, gastritis, or difficulty swallowing
- Digestive tract bleeding
- Changes in bowel habits (chronic constipation or diarrhea)
- Polyps or growths in the colon

Risks:

Overall, endoscopy is very safe; however, the procedure does have a few potential complications, which may include:

- Perforation (tear in the gut wall)
- Reaction to sedation
- Infection
- Bleeding
- Pancreatitis as a result of ERCP

THE PHYSICAL STRUCTURE OF THE ENDOSCOPY DEPARTMENT

It is located in the second floor. There are two suites ,each suite is roughly about 200 sft.

No. of procedures/day- 20-25 .

ORGANIZATIONAL STRUCTURE

HOD - Dr. P.K Shetty

Consultant Gastroenterologist

Reports to: MD

Senior Technician

Mr. Bijoy Bhatta

Academic profile: Grad in B.Sc.

Experience: 12 Years

Repoorts to: HOD

Technicians

No. of technicians - 3

Experience: 3 to 10 years

Reports to: Sr. Technician

Patient Flow:

- **Gut Preparation.** Examining the upper digestive tract (upper endoscopy or ERCP) requires nothing more than fasting for 6-8 hours prior to the procedure. To examine the colon, it must be cleared of stool. Therefore, a laxative or group of laxatives is given on the day before the procedure.
- **Sedation.** For most examinations with an endoscope, a sedative is provided. This increases the comfort of the individual undergoing the examination. The sedative, which is administered via an injection into the vein, produces relaxation and light sleep. An anaesthesist is required in case of ERCP procedures.
- **Procedure:** The procedure itself is quite fast , with average non theraputic procedures taking around 5 mins for upper GI and around 10 mins for colonoscopy.The procedure might cause discomfort during the insertion of the tube for e.g Gagging .However the lubricant jelly applied on the insertion section helps numb out the nerves and help the patient relax.
- **Recovery :** There are usually few if any recollections of the procedure. Patients wake up within an hour, but the effects of the medicines are more prolonged, so it is not safe to drive until the next day. General anesthesia (puts you totally asleep for a period of time) is given in only very special circumstances (in young children, and when very complex procedures are planned like ERCP).

Reprocessing of endoscopes and accessories:

1. If an Automated Endoscope Washer Disinfector (AEWD) is used, ensure that the endoscopes and its components can be effectively reprocessed in the AEWD. Obtain and review model-specific reprocessing protocols from the endoscope and AEWD manufacturers and check for compatibility.

2. Reusable endoscopic accessories (e.g., biopsy forceps or other cutting instruments) that break the mucosal barrier should be mechanically cleaned as described earlier and then sterilized between each patient use (high-level disinfection is not appropriate).

3. Endoscopes (and accessories) that come in contact with mucous membranes are classified as Semicritical items and should receive at least high-level disinfection after each patient use.

4. Perform pressure/leak testing after each use according to manufacturer guidelines.

- Observe the instrument carefully for continuous bubbling. If continuous bubbling is observed from a given area, this indicates a leak. Remove instrument from water immediately after leak test cycle. Do not use the instrument.
- Dry and clean instrument and place in plastic bag and pack into transport case. Contact appropriate department for repairs.

5. Disconnect and disassemble endoscope components (e.g., air/water and suction valves) as far as possible and completely immerse the endoscope and components in the enzymatic detergent.

6. Cleaning is essential before manual or automated disinfection.

- Meticulously clean the entire endoscope immediately after use,including valves, channels, connectors, and all detachable parts, according to the manufacturer's instructions, using an enzymatic detergent compatible with the endoscope.

- Flush and brush all accessible channels to remove all organic (e.g., blood, tissue) and other residues. Repeatedly actuate the valves during cleaning to facilitate access to all surfaces.
- Clean the external surfaces and components of the endoscope using a soft cloth, sponge, or brushes.

7. Use brushes appropriate for the size of the endoscope's channel, parts, connectors, and orifices (e.g., bristles should contact all surfaces) for cleaning. Cleaning items should be disposable or thoroughly cleaned and disinfected/ sterilized between uses.

8. Ultrasonic cleaning of reusable endoscopic accessories and endoscope components may be used to remove soil and organic material from hard to clean areas.

9. Select a disinfectant/sterilant that is compatible with the endoscope. Exposure time, concentration, and temperature for disinfection the scope must be followed as per manufacturer's recommendations.

10. After high-level disinfection, rinse the endoscope and flush the channels with sterile, filtered, or tap water to remove the disinfectant/sterilant. Discard the rinse water after each use/cycle. Flush the channels with 70–90% ethyl or isopropyl alcohol and dry using forced-air. The final drying steps greatly reduce the possibility of recontamination of the endoscope by waterborne microorganisms.

11. High-level disinfect or sterilize the water bottle (used for cleaning the lens and irrigation during the procedure), and its connecting tube at least daily. Sterile water should be used to fill the water bottle.

12. Perform routine testing of the liquid sterilant/high-level disinfectant to ensure minimal effective concentration (MEC) of the active ingredient.

- Check the solution at the beginning of each day of use (or more frequently) and document the results. If the chemical indicator shows that the concentration is less than the MEC, the solution should be discarded.
- Discard the liquid sterilant/high-level disinfectant at the end of its reuse life (which may be single use) regardless of the MEC. If additional liquid sterilant/ high-level disinfectant is added to an AEWD (or basin, if manually disinfected), the reuse life should be determined by the first use/activation of the original solution (i.e., the practice of "topping off" of a liquid sterilant/high-level disinfectant pool does not extend the reuse life of the liquid sterilant/high-level disinfectant).
- Discard enzymatic detergents after each use, as these products are not microcidal and will not retard microbial growth.

Storage of Clean/Sterile Endoscopes:

- Examine and test endoscope for proper angulation before storing. Hold fiberscope with both hands when storing to prevent banging against cupboard and therefore damaging fiberoptic bundles.
- When storing the endoscope, hang it in a vertical position to facilitate drying (with caps, valves and other detachable components removed as per manufacturer instructions).
- Endoscopes should be stored in a vertical manner that will protect the endoscope and minimize the potential for residual moisture accumulation; and allow for proper airing to ensure endoscopes are kept dry.
- Cabinets used for drying and storage of endoscopes should be constructed of material that can be cleaned easily.
- Endoscopes should not be stored in foam-lined cases, as foam lining is impossible to clean and harbors contamination.

- Endoscopes should be stored in a manner that will protect the endoscope from contamination

Cleaning and disinfection area:

- Space used for the cleaning, disinfecting, and sterilizing should have adequate ventilation to exhaust toxic vapors. Air-exchange equipment (ventilation system, exhaust hoods, etc) should be used to minimize the exposure of all persons to potentially toxic vapors released from chemical sterilants.
- The air system should provide at least 12 air change per hour for negative room pressure.
- The utility sink used to clean instruments should be functionally separate from the hand hygiene sink, and be large enough to accommodate the endoscope and accessories.
- Adequate space should be designated for the storage of chemical sterilant, with consideration given to their special handling requirements as hazardous materials.
- Cleaning/disinfection and sterilization will be carried out by trained personnel only.

Reprocessing Technicians:

1. Personal protective equipment (gloves, gowns, eyewear, respiratory protection devices, etc.) should be readily available and should be used, as appropriate, to protect workers from exposure to chemicals, blood, or other potentially infectious material.
2. Strict use of hand hygiene by all healthcare workers.
3. All healthcare personnel assigned to reprocess endoscopes should be trained in, and adhere to, standard infection control recommendations, including those to protect both patients and healthcare workers.

- Personnel should receive device-specific reprocessing instructions to ensure proper cleaning and high-level disinfection or sterilization.
- b. Competency testing of personnel should be done regularly (e.g annually)
- c. Temporary personnel should not be allowed to reprocess endoscopes until competency has been established.

4. All personnel using chemicals should be educated about the biological and chemical hazards present while performing procedures that use disinfectants.

Equipment Used :

1. Olympus Evis EXERA II System consisting of
    - Light Source CLV- 180
    - Processor CV- 180
    - Gastroscope GIF H 180
    - Colonoscope CF H180L
    - Duodenoscope TJF 150
2. Fujifilm
    - Processor cum Light Source EPX 2500
    - Gastroscope - EG 250 WR5
    - Colonoscope -EC 250 WL3
    - Bronchoscope- EB 530 T
3. High Definition Monitor- Sony
4. Suction Apparatus
5. GE Pulse Oxymeter
6. PC with inkjet printer for reporting
7. Insufflator
8. Argon Plasma Coagulator

STUDY OF THE DIALYSIS DEPARTMENT

DIALYSIS

In medicine, **dialysis** (from Greek "dialusis", meaning dissolution, "dia", meaning through, and "lusis", meaning loosening) is primarily used to provide an artificial replacement for lost kidney function (renal replacement therapy) due to renal failure. Dialysis may be used for very sick patients who have suddenly but temporarily, lost their kidney function (acute renal failure) or for quite stable patients who have permanently lost their kidney function (stage 5 chronic kidney disease). When healthy, the kidneys maintain the body's internal equilibrium of water and minerals (sodium, potassium, chloride, calcium, phosphorus, magnesium, sulfate) and the kidneys remove from the blood the daily metabolic load of fixed hydrogen ions. The kidneys also function as a part of the endocrine system producing erythropoietin and 1,25-dihydroxycholecalciferol (calcitriol). Dialysis is an imperfect treatment to replace kidney function because it does not correct the endocrine functions of the kidney. Dialysis treatments replace some of these functions through diffusion (waste removal) and ultrafiltration (fluid removal)

PRINCIPLE OF DIALYSIS

Dialysis works on the principles of the diffusion of solutes and ultrafiltration of fluid across a semi-permeable membrane. Blood flows by one side of a semi-permeable membrane, and a dialysate or fluid flows by the opposite side. Smaller solutes and fluid pass through the membrane. The blood flows in one direction and the dialysate flows in the opposite. The counter-current flow of the blood and dialysate maximizes the concentration gradient of solutes between the blood and dialysate, which helps to remove more urea and creatinine from the blood. The concentrations of solutes (for example potassium, phosphorus, and urea) are undesirably high in the blood, but low or absent in the dialysis solution and constant replacement of the dialysate ensures that the concentration of undesired solutes is kept low on this side of the membrane. The dialysis solution has levels of minerals like potassium and calcium that are similar to their natural concentration in healthy blood. For another solute, bicarbonate, dialysis solution level is set at a slightly higher level than in normal blood, to encourage diffusion ofbicarbonate into the blood, to act as a pH buffer to neutralise the metabolic acidosis that is often present in these patients. The levels of the components of dialysate are typically prescribed by a nephrologist according to the needs of the individual patient.

TYPES OF DIALYSIS

There are two primary types of dialysis, hemodialysis and peritoneal dialysis, and a third investigational type, intestinal dialysis.

Hemodialysis

In hemodialysis, the patient's blood is pumped through the blood compartment of a dialyzer, exposing it to a semipermeable membrane. The cleansed blood is then returned via the circuitback to the body. Ultrafiltration occurs by increasing the hydrostatic pressure across the dialyzer membrane. This usually is done by applying a negative pressure to the dialysate compartment of the dialyzer. This pressure gradient causes water and dissolved solutes to move from blood to dialysate, and allows the removal of several litres of excess fluid during a typical 3 to 5 hour treatment. In the US, hemodialysis treatments are typically given in a dialysis center three times per week (due in the US to Medicare reimbursement rules),however, as of 2007 over 2,000 people in the US are dialyzing at home more frequently for various treatment lengths.[2] Studies have demonstrated the clinical benefits of dialyzing 5 to 7 times a week, for 6 to 8 hours. These frequent long treatments are often done at home, while sleeping but home dialysis is a flexible modality and schedules can be changed day today, week to week. In general, studies have shown that both increased treatment length and frequency are clinically beneficial.

Peritoneal dialysis

In peritoneal dialysis, a sterile solution containing minerals and glucose is run through a tube into the peritoneal cavity, the abdominal body cavity around the intestine, where the peritonealmembrane acts as a semipermeable membrane. The dialysate is left there for a period of time to remove waste products and water, and then it is drained out through the tube and discarded. This cycle or "exchange" is normally repeated 4-5 times during the day,(sometimes more often overnight with an automated system). Ultrafiltration occurs via osmosis; the dialysis solution used contains a high concentration of glucose, and the resulting osmotic pressure causes fluid to move from the blood into the dialysate. As a result,more fluid is drained than was instilled. Peritoneal dialysis is less efficient than hemodialysis,but because it is carried out for a longer period of time the net effect in terms of removal of waste products and of salt and water are similar to hemodialysis. Peritoneal dialysis is carried out at home by the patient and it requires motivation. Although support is helpful, it is not essential. It does free patients from the routine of having to go to a dialysis clinic on a fixed schedule multiple times per week, and it can be done while travelling with a minimum of specialized equipment. Because survival and quality of life are similar with both peritoneal and hemodialysis, the selection of modality by the patient should be dictated by the life style that each therapy offers.

Hemofiltration

Hemofiltration is a similar treatment to hemodialysis, but it makes use of a different principle.The blood is pumped through a dialyzer or "hemofilter" as in dialysis, but no dialysate is used. A pressure gradient is applied; as a result, water moves across the very permeable membrane rapidly, "dragging" along with it many dissolved substances, importantly ones with large molecular weights, which are cleared less well by hemodialysis. Salts and water lost from the blood during this process are replaced with a "substitution fluid" that is infused into theextracorporeal circuit during the treatment. Hemodiafiltration is a term used to describe several methods of combining hemodialysis and hemofiltration in one process.

THE PHYSICAL STRUCTURE OF THE DIALYSIS DEPARTMENT

It is located in the second floor. Total area is roughly about 4000 sft

Present Bed Capacity - 50 bedded, with sufficient place for the beds with the equipment and place for personnel to freely move round

Equipments – Total 56 machines including 6 machines used as standby which are normally used in ICU.

ORGANIZATIONAL STRUCTURE

HOD - Dr.D.K. Pahari

Consultant Nephrologist.

Reports to: MD

Manager Dialysis

Ms. Panchali Dutta

Academic profile: Grad in B.Sc. + MBA(Hospital)

Reports to : GM (Operations)

Senior Technician

Mr.A.Maity

Academic Qualification required: B.Sc.+ Diploma in Dialysis Technology

Reports to: HOD

Experience: 20 years

Technicians

No. of technicians - 16

Academic Qualification required: Diploma in Dialysis Technology

Experience: 3 to 10 years

Reports to: Sr. Technician

Nurses

Total number of nurses – 8

ACTIVITIES UNDERTAKEN TO SUPERVISE

1. Preparing the machines for dialysis before the patient comes.
2. Receiving and preparing the patient for dialysis, initiation and termination of dialysis.
3. Ensuring that all the parameters are set in the machine.
4. Continuous monitoring of all the relevant parameters throughout the procedure.
5. Ensuring that all the necessary materials are available at all times.
6. Taking instructions from the consultant and implementing the same.

REVERSE OSMOSIS (RO) PLANT

This is the water purifying system for dialysis machines.

Sand Filter - filters undissolved suspended particles from the feed water.
Activated Carbon Filter - removes bacteria and odor by adsorption.
Water Softener - Softens the feed water by nullifying the hardness of the feed water thus increasing the RO output.

Micro filters-20” 10 micron filter is used which filters particles up to the size of 10 microns if the particles have escaped from sand and carbon filters. It needs to be changed once in three months.20” 5 micron filter which filters particles up to the size of 5 microns if particles have escaped from sand and carbon filters and the 10 micron filter. It needs to be changed once in three months.

RO unit - It is a 3 membrane unit and the approximate output is 650 – 700 lts per hr. Life span of the membrane is approximately 3 years.

Collection Tanks - Permeate water is collected in 2 tanks of 2000 lts each. From the tank water is passed through UV lamp which kills micro-organisms if present.
Back wash procedure for Sand and Carbon filters

1. Switch off the feed water pump.
2. Turn the handle in the multiport valve mounted on top of the filter vessel to back wash position from filter position.
3. Switch on the feed water pump and allow the water to flow through the filter.
4. Water moves in opposite direction and pushes all dust particles through the drain. Wait till the presence of the dust in the drain to clear.

5. Switch off the fed water pump.
6. Turn the handle in the multiport valve to Rinse position.
7. Switch on the feed water pump. Filter is rinsed.
8. Repeat the above till get satisfied and allow the water to other side.

Time taken for this procedure mentioned above is approximately 30 to 45 minutes.
Repeat frequency - Once in 3 days.

Softener – regeneration

1. Take 18 Kg of common salt in the regeneration tank.
2. Add filtered water dissolve the salt and make it to 50 lts.
3. Turn the multiport valve handle to slow rinse (regeneration) position.
4. Place the injection tube in the regeneration tank.
5. Switch on the feed water pump.
6. Slowly open the injection valve and allow the salt solution to get sucked in.
7. Once over close the injection valve. Switch off the pump.
8. Turn the multiport valve handle to fast rinse position.
9. Switch on the feed water pump and rinse the softener.
10. Check the hardness of the water using hardness testing kit.
11. Once the desired level (<40 ppm) attained switch off the pump.
12. Turn the multiport valve handle to service position.

Time taken for this procedure, mentioned above is approximately 2 hrs 30 minutes.
Repeat frequency: Once in a week.

PREPARING THE MACHINE FOR DIALYSIS

1. Connect the water input line to the RO water line and open it.

2. Place the drain line in the drain hole.
3. Plug in the electrical connection and switch on the machine.
4. Set the machine for rinse mode for 10 minutes.
5. After rinse set preparation mode and connect acid and bi-carbonate concentrate solution.
6. Machine goes in to self checking mode and come final conductivity..
7. Once machine ready start the dialysis…
8. Connect the dialyser and blood tubing to the machine and prime with normal saline. Tap on the head of the dialyser and remove all the air from the blood compartment. Fill the tubing also with saline. Connect the recirculation connecter in the tip and set for recirculation.

Time taken for preparation is 30 minutes.

STARTING AND CLOSING OF DIALYSIS

Before starting the dialysis the hands of the technicians and associated staff should be thoroughly washed with soap solution and dried with a clean towel. The following things should be kept ready before starting the dialysis procedure.

1. AV fistula needles 2nos
2. Disposable syringe 20ml 1
3. Syringe 1ml 1
4. Xylocaine injection
5. Sterile glove 1pair
6. HD set 1
7. Surgical spirit
8. Four Pieces of 3 inch plaster
9. Normal saline

STARTING OF DIALYSIS

Patient

1. Check patient weight and BP make the patient lie down on the bed.
2. Inform the consultant and take necessary instructions for the dialysis.
3. Open the HD set and place all the things mentioned above in the set.

4. Wear the hand gloves and clean the fistula hand top and bottom with spirit and put sterile towel under the hand.
5. Load Xylocaine 2% in 1ml syringe.
6. Select a convenient place for cannulation.
7. Inject local injection and insert the fistula needle in to the vein. One needle should be inserted towards the fistula (artery) and another one towards the heart (vein).

Machine

1. Switch off the blood pump and disconnect the recirculation connector from arterial line.
2. Clean the tip of the arterial line with spirit swab and connect to the arterial needle.
3. Set the pump speed of 100ml per minute on the blood pump and let the blood flow through the line.
4. Once the saline in drained and the line filled with blood clamp the venous line of the tube and immediately switch off the blood pump.
5. Clean the tips of the venous line connect to the venous needle.
6. Release the clamp of the venous line and needle.
7. Connect the venous monitor line and release the clamp.
8. Switch on the blood pump.
9. Set the time and weight loss, confirm and press UF/ Dialyze mode.
10. The dialysis starts.
11. Load 5000 IU of injection heparin in 20ml syringe make it to 10ml and fix in the syringe pump in machine and set the flow rate.
12. Enter the time of starting, blood flow, venous pressure, TMP in the dialysis chart.
13. Check BP of the patient every half an hour and enter in the dialysis chart.

CLOSING OF DIALYSIS

Material needed: Gloves 1 pair, sterile gauze 1pack

Machine

1. Wear the gloves, switch off the blood pump and clamp the artery line and the artery fistula needle.

2. Disconnect the artery line from the fistula needle.
3. Connect recirculation connector to the blood line and connect saline to it.
4. Switch on the blood pump and let 100 – 150 ml of saline to clean the blood line and the dialyser off blood.
5. Once the saline in returned to the patient body switch off the blood pump and clamp the venous line thus to prevent any air entering the blood stream.

Patient

1. Remove plaster from the artery needle.
2. Tightly fold gauze piece, pull half of the needle out pour little Neosporin Powder, put the folded gauze piece there and remove the needle hold till bleeding stops and secure with tourniquet.
3. Repeat the same procedure to the venous line also.
4. Check patient BP and Post dialysis weight and record it into the patient file.

MEDICAL EMERGENCY DURING DIALYSIS

Hypotension

A decrease in blood pressure is the most frequent complication reported during hemodialysis.

When fluid is removed during hemodialysis, the osmotic pressure is increased and this prompts refilling from the interstitial space. The interstitial space is then refilled by fluid from the intracellular space. Excessive ultra filtration with inadequate vascular refilling plays a major role in dialysis induced hypotension. The immediate treatment to hypotension is to discontinue dialysis and place the patient in a trendelenburg position. This will increase cardiac filling and may increase the blood pressure promptly.

Cramps

In the majority of hemodialysis patients, cramps occur toward the end of the dialysis procedure after a significant volume of fluid has been removed by ultra filtration. The immediate treatment for cramps is directed at restoring intravascular volume through the use of small boluses of isotonic saline. Prevention of cramps has been attempted with the prophylactic use of quinine sulfate at least 2 hours prior to dialysis.

STUDY OF THE CENTRAL STERILE SERVICES DEPARTMENT

The Central Sterile Supply Department (CSSD):

It is the service responsible for receiving, storing, processing, distributing and controlling the professional supplies and equipments(both sterile and non sterile) for all user unit of hospital for the care and safety of patient under strict quality control.

Aim:

- Centralizing the activities of receipt, cleaning, assembly, sterilization, storage and distribution of sterilized materials from a central department where safe sterilization is done under controlled conditions with adequate managerial and technical supervision at an optimum cost.
- To provide an efficient, economic, continuous and quality supply of sterilized material to various areas of the hospital to deliver quality and infection free patient care.
- Contributes to reduction in hospital infection rate.
- To reduce the burden of work of the nursing personnel, there by enabling them to devote more of their time to patient care.

Objective:

- To provide efficient, economic and uniform source of sterile supply for the care and treatment of sick.
- To assist purchase department for decision making and selection of goods.
- To assist management of hospital in standardization of goods.
- Cleaning ,Packaging ,Labeling and Dating of materials.
- To supply equipments to highly specialized units.
- To educate students, Nurse and ancillary persons

- To save nursing time at nursing station
- To participate effectively in Hospital infection control committee.
- Applied research for improvement techniques.

Normally the following types of article are entertained by CSSD:

- Diagnostic sets like L.P set, Sternal Puncture set etc
- Treatment sets like Cut down sets, aspiration set etc.
- Dressing materials.
- OT linen & instruments.
- Rubber Gloves, Catheters.
- IV sets & infusion sets .

History and Development:

- The development of concept of sepsis was coined by Lister and Koch as a result of discovery of microorganism. With this discovery, the need for aseptic technique in handling and sterilizing the equipment used in surgery and medicine was felt for the care of patient.
- The mordern concept of CSSD was derived during second world war.
- Now every modern hospital has a functional CSSD department.

THE PHYSICAL STRUCTURE OF THE CSSD DEPARTMENT

It is located in the second floor. Total area is roughly about 1500 sft

ORGANIZATIONAL STRUCTURE

HOD – Ms.Anita M Beg

Experience-15 years

Reports to: GM (Operation)

Technicians and Staff-20

Planning :

The CSSD can be broadly classified into two parts:

Responsible for receiving dirty utilities, cleaning, processing, sterilizing,storage

Sterilization, storage and supply

Mainly responsible for distribution

Layout :

- There is no back tracking of sterile goods.
- One way movement from receiving counter to issue counter.
- Sterile area should be prior to sterile storage and issue.
- The receiving counter must be away from the issue counter.

- Separate receiving and issuing counter.

Contaminated area

There should be minimum six divisions in a CSSD as follows:

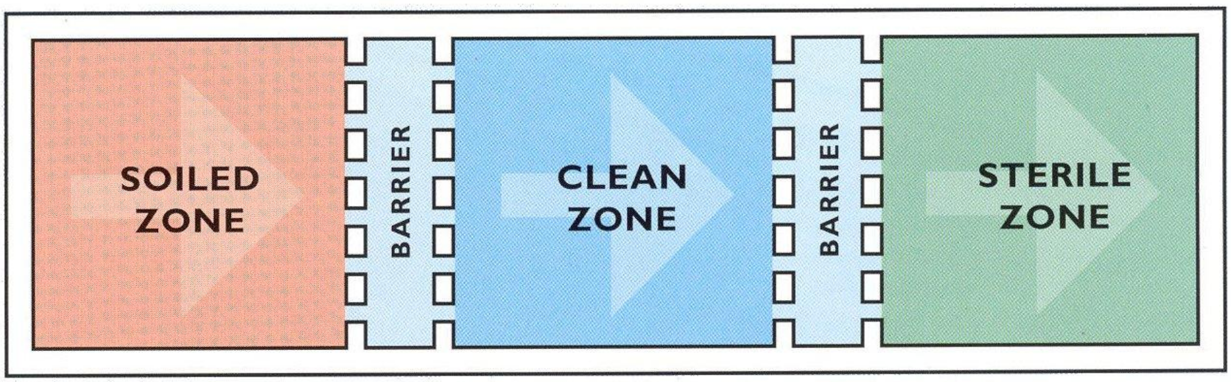
Clean Area

Sterile Area

Process Flow of CSSD :

Structural Design

The central Unit comprises of three zones,separated by two distinct barriers.



Equipments in CSSD :

- Cleaning and decontamination devices
- Hot air Oven for drying & heat sterilization
- Testing apparatus for emergency sterilization
- Others :- trolleys, work surface, telephones
- Maintenance and repair of equipments
- Material : chemicals for washing and cleaning
- Steam Boiler
- Hot air ovens for drying instruments
- Autoclaves using dry heat, moist heat.
- Ethylene oxide sterilizers.
- Plasma Sterilizer.
- Testing material to check effectiveness of sterilization.

- Sealing machine
- Ultrasonic Washer
- Washer/Disinfector

STERILIZATION

- It is a process of freeing an article from all living organisms including bacteria ,fungal spores and viruses.
- A material is pronounced sterile if it achieves 99.99% kill of bacterial spores.

Types Of Sterilization

- Dry Heat.
- Steam High Pressure-Autoclaves operated by Gas, K.oil or Electricity (Flash, Pulse).
- Ethylene Oxide Sterilization.
- Plasma Sterilization.
- Chemical Sterilization.
- Radiation Sterilization.
- Infra Red Radiation – Syringes.
- Ultra Violet Radiation – Decontamination of Air.
- Ionizing Radiation / Gamma Radiation.

Chemical sterilization

CIDEX

- A Glutaraldehyde derivative is most effective as it destroys spores too.
- It is **high level disinfectant**. It kills spores within 12 hrs and viruses within 10 min.
- Widely used because of their excellent biocidal properties, activity in the presence of organic matter, non corrosiveness and noncoagulation of proteinaceous material.

Hydrogen peroxide

- It is an effective bactericidal, fungicidal, viricidal and sporicidal.
- It is commercially available as 3% solution but can be used upto 25% concentration.
- It is non corrosive and not inactivated by organic matter but irritant to skin and eyes lutaraldehyde derivative is most effective as it destroys spores too.

Steam sterilization

- It is most commonly used sterilizer because it is safe ,inexpensive and time saving. There should be proper coordination between pressure, temperature and time . Articles are subjected to sterilize in 121 degree Celsius in 10-15 minutes and 134 degree Celsius in 3 minutes in 20 PSI pressure. The outer layer of microorganism is softened by steam which coagulates internal portion of organism. In this way steam sterilization is effective against microorganism.
- Machine is operated either by supply of steam through a boiler or by inbuilt electrical steam generator
- They are used for sterilization of glass wares, container, vessel, linen, rubber articles, OT instruments etc.
- The equipments are first cleaned & the packaged in muslin, linen or paper which are easily penetrated by steam & then placed on shelf in the chamber.
- Steam with <0.95 Dryness Factor is not useful for Sterilization.
- Superheated Steam acts like Dry Hot Air only . (Strength Of Steam is its Latent Heat)

Equipment Installed :

1. Steris Amsco Century V-120
2. Steris Amsco Century V- 136

- **Total time Required**

- ❑ Autoclave – 45 to 50 min
- ❑ No. of cycles/day-13-14

ETO Sterilization

- It is carried out by use of ethylene oxide as biocide to destroy bacteria , virus ,fungus and other microorganism.
- This method was developed by American army for sterilizing articles, which are damaged by high temperature, like plastic product and sensitive surgical materials.
- It is used for those materials that are heat and moisture sensitive.
- Since it is explosive, it is mixed with co2 or nitrogen and supplied in a cartridge.
- Delicate surgical instrument like cystoscope, heart lung machine, bronchoscope, implants etc are sterilized by this method.
- Commonly used in tertiary level hospital for sterilization of costly and sensitive materials.

Steps in ETO Sterilization

- **Preconditioning-** Preconditioning prepares the chamber environment to meet the ideal conditions for temperature, pressure and humidity. First air is removed from the chamber to allow for gas penetration. A leakage test is performed, to ensure that staff and environment are safe. Next, some steam is injected into the chamber and humidifies the load, since EtO is only effective in a humid environment. The chamber is heated by either steam or hot water which is present in the jacket. Normally the jacket is kept at the same temperature 24/7 to minimize temperature fluctuations.

- **Sterilization-** The second stage is the actual sterilization process. The EtO enters the chamber via evaporation with a certain amount of steam to keep the humidity level up as well as to make sure the EtO is reaching all parts of the load. When the required concentration in the chamber and load is achieved the actual sterilization stage starts. The lower the gas concentration in the chamber the longer is the sterilization time. As EtO is absorbed by many kinds of plastic materials it is important to keep the concentration at the right level. To achieve this EtO is sometimes added to the chamber after a while. It is of major importance to ensure the appropriate concentration level of EtO in the chamber to achieve effective and safe sterilization.

- **Aeration(Degassing)-** Aeration is the most important and longest part of the EtO sterilization cycle. As mentioned, materials such as plastics and rubbers absorb gas and if applied to patients, the toxic gas could damage their body tissue! For this reason it is very important to have an excessive aeration stage to remove any remaining EtO gas and to allow absorbed gas to evaporate again from the sterilized items. This is done by circulating HEPA filtered air over the load at a temperature of 30°C to 50°C. This is sometimes done in the sterilizer's chamber, but sometimes the sterilized items are placed in a special aeration cabinet. If the sterilized items are repositioned from the chamber to the aeration cabinet then strict safety precautions should be in place to prevent EtO gas exposure to the people who perform this function. A commonly used time period for this aeration treatment is 48 hours which results in a very slow instrument turnaround. A special infrastructure is required, with gas tight ventilation piping to the roof top or to a catalyzer. The sterilizer cannot use the hospital's ventilation system because it is too dangerous. The special ventilation piping has to be tested for gas leaks all the way as this is the only way to minimize the risks.

Advantages:

- Low temperature.
- High efficiency – destroys microorganisms including resistant spores.
- Large sterilizing volume/ chamber capacity.
- Non corrosive to: plastic, metal and rubber materials.

Disavantages:

- Excessively Long cycle.
- Safety concerns - **carcinogenic** to humans.
- Toxicity issues - toxic residues on surgical instruments and tubing.
- Not recommended for flexible scope.
- EtO is flammable.
- Requires special room conditions, safety equipment and separate ventilation system.
- Relatively high annual costs for maintenance, servicing and consumables.

Equipment Installed

- ❑ Steris Amsco Eagle 3017 ETO Sterilizer

Total time required

- ❑ 11-12 hour/cycle
- ❑ No.of cycles/day-1

Consumable Required

- ❑ EO gas catridge

Plasma Sterilization

Plasma: The fourth state of matter also is known as plasma, which in this context of is a gas-like substance consisting of particles such as positive ions and electrons. A plasma can be created by heating the gas or applying a strong electromagnetic field.

In a plasma sterilizer, hydrogen peroxide, a type of highly reactive compound, is added to a chamber, where it is vaporized into a gaseous state. Once the gaseous state of hydrogen peroxide is achieved, an electrical field is applied to it. The field causes the gas to ionize ; meaning ions and electrons are generated and form something called a plasma cloud.

The mechanism of action of this device is the production of free radicals within a plasma field that are capable of interacting with essential cell components, ie is enzymes and nucleic acids. And thereby disrupt the metabolism of microorganisms.

Basic Mechanism of Plasma Sterilization

- A-Destruction by UV irradiation of the genetic material of the microorganism; this is a statistical process requiring a sufficient number of lesions of the DNA strands.
- B- Erosion of the microorganism, atom by atom, through intrinsic photo desorption Photon-induced desorption results from UV photons breaking chemical bonds in th microorganism material and leading to the formation of volatile compounds from atoms intrinsic to the microorganism. The volatile by-products of this nonequilibrium chemistry are small molecules (e.g., CO and CHx)

Steps In Plasma Sterilization

- **The Vacuum Phase** - The chamber is evacuated, reducing internal pressure in preparation for the subsequent reaction.

- **The Injection Phase** - A measured amount of liquid peroxide is injected into the chamber, evaporating the aqueous hydrogen peroxide solution and dispersing it into the chamber, where it kills bacteria on any surface it can reach.

- **The Diffusion Phase** - The hydrogen peroxide vapour permeates the chamber, exposing all load surfaces to the sterilant and rapidly sterilizes devices and materials without leaving any toxic residues. At the completion of this phase, the chamber pressure is reduced and the plasma discharge is initiated.

- **The Plasma Phase** - An electromagnetic field is created in which the hydrogen peroxide vapour breaks apart, producing a low-temperature plasma cloud that contains ultraviolet light and free radicals. Following the reaction, the activated components lose their high energy and recombine to form oxygen and water. Phases 1, 2, and 3 are then run a second time for added efficacy. This built-in reprocessing assures optimal sterilization for even the most difficult-to-sterilize devices.

- **The Vent Phase** - The chamber is vented to equalize the pressure enabling the chamber door to be opened. There is no need for aeration or cool-down. Devices are ready for immediate use.

Advantages

- Materials and device compatibility.
- Low turnaround times.
- In-house control of the sterilization process.
- Low temperature sterilization method.

Disadvantages

- Presence of organic residue give rise to complications.
- Complex geometries are harder to sterilize.
- Cannot be used for bulk sterilization of many devices.
- Cannot be used on paper, cellulose or linen.
- Do not penetrate well in devices with long lumens.

Equipment Installed

- ❑ ASP Sterrad 100S

Total Time Required

- ❑ 50-60 Mins (cycle)
- ❑ No. Of cycles/day- 11-12

Consumable Required

- ❑ H2O2 Sterrad Rolls

STERILIZATION INDICATORS

Mechanical Monitors:

- Devices that record time, temperature & pressure.

Biological Indicators:

- They are standardized preparation of spores.
- A positive biological indicator is indicative of

  a possible sterilization process failure.
- They should be used atleast once a week but
- Time needed for incubation is long.

E.g. spores of Bacillus Sterothermophilus

Chemical Indicators:

- These are more practical means & detect problems immediately.
- The CDC & all major U.S organizations standards & guidelines advocate that a chemical indicator be attached to every package that goes through a sterilization cycle & within each package to be sterilized in what is expected to be the most difficult-to-sterilize location.
- These are divided into 6 classes, higher the class, more sensitive the indicator

- Class 1- E.g. External Process Indicator – Autoclave Tape. These are Internal & External Process Indicator.These inform that item has been exposed to sterilization process.

- Class 2- E.g. Bowie-Dick test for vacuum steam sterilizer.They only access Vacuum Pump efficiency & detect the presence of air leaks &/or gases in steam.

- Class 3- E.g. Temperature Tube.Contains chemicals that melts & sometimes changes color when the appropriate temp is attained.

- Class 4- Respond to one or more sterilization parameters.Contains Ink that changes color when exposed to correct combination of sterilization parameters.

- Class 5 Known as Integrating Indicators or Integrators.Respond to all parameters of sterilization over a specified range of temperatures.

- Class 6- These are emulating indicators. These are designed to react to all critical parameters over a specified range of sterilization cycles for which the stated values are based on the settings of the selected sterilization cycles

Storage :

- After sterilization the sterilized items are kept in different racks as per labeling.
- Supplied as per the demand of different area.
- To ensure continuous availability of sterile supply five times of daily requirement should be available in storage.

Distribution:

There are 4 major system of distribution as folllows:

- **Topping up:** Each department set predetermined stock level for each user and distributing routinely with record.
- **Clean for dirty exchange:** one clean article for each dirty is exchanged.
- **Regular complete stock issue:** demand for box, trolley, basket containing article for need for specific period.
- **Ordinary order system :**straight forward ordering system of user in order to keep their local store full.

The Study Of The

Biomedical Engineering Department

BIOMEDICAL ENGINEERING DEPARTMENT

Modern patient care revolves around not just the skill of the doctor, but technology as well.When the equipment is running correctly, it allows the docs to do their job to the best of their ability. With the most accurate diagnostic equipment at the docs' disposal, the patients have a better chance at survival and recovery.When things are running smoothly around the facility and nothing is broken, the biomedicalmaintenance flight technicians use the time to perform routine preventative maintenance on all the equipment.

They also provide the medics with training on how to properly use new equipment to prevent user error.

Biomedical equipment models and makes also changes almost every day, It's not realistic to think you can learn everything about every piece of equipment.

The technical school helps prepare the engineers by giving the foundation and framework --the basics. The junior engineers fill in the gaps as they sort of teach themselves by using the literature and skills picked up along the way from co-workers."Plumbers work on pipes, carpenters work with wood, but we can work on everything in the hospital. We're not limited to one field, when you work on medical equipment, you have to know how to fix everything, and we do because there's no telling what you're going to see”.

HOD – Mr. Tapas Choudhury

Academic profile: BE in Electronics and Communication.

Experience: 30 years.

Reports to: GM (Operations).

Deputy Manager(Biomedical)- Mr. Abhijit Roy Choudhury

Academic: BE in Electronics.

Experience: 9 years

Reports to: HOD

Senior Engineer (Biomedical)-Mr .Saikat Koley

Academic : Electronics

Expeience:5 years

Junior Engineer (Biomedical)- Ms.Aryakanya Choudhury

Academic: B.Tech in Biomedical

Experience:2 Years

WORKING HOURS
General Shift 9.00 am to 5.00 pm
In addition to it - on call support 24/7.

PHYSICAL STRUCTURE
It is located at the second floor.
The area allotted is (7` x 10`) = 70 SFT.

TECHNOLOGY
The department is provided with a helpline and a computer which is part of the hospital network. Within the 70 SFT area provided to the department, there is a small office space, a work station and 2 big sized shelfs, one for documents and the other for tools and equipments.

PREVENTIVE MAINTENANCE
The biomedical engineer has to perform daily routine visit to all departments to take stock of the condition of the biomedical equipments. The visits are registered in a routine visit register.This register contain all the details of any new breakdowns, breakdowns pending repair, equipment wear and tear etc.

BREAKDOWN MAINTENANCE
When there is a breakdown call from any department, the Engineers visit the site and attend to it. There are many aspects to be taken care before opening an equipment for service/maintenance. The things to be checked before starting the maintenance procedure are as follows:

1. Check whether the power chords and plugs of the equipment are not damaged.
2. The power supply sockets are not damaged
3. The equipment warranty should be checked. If it is still under warranty, the equipment should not be opened and the service ticket has to be raised with the technical support of the vendor.
4. If the equipment is on a major breakdown, and the equipment is high value equipment and has been insured, then appropriate procedures to make the claim should be followed.
5. If equipment broken down can be repaired by the department engineers, only then it has to be opened.
6. If the equipment cannot be maintained by the departmental engineers, the respective vendors should be informed and followed up to ensure the equipments are restored with minimal breakdown time.
7. High Value equipment which are out of warranty period should be periodically checked for the validity of AMC and insurance so that repair costs can be minimized.

PROCUREMENT

The department participates in the decision making process of the procurement of Biomedical Equipment (Hospital Assets) in the hospital. It receives copies of purchase orders placed for procurement of biomedical assets. On arrival of the ordered equipment, the opening of the pack is done in presence of a biomedical engineer who inspects the equipment for physical fitness and technical compatibility. Then if the consignment meets the hospital requirements, the items are approved and in-warded. Then the goods receipt number - GRN is prepared and forwarded by the stores to the Accounts department. The installation and operating of the equipment should be demonstrated to the biomedicalengineer as well. Also the biomedical engineer needs to be demonstrated and trained to handle some basic breakdowns. Most important thing is that the engineers should be trained on what should not be done during the course of maintenance. What activities would lead to the lapse of warranty etc.

A Project Report on

Utilization Study of CT Scanner in a

Super Speciality Hospital.

Master of Business Administration in Hospital and Health Management

Introduction:

In the present healthcare scenario, increasing operational efficiency and reducing costs, whilst improving service provided to the patient, are a constant challenge. Advances in engineering and information technology, particularly during the last few decades, have revolutionized medical care. The availability and utilization of various healthcare equipment, at all levels, in the health system for effective and efficient service delivery was amply emphasized in the *Alma-Ata declaration* at the International Conference on Primary Healthcare in 1978, which was later included in the strategy paper of *Health for All by 2000AD*. The sophistication in the medical field has led to the development of specialized care centers in an attempt to provide high quality care. Medical equipment plays a very significant role in the healthcare delivery system. The equipment has become more complex and requires regular specialized maintenance and repair, which is very expensive. Hospital equipment falls into an extremely wide spectrum ranging from a simple patient trolley to a hi-tech PET, MRI, and CT scanner. The term "equipment" in the context of a hospital, generally means any instrument, apparatus, tool, appliance, machine or any other related article, used for various preventive, diagnostic, therapeutic, supportive, and control procedures for day to day patient care activities.

All these account for a major part of any hospital project cost, which could go up to almost 60 percent. Of this, biomedical equipment could account for nearly 50 percent of the cost. Keeping this in view, it is essential to ensure maximum utilization of the equipment with minimum downtime. With the adaptation of proper maintenance techniques and management systems one can utilize resources optimally and reduce the breakdown and related maintenance workload.

It should be an earnest endeavor of the management and users to optimize the equipment utilization to obtain maximum return on capital invested. In an era of cost-intensive medical care, every equipment being installed in healthcare institutions need to be fully and properly utilized.

Aim :

To study the utilization patterns of CT Scanner at Medica Hospital,Kolkata.

Objectives:

1. To observe the patient load of the CT scanner and calculating the utilization index (U.I).
2. To analyze the utilization pattern and suggest recommendations to improve the (U.I).

Study Type:

Prospective.

Methodology :

1. The patient load was calculated by the number of by the number of scans done over a One month period.
2. The average time taken for all the procedures where collected.
3. The total number of CTs done and total time the machine was operated was computed.
4. The Utilization Index was computed using the above data.

Observations:

Utilization means the use of the equipment to its full potential. Utilization index is one of the important parameters to monitor the functional status of an equipment.

Using Utilization Index (U.I) = $S / T \times 100$

Where $S \rightarrow$ Average number of hours the machine is used in a standard day.

$T \rightarrow$ Maximum number of hours the machine can be used in a standard day. If the use is less than 50%, it is considered to be under-utilized and hence a bad investment. Some strategies can be built up to improve the utilisation of the equipment. However, life-saving equipment cannot be subjected to this kind of assessment.

Centers for Medicare and Medicaid Services (CMS) defines 100% utilization as equipment operating for 50 hours per week, 52 weeks per year.

Since a year long record of patient list was not available in the scope of this study hence a month long record (1st March to 31st March) was collected.Hence for this study T was taken as 200 hours(50×4).

Results:

The patient load was collected form screenshots from the CT console.In absense of a PACS sytem this was the only way to collect examination start time or the machine was ‘ON’. Average time taken to conclude an examination was collected from the experienced imaging staff at the hospital. The average times for the various procedures are taken as follows:

Procedures	Average time taken in minutes	Number of procedures in the month of March 2015
BRAIN(PLAIN)	4	204
BRAIN (PLAIN+CONTRAST)	12	15
BRAIN+ORBIT	10	1
PNS(PLAIN)	5	37
PNS(PLAIN+CONTRAST)	15	2
NECK(PLAIN)	12	3
NECK(PLAIN+CONTRAST)	25	2
CHEST(PLAIN)	6	28
CHEST (PLAIN+CONTRAST)	12	16
HRCT CHEST	10	47
HRCT CHEST(PLAIN+CONTRAST)	25	12
ABDOMEN UPPER	10	8
ABDOMEN UPPER (PLAIN+CONTRAST)	20	10
ABDOMEN LOWER	10	33
ABDOMEN LOWER(PLAIN+CONTRAST)	20	0
ABDOMEN WHOLE	12	38
ABDOMEN WHOLE (PLAIN+CONTRAST)	25	56
KUB(PLAIN)	15	19
KUB(PLAIN+CONTRAST)	30	13
ANGIO(RENAL,PERIPHERAL,BRAIN,CAROTID ,ABDOMINAL)	25	44
ANGIO (CORONARY)	50	6
FNAC PROCEDURE	45	1
BIOPSY PROCEDURE	50	4
PIGTAIL PROCEDURE	50	2
ASPIRATION PROCEDURE	60	3
HR TEMPORAL BONES	15	1
DELAYED	30	8
WRIST,ELBOW,KNEE,ANKLE,PELVIS,T	15	33

It was observed that the total number of cases in the month of March was 674. Out of this 129 cases required contrast while 545 were plain.The average scan time per patient was found to be 13.4 minutes.

Chart 1

The maximum number of scans were that of the Brain (243) followed by Abdomen (147) and Chest (113).The other procedures were few in number and constitutes the rest. This shows that CT is the preferred modality in case of head injury or trauma.

Chart 2

The average time was multiplied with the corresponding procedure (Table 1) and they were multiplied by number of times the same procedure happened in the month of March.It was found that the machine was operated for a total of 9012 minutes or 150.2 hours in the month of March.

The Utilization Index of the CT scan ,considering it is running for 50 hrs a week or 200 hours a month ,

$$U.I = (150.2/200) \times 100$$

$$= 75.1\ \%$$

According to the authors of this index, if this value is less than 50%, then the equipment is under-utilized. This shows that the CT scanner at this hospital is not under-utilized; rather it is utilized very well.

Serial No.	Particular	Value
1.	Patient/Month	674
2.	Average Scan Time/Patient (in minutes)	13.4
3.	Equipment Used /Month (in minutes)	9012
4.	Equipment Used/Month (in hours)	150.2
5.	Maximum Utilization/Month (in hours)	200
6.	Utilization Index	75.1

However if we see the utilization of the during night if was found to be very low. Of the 674 cases studied 601 of the cases took place between 8:00 AM to 8:00 PM. Only 73 cases were done in the 8:00PM to 8:00 AM slot which gives an average 2.35 cases every night.

Chart 3

Conclusion & Recommendations:

It is seen that the Utilization pattern of the CT system is quite high;however there is some scope of improvement. Very often it is seen the equipments have utilization index of more than 100 percent.

In the case of our study the day shift is packed,there are back to back cases with patients waiting outside.Increasing the number of cases in such scenario might not feasible.

However the machine remains quite idle during the night with exceptions of accident/trauma cases. If the system can be utilized even a little more the utilization pattern can be substantially improved. As such I would like to make the following recommedations:

- If some of the **non –critical ,non-emergency ,theraputic** examinations of Inhouse patients can be done in the night; a lot of slots will open up during the day which can used to cater to more outpatient examination.
- Medica being a big name ; it should use its clout to bring in more CT cases from private nursing homes,poly clinics and individual practitioners . A thorough marketing drive of its imaging services should be undertaken.
- With a Utilization Index of 75.1 already; and Medica being a tertiary level hospital should invest in its own CT system rather than having a profit/cost sharing setup with a third party diagnostic service. It will be a wise investment and will add up to the image of this organization.

Thank You