Summer Training at

Study on Time Utilization of Cardiac Catheterization Laboratory at Narayana Hrudayalaya Hospital, Jaipur

By
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Under the guidance of
Dr. Arindam Das

Post Graduate Diploma in Hospital and Health Management
2011-2013

Institute of Health Management Research,
Jaipur
2012

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Certificate

This is to certify that Dr.Neha Gupta from Institute of Health Management Research, Jaipur has undergone Summer Training at Narayana Hrudayalaya Hospital, Jaipur from 9th April, 2012 to 2nd June, 2012.

The candidate herself carried out the project. Her approach to the study has been sincere, scientific and analytical. This summer training is partial fulfillment of the course requirement is recommended for the award of post graduate diploma in health and hospital management.

I wish her success in all her future endeavors.

Dr. P.R. Sodani
Dean (Academic and Students Affairs)
IHMR, Jaipur

Dr.Arindam Das
Assistant Professor
IHMR, Jaipur

Certificate

This is to certify that the study entitled 'To Study the utilization of Cardiac Catheterization laboratory" at Narayana Hrudayalaya Hospital, Jaipur is a bonafide original work of ***Dr.Neha Gupta(PGDHHM BATCH 16TH, IIHMR)*** *and has been carried out under our direct guidance, supervision and to our entire satisfaction.*

The work presented herein has not been previously submitted for the award of any degree, diploma, and fellowship or, any other similar distinction.

During her training period 09.04.2012 to 02.05.2012 her performance and conduct was found to be good.

Dr. Mala Airun
Medical Superintendent
Narayana Hrudayalaya Hospital,
Jaipur

Mr.Arunesh Punetha
Chief Administrative Officer
Narayana Hrudayalaya Hospital,
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12/6/12

Dr.Avadhesh Agrawala
Deputy Medical Superintendent
Narayana Hrudayalaya Hospital,
Jaipur

Narayana Hrudayalaya Hospitals
Caring with Compassion

NH/HRD-Off/2012/047

Date: 13th June 2012

TO WHOM SO EVER IT MAY CONCERN

This is to certify that Dr. Neha Gupta has completed her Summer Training Successfully in Narayana Hrudayalaya Hospital, Jaipur from 9th April 2012 to 2nd June 2012.

Her Work during the Period was Commendable and appreciable. Her character and conduct was good.

We wish her success in future endeavors.

Vishnu Priya Sharma
HR Department

Narayanaya Hrudayalaya-Jaipur

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I express my deepest regards and gratitude to **my seniors (Dr.Jitendra Sharma and Dr. Mahesh Belagere), all friends and my family**, for their constant encouragement and support at every step.

A special thanks is also extended to the **IIHMR Library and staff & Gupta Photo stat** for the much needed help and constant support throughout.

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List of Abbreviations

- NH –Narayana Hrudayalaya
- SILS-Single Incision Laparoscopic Surgery
- MRI- Magnetic Resonance Imaging
- CT-Computed Tomography
- CBC-Complete Blood check up
- ECG-Echocardiogram
- USG-Ultra Sonography
- PSA-Prostate Specific Antigen
- TSH-Thyroid Stimulating Hormone
- OPD-Outpatient Department
- IPD-Inpatient Department
- OT- Operation Theatre
- ICU-Intensive Care Unit
- CTVS-Chest Physiotherapy
- BLS-Basic Life Support
- ALS-Advanced Life Support
- CPR-Cardio Pulmonary Resuscitation
- NCI-National cancer Registry
- ECHO-Echo Cardiogram
- CCU- Coronary Care Unit
- CATH. LAB-Cardiac Catheterization Laboratory
- HR-Human Resource
- GM-General Manager
- CMD-Chief Managing Director
- CEO-Chief Executive Director
- MRD-Medical Records Department
- TMT-Tread Mill Test
- LAMA-Left Against Medical Advice
- ALOS-Average Length of Stay

BACKGROUND

The primary objective of the summer internship program was to prepare a student interested in the field of hospital management and administration, some experience and knowledge on the management and operations of a hospital.

To accomplish these objectives, the student was expected to participate in a variety of activities in the hospital. The duties require significant involvement in minimum activities and ability to work effectively with co-workers.

Objectives of summer internship:

- To understand working of the entire hospital and to work opportunities that will provide whole some experience.
- To study different departments in the hospital.
- To know operations systems of the hospital in detail.
- To study the time utilization of cardiac catheterization Laboratory at Narayana Hrudayalaya, Hospital, Jaipur.

Methodology

The time of two months spent at Narayana Hrudayalaya hospital Jaipur gave me an experience that was diverse and exhilarating as it gave me an opportunity to actually learn and understand the various aspects of hospital management.

The study and project report prepared during the tenure was developed using methodologies of data collection, analysis and table generation and its interpretation.

HOSPITAL PROFILE

Narayana Hrudayalaya headquartered in the city of Bengaluru, India, is one of India's largest multi-specialty hospital chains. The Bangalore cardiac unit of Narayana Hrudayalaya is one of the world's largest pediatric heart hospitals. It is the brainchild of the renowned cardiac surgeon, Dr. Devi Shetty. Narayana Hrudayalaya also receives patients from abroad, and it has created a record of performing nearly 15,000 surgeries on patients from 25 foreign countries. It is also a renowned centre for telemedicine and it offers this service free of cost.

Despite helping so many poor patients, it is known for being so efficient, that it has a higher profit margin (7.7percent after tax) than most American Private Hospitals (6.9percent).

It is building large hospitals across India totaling 30,000 beds, to enable it to gain large economies of scale and bargain down the cost of supplies to the hospitals.

Narayana Hrudayalaya was started in the year **2000 by Dr. Devi Shetty** under the aegis of the Asian Heart Foundation (AHF). The flagship hospitals of the group are located in the cities of Bengaluru and Kolkata. They are both multi-specialty hospitals which cater to a wide variety of illnesses and diseases.

Spread over **25 acres (100,000 m^2),** it is located in the Bommasandra Industrial Area on the Hosur Road in Bengaluru. With the Phase I of the construction being completed, the hospital currently has six stories containing **500 beds and 10 operating theatres**.

Apart from cardiology, the hospital also offers treatments in the area of **Pediatrics, Neurology, Gastroenterology, GeneralSurgery,Dental, Nephrology, Urology, Transplants, Nuclear Medicine, Medical Imaging and Radiology.** It also houses a Blood bank and laboratory. With the help of ISRO, Narayana Hrudayalaya has pioneered some of the aspects of Telemedicine.

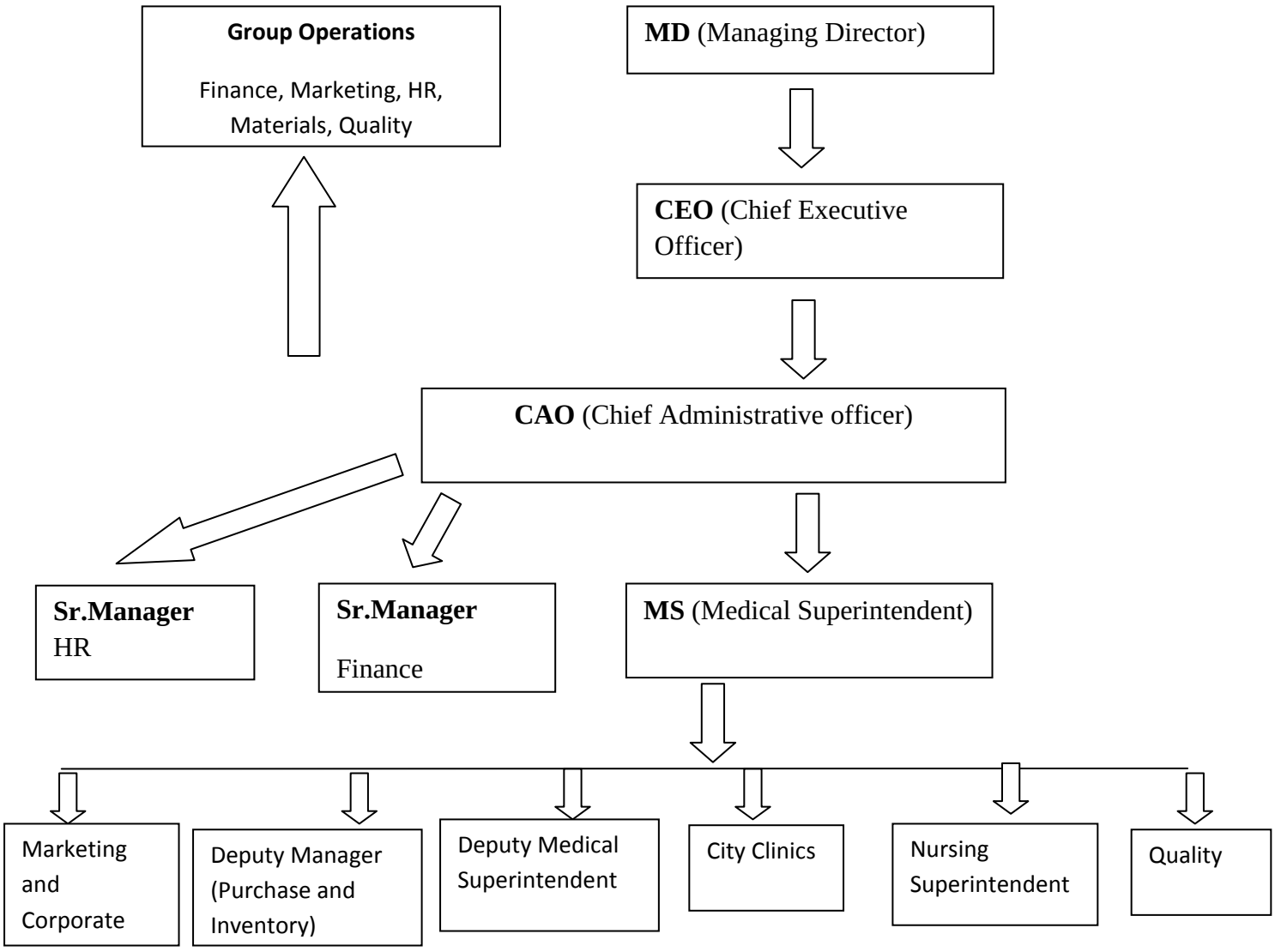
Narayana Hrudayalaya Health city, Bangalore, is a conglomeration of hospitals in one campus:

- 1000 Beds, Narayana Hrudayalaya Heart Hospital
- Asha Dinesh Institute for Organ Transplant
- Sparsh Hospital
- Narayana Nethralaya

- Mazumdar Shaw Cancer Center

Today, Narayana Hrudayalaya provides complete, expert and holistic treatment to the millions of afflicted individuals in need of treatment by experts at an affordable cost. Health care services spread across Cardiac, Neuro, Specialist Pediatric Care, Organ Transplants, Gastroenterology and much more.

ORGANIZATIONAL STRUCTURE (Fig-1)



VISION:

"Affordable quality healthcare to the masses worldwide"

MISSION:

Narayana Hrudayalaya Hospitals have a dream!

"A dream of making quality healthcare available to the masses worldwide"

To make the dream a reality they commit themselves to: -

- Being a tertiary care referral center for complex medical and surgical problems.
- Developing a Health City Model , to be replicated nationally and internationally.
- Excelling as an Education, Training and Research Center in Medical, Paramedical and Allied specialties

NARAYANA HRUDAYALAYA, JAIPUR

Narayana Hrudayalaya is now, without a shadow of doubt, the spark that has radically changed the scenario of accessibility, pricing and state of the art healthcare in India. Originally, the radical new concept started as the Spartan Narayana Hrudayalaya Heart Hospital Bangalore by the founder Dr. Devi Prasad Shetty, has eventually evolved as a truly global healthcare provider. Dr. Devi Shetty has over the past three decades re affirmed his commitment to ***'An equitable distribution of world class healthcare for the masses at an affordable cost'***. The group's firm belief in the mission statement and its core values help reinforce their everlasting commitment to the people of Rajasthan. Narayana Hrudayalaya believes to bring the very same revolutionary concept to the state and its people with the promise of an affordable one stop health solution.

"We aim to reproduce the highly efficient Healthcare model of Narayana Hrudayalaya Hospitals in Jaipur and other Northern regions of the country."

Located on Hrudayalaya avenue, off Kumbha Marg at Pratap Nagar in New Sanganer, Jaipur, over sprawling 4.7 acre campus, it reaffirms their commitment to society, with no distinction in classes, religion or faith. This is a `Temple of healing ‘and that sentiment echoes throughout a patient’s experience at NH hospital.

It is functional as phase 1 with a capacity **of 200 beds** that includes tertiary intensive care beds with **additional intermediate care areas and wards**. They offer centers of excellence that have a unique multidimensional approach to patient care - The Heart centre, The center for Bone, Joint and Spine, The division of Renal sciences and Transplant Urology ,The Advanced center for Minimal Access surgeries and the Maternity and Child unit to name a few.

Ensuring quality medical treatment at Narayana Hrudayalaya Hospital Jaipur, are the most comprehensive facilities available in Rajasthan which includes a **64 slice CT scan machine, 1.5 Tesla MRI, Nuclear medicine, touch screen monitors, world class dialysis facility , and a flat panel Catheterization Laboratory**. The idea is to bring together the group’s vision, its effective view of healthcare for the common person and the expertise of multidisciplinary specialists.

DEPARTMENTS and SERVICES

Cardiology and cardiac surgery

Narayana Hrudayalaya Hospital, Jaipur has put together a team of experts for achieving excellence in cardiac treatment .The cardiac operation theatre is equipped for cardiac bypass and off pump beating heart surgery, exclusive cardiac surgical ICU recovery, new top of the line Catheterization Laboratory and a advanced heart command centre with latest monitoring system which provides comprehensive invasive and non invasive services by highly trained and skilled medical and para-medical staff.

Neurosciences

Nephrology and urology

Gastroenterology

Orthopedics and joint replacement

Trauma care and emergency services
Critical care

Mother and child care

Pulmonary medicine

Burns, plastic surgery, cosmetic and reconstructive surgery

Internal medicine

Diabetes and endocrinology

Physiotherapy and rehabilitation centre

Nutrition

Preventive health check unit

Radio diagnosis and imaging

Pathology and microbiology

Comfort, safety and supportive care.

NARAYANA HRUDAYALAYA DEPARTMENT LOCATIONS:

The hospital has 4 floors including Basement and divided into 3 Blocks- A Block, B Block, C Block.

BASEMENT

Block A: Physiotherapy Department

Block B:

- HR department
- Administration Department
- Marketing Department
- Biomedical Engineering Department

- Food Court for Staff and Attendants and Visitors
- Dialysis Unit: 14 Bedded

Block C:

- CSSD
- Main Store
- Mortuary :4 Unit
- Linen Room
- MRI
- CT Scan
- X Rays
- Mammography
- Console Room
- Diagnostic Waiting Area
- Emergency Department :7 Bedded

GROUND FLOOR

Block A:

- Front Office
- Centralized OPD Wing
- Billing Section Finance Department
- TPA cell
- Pharmacy Outlet
- Food Counter

Block B:

- Blood Bank
- Laboratory Medicine
- Cardiac Diagnostics (ECG, Echo, TMT, Holter Monitor)
- Ultrasound
- VIP Waiting Lounge
- OPD Procedure

Block C:

- Cardiac OPD
- CCU: 40 Bedded
- Catheterization Laboratory
- MRD Department
- VIP Waiting Area

FIRST FLOOR

Block A:

- Obstetrics and Gynecology Department
- Septic labor room
- NICU
- Female General ward
- Private and Semi Private Wards

Block B:

- Male General ward: 34 Bedded

Block C:

- OT: 5 in No
- ITU:40 Bedded

SECOND FLOOR: Under Construction

Department Profiling

1 . Front Office

Organ gram

Medical Superintendent

⇩

Deputy Medical Superintendent (Is concerned with IP / Med Services only)

⇩

Managerial Admin (01)

⇩

Front Office Executive (01) – floor coordinator

⇩

Front Office Assistant (11)

Scope of Services

- Reception or Information
- Appointment
- Registration – OPD, Diagnostics
- Billing –OPD , Diagnostics , Emergency
- Admission –IPD Services
- Report or Document Delivery
- Processing of TPA
- Customer Feedback

A . Enquiry Department

Scope of services:

1. Filling of registration form

2. All types of quarries related to patient and doctors.

3. Appointment procedure

There are 4 types of registrations like-

a. General: for OPD patient only (registration charge +consultation charges)

b. Revisit: follow up patient (only consultation fee are taken after 7 days)

c. IP_Admission_REG: package (with only registration fee)

d. IP_Admission: Zero billing registration.

2 : Outpatient Department

Location: Just after entrance to the main entrance divided into north & south. On the left hand side is the south OPD and right hand side north OPD.

Function of OPD

- To provide diagnostic, curative preventive and rehabilitative services on ambulatory basis to the people of the community
- The promotion of health of the individuals under their care by means of health education
- The admission or referral for admission to the hospital of those patient who need it
- The keeping of records and collection of data for epidemiological and social research
- The most imp function is continuity of care

Appointment System:

First come first serve basis depending upon the availability of the consultant.

Prior appointments can be taken from the enquiry and the date and time is given by the receptionist and the patient details are recorded in the system.

OPD Record keeping: All record is maintained in the system/Software

Patient Flow Process

Enquiry

⇩

Reception/Registration Counter (Registr

⇩

Out Patient Department Reception

(File is taken by the receptionist and according to FCFS basis, sends the patient to the respective consultants)

⇩

Consultant

⇩ ⇩

Any investigation/Drugs needed then billing

At OPD Reception

(Echo, ECG, Pathology)

IPD

(if pt advised admission)

⇩

Admission office (counselling dept)

⇩

IPD Billing Counter

⇩

Ward

Short comings:

- No replacement while receptionist is off the desk
- Fire orders are only in English
- Signage are no enough & that too mostly in English.

3 : In Patient Department

- **Female General Ward**
- **Male General Ward 1 & 2**
- **ANC Ward**
- **CTVS Ward**
- **MICU**
- **ITU**
- **NICU**
- **CCU**
- **Private & semi private wards**

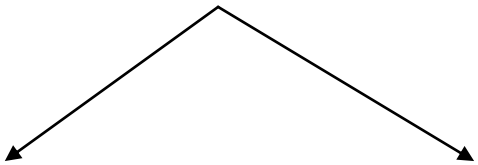
Function of IPD SERVICES

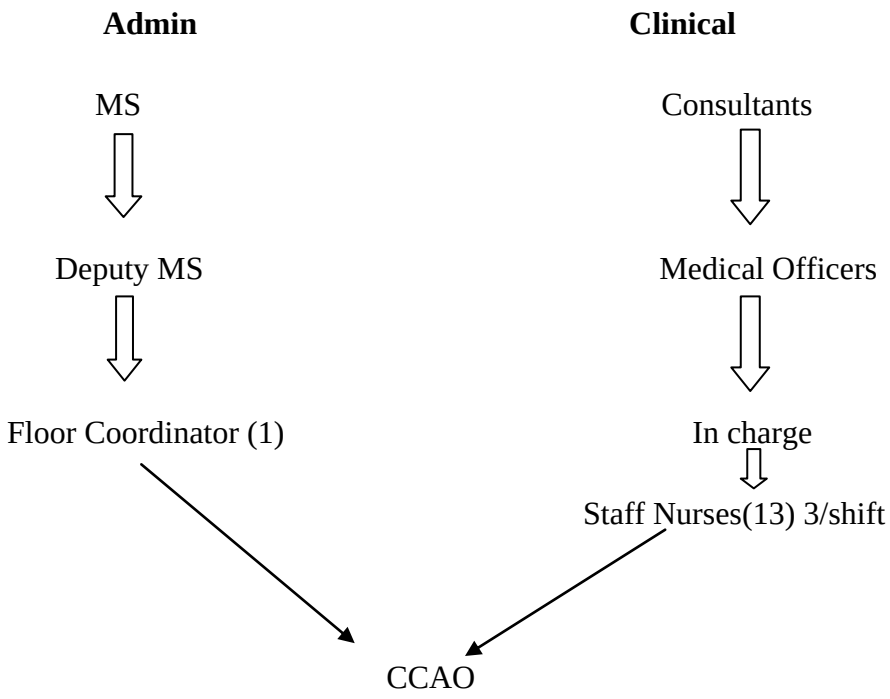
- To provide the highest quality of medical and nursing care to the patient
- To provide necessary equipment ,essential drugs required for the patient care
- To provide facilities to meet the needs of the visitors and attendants
- To provide the highest degree of job satisfaction to the nursing and medical staff

Floor coordinators -3 (Reports to Deputy MS & MS)

Evening & Night – 1 MOD (Manager on Duty)

Organ gram:





Female General Ward

Location: First Floor

Bedded: 33

MGW 1 & 2

Location: Lower ground floor

Bedded: 16 & 19 respectively

CTVS Male:

Location: Lower ground floor

Bedded: 12

Neonatal ICU & Nursery:

Location: first floor

Bedded :5 Bedded

ITU:

Location: First floor

Bedded: 14

CCU:

Location: first floor

Bedded: 17

MICU:

Location: first floor

Bedded: 12

ANC Ward

Location : second floor

Bedded: 8

Private & Semi private Ward

Location :First floor

Bedded : 18

Private -6

Isolation -2

Semiprivate -10

3. Emergency Services

Well equipped seven bedded Triage and an emergency O.T supported by ICU where critically ill and polytrauma patient are attended in an integrated manner.

The hospital has code Blue team comprising of an emergency Physician, Cardiologist, Anaesthesia and a nurse, all are responding to such emergencies.

The distance between emergency Triage, OT, Cath lab has been kept minimal for the speedy approach of facilities provided by the hospital.

Location: Lower ground Floor

Entrance: Separate entry directly from the main road.

Emergency is divided into 3 Zones based on Triage of patients.

Red (Priority- 1)	**Yellow (Priority -2)**	**Green (Priority -3)**
• Chronic self limiting disorder etc. • Patient have life threatening injuries or conditions that are critical. • Survival with immediate treatment. Ex: Respiratory, Arrest	• Patient requires definite treatment but no immediate threat to life exists. Ex: Acute abdominal pain, acute Renal failure, acute asthmatic attack	• Patient having minimal injuries or minor conditions and ambulation. Ex: Abrasion &superficial.

Organ gram:

Emergency In charge:-1

Medical Officer: 3

Nurses: - 2

General duty assistant: 2

Housekeeping worker: 3-4

MLC Cases: Same procedure but informed to PCR & they come & do their enquiry accordingly.

Ambulance Services

Outsourced

ALS-1

BLS-1

Scope of service :

- Request for the use of ambulance services arise from the following individuals, organization and services
- Member of the community calling ambulance to the scene of accident or other emergencies
- General practioners nursing homes arranging out patient booking of ambulance by telephone

Hospitals requiring transport on long and short notice for

- Patient to be admitted
- Out patient or accident or emergency case to go home
- Discharge in patient to go home
- Patient to be transferred from one hospital to another

4 : Operation Theatres

Location: First Floor

Distance from:

- **Blood Bank:** easy accessibility through lift
- **Emergency:**
- **CSSD:**
- **ITU/ICU/CCU**: ITU is attached to OT & ICU/CCU on lower floor but accessible by lifts
- Access to lifts- Easily

OT Complex: 5

Specifications:

- **Area:** 471784.862 m²/OT
- **No. & type of Rooms:** 5 rooms
- **Average surgeries/month=** 276 surgeries.

5: Cath Lab

Location : First floor

Functions :All invasive process are done in cath lab .processs are –

- Angiogrphy
- Angioplasty
- Cathstudy
- EP(Electrophysiological) study etc.

6 : CSSD (Central sterile supply department)

Location: Lower ground floor

Organ gram:

CSSD In charge

OT Tech

(In 3 shifts 2 in each shift and 2 relievers)

Housekeeping Staff (3)

(1 in each shift)

Total Area: 6000 sq ft

- Dirty area
- Clean area
- Sterile Area

Major Equipments:

- Autoclave Large(450 litre)- 2 Temp-134°c & pressure 2.5kg
- Autoclave small 1(300 litre)-1 Temp-134°c & pressure 2.5kg
- Air Guns -2
- ETO Sterilizer-1
- Packing machines/Sealing machines-2

Check of sterilization:

- **Bordic test-Colour** changes Yellow-Black(Autoclave) Green(ETO)

- **Leak test**
- **Sterilization test**
- **Batch monitoring test**

After confirmation of proper colour change it can be only 50%assured that the instruments are sterilized. It is sent to lab for 100% confirmation.

If lab report is positive of bacteria, the instruments are again called up from the issued department and resterilized.

All through the entire procedure unidirectional flow is maintained.

CSSD Department is the heart core department of any hospital due to its functionin

Which are as follows-

- Cleaning
- Processing
- Sterilization Of all instruments, Treatment trays, dressing trays etc.
- It also helps in infection control Process
- It is responsible for the optimum utilization of equipment resources of the hospital

7 : RADIOLOGY DEPARTMENT

Location: Lower ground floor

Areas:

- **Reception Area**
- **Console Room**

Different rooms for X-Ray, Mammography, MRI & CT Scan

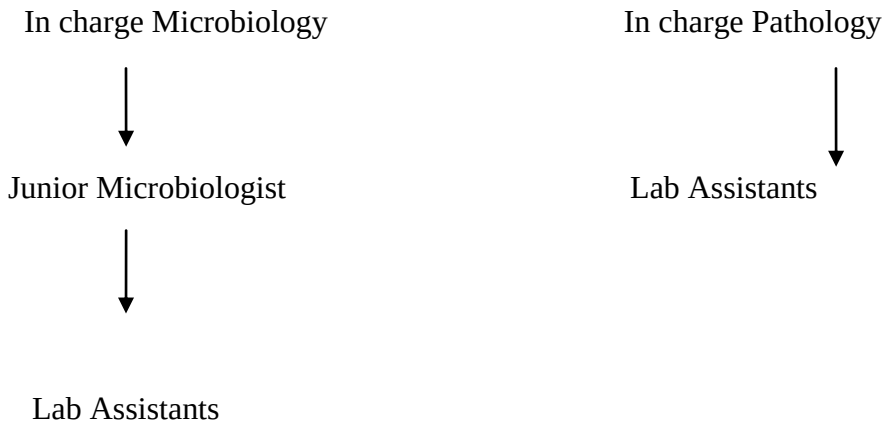
Services provided are –

- X-Ray
- Digital Radiography
- CT scan
- USG
- MRI
- Ultra Colour Doppler & Mammography
- Mammography

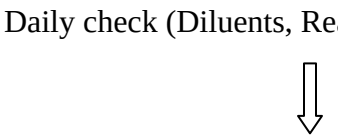
8 : Laboratory

Location: Ground floor

Organ gram:



Lab daily Process:



Quality Control (Sample run acc to standards & check results)

Sample Processing

9 : Physiotherapy and Rehabilitation Centre

Well trained team of physiotherapists managing these department and there is rehabilitation therapy was given for the joint disease, stroke, backache e, Trauma etc.

Manpower:

Physiotherapist: 4

- MPT-2
- BPT-2

General on Duty :2

Other Facilities:

- Wax Therapy
- Hydro collator-Hot Pack
- Interferential Therapy-Slimming
- IFT-Pain relief
- Ultrasound Therapy-Piezoelectric effect
- TENS- Transcutanous electrical & stimulation
- Muscle stimulator-
- SWD-Short Wave Diathermy(Electromagnetic Radiation)
- Traction Unit
- Paddle Cycle
- Wobble Bond
- Parallel Cycle

- Bolster
- Peg Boards(Coordination & strengthening)
- Quadric Table
- Hamstring
- Muscle Stimulator
- Shoulder Bulley-For frozen shoulder, to increase range of shoulder
- Finger Ladder
- Stepper
- Dumbler
- Finger & hand exercise table(Grippng)

10 : Medical Record Department

Scope of services –

- Maintenance of all medical records
- Storage of records
- Maintenance of integrity and confidentiality of medical records
- Maintenance of Medico legal certificates(MLC)
- Quantitative analysis of records
- Retrieval of records
- Numbering and filing
- Completion of incomplete records
- Coding
- Indexing
- Analysis and statics
- Reporting
- Deficiency check

11: Food and Beverages and dietetics

Contributes to recovery of health through scientifically prepared diets & educating the patients regarding use & utility of different foods & balanced diets.

Location: Lower ground floor

Outsourced: Packing & Distribution is done here and some small & special items are cooked.

Organ gram:

HOD (Housekeeping & F&B)

⇩

Unit Manager (1

⇩

Supervisors (4)

⇩

Order Takers (2)

⇩

Store keeper (1)

⇩

Cashier (2)

⇩

Steward (18)

⇩

Pantry Man(cooks) (3)

⇩

Utility (7)

Types of Diet:

- Full Diet
- Soft diet
- Renal
- Liquid
- Diabetic
- RT

Areas of F&B department

- Receiving area
- Storing area
- Washing area
- Portioning area
- Trolley area
- Kitchen Area

Scope of services –

- To provide nutritionally well balanced food for all patients' according to their need
- To serve the all staff and patients attendants also
- To help in improving the patients health by serving the proper and nutritious diet on order of dietician

12 :House Keeping Department

Responsible for activities aimed at maintaining the facilities presentable, pleasant, comfortable and safe for the people living or working within the hospital or visiting from outside. To provide clean pleasing and odour free environment this is free from infections and promotes early healing.

3-5 % budget is spent on Housekeeping.

Outsourced: 3Floors by different agencies

Shifts: 3 Morning (7:00AM -3:00PM) Evening (11:00AM-7:00PM) Night (7:00PM-7:00AM)

Frequency of cleaning: Thoroughly twice and total 4 times/shift

Procedure: Aseptic cleaning techniques are used by the hospital with care to use recommended chemicals of good variety e.g. Taski / Bio sol.

Washing, cleaning, Wiping window panes, walls doors etc, dry mopping & wet mopping and use of mechanized tools like scrubbers for floor.

Material used for mopping: Veriax &Bale floor

Team of 3 goes for cleaning the rooms: 2 for Room & 1 for toilet

Recommended: 25 for 200 bedded hospital/ 1 HK per 1400 sq ft

1 supervisor/10 HK staff

Function of housekeeping is-

- Maintain Hygiene of the patients and hospital
- Helps in patient preparation
- Prevent infection control
- Waste Disposal

13: Linen and Laundry

Totally outsourced

Linen room 3 staffs are there.

Location: Lower ground floor

Process:

Dirty linen is collected &sent to the linen room by CCA's

⇩

Sorted and sent for washing, ironing etc

⇩

Clean linen received from outside

⇩

Sent to CSSD for sterilization

⇩

CCA from respective wards collect the sterilized linen.

Areas:

- Dirty area
- Clean receiving area there

Functions of laundry is

- Controlling cross infection
- Patient comfort and satisfaction
- Human public relation

14 : Main Store

Location: Lower ground floor

Store receives all medicines, medical equipments, instrument, consumables, and other essential goods and printing &stationary materials which are required by the hospital time to time.

15 :Pharmacy Department

There are three types of pharmacy departments in the hospital:

i. IPD pharmacy
ii. OPD pharmacy
iii. OT pharmacy

(i) IPD pharmacy

Organogram:

Executive IP pharmacy (1)

↓

Shift Incharge (3)

↓

Pharmacist (3)

↓

Pharmacy assistant (1)

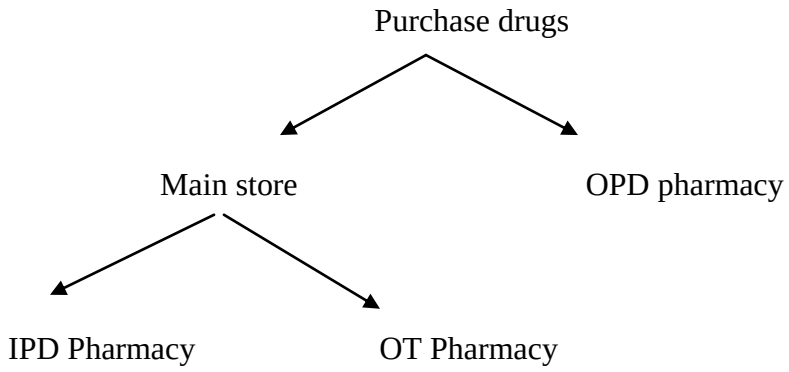
↓

Housekeeping runners (6)

Process flow

Purchase department

↓



MICU, ICU, ITU are kept on priority in dispensing indents, in comparison to wards.

In case of non-availability of emergency drugs in the store, cash purchase of drug from outside drug store is allowed without any permission from MS/DMS up to a price range of 1000 rupees.

Function of pharmacy

- Supply of drugs to in patient ,wards, various sensitive patient care unit like ICU,OT ,Emergency,
- Dispensing for out patient
- Demand estimation according to formulary, in the absence of formulary, establishment of specification for drug procurement
- Furnishing drug information to physician and other professional staff
- Quality control of drugs purchased and those compounded and manufactured in pharmacy

Limitations

- Delay in delivering of indents
- Problems with online ordering of indent

IPD Store

Location: 1st Floor

Organ gram: Executive IPD Store

Shift In charge

Pharmacists

- Online Indenting is done.
- Drug is ordered by generic name
- 3 months expiry is maintained.
- Average time taken after indenting to drug delivery is 2 hrs
- OT 7 IPD has different purchase lessening.

16: Engineering Department

Location: Lower ground floor

Scope of services

- To maintain the overall electric supply of the hospital
- To maintain the chilling plant room of the hospital
- To train the security staff about fire safety measures

17: Mortuary services

Location: Lower ground floor

Scope of services

- To keep the bodies of the patient dying in the hospital ,until the relatives claim them and arrange for their disposal
- To keep dead bodies requiring pathological post-mortems(in MLC cases)

18:.Security Services

The role of hospital security department is "to provide security services to all staff, patient and visitors and for protection of hospital property on the premises ,through use of well trained personnel technology, prevent activities and timely response to requests.

- Analysis of security threats and vulnerabilities in conjunction with the management, civil police and others.
- Preparation of strategic security plan, security standing instruction and security operational deployment plan and their periodic updating, based on directions of the management.
- Control of Movement of vehicular traffic within the premises.

19 : Preventive Health Checkups Unit

Hospital has lots of preventive health packages for their executive as well as for general population i.e. Blood tests, USG, TMT, ECG, Pulmonary Function test etc

20 : Blood Bank

Department dealing with collection, testing, processing, component separation, storage, preservation and issue of blood and its products for safe transfusion to patients as requisitioned by physicians.

Location: Ground Floor

Area:

- **Medical Examination room:** 1255863 m2
- **Bleeding area:** 2126246.32 m2
- **Component separation:**1614395.7 m2
- **Component storage:** 2871306.8 m2
- **Refreashment:**1099776.8m2

- **TTD:** 1397308.21m2
- **Blood bank store:**865196.7 m2

Proximity to:

Emergency (Lower Ground): Accessible through lifts and ramps

- **OT (First floor):** Accessible through lifts and ramps

Wards (Lower ground & first floor): Accessible through lifts and ramps

Areas:

- Consultant room
- Medical examination counselling area
- Donor room
- Serology room

Organogram:

MO In charge

⇩

Lab Technicians (3)

⇩

Staff Nurses (Works in 3 shifts)

⇩

Housekeeping staff

FUTURE PLANS

Phase two of the project would make it 1,000 beds at a cost of Rs 250 crore. The current facilities allow for 4000 beds and they positively look at being able to equip and service 30,000 beds by 2015.

During the summer training, the various activities were undertaken:

- Main project on Catheterization Laboratory
- Assignment (15 Days) in Food and Beverage Department "Streamlining of the process flow to improve the working of F&B and draft SOP's for the same."
- Medical Auditing in inpatient departments to access the

Study on Utilization of Cardiac Catheterization Laboratory in Narayana Hrudayalaya Hospital , Jaipur

INTRODUCTION:

Cardiovascular Diseases are the leading causes of death and disability in the world. Although a large proportion of CVDs is preventable, they continue to rise mainly because preventive measures are inadequate.[1]

India has the highest incidence of heart related diseases in the world and the number of those affected is **likely to double** in the coming years. The percentage of people having heart disease had increased from **1-2 to 3-5 per cent in rural India and from 2-3 to 10-11 per cent in urban India**. This represented an overall increase of **300 per cent over the past 30 years.**[2]

New research has found that **India will bear 60 percent of the world's heart disease burden in next two years.**[3]

A **cardiac Catheterization Laboratory** is an examination room in a hospital or clinic with diagnostic imaging equipment used to support the Catheterization procedure.

It provides minimally invasive cardiac care and is most responsible for identifying and unblocking interruptions in blood flow to the heart. The Catheterization Laboratory supports both emergent and elective procedures. Not only do these services save lives, but they are also a

vast source of revenue for the hospital[4]. There are regulations and guidelines mandated to ensure high quality of patient care[7]. Additionally, advancements in technology continue to revolutionize the ability to provide the best possible cardiac care to every patient.

In addition to quality guidelines, financial metrics are also important to the Catheterization Laboratory because the total revenue of a hospital on average is comprised 30-50 percent from a cardiovascular program.[5] "Cardiovascular programs-which increasingly rely on procedures performed in the Catheterization Laboratory-have long been the linchpin of hospital profitability" (Medical Buyer).[17] A close eye on the financials of the department is essential to maintain appropriate resources and healthy revenue.[5]

Patient flow through the Catheterization Laboratory is most important and closely monitored process to ensure a quick process resulting in better patient outcomes.[4]

REVIEW OF LITERATURE:

Michael Heinrichs et al (2004) emphasizes that implementation of effective, integrated practices can lead to many benefits. Patients benefit from a safer and more efficient work environment. Medical staff benefits from improved workflow and more satisfied patients. Employees are satisfied with the elimination of wasteful work activities, resulting in a less stressful work experience and improved productivity.[6]

Heupler FA, Jr, al-Hani AJ, Dear, WE (2004) Laboratory Performance Standards Committee of the Society for Cardiac Angiography and Interventions. Department of Cardiology, Cleveland Clinic Foundation, Ohio has complied guidelines for continuous improvement of cardiac Catheterization Laboratory, the first step is to identify "quality indicators" in order to quantify the results. The indicators must be risk-adjusted to assure validity of comparative data. The second step is development of a data collection process that continues after the patient has left the Catheterization Laboratory. The third step, data evaluation, requires determination of normal ranges of occurrence rates and identification of adverse events that exceed these rates. An

investigation should be undertaken to determine the processes and systems that may produce the undesirable outcome. The fourth step is creation of a solution to correct the deficiency.[7]

Carl Vieth and Carolyn Pexton, University of Pittsburg,(2010) emphasizes that Medical Centre health care organizations are increasingly targeting the working of critical areas such as the Cardiac Catheterization Laboratory, which is generally a high volume, challenging and complex environment within any health care facility, to find ways of cutting cost while ensuring better quality of service.[8]

Rose Czarnecki, RN,BSN,MPM Senior Cardiovascular Consultant Health Care Visions, Ltd. Pittsburg, Pennsylvania, identifies in this article that analysis and documentation of what is involved in each step is essential to discover ways to improve the processes and save recourses. It proposes the PDSA Plan (Plan-Do-Study-Act) for optimization the utilization time as well as cost.[9]

Cristina Carni, Jessica Schwartz and Bran Hill (2010) in the article "Catheterization Laboratory Paper Operations Management" found out that turnaround time in the Catheterization Laboratory is a key determinant in decreasing door-to-balloon time and ensuring the highest quality patient care. **The national average for turnaround time is 41.6 minutes, assuming 3 Laboratories, 8 hours per day, and 20 cases**[5] (Haugh). A turnaround time of 20-30 minutes is optimal for a Catheterization Laboratory[5] (Winslow). If the turnaround times are extensive then the following case start time is delayed, physician's time is wasted, and satisfaction is decreased for both the physician and the patient. Extensive turnaround times can result in less cases performed per day. Every excess minute that the Catheterization Laboratory is unoccupied the hospital is losing revenues.[5]

Richard J. Merschen, MS, RT(R)(CV), Pennsylvania Hospital, Margaret Coburn, RT(R), Jefferson College of Health Professions, Philadelphia, Pennsylvania(2010) has mentioned the importance of continuous quality improvement which includes a wide array of concepts such as quality control, key performance or quality indicators, resource management, value-added processes, process improvements, organizational mission and vision philosophies, and strategic planning.[10]

Carl Vieth and Carolyn Pexton, 2010 Increasing Catheterization Laboratory Capacity through Six Sigma, explains how a Catheterization Laboratory's performance can be increased by decreasing the procedure start time, in room wait time and turnaround time and streamlining the patient flow process. They had developed target timings to achieve and by identifying the bottlenecks where time lag could be improved achieved those targets.[8]

Adam Pegan, Basma Khurshid, and Lindsay Nieman (2011) in an article **"**Cardiac Catheterization Laboratory Operations Management Paper" suggested that, the procedures vary in length based on complexity but simple procedures can be between 8 and 20 minutes (Espanto, 2011). Procedures vary but cleanup between cases should be less than 20 minutes. Accurate case scheduling should help utilization. Consistent and correct scheduling of the staff to meet the needs of the daily patient schedule as well as the add-on patients. Assuming this is done correctly, the staff should be productive, have no overtime hours, and no contracted workers. Different facilities staff differently to meet these needs whether rotating in shifts or having on call workers. [11]

In a dissertation report by **Ms. Gargi Consul in 2009** on cardiac catheterization Laboratory at Narayana Hrudayalaya, Jaipur the average utilization was 36percent in March 2009 [12]

RATIONALE:

Catheterization Laboratory is one of the most important and among the most critical and expensive areas of the hospital especially of those hospitals which are dedicated to the cardiac specialty.

The cardiac Catheterization Laboratory is one of the engines that drive revenue for hospitals. If the cardiac Catheterization Laboratory is underutilized, inefficient or disorganized, there could be missing out on a valuable revenue stream.[4]

With the mission of the hospital of providing quality care at affordable cost to the masses, it becomes even more important that the services rendered are cost effective and the cost of inputs is lowered as much as possible to increase profits. Since direct reduction of cost and reduction in manpower is possible only to a certain limit, other ways for cost reduction are necessary to identify.

Optimum utilization and minimizing wastage of resources is one such way, hence the same justifies the importance and need of the study.

This study will help the department to assess the existing workload and identify means of optimizing the facility, functioning and patient scheduling while ensuring quality care for patients undergoing Catheterization procedures and better utilization of time taken in providing care in such critical areas.

From the administrative point of view, Catheterization Laboratories are very significant for a hospital as it saves time, manpower and other important resources which might be consumed on these types of surgeries, had it been performed in operation theaters.

Through this project the student, as a management trainee is expected to gain hands on experience of the non-clinical aspects of management of a department, as critical as a Catheterization Laboratory.

BROAD OBJECTIVE:

The broad objective of this summer internship is **to "Study the utilization of cardiac Catheterization Laboratory in Narayana Hrudayalaya Hospital, Jaipur"**

SPECIFIC OBJECTIVES:

However, the specific objectives are:

- Study the existing **process flow of the Catheterization Laboratory** in the hospital.
- Observe the **patient scheduling process** presently being followed in the Laboratory.
- Calculate the **key metrics of Catheterization Laboratory.(**Turnaround time, in room patient waiting time,1st case start time, preparation and waiting time in CCU, Daily OPD converted into catheterization procedures)
- Calculate the **average utilization** of cardiac catheterization Laboratory.
- Identify the **Gaps in the process** hampering optimum utilization.
- Suggest **ways of enhancing the use** of existing facilities.

METHODOLOGY:

Type of Study: Descriptive observational study

Place of Study: Catheterization Laboratory at Narayana Hrudayalaya Hospital, Jaipur

Study Population: All patients who had undergone procedures at Catheterization Laboratory in Narayana Hrudayalaya during the study period.

Sample Size: Sample is collected for **20 days (133 patients)** by direct observation and informal interview with the staff, which included six consultants, three technicians, three nursing staff, one CCA and one housekeeping staff.

This is divided into **Planned/Emergency procedures** and emergencies are further divided into **emergencies during working hours (8 AM- 8PM) and emergencies after 8PM**

The entire process is divided into **Pre Catheterization procedure, waiting time and Catheterization procedure** and the time taken for each of these steps is recorded, analyzed and the bottlenecks occurring at every step is identified and corrective measures are suggested for **optimum utilization.**

Primary Data Collection:

a) **Direct Observation & informal interview:** To study the functioning of Catheterization Laboratory and for recording time at every step.
b) **Process Mapping:** Entire patient flow process is understood and mapped.

Secondary Data Collection:

Records of catheterization laboratory from January (2011) to March 2012 were reviewed and analyzed to know the workload ,type and pattern of cases.

Time Line for the study:

1. **Observation and Data collection:** 20.04.2012 to 10.05.2012
2. **Data Analysis:** 10.05.2012 to 15.05.2012
3. **Report writing and framing the recommendations :** 20.05.2012

OBSERVATIONS AND DISCUSSION:

This study was conducted in the Catheterization Laboratory- an integral part of Narayana Hrudayalaya, Jaipur which offers super-specialized care in the disciplines of Cardiology and Cardio-thoracic and Vascular Surgery.

This technologically advanced, state-of-the-art facility has all the processes and systems which are geared to ensure that the patient's care and comfort takes precedence over everything else.

Location: It is located in block C of ground Floor adjacent to cardiac OPD's and Cardiac care unit.

No. of Laboratories: 2 (presently 1 working)

Other rooms: Coordinator's room, doctors changing room, male and female changing rooms, console room, preoperative room and store.

Timings: 8:00 am to 8:00 pm (On call 24 hrs)

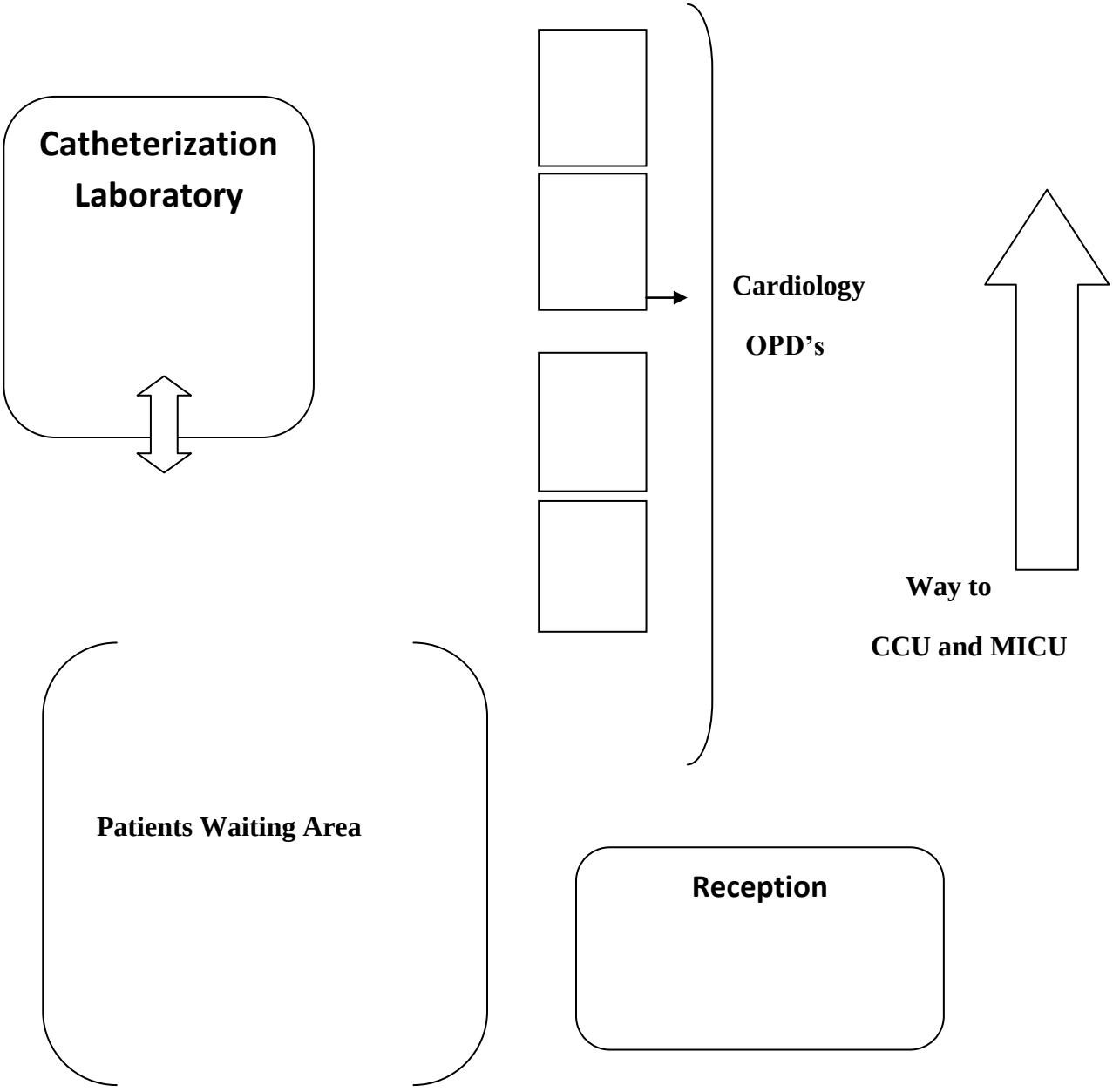
Area Covered:

One Catheterization Laboratory**:** **46.2m²**

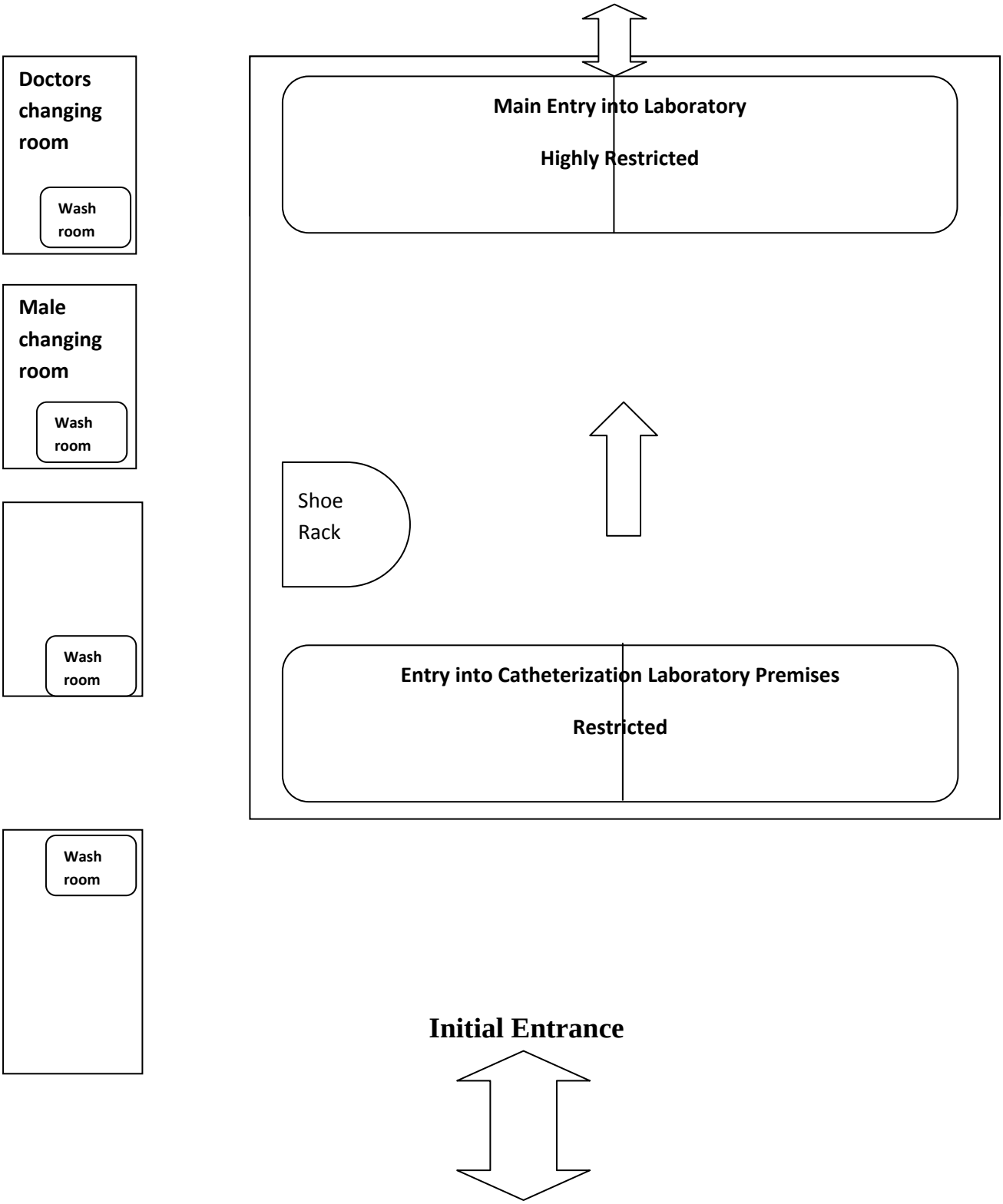
Console Room: **12.76 m^2**

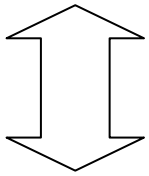
Store: **8.7 m^2**

Lay Out: Outside the Catheterization Laboratory (Location) Fig-2



Inside the Catheterization Laboratory





Way to CCU, IPD Store

Store

Scrub Area

Washing Area

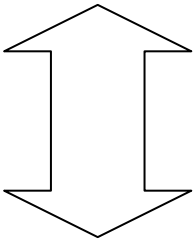
Catheterization Laboratory 1

Console Room

2 Bedded Pre and Post operative room

Catheterization Laboratory 2

(Not yet Working)



Appointment system:

Two types of appointment systems were observed in the hospital. For the routine cases first come first serve was followed, whereas, for the emergency cases the priority was given according to the importance based on triage of the case.

Doctors register their patients by informing in the Catheterization Laboratory and sequencing is done according to the priority of information.

Services and procedure:

The lists of procedures done in the Catheterization Laboratory are as follows:

Diagnostic procedures

- Angiograms
- Bronchogram
- Cardiac Catheterization (pediatric)
- Carotid Angiography
- Renal Angiography
- Peripheral angiography
- Coronary Angiography
- TPI
- Cardioversion
- Fluroscopy
- EPS (Electro physiology study)

Therapeutic procedures

- Coronary intervention
- Radio frequency ablation

- PTCA
- Non-coronary intervention
- PTA
- Balloon valvotomy (BPV,BMV,BAV)
- Device closure(ASD,VSD,PDA)
- BIV
- Septal ablation
- Repositioning /replacement

Records Books Maintained:

- Procedures record
- Intervention Register
- Narcotic Drugs Register
- Inventory Book
- Crash Cart Checklist
- Defibrillator Record
- Complaint Register
- Bio medical Complaint Register
- Training Register
- CSSD Register
- Medication error Register
- Quality Register
- Fumigation Register
- Patient item due register
- Drug Register

Infrastructure:

NH, Jaipur Cardiac Catheterization Laboratory is one of the most advanced cardiac Catheterization Laboratories. The hospital has been functioning since January 2011 and cardiologists here perform procedures which are complicated aiming to provide a better health.

They have two state of the art and most advanced flat panel cardiac Catheterization Laboratories (2nd not started yet) These Laboratories are being used for **adult and pediatric cases**. Doctors are well qualified and leader in their field. The staffs are friendly and dedicated to their work. The interdisciplinary team at NH, Jaipur is believed to preserving the utmost quality of patient care by using latest techniques in the diagnosis and treatment of coronary artery disease.

The major equipments include:

Patient Table, Catheterization Laboratory System (Monitors, ,**C**-Arm, Lead glass, ECG machine), Crash Cart, Warmer, Saturation machine and Probe, EP System, ACT(Actual Clotting time) Machine, Defibrillator, Infusion Pump and Anesthesia Machine.

The major consumables include:

Catheters (Diagnostic and Guiding), **Stents** (Drug Eluting stent (Medicated) Bare Metal stent (Non medicated)), Lead Aprons, Drugs, Contrast, Syringes (Injector, HP line, Injector Syringe), **Sheaths (**Femoral, Radial, Pediatrics, PPI Sheath, Mulan Sheath), Wires (PATIENTCA wire, Teflon wire, Terumo Wire)

Manpower: 11 (Catheterization Laboratory) **Fig-3**

Organogram:

HOD (Catheterization Laboratory)

⇩

Consultants (6)

⇩

Catheterization Laboratory Coordinator (1)

⇩

Laboratory Technicians (3)

⇩

Nursing Staff (3)

⇩

Clinical Care Assistant (2)

⇩

Housekeeping (2)

Duty Shifts and Job Profile:

- **Catheterization Laboratory coordinator:** 9:00 am to 5:00 pm
  Her works and responsibilities include Coordination between Consultants, patients and finance department, Scheduling of cases and dissemination of information among the concerned personnel, Coordination between wards (General, CCU, ICU) OPD regarding admission, billing, Discharge etc, maintaining smooth patient flow in the department, solving day to day problems of the Laboratory related to purchase, maintenance, staff, and solving conflicts by coordinating with the concerned people.

- **Technicians:**
  Their works include Operating Catheterization Laboratory Systems, Inventory Management, Checking for proper functioning of equipments and Computer operations.

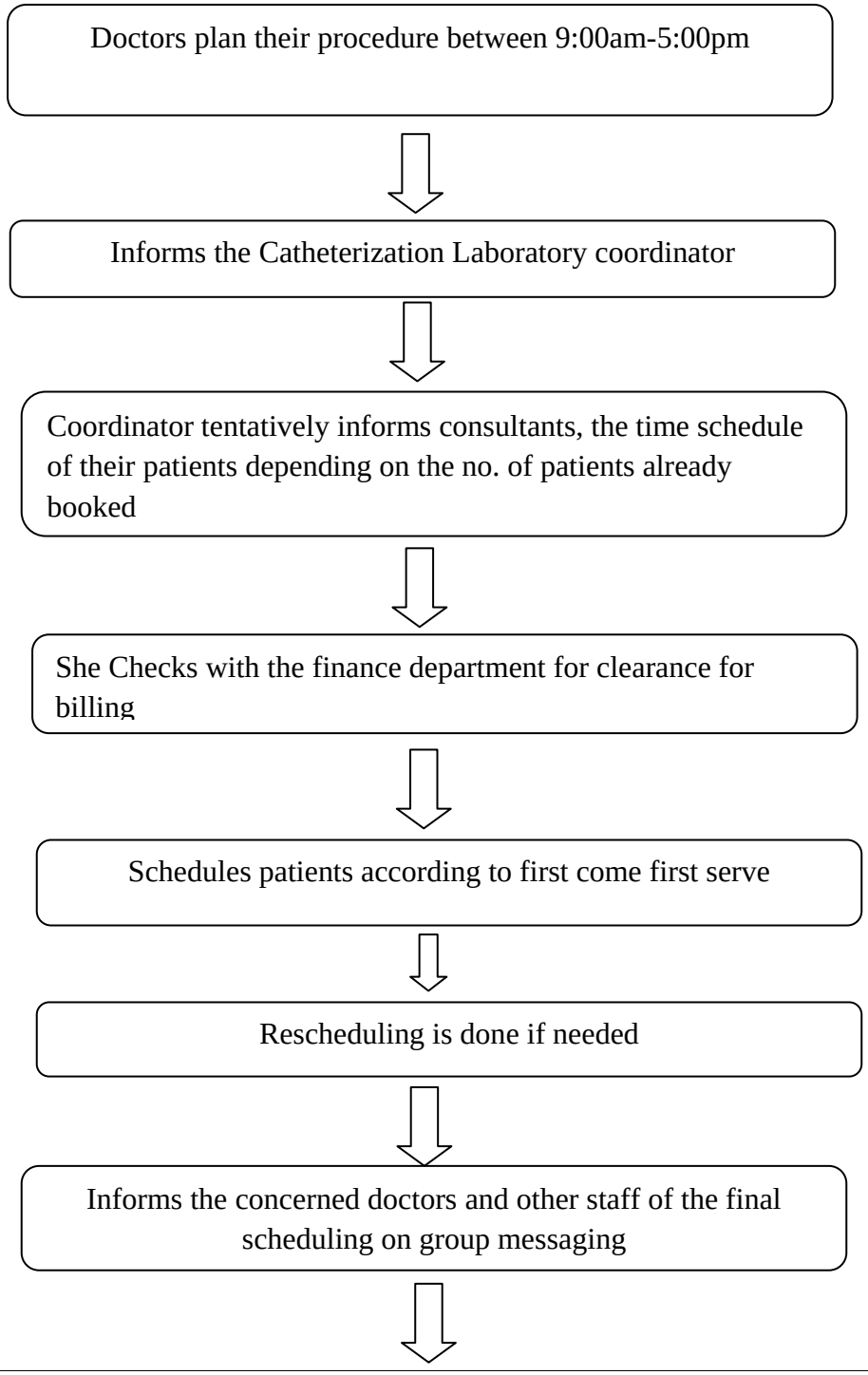
- **Nursing Staff:**
  The various responsibilities are preparation of patients for the procedure, Sheath Removal, Assisting the doctor during the procedure and shifting of patients after procedure to CCU.

- **Housekeeping Staff:**
  They are responsible for Cleaning of the procedure room after every procedure, Removal of dirty linen and cleaning of the Laboratory.

- **CCA(Clinical care assistant)**
  Works includes washing of soiled instruments, supply and receipt of instruments to the CSSD and Supply and receipt of linen.

Process Mapping:

- **Protocol for planned Procedure scheduling:** Flow Chart-1



.

Coordinator then again informs all other staff.

Written consent from Patient's attendant obtained

Procedure done

Report along with CD is prepared by technicians and sent to the respective wards to deliver it to the patient's relatives before discharge

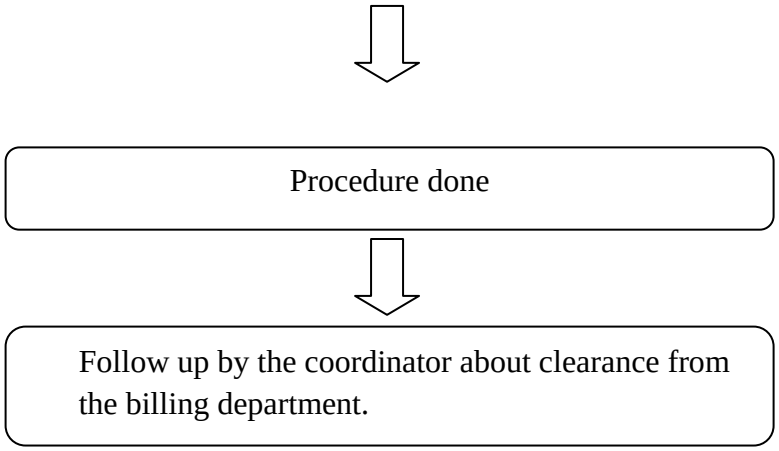
- **In case of emergency:**

Doctor informs the coordinator or technician in the Catheterization Laboratory.

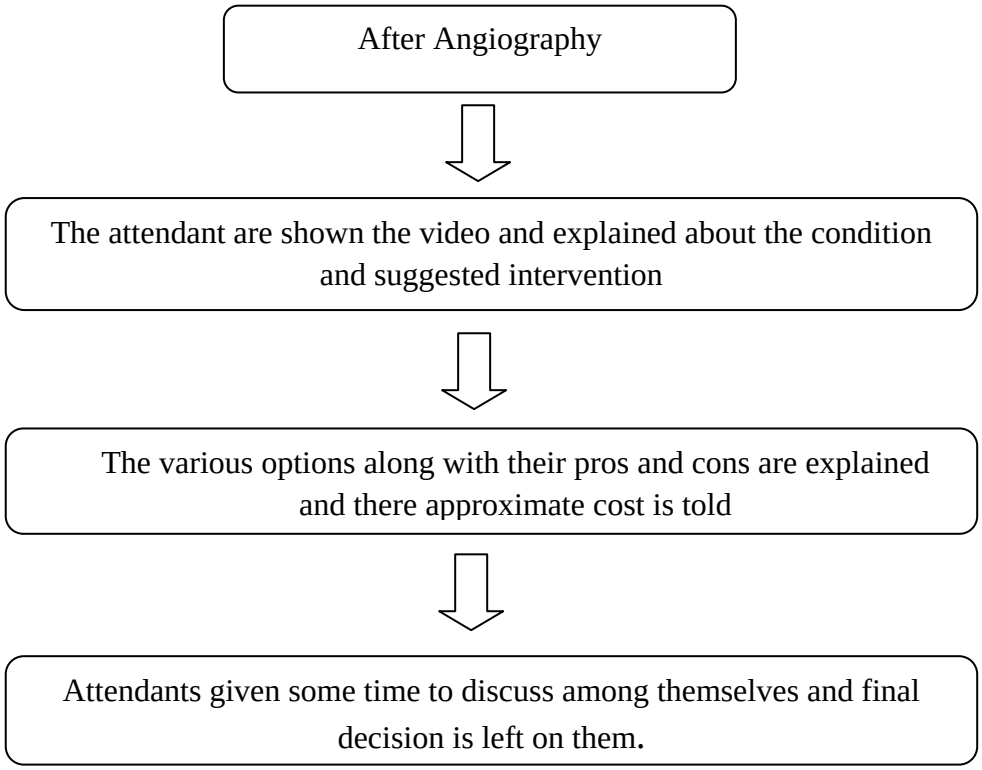
Coordinator schedules the patient according to the urgency and informs the staff of Catheterization Laboratory, also informs the doctor of the prescheduled case

Checks with the billing clearance of at least a minimum amount at that time and confirmation of the attendant to pay the remaining as soon as possible.

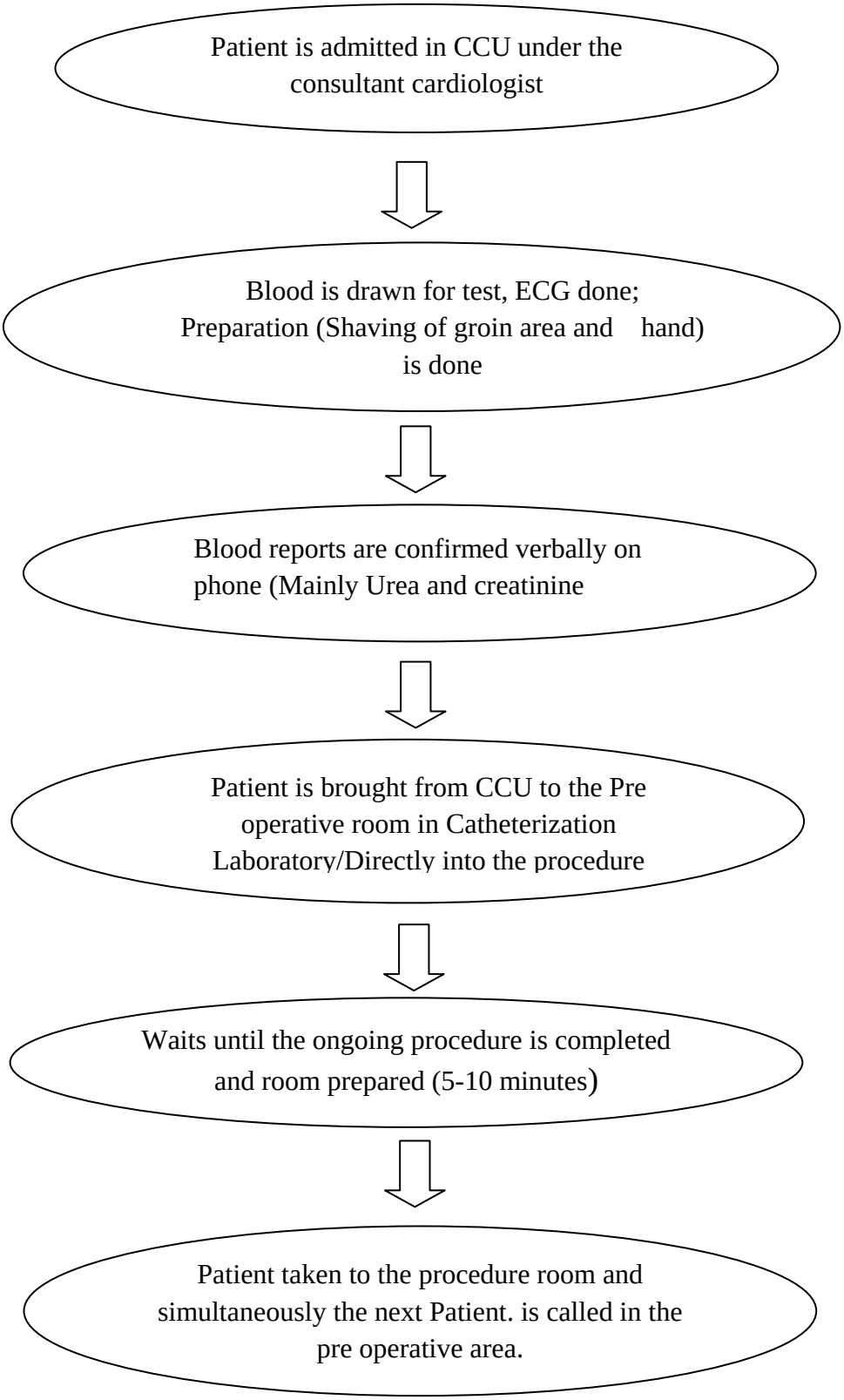
Written consent of Patient's attendant is obtained.

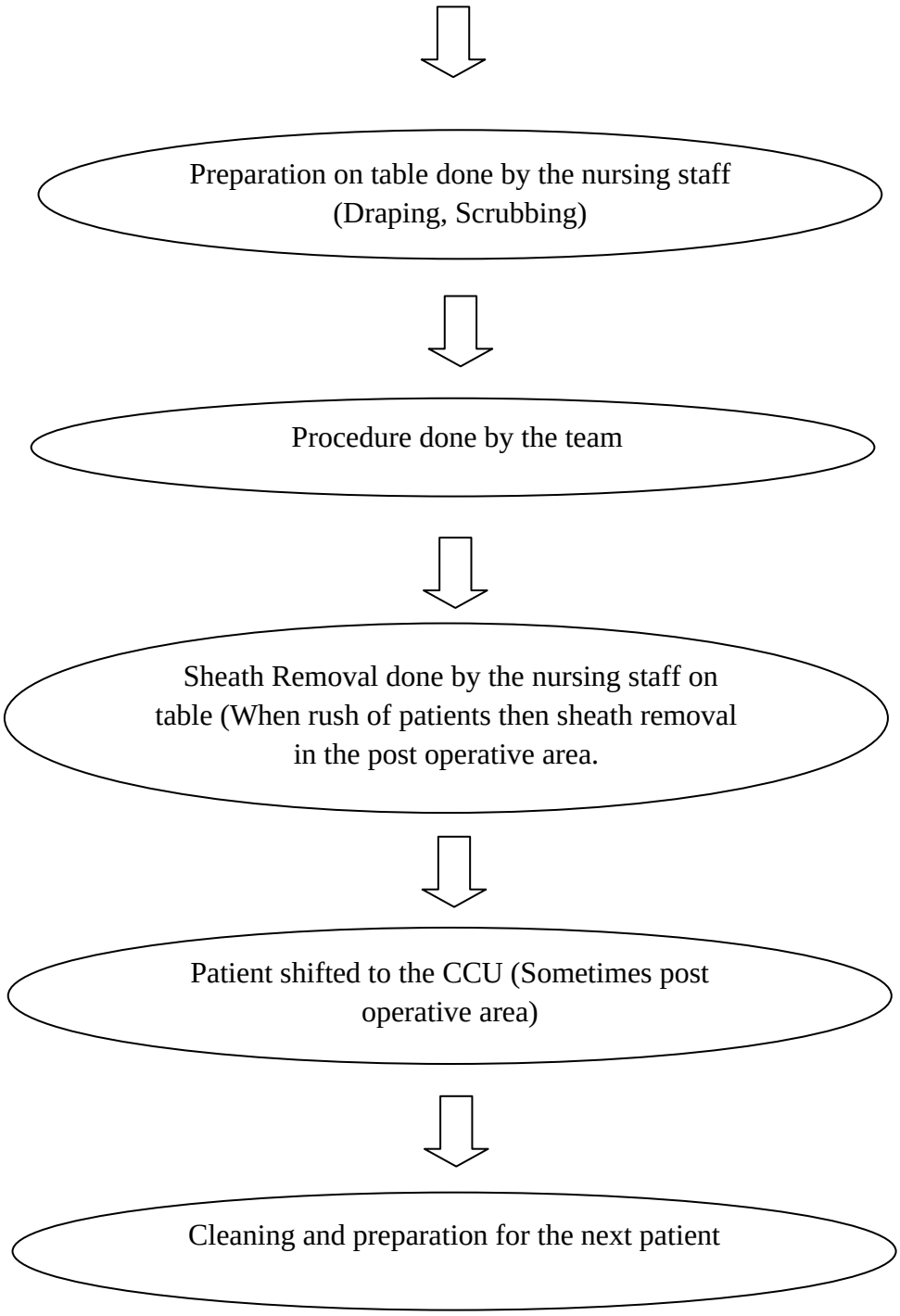


- **For intervention after angiography:**



Patient Flow: Flow chart-2




Preparation on table done by the nursing staff (Draping, Scrubbing)
Procedure done by the team
Sheath Removal done by the nursing staff on table (When rush of patients then sheath removal in the post operative area.
Patient shifted to the CCU (Sometimes post operative area)
Cleaning and preparation for the next patient

Indenting Procedure:

Consumables:

After every patient the indent for the materials consumed are sent to the store, the next day in the morning, all materials are received collectively of all previous day's patients.

Permanent Items:

Indent for the equipments are sent to HOD then MS, after whose approval it is sent to purchase department and the buying procedure is followed.

Condemnation Procedure:

Instruments /Linen are sent to CSSD, Equipments sent to Biomedical Engineering department and if repair is not possible, they condemn them and Items related to maintenance department are sent to the department who are responsible for condemnation.

Maintenance:

Regular weekly/monthly maintenance is not done by the maintenance personnel which ideally must be every 3 months and maintenance are only called when something needs to be repaired., daily equipment check is done by the technicians e.g. defibrillator etc.

Cleaning and Housekeeping:

It is done by housekeeping staff twice a day and in procedure room cleaning and mopping done after every patient but disinfectants are not available. Weekly fumigation is done in the procedure room.

Bio Medical Waste Disposal:

Waste collected in color coded bins in the procedure room, console room, store, changing rooms by housekeeping staff and dumped in big bins near the entrance which is collected by the Biomedical hospital personnel.

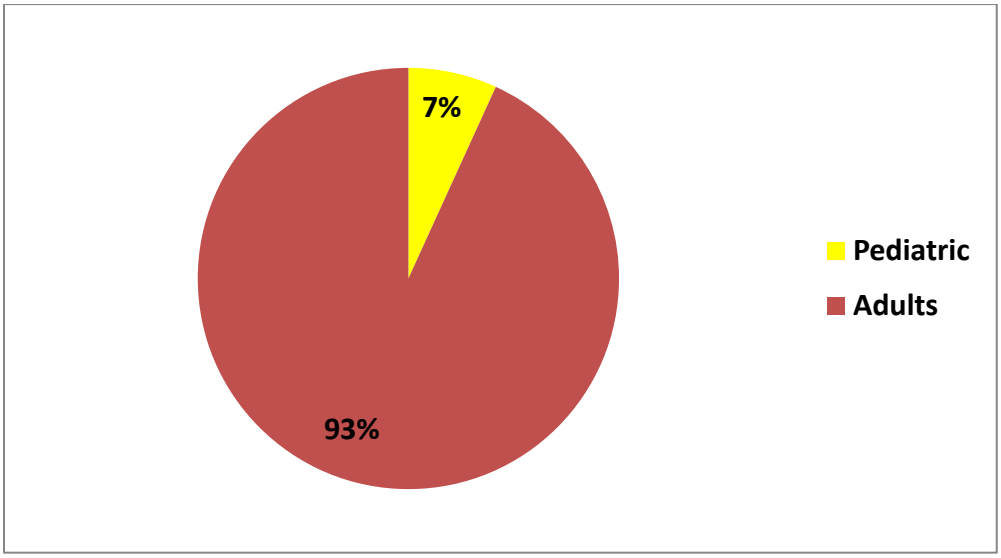
Inventory Management: Permanent articles (Annexure 1)

Consumables (Annexure 2)

ANALYSIS OF THE STUDY

Workload

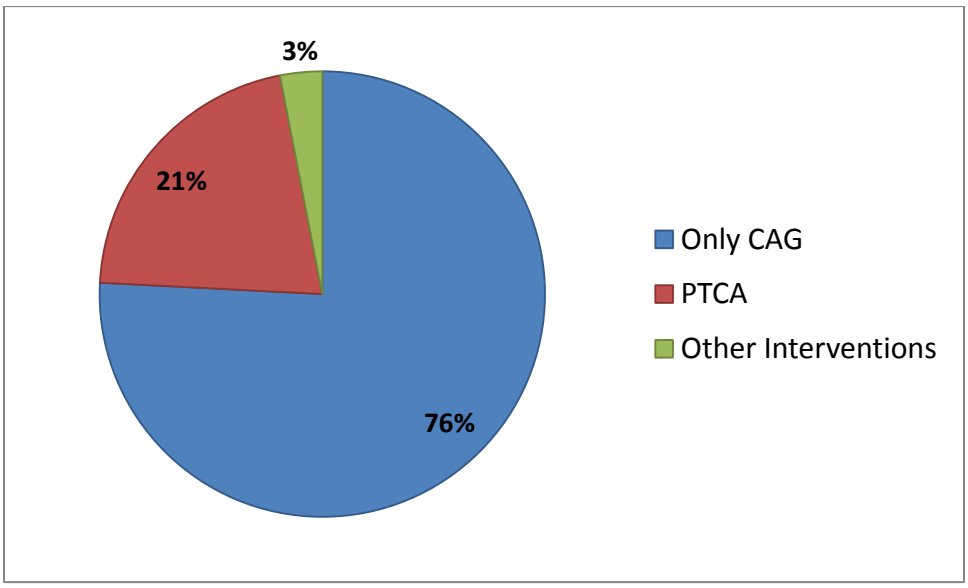
Jan 2011 – Dec 2011 N=1512 Chart-1



Total No. of patients in the year 2011

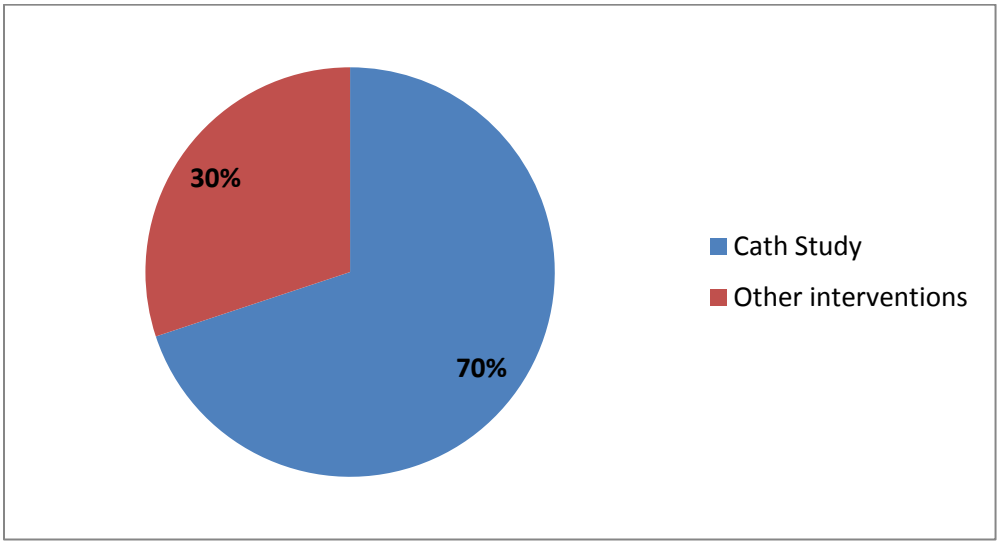
Total **1512 cases** were found during the study period. A **majority (93 percent)** of the patients were adults. The remaining cases were **pediatric.**

Adult cases converted into interventions: N=1409 Chart-2



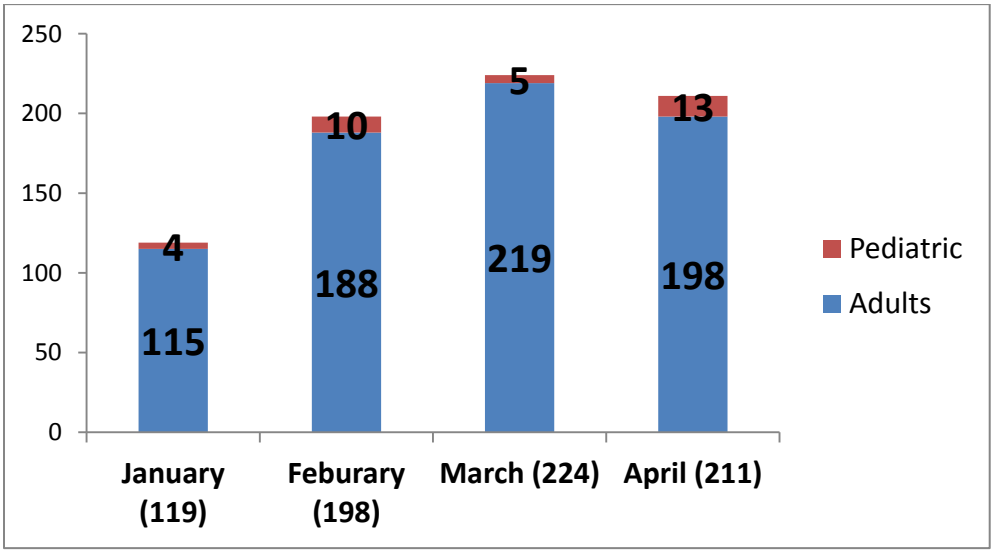
Out of total adult patients, **more than three fourth (76 percent**) were only CAG, **21 percent** were converted for angioplasty and **three percent** to other interventions like BPV, BAV, BMV, PPI, and EPS

Pediatric cases converted into interventions N=103 Chart-3



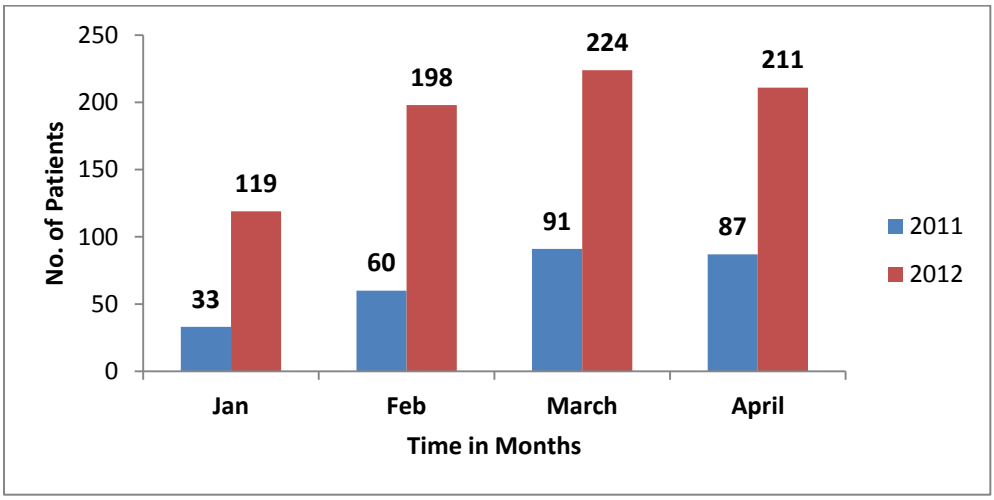
Out of total pediatric patients **70 percent** were Catheterization study and **30 percent** were interventions like ASD, VSD, PDA

In 2012 Graph-1



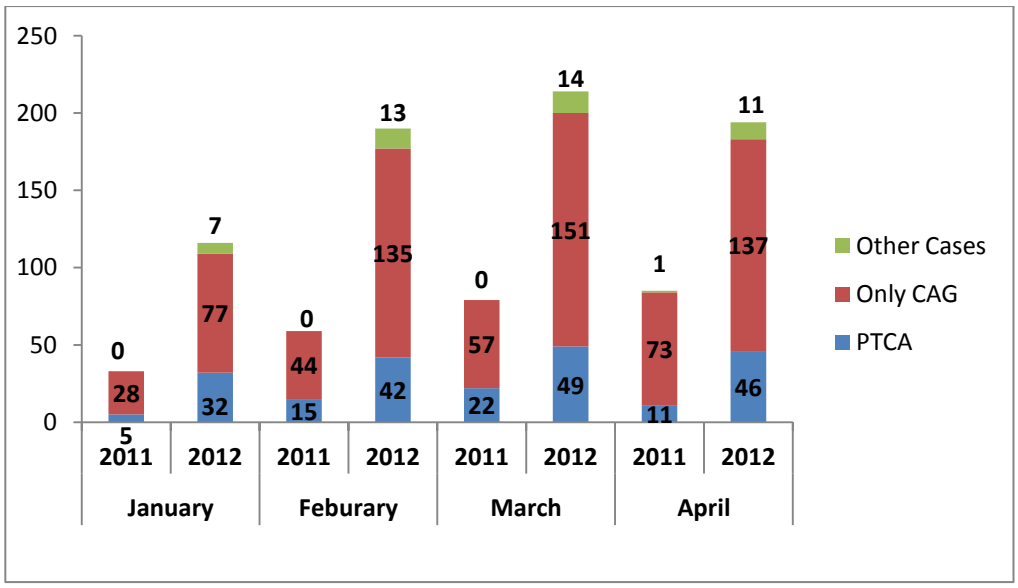
Graph represents the distribution of adult and pediatric patients from January to April 2012 with maximum pediatric cases in April, but total cases as well as total adult cases being maximum in March.

Comparison of cases from January –April in 2011 and 2012 Graph-2

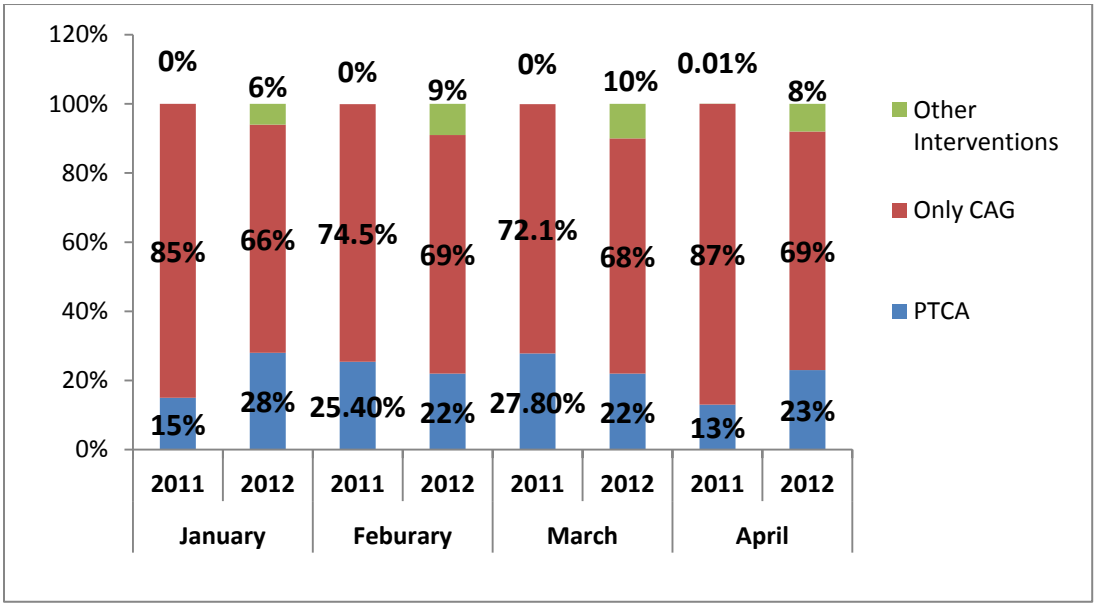


The analysis suggests that by and large the number of patients have increased more than two and half times during the period of January to April 2012 while comparing with same period of 2011. However, it varies among the months.

Comparison of adult angiography converted into interventions: Graph-3

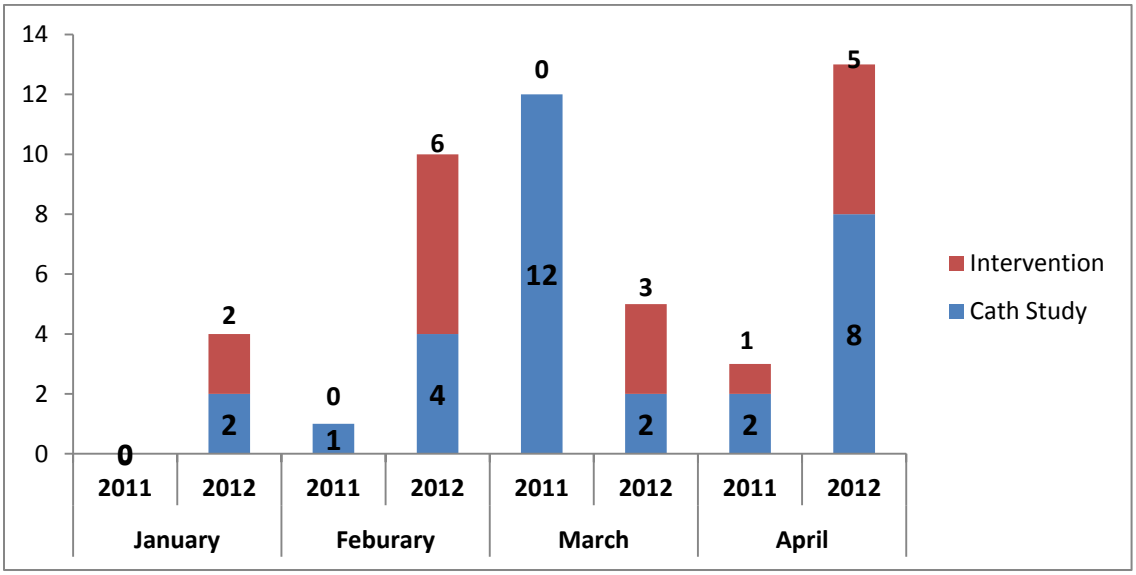


In percentage **Graph-4**

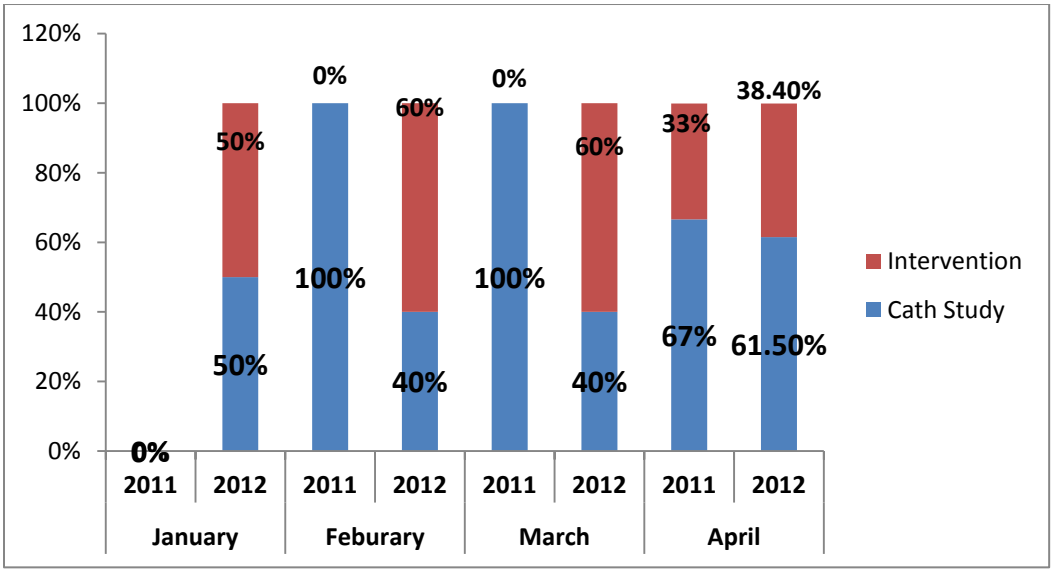


This suggests that the interventions have increased to almost **10 percent** as compared to **2011** during the same period, while **in 2012** also, maximum interventional procedures are in **March.**

Comparison of pediatric cases converted into interventions: Graph-5



In percentage **Graph-6**



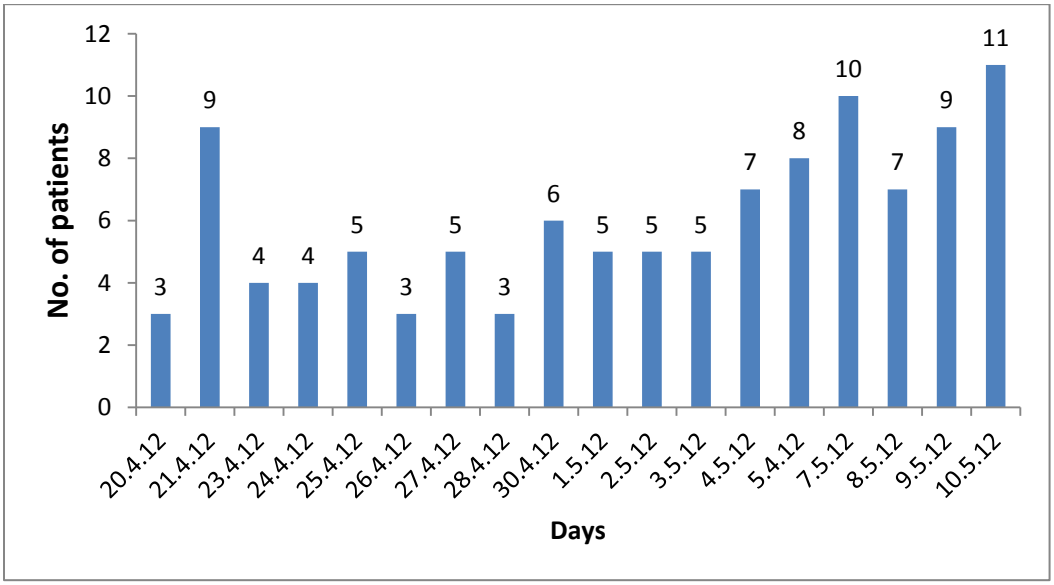
The above two graphs suggests that the pediatric cases have shown an increase for more than **ten times** compared to 2011.Comparing the four months in 2012 the **maximum percent of interventions** are seen in **February** while **maximum patients were in month of March.**

KEY FINDINGS:

Calculation of key Metrics

- **Average no. of patients per day** (Emergency excluded)

No. of patients per day **Graph - 7**



Total No. of patients= 109/17
Total no. of days

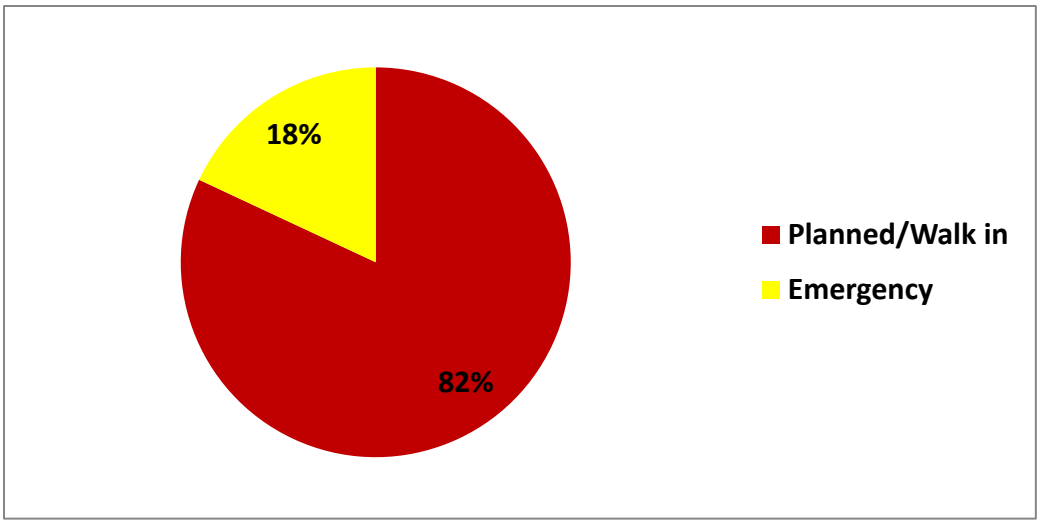
= 6.4 patients/day

Range: 3 to 11 patients per day.

This shows that the volume of cases varies from day-to-day requiring staffing and planning done accordingly.

No. of Emergency Patients: 24

No. of cases from 20.4.2012 to 10.5.2012 (133) **Chart-4**

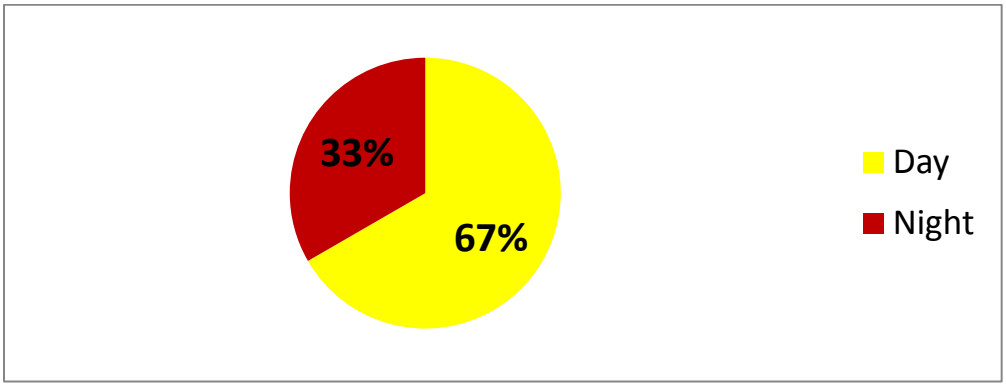


Out of 133 patients 109 were planned and 24 were emergency cases.

Time of emergency cases:

During Working Hours (8:00 to 20:00)

After Working Hours (After 20:00) **Chart-5**



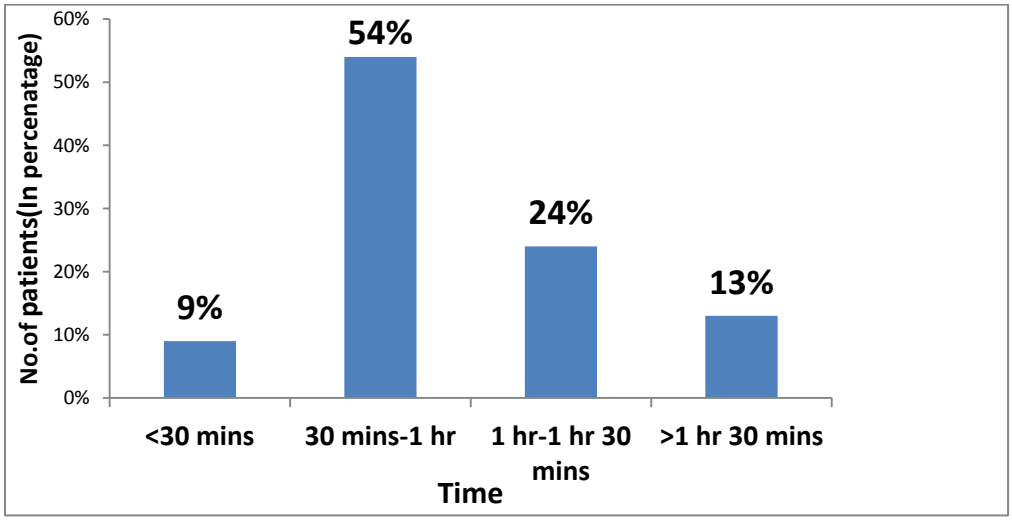
At night there are **33 percent of emergency cases**, so at least one nursing and one technician must be there, after 8 pm, and it is not justifiable to make staff who has already been working for 12 hours since 8 am to work also after 8pm.

METRICS FOR PLANNED CASES:

1. Average turnaround time:

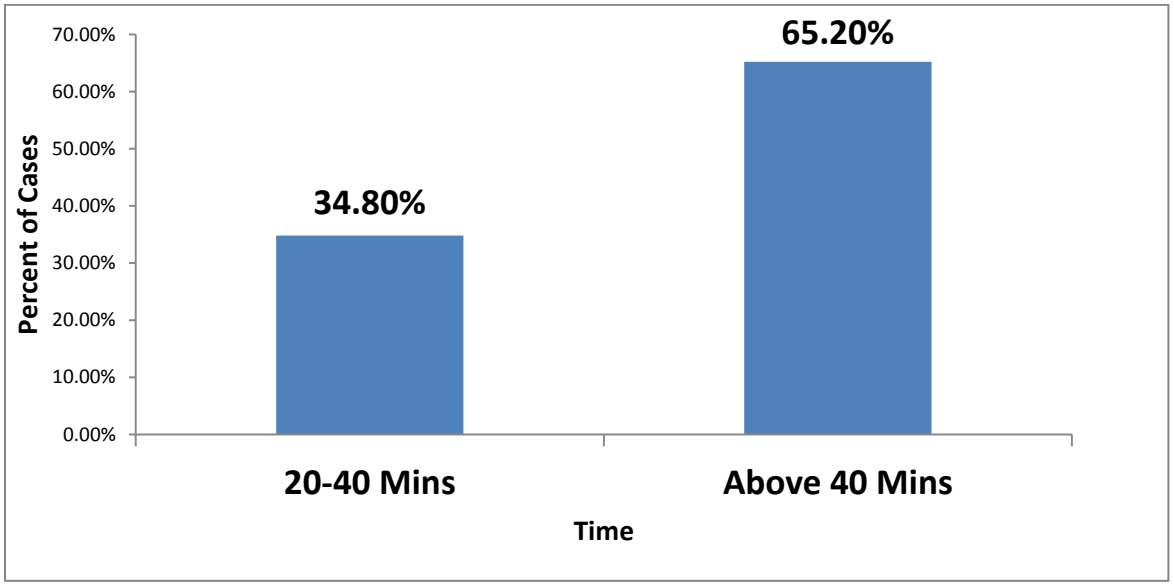
Time taken from the entry of patient to the procedure room of Catheterization Laboratory till he exits and the room is ready for the next patient**.**

1Hr 8 minutes **Graph-8**



Turnaround time for maxixmum cases is seen to be between **30 minutes to 1 hr.**

Standard: 20 to 42 minutes[5] **Graph-9**



Probable reasons:

- Around 10 minutes on an average is the extra time when patients are in the procedure room after room preparation (draping, scrubbing, IV settings) has been done but procedure has not started. This is because of **improper scheduling of patients** i.e there is no surety of which consultant's patient will be taken, and this is mainly because it takes a lot of time in CCU for the preparation of patient and so the scheduled time is overshooted resulting in returning of the consultant to his/her OPD after waiting for the patient. By the time the patient comes to the Catheterization Laboratory, the doctors become busy in their OPD's hence, patient has to wait which results in wasting of time of Laboratory, Laboratory staff, doctors, patients and their attendants.

- Average time for cleaning the room after procedure and preparation for the next patient is 15 minutes and ranges from 5 minutes to 25 minutes, which means the cleaning can be done in 5 minutes after each procedure but is not the case, which is due to **unavailability of housekeeping staff at that moment** of time resulting in time wastage, in waiting for the staff to come.
- Many a times the staff is ready and waiting for the patient but the patient is not shifted to Catheterization Laboratory in time.
- Instances were also seen when patients even being for more than two hours in CCU were still not prepared which was because of **delay in arrival of barber**, as a result had to be prepared in the Laboratory itself.
- **Lack of communication and information,** sometimes the consultants are uninformed about their cases, or Catheterization Laboratory staff themselves have no prior information about the cases.
- Instances the patient attendants delaying in making decision for interventional procedures have also been noticed.

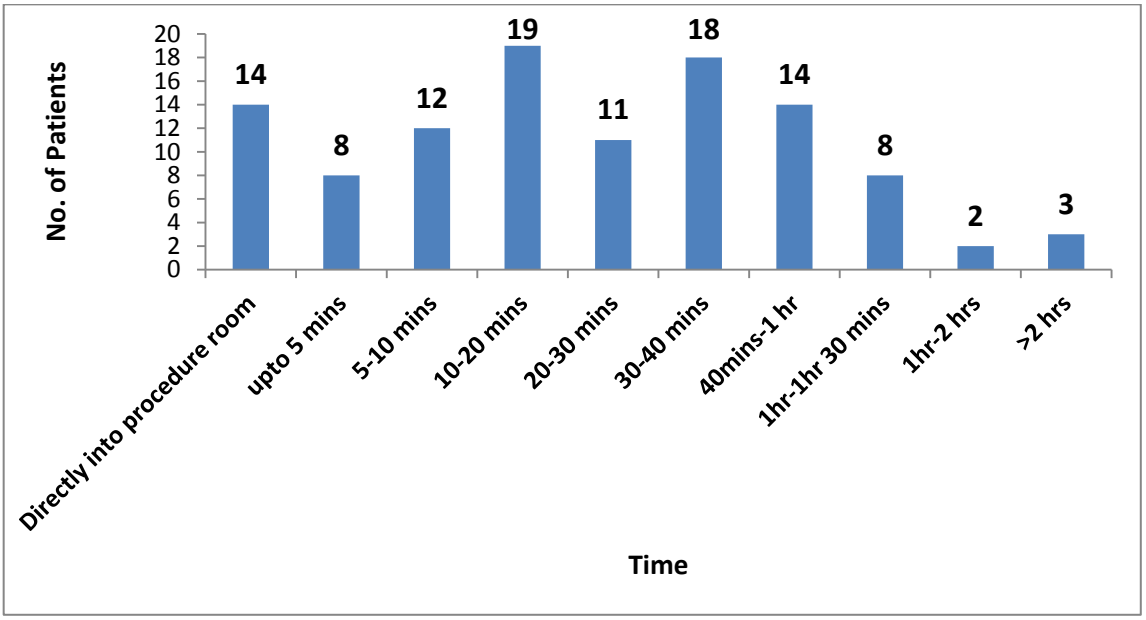
2. In room Patient waiting time:

Time taken from the entry of the patient in procedure room to the start of procedure.

31 minutes

Standard: 5-20 minutes [8]

Graph-10



Waiting times for all but emergency cases are often extended, contributing to artificially long lengths of stay. Long patient wait is a big problem for the hospital. The schedule in the Catheterization Laboratory is built around elective cases, with urgent add-on cases being squeezed between scheduled cases or performed at the end of the day. This approach often leads to long wait times for add-on cases, resulting in patients being held without food or drink for long periods of time--increasing expenses for the hospital and undermining patient satisfaction and quality of care.

As compared to previous study which was **33 minutes**, there is no improvement in the patient waiting time.

Probable reasons:

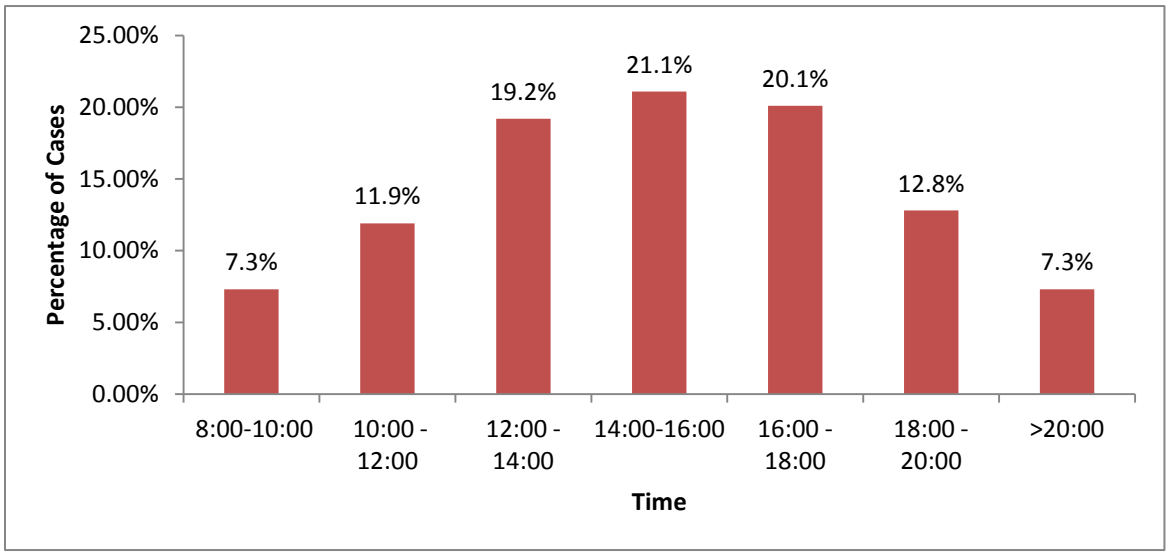
- Systematic and timely preparation does not occur in CCU resulting in disturbing the entire schedule and haphazard and disturbed patient flow pattern.

- Delay in doctors arrival because they become busy at their OPD's since there scheduled time is overshooted and so by the time the patient is ready the doctors return to their OPD's after long waiting.
- Lack of coordination among Laboratory personnel and also with CCU staff.

3. **Average first case start time:** 10:30 am

This starting time is late considering the timings of Laboratory i.e.8 am which results in disturbance in the entire patient scheduling which subsequently results in wastage of time of Laboratory personnel doctors and patients leaving then thirsty, hungry ,anxious and frustrated for a very long duration.

Percent of cases at various times of the day. **Graph-11**



This shows the uneven distribution of patients throughout the day with maximum between 12 noon to 6 pm and minimum from 8 am to 10 am within working hours and 11percent of cases are after working hours.

This depicts that in the morning i.e. out of 5 hours from 8 am to 12 noon there are only 19 percent of cases and the same is after 6 pm ie.20 percent from 5 to 8 pm .while major bulk i.e. 60 percent of cases are between 12 to 6 pm and small no. of cases seven percent also occur after 8pm. This pattern of cases keeps the staff busy throughout the day, along with overtime without

any rest period resulting in fatigue and at the same time wastage of resources without desirable outputs.

Efforts should be made to shift the patients which are done after 8 pm to the morning hours i.e from 8 am to 10 am and prevent any planned procedure after working hours.

Probable reasons:

- Delay in admission process
- Delay in CCU preparation
- Delay in doctors arrival
- Sometimes delay in staff arrival if they had been working very late the previous night, this is because of lack of Laboratory staff for relieving according to shifts.
- Delay in cleaning of Catheterization Laboratory because of only one dedicated housekeeping staff.
- Lack of communication and prior information .For e g if patient is late for some reason ,the doctor is not informed and if a patient is admitted under some consultant then there are times when neither the consultant is informed nor ant staff in Catheterization Laboratory.

4. **Average time taken for start of procedure after Patient enters the procedure room**:
   21 minutes

   Standard: 10 minutes [4]

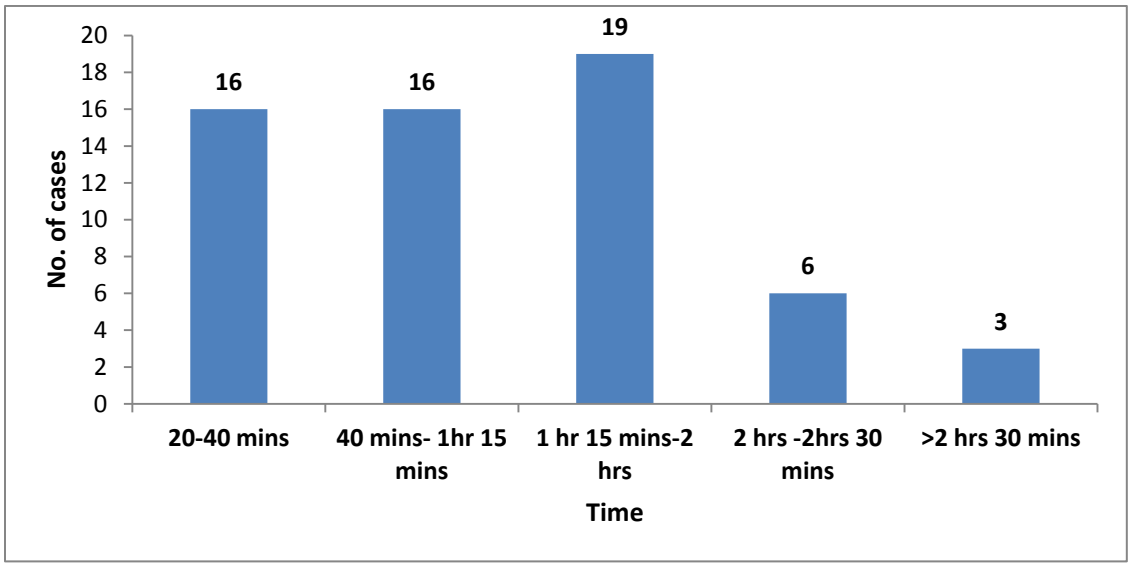
   This time is also more because after the patient is in the procedure room it takes average 10 minutes in patient preparation (Draping, scrubbing, IV settings) and further 5 minutes for the doctor to start the procedure, but rest 5 minutes are additional which can be reduced.

5. **Average Total preparation time in CCU:** 1 hr 13 minutes

   50 percent are above the average time.

   Ranges between 20 minutes to 3 hrs 45 minutes

Distribution for preparation time in CCU **Graph-12**



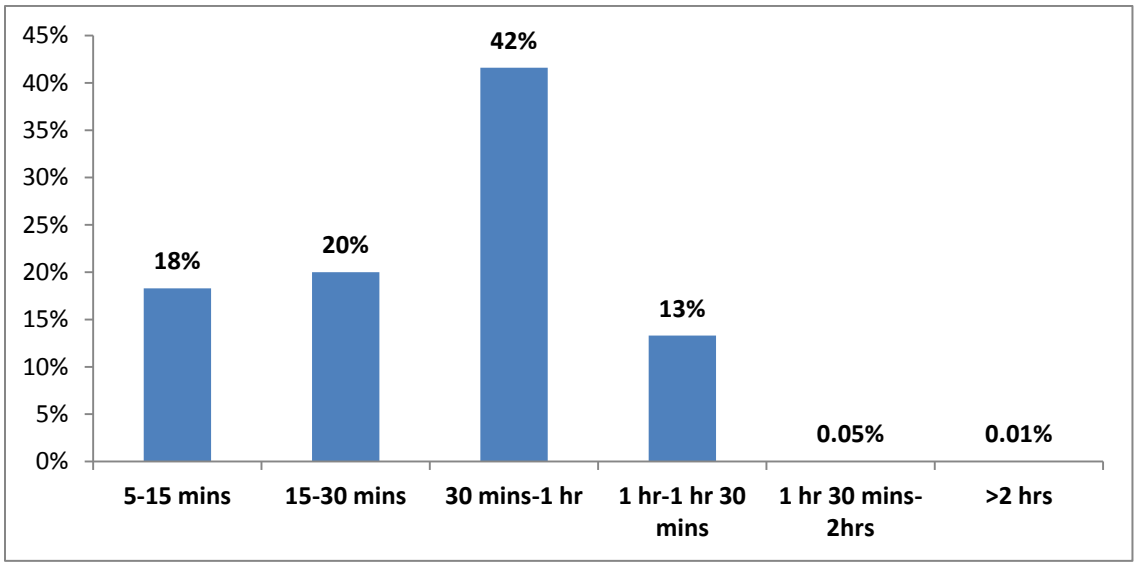
The preparation which can be done in **20-30 minutes** is taking more than an hour on an average which means around one hour is totally wasted, and in more than 50percent cases this time wastage is even more. The reduction in this time is mandatory to streamline the entire process.

6. **Average time for blood drawing and ECG:** 20 minutes
   Both procedures should not take more than 10 minutes.

7. **Average time taken for part preparation:** 15 minutes

8. **Average Patient waiting time for part preparation after ECG and blood sample taken:** 42 minutes

Patient waiting time for part preparation (after Blood drawing and ECG) Graph-13



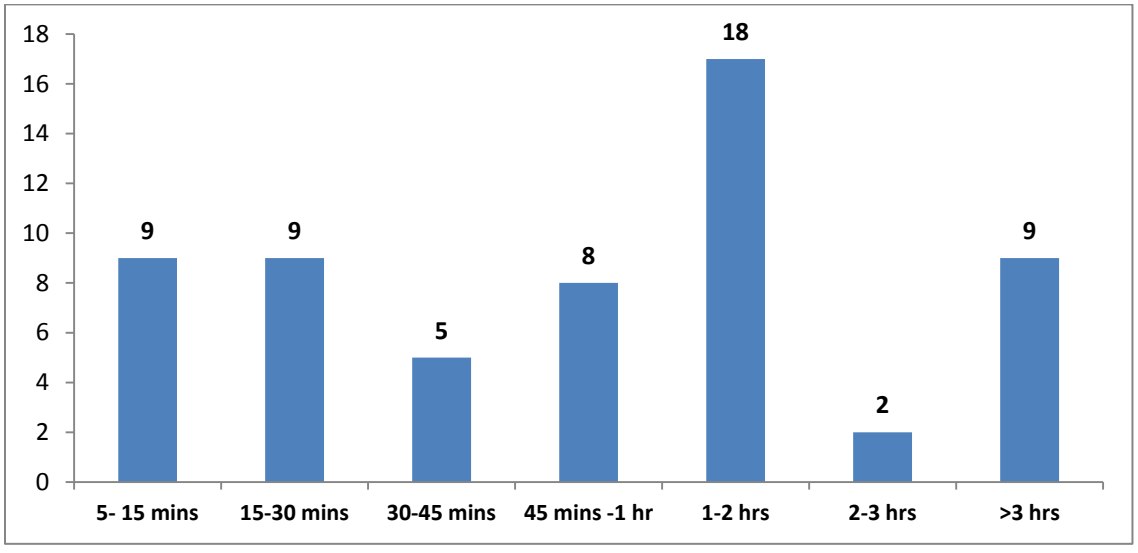
38 percent take a longer time than the average.

Ranges between: 15 minutes to 3 hrs

This shows that, more time is wasted for waiting for the barber for part preparation as compared to the total time taken for preparation and out of total patients, **38 percent** has to wait even longer.

9. **Average Patient waiting time after complete preparation:** 1hr 18 minutes

Ranges between: 5 minutes to 4 hrs **Graph-14**



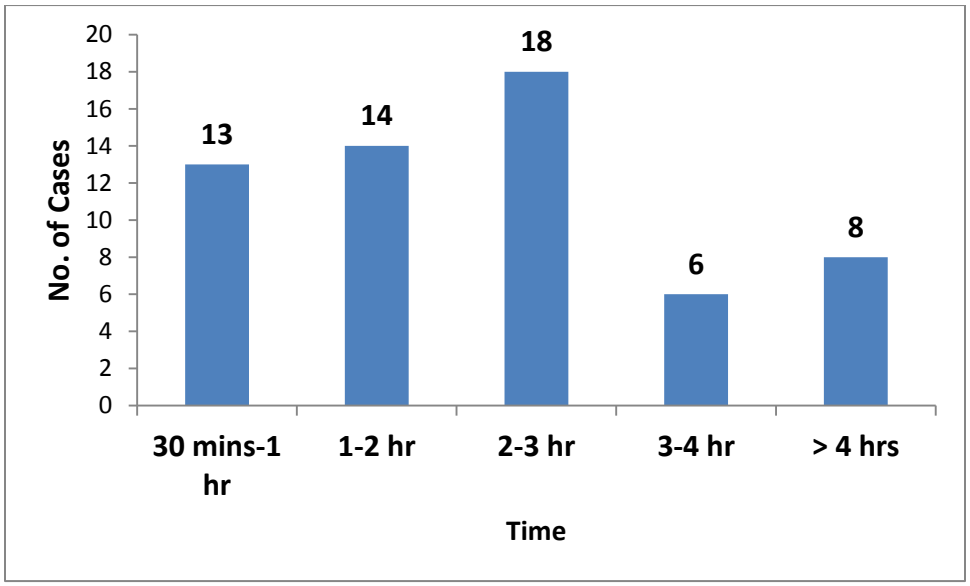
Maximum patients i.e 29 percent had to wait for 1-2 hrs after total preparation.

Average total time of a patient in CCU for the same day procedure:

2hrs 31 minutes

Ranges between: 30 minutes to 7 hrs 55 minutes

Total time in CCU for same day procedure Graph-15



This clearly shows that the entire preparation should take maximum 35 minutes + 10-20 minutes waiting time if there more than 2 patients to be prepared simultaneously = maximum one hour, which actually is taking 1 hr 13 minutes+1 hr 18 minutes of waiting time=2 hrs 31 minutes i.e more than double.

10. **Average utilization:**

Total no. of hours spent on 109 patients
Total working days x Total working hours (Excluding emergencies and Sundays)
=55.7 percent

Average total time of Laboratory spent on one Patient: 1hr 08 minutes

The Laboratory is working for 12 hours and average patients per day are around 6.4, so if one patients takes 1hr 08 minutes, so Laboratory is working for 7 hrs 25 minutes.

Total time Catheterization Laboratory is legitimately used 7 hrs 25 minutes

Can be used for 12 hrs

Catheterization Laboratory under utilization is 4 hrs 35 minutes= 4.58 hr

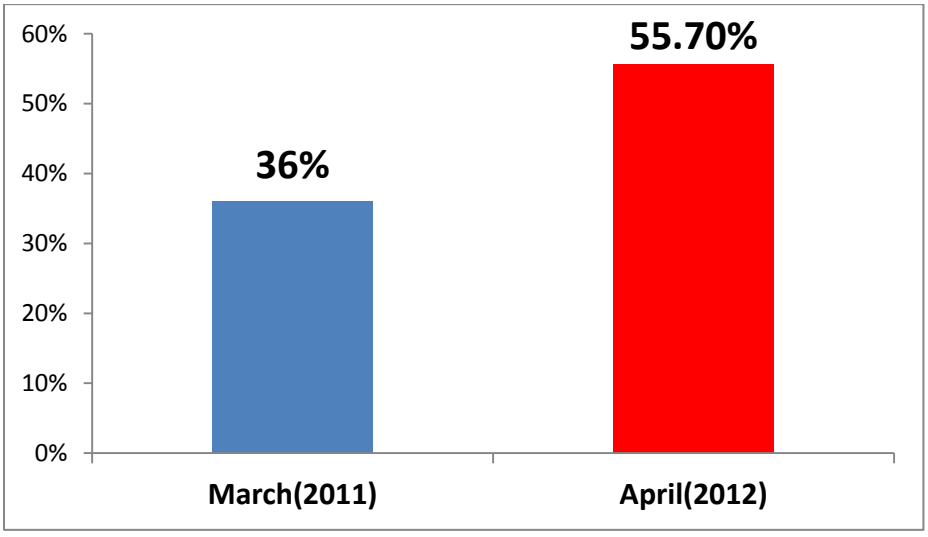
This is 44 percent underutilization

=4.05 more procedures can be done per day. (4.58/1.13 hrs)

97.27 more procedures can be done in one month.(4.05X 24 working days)

Apparently, the Catheterization Laboratory staff is busy all through the day, and as almost 60percent of cases are done after 12 noon, it results in sudden work overload in afternoons and evenings and free hours in the morning which is almost wasted resulting in more patient waiting time, wastage of doctors time, frustration and dissatisfaction of doctors, staff fatigue and overwork that too along with underutilization without appropriate outcomes. **The revenue that can be earned by 4 procedures, which is on an average 3 angiograms and one intervention is lost each day.**

Comparison of Cath lab Utilization with study in (March 2011)[12] **Graph-16**



.

This shows that the Catheterization Laboratory utilization had increased by around twenty percent as compared from March 2011.

No. of OPD patients converted into catheterization procedures

Table 1

S.No	Date	Total Patient's in OPD	No.of OPD Patients turned for Cath Procedures
1.	20.04.2012	**26**	**8**
2.	21.04.2012	**35**	**11**
3.	23.04.2012	**34**	**9**
4.	24.04.2012	**26**	**9**
6.	26.04.2012	**21**	**5**
7.	27.04.2012	**29**	**7**
8.	28.04.2012	**33**	**11**
9.	30.04.2012	**24**	**6**
10.	01.05.2012	**39**	**12**

Average case load per day (from the table above) = 267/9= 30 cases per day (approx.)

No of catheterization procedures per day = 78/9 = 8.6 catheterization procedures per day (approx.)

(9/30) x 100 = **30 percent of all OPD cases in Cardiology OPD go in for catheterization procedures.**

Since 4.05 catheterization procedures can be done more everyday (from the analysis above the table), deducting 20 percent of the this extra unused time is also kept for increase in emergency cases,

80 percent of 4.05 cases = 3.24 cases per day could be done more in cath.

Since this extra no of cases that could be performed is to be 30 percent of the extra no of OPDs (since, catheterization procedures on any day forms 30 percent of cardiology OPDs cases)

= 30percent of ‘A’ (Where A – is the extra number of OPDs that are to be done to keep the catheterization Laboratory justifiably occupied)

3.24 = (30 x A) / 100

A = (3.24 x 100)/30 = 11 cases

Thus to have the catheterization Laboratory optimally utilized, the per day OPD should be increased by approx. 11 cases per day. Thereby, raising the per day average of 30 cases per day to 41 per day.

Problem Areas:

- **Inaccurate scheduling:** The scheduling system used in the Catheterization Laboratory is an open schedule (i.e. no block time) in which add-on patients received care on a first-come-first-served basis.
- If previous Patient takes a longer time in procedure, it creates a rush of 3- docs waiting for their turn of patients and each one tries to do his/her Patient first, so there is a waste of docs time as well, coz they have to sit in the Catheterization Laboratory for their turn.
- Prior scheduling of patients for the next day is mostly not possible and so planning for procedures, investigations and preparation in advance is not possible which would have saved a lot of time. The patients are planned mostly for the same day and therefore wait times for doctors, staff as well as the patient increases and initial morning hours are wasted.
- If rescheduling has to be done due to any reason, there is no mutual communication among the doctors and there is lack of coordination so it becomes difficult for the coordinator to convince the doctors which results in time wastage and dissatisfaction among the staff.
- **Lack of clarity of job responsibilities** among the staff and no one person who is informed about the scheduling or cancellation of cases, sometimes the coordinator is informed, sometimes the technician or nursing staff is informed and this creates confusion, lack of responsibility and accountability which again hampers the smooth functioning.
- **Lack of coordination** among the staff and also consultants. If the patient one consultant is waiting in preoperative room and for some reason he/she has not yet come o the Laboratory, the other consultant starts with his/her patient resulting in increase in wait time of the previous patient and also dissatisfaction and frustration of the staff.
- **There is no shift system and the entire Catheterization Laboratory** staff is working 24 hrs, which becomes very hectic and is not justifiable as it relates to deterioration of quality of work and also fatigue and dissatisfaction.

- **Lack of adherence** of timings of Laboratory, the cases which are planned are also continuing after 8 pm till even 12 midnight which also results in staff coming late in the morning or they are tired and dissatisfied even if they turn up on time.
- **Long time in admission process** which delays the start time and then the whole cycle is disturbed.
- **Delay in patient preparation in the CCU** especially for male patients because only female nursing staff is there and no ward boys for groin preparation, so they are bound to wait for the barber which is only two in the entire hospital, hence the delay is caused.
- **No receipt of blood reports:** even just hand written ones are also not received, and there is no one responsible to orally ask the results of the reports before the procedure, the doctors ask only for those patients where they are suspicious. This also takes extra time before the start of procedure, and is also dangerous if a patient is positive for HIV/Hbsv which was found in one of the cases during the study period.

The following criterion was used to analyze the bottlenecks at various levels:

Did Patient arrive on time?

Was all documentation available? Reports?

Were all supplies needed were available?

Was patient on the table on time?

Did doctor arrive in time?

Who pulls out the sheath?

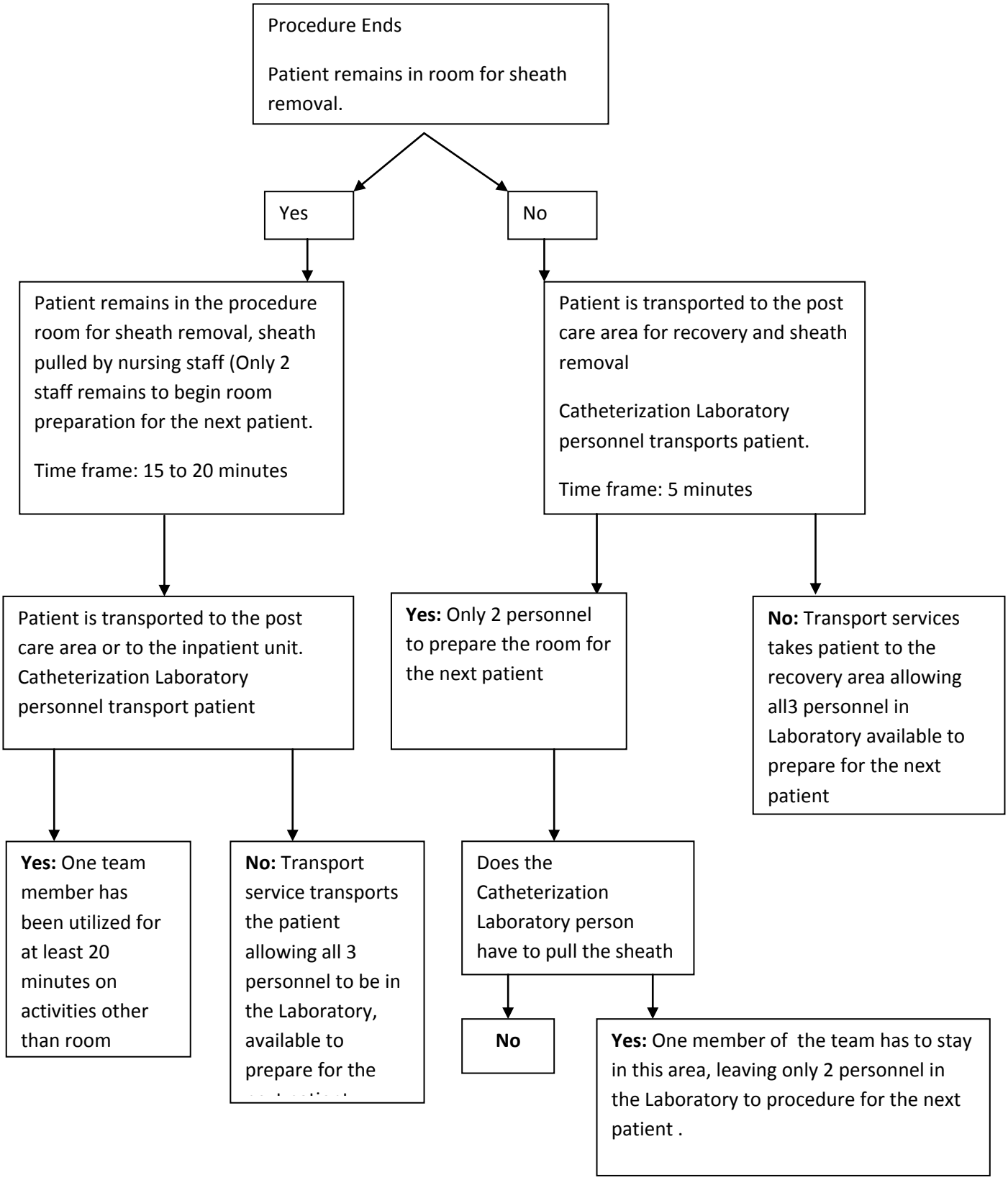
Where is it done?

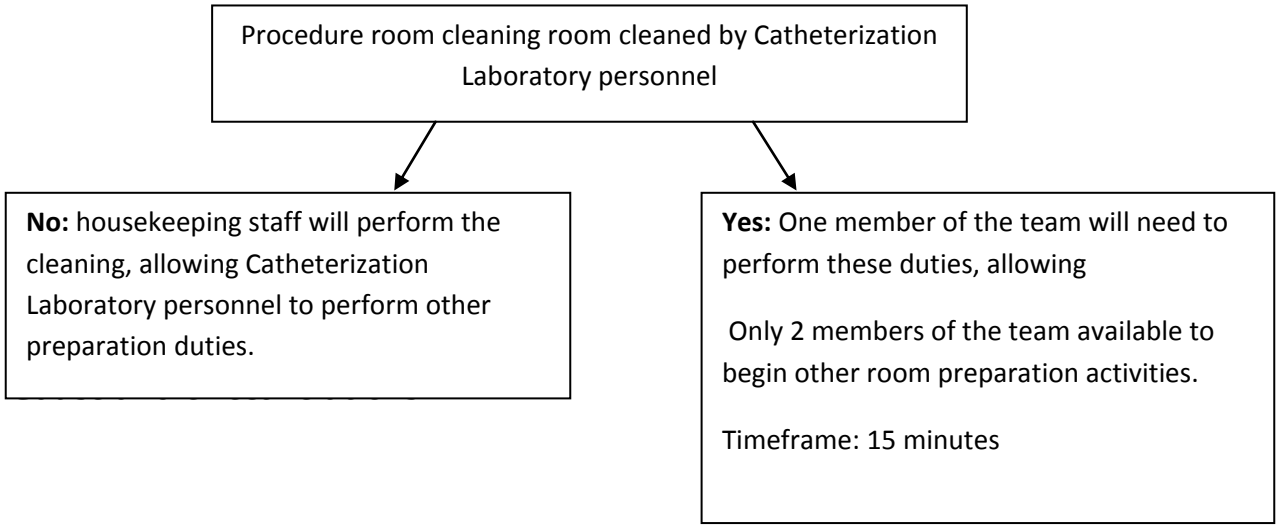
Who transfers the Patient to the CCU?

Who cleans the room between cases?

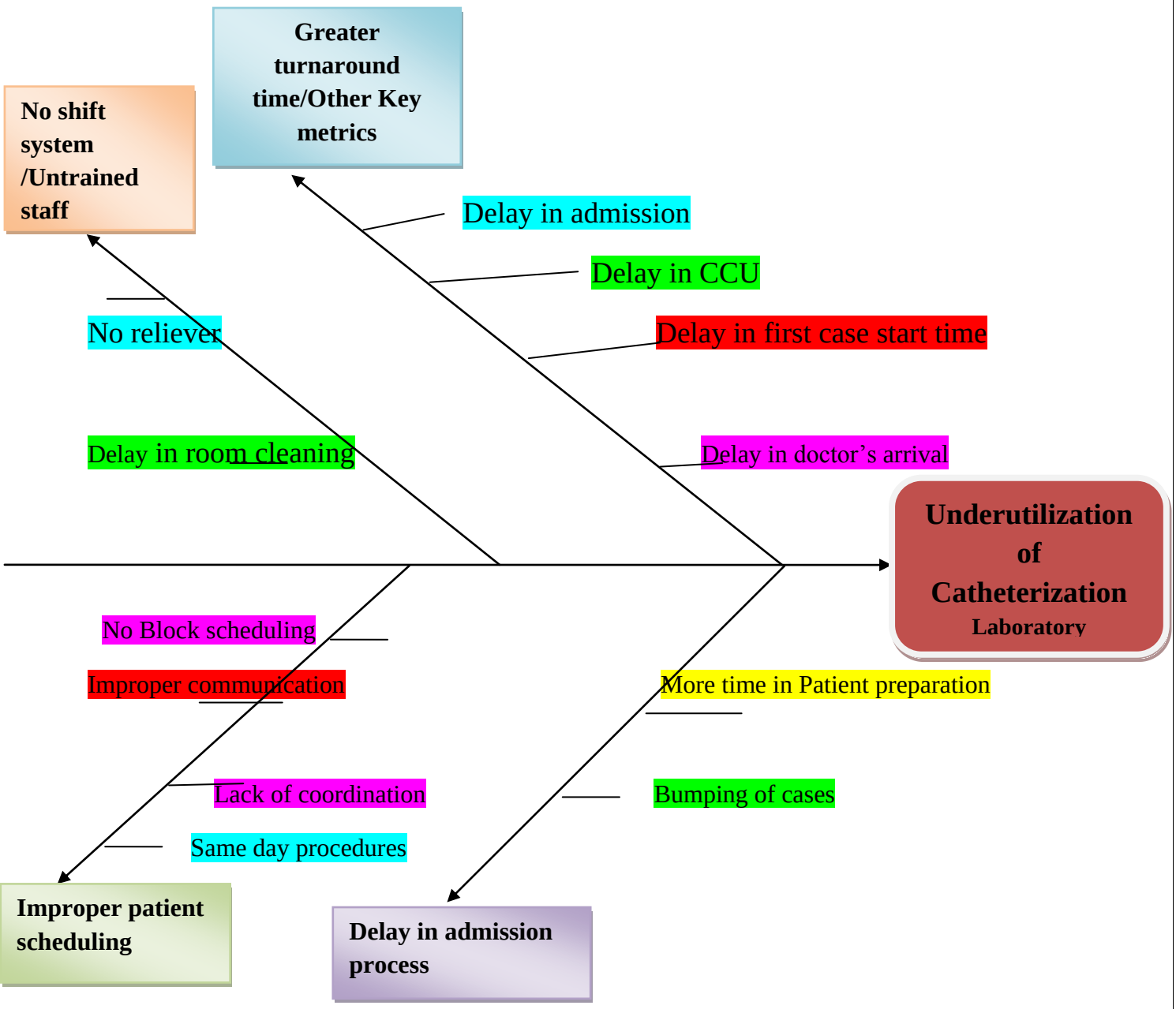
Are there times when Housekeeping unavailability contributed to delay in taking the next case?

Fig-4


Procedure Ends
Patient remains in room for sheath removal.
Yes
No
Patient remains in the procedure room for sheath removal, sheath pulled by nursing staff (Only 2 staff remains to begin room preparation for the next patient.
Time frame: 15 to 20 minutes
Patient is transported to the post care area for recovery and sheath removal
Catheterization Laboratory personnel transports patient.
Time frame: 5 minutes
Patient is transported to the post care area or to the inpatient unit. Catheterization Laboratory personnel transport patient
Yes: Only 2 personnel to prepare the room for the next patient
No: Transport services takes patient to the recovery area allowing all3 personnel in Laboratory available to prepare for the next patient
Yes: One team member has been utilized for at least 20 minutes on activities other than room
No: Transport service transports the patient allowing all 3 personnel to be in the Laboratory, available to prepare for the
Does the Catheterization Laboratory person have to pull the sheath
No
Yes: One member of the team has to stay in this area, leaving only 2 personnel in the Laboratory to procedure for the next patient .


Procedure room cleaning room cleaned by Catheterization Laboratory personnel
No: housekeeping staff will perform the cleaning, allowing Catheterization Laboratory personnel to perform other preparation duties.
Yes: One member of the team will need to perform these duties, allowing
Only 2 members of the team available to begin other room preparation activities.
Timeframe: 15 minutes

CAUSE AND EFFECT RELATIONSHIP FOR REASONS OF UNDERUTILIZATION OF CATHETERIZATION LABORATORY (Fig-5)



CONCLUSION:

Cardiac Catheterization Laboratory, which is generally a high-volume, challenging and complex environment within any healthcare facility, can operate efficiently only if it has a highly integrated system that brings together all the different aspects of managing the facility.
From this study, we can infer that:

- The protocol for patient scheduling is very well made but practically not followed as such which results in lack of organization of catheterization Laboratory and this is mainly because there are **no catheterization Laboratory teams made** where one team can do the OPD while the other can do the catheterization procedures.
- The staff duty roster is not according to shifts resulting in overwork and dissatisfaction.
- The average turnaround time, first case start time, Patient preparation and waiting time are more which results in wastage of Laboratory time, doctor's, staff and patients time and also wastage of resources.
- As a result there is only 56 percent utilization resulting loss of revenue of approximately 4 angiograms and one angioplasty per day.

Proper scheduling facilitates efficient and effective turnover of patients, reduced waiting times, start of cases on time and reduced time in investigations will automatically translate into better utilization of the facility while ensuring quality care in many ways than one. Reduction in patient waiting time, better and timely care by nursing staff, training and re-education of staff can help improve the process many folds.
Ultimately, patients benefit from a safer and more efficient work environment; Medical staff benefits from improved workflow and more satisfied patients; Employees win as a result of the elimination of wasteful work, resulting in a less-stressful work experience and improved productivity. Finally, the value benefits all hospital stakeholders, from staff who enjoy a better working environment to physicians who can plan for their procedures to start on time, to the community at large.
All the parameters studied above show that **there is respective growth in no. of cases that shows that Laboratory can be utilized much more efficiently provided some important and minor changes are made.**

RECOMMENDATIONS

- **Block Scheduling and team bifurcation:**

Firstly, the time required for each consultant must be analyzed and accordingly slots must be allotted to them.

Two consultants can be allotted time in a day i.e one in the morning 8 am to 1:00 pm and the other 2:00 pm to 8 pm ,or one consultant can have 8:00 am to 12 noon, 3 to 6 and the other can be allotted 12:00to 3:00pm then 6 to 8 pm.

Two teams can be made of the total consultants (two teams for adult cases and one for pediatric cases) One team can look after the OPD and simultaneously at the same time the other team can do the catheterization procedures, which can then be interchanged.

If some changes are to be made because of unavailability of some doctor or any other reason then rescheduling can be done with mutual consensus among the consultants and must informed to the coordinator in advance so that the staff can prepare for the materials etc before hand, so that smooth functioning is not hampered.

- **Early start time:**

Prior scheduling will help to start the cases on time, instead of start time of 10:30, and maximum cases 605 after 12 noon, it should at least start from 8:30, so that initial two hours can be utilized and time after working hours can be reduced with well distribution of cases throughout the day.

- **Streamlining of process flow in CCU:**

If there is an organized and timely procedure of patient flow and patient preparation in CCU, the waiting time in CCU will reduce and this will not disturb the scheduling of Catheterization Laboratory patients which will in turn reduce the waiting time of patients in the preoperative area of Catheterization Laboratory. It should be clear which patient has to be prepared upto what time and the priority of turn.

- **Job clarity and responsibility and line of authority:**

  There should be job profiles and responsibilities which must be clarified to the staff so that they are clear of their responsibilities and also must be clear of who has to report to whom.

  There should be distribution of responsibilities and one person should be responsible for a particular job and everyone must know to whom to reach for what issue. Example:

  The coordinator is responsible for scheduling of patients, so any information related to patient scheduling or rescheduling must be given to her, and she must then disseminate that information to other concerned persons.

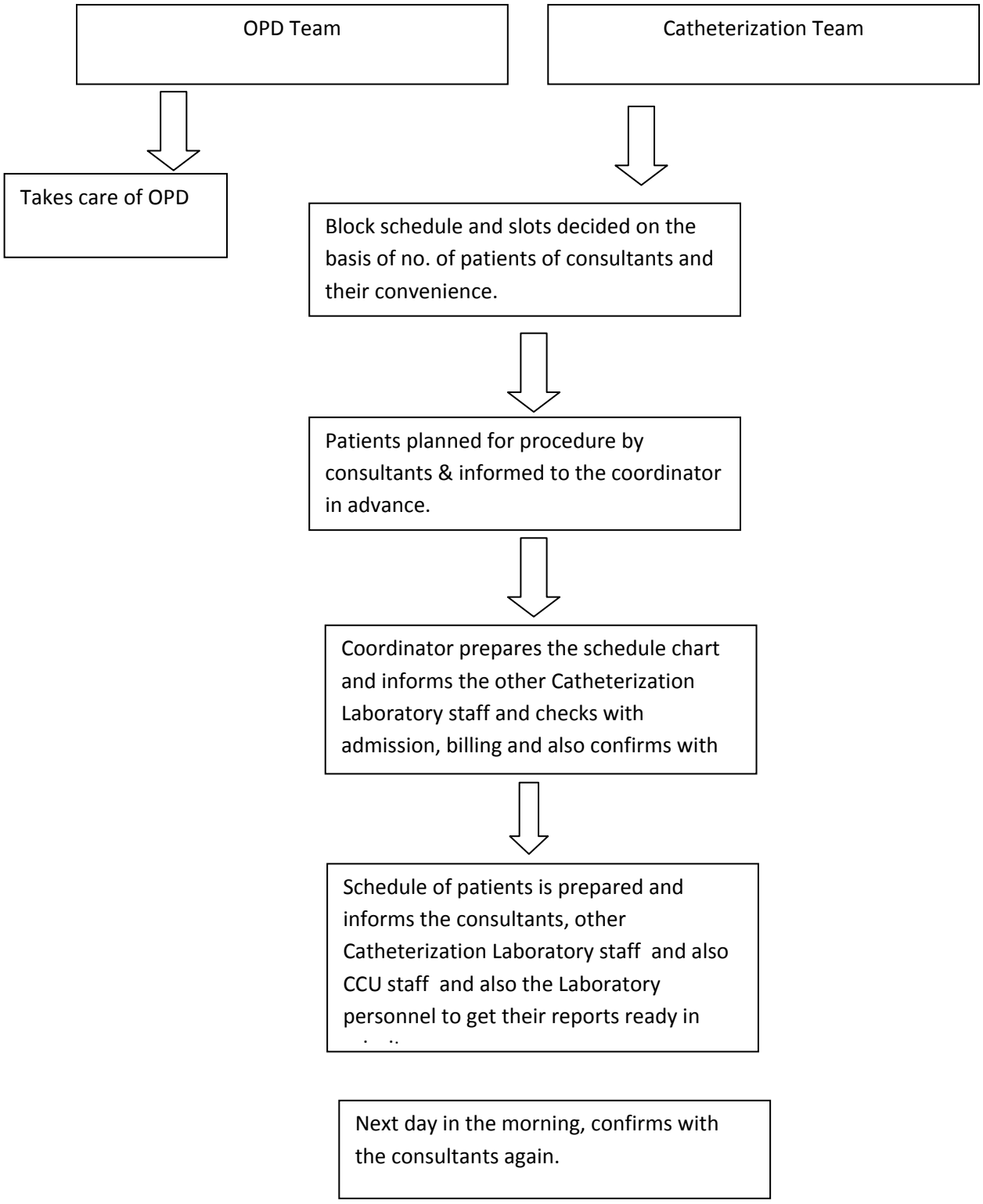
  In CCU one person must be responsible for instructions from the Catheterization Laboratory and then she/he should make sure that those are followed.

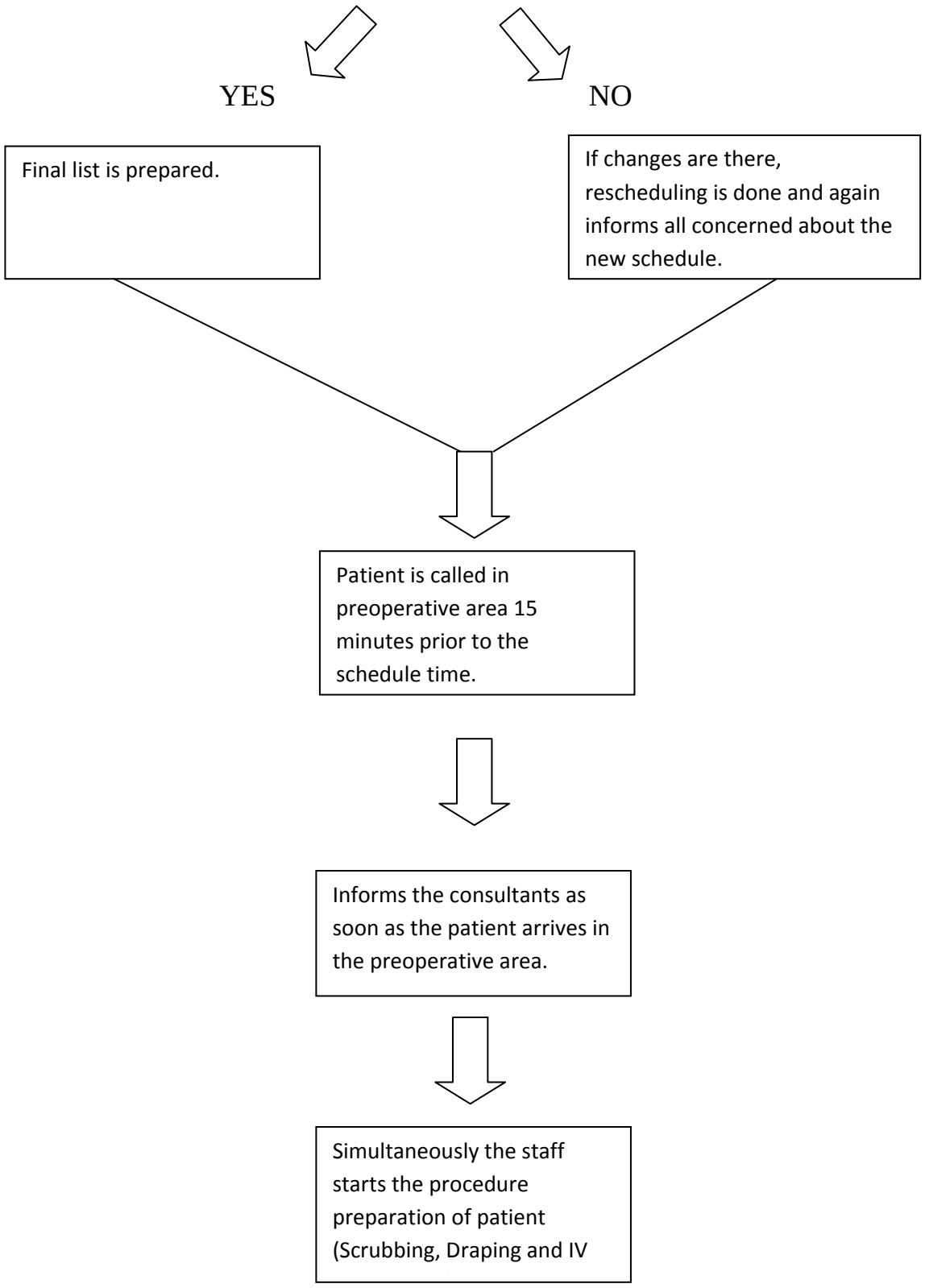
- **Staffing according to shifts:**

  The duty rosters must be prepared according to morning evening and night shifts, which minimum staff at night and maximum in afternoon and evening time. The same staff should not made to work 24 hours as it will lead to fatigue and frustration of staff which will have a direct effect on the quality of work.

- **OPD's must be adjusted** by the consultants according to their patient schedule slot, so that the planned patient must not be kept waiting because of the doctors busy in OPD.

PATIENT SCHEDULING MODEL FOR SMOOTH FUNCTIONING OF CATHETERIZATION LABORATORY (Fig-6)




YES
NO
Final list is prepared.
If changes are there, rescheduling is done and again informs all concerned about the new schedule.
Patient is called in preoperative area 15 minutes prior to the schedule time.
Informs the consultants as soon as the patient arrives in the preoperative area.
Simultaneously the staff starts the procedure preparation of patient (Scrubbing, Draping and IV

LIMITATIONS OF THE STUDY

- The Emergencies after working hours and on Sundays are not included in the study.
- The study was analyzed based on data collected for only 20 days because of limitation of time period of the summer training, therefore seasonal and other variations of cases could not be taken into account.
- The emergency cases and cases also done on Sundays or gazzetted holidays are not included in calculating the key metrics.
- The cases done at Catheterization Laboratory are very varied and unpredictable and so time and resources vary from case to case.

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ANNEXURE (1)

Inventory of Permanent articles in Cath Laboratory

S.no	Article	Quantity
1.	Defibrillator	1
2.	Syringe pump with cord	5
3.	Patient Monitor	2
4.	Bowl	20
5.	IV Stand	1
6.	Pace Maker CTPD	1
7.	Patient Warmer	1
8.	Sputum Cup	1
9.	Instrument trolley	1
10.	Small Trolley	1
11.	Pulse Oxymeter	1
12.	Kidney Tray	2
13.	Instrument tray	4
14.	Urine pot (Plastic)	2
15.	NIBP Lead	2
16.	ECG Lead	2
17.	Spo2 Lead	2
18	Foot step	1
19.	Notice board	1
20	Patient Board	1
21	Towel clip	10
22.	Sponge holder	10
23.	Knife handle	1
24.	Needle holder	5
25.	Bowl (Medium)	4
26.	Scissor curved	1
27.	Artery forceps	4
28.	Allis Forcep	4
29.	Plain Forceps	1
30.	Tooth Forceps	1

ANNEXURE (2)

S.no	Article	Quantity
1.	Puncture Needle	100
2.	Sheath Introducer	5 sizes(10 each)
3.	Catheters(Diagnostic)	5 each(13 types and5 sizes)
4.	Catheters(Guiding)	3 each(5 types and 3 sizes)
5.	Drape Kits	10
6.	Guide Wires	5 each(5 types
7.	Indeflator Kit	5
8.	Y connection Kit	5
9.	ACT Cartridge	100
10.	Berman Balloon Catheter	2 each(4 sizes)
11.	Wedge Pressure catheter	2 each(4 sizes)
12.	High Pressure connection line	5
13.	PATIENTCA Wires	5 each(types)
14.	Balloons	3 types
15.	Needles(26)	50
16.	Needles(18)	20
17.	Syringes Plain	100 each(3 sizes)
18	Syringes LL	100 each(4 sizes)
19.	Dynaplast	20
20	ECG Electrodes adult/pediatric	160
21.	Infusion Set	20