

Implementation of The Cardiac Catheterization Lab in Thumbay Hospital, Dubai

By

Anubha Saini

*Dissertation submitted for the partial fulfillment of the
MBA Hospital and Health Management*

Academic year, 2016-2018



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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Anubha Saini** student of MBA Hospital & Health Management from The IIHMR University, Jaipur has undergone dissertation training at **Thumbay Hospital, Dubai** from **11th February, 2018 to 8th May, 2018.**

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

The Internship is in fulfilment of the course requirements.

I wish her all success in all her future endeavours.



(Col.) Dr. Ashok Kaushik
Dean, Academics and Student Affairs
The IIHMR University, Jaipur



Dr. Monika Chaudhary
Associate Professor
The IIHMR University, Jaipur



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May 03, 2018

To Whom It May Concern

This is to certify that **Dr. Anubha Saini** holder of Indian Passport Number R7532546 was working in our institution as Management Trainee from 11th February 2018 till 8th May 2018, as a part of dissertation of her M.B.A in Hospital and Health Management program. She has completed the assigned project.

We wish her all the best.

For Thumbay Hospital, Dubai


THUMBAY MOIDEEN
President



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THE IIHMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **Implementation of the cardiac catheterization lab in Thumbay Hospital, Dubai** and submitted by **AnubhaSaini** Enrollment No. **IIHMR-U/01/2016-18/0391** under the supervision of **Dr. Monika Chaudhary** for award of **MBA in Hospital and Health Management** of the University carried out during the period from **11th Feb 2018 to 8th May 2018** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other institute or other similar institution of higher learning.



Signature

The IIHMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that all the ethical issues have been considered while collecting data for my dissertation titled, "**Implementation of the cardiac catheterization lab in Thumbay Hospital, Dubai**"

Anusha.

Signature

ACKNOWLEDGEMENT

I am exceptionally thankful to all the professionals at Thumbay Hospital, Dubai for sharing generously their knowledge and precious time. I owe a great debt to Dr.ChandrashekharJhadav (Chief Operations Officer) and Mr.Mohammad Noor Alam Khan (Senior Operations Manager) for sharing their valuable views in spite of their busy schedule. It has been my privilege to work under their dynamic supervision in the hospital.

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I am highly grateful to all the departmental heads and staff for giving me time and have helped in learning the process. Without their active cooperation and participation of THUMBAY TEAM it would not have been possible to obtain in depth knowledge about operations and quality aspects of the Hospital.

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ABBREVIATIONS

JCI	Joint commission international
DHA	Dubai health authority
AHA	American Heart Association
ACC	American College of Cardiology
SOP	Standard Operating Procedure
CCL	Cardiac Catheterization Lab
ICU	Intensive Care Unit
PCI	Percutaneous Coronary Intervention
STEMI	S T segment elevation Myocardial Infarction
ED	Emergency Department
CA	Coronary Angiography
PHD	Patient Happiness Department
IPD	In-Patient Department
OPD	Out-Patient Department

1. INTRODUCTION

A Cardiac catheterization laboratory or Cath lab is an examination room with diagnostic imaging equipment used to visualize the arteries of the heart and the chambers of the heart and treat any stenosis or abnormality found. Planning and implementing the best Cath lab for hospital requires a wide range of considerations, from current and future planning of the workflow and communication concerns. It requires a realistic view of current and future planning.

Advances in the treatment of coronary artery disease have substantially increased the average life expectancy in developed nations over the past few decades. Percutaneous coronary intervention provides a less invasive alternative for coronary artery bypass grafting for the treatment of acute myocardial infarction and unstable angina. While some cases in the Cardiac Catheterization Lab (CCL) are elective and thus scheduled in advance, the flow of the day is always subject to interruption by emergencies, in particular ST-elevation myocardial infarctions. A properly planned process is needed for the CCL on any particular day to be capable of not only treating emergency patients in a timely manner, but also treating all patients through a cost effective process.

As, Thumbay Hospital, Dubai has come up with a new ADVANCE CARDIAC CARE UNIT; therefore setting up of the cardiac catheterization laboratory requires utmost care and attention since it deals with the life of innumerable people. The Cath lab facilitates with the staff and technology to support advanced coronary, valvular, and structural heart disease therapies. The latest interventional devices and supporting diagnostic tools are taken in use. The expertise in cardiac care helps us in caring for patients with heart disease by providing complete all-round care. Hence the Cath lab plays a pivotal role in the functioning of the hospital. As it offers prompt, efficient and competent service to the patients at all times and help in carrying out an in-depth investigation of patient condition taking into account patient's complete medical history, therefore strategizing a tailored treatment and top recovery plan for each.

The directive of the Cardiac Catheterization Laboratory is to provide state-of-the-art invasive diagnostic and / or therapeutic procedures for patients with cardiovascular disease. In the aspect, to endorse the highest quality care to patients undergoing invasive procedures in cardiac catheterization laboratories it is important to follow the written standards, orientation guidelines, position statements and highest clinical competence and to maintain good departmental administrative policies and procedures, and adhere to standards of courtesy established by the hospital. The standard operating procedure (SOPs) provides guidelines to be followed in the Cath lab for general operations and management of the services to aid in patient care delivery. The manual is a ready reference of the practical, useful information of immediate clinical relevance. It includes a collection of standards and guidelines that is assembled for the better understanding and operation of the department.

Therefore it is mandatory to follow the standard operating procedure (SOPs) of the hospital in consideration of the JCI (joint commission international) and DHA (Dubai health authority) guidelines while planning and designing the policy & procedure and mapping the process flow for the Cath lab.

This project has been divided into two phases for the implementation of cardiac catheterization lab in the Thumbay Hospital, Dubai.

Phase I include: Process mapping for the Cath lab in relation to the other departments in the hospital and mapping the cross functional flow for the smooth and effective functioning of the department without any delays to deliver service and quality of care to the patient.

Phase II include: Designing of the Cath lab service manual for the hospital it is created to serve both as a reference document and a training resource. The manual touches upon the structural and functional aspects of the department. It covers the procedures integral to effective and efficient delivery of services. It also summarizes the quality indicators, forms in use and reporting formats. This manual is designed as living document in line with on-going business direction and growth

2. AIM OF THE STUDY

To achieve well-organized and efficient implementation of the CardiacCatheterization unit in the hospital and maintaining smooth and effective management of the Cath lab to ensure quality of care in Thumbay Hospital, Dubai.

3. RATIONALE

To ensure the quality of care by the hospital for cardiac patient by:

- Designing and implementing the policy and procedures manual which will help to communicate employees the desired outcomes of the organization and understand their roles and responsibilities within the organization.
- Tracing the process maps which will help in strategic analysis of identifying and creating a visual depiction of the process flow of various areas of a hospital. It provides benefits to the hospital to improve efficiency and quality of workflow.

4. OBJECTIVE

- To review and understand the current standards of the procedures and the process of the hospital to avoid any delay or gap in the functioning of the department.
- To analyse JCI (Joint commission international), DHA (Dubai Health Authority) and AHA (American heart association) guidelines to implement and design the process mapping, polices and procedure manual for Cath lab.

5. METHODOLOGY

- Study from the available online research paper on the processes of the Cath lab.
- Reference from ACC/AHA guidelines to formulate processes
- JCI &DHA guidelines are considered to formulate all the policies,forms and manuals.
- Discussions with the concerned staff and specialist.
- Expertise opinions were taken.
- Analysis of the blue print to the Cath lab to design various processmaps.
- Period of Study: February to April 2018; i.e. 3 months

Phase I

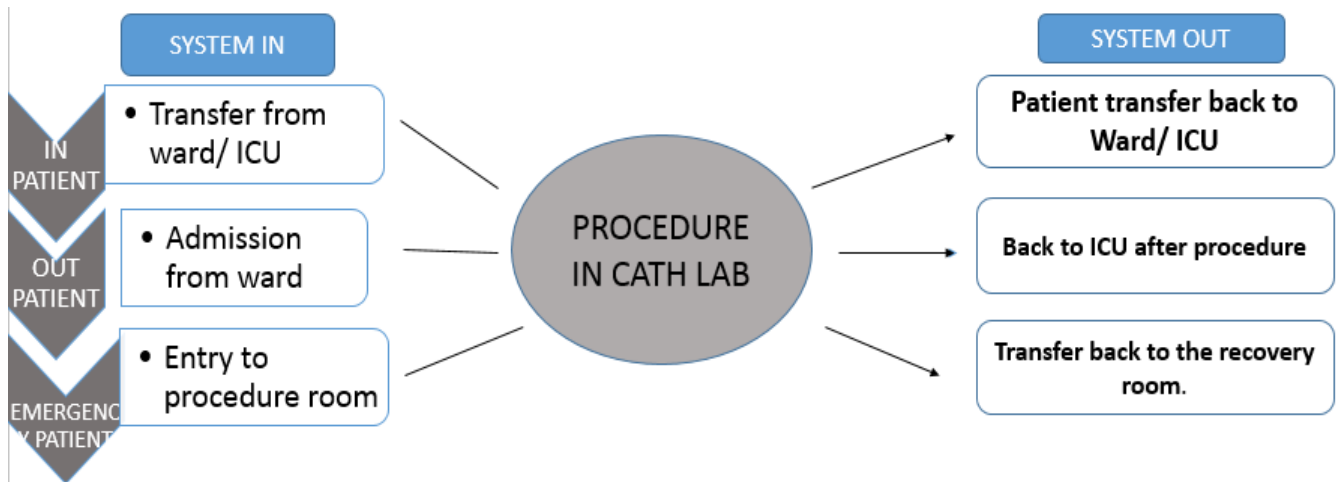
PROCESS MAPPING FOR THE CARDIAC CATHETERIZATION LAB

1. Process Mapping

For the implementation of the Cardiac catheterization laboratory it is important to map the process flow for the patient to improve the quality of care, therefore process mapping is planned and used as management tool to visually describes the flow of work.

Cardiac catheterization laboratory will have patient flow from three departments or units:

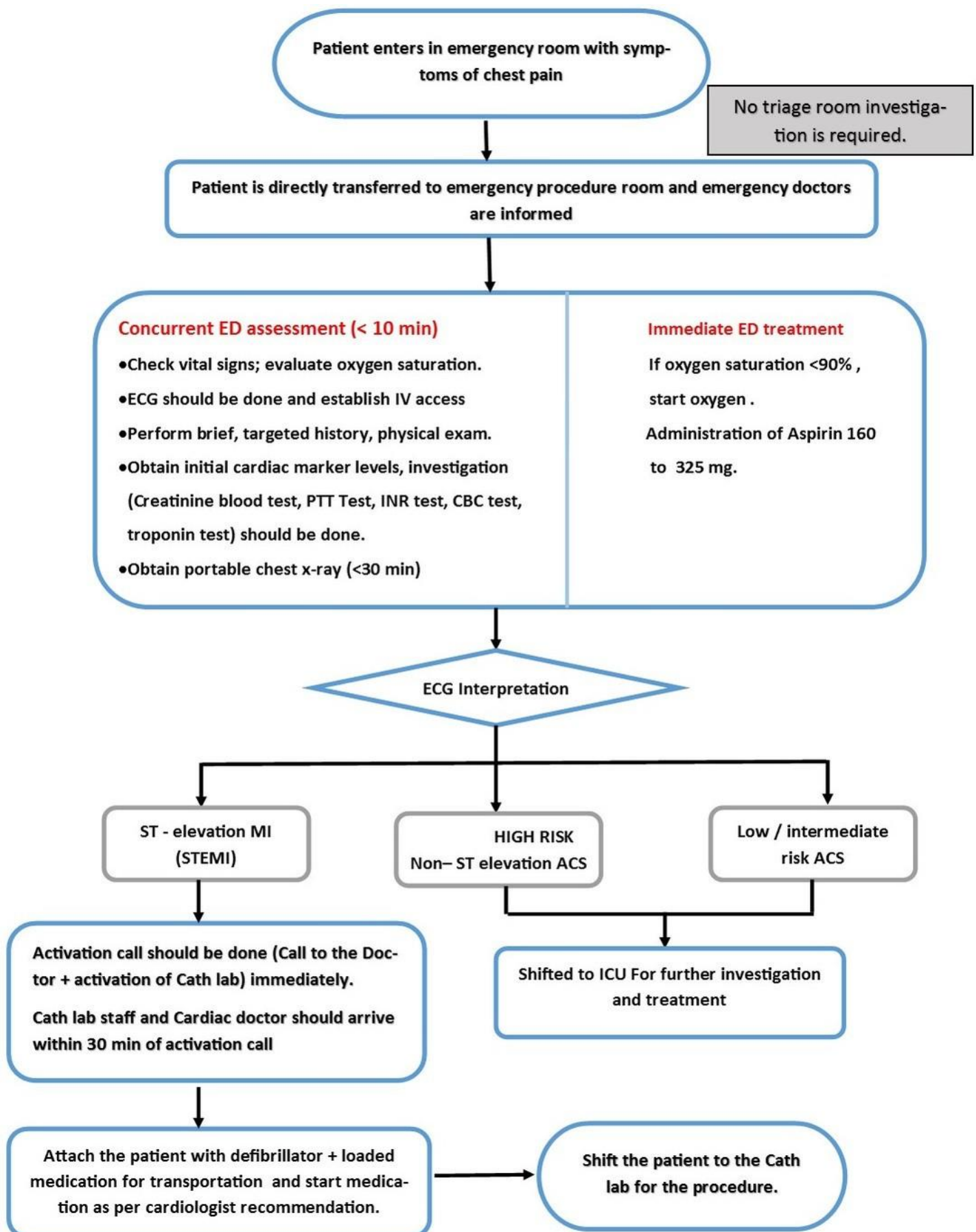
1. Emergency patients
2. Inpatient
3. Outpatient



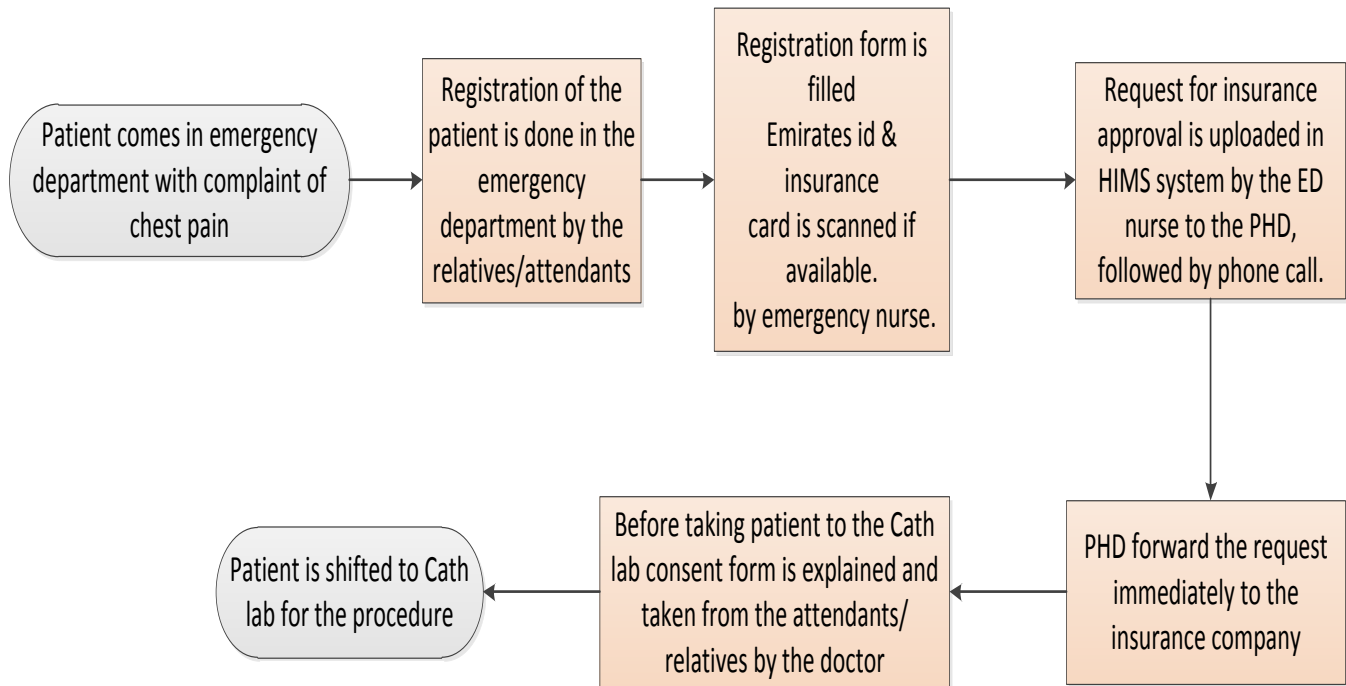
1.1 Process mapping for Emergency Patient (Door to Balloon time):

- Patient arriving at hospital with the complain of chest pain has to be treated on priority basis, and **Door to Balloon time** is measured for emergency cardiac care (ECC), specifically in the treatment of ST segment elevation myocardial infarction (or STEMI).
- The interval starts with the patient's arrival in the emergency department, and ends when a catheter guidewire crosses the culprit lesion in the cardiac cath lab. Because of the adage that "time is muscle", meaning that delays in treating a myocardial infarction increase the likelihood and amount of cardiac muscle damage due to localised hypoxia.
- According to ACC/AHA guidelines recommend a door-to-balloon interval of no more than **90 minutes**. The 30-30-30 rule takes the goal of achieving a 90-minute door-to-balloon time and divides it into 3 equal time segments. EMS, the emergency department, and the cardiac cath lab has 30 minutes to complete assigned tasks and seamlessly "hand off the STEMI patient to the next provider.

1.1(a) Desining the clinical pathway for Door to Balloon time for STEMI - Patient



1.1(b)Administrative process flow for the emergency patient



Consideration while admitting emergency cases in Cath lab:

- According to DHA for life threatening cases treating physician has to take the call to initiate the procedure as patient should not be left to wait for any approvals from the insurance but approval has to be sorted within 24 hours of the admission.
- Catheterization lab will be functional 24*7 for emergency cases; doctors, Cath lab technicians and nursing staff will be available on call.

1.2 Process mapping for the Out - patient:

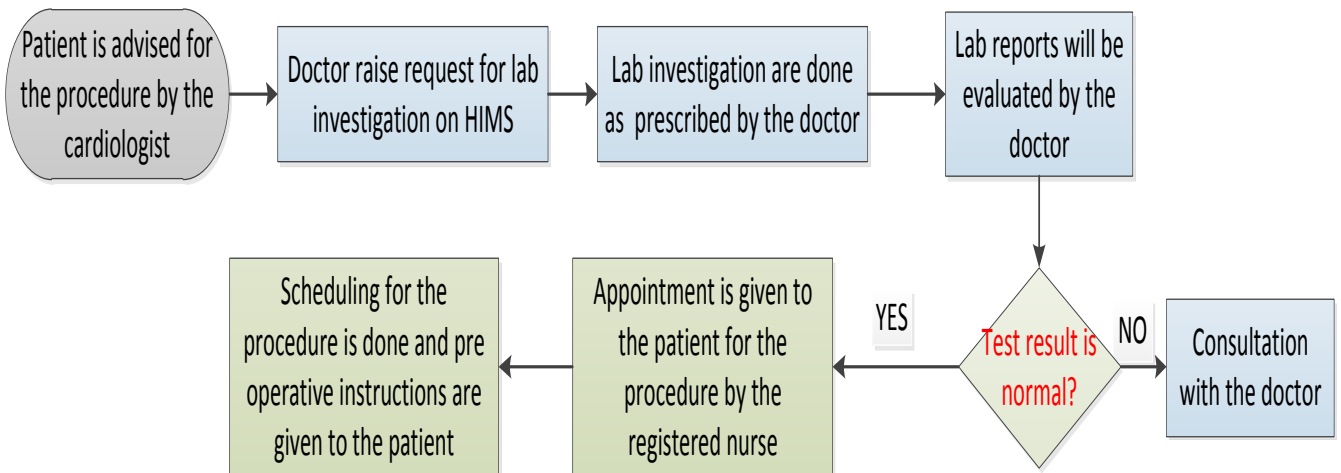
Patient undergoing minor procedure in the Cath lab which does not require overnight stay in the hospital can be considered as out patient. The patient can be relieved from the hospital after a short stay in recovery room subsequent to the surgery or procedure.

Outpatient elective cases will be scheduled by the cardiac doctor during functional hours of the Cath lab and patient will be counselled well before the surgery about the procedure and the complication (if any).

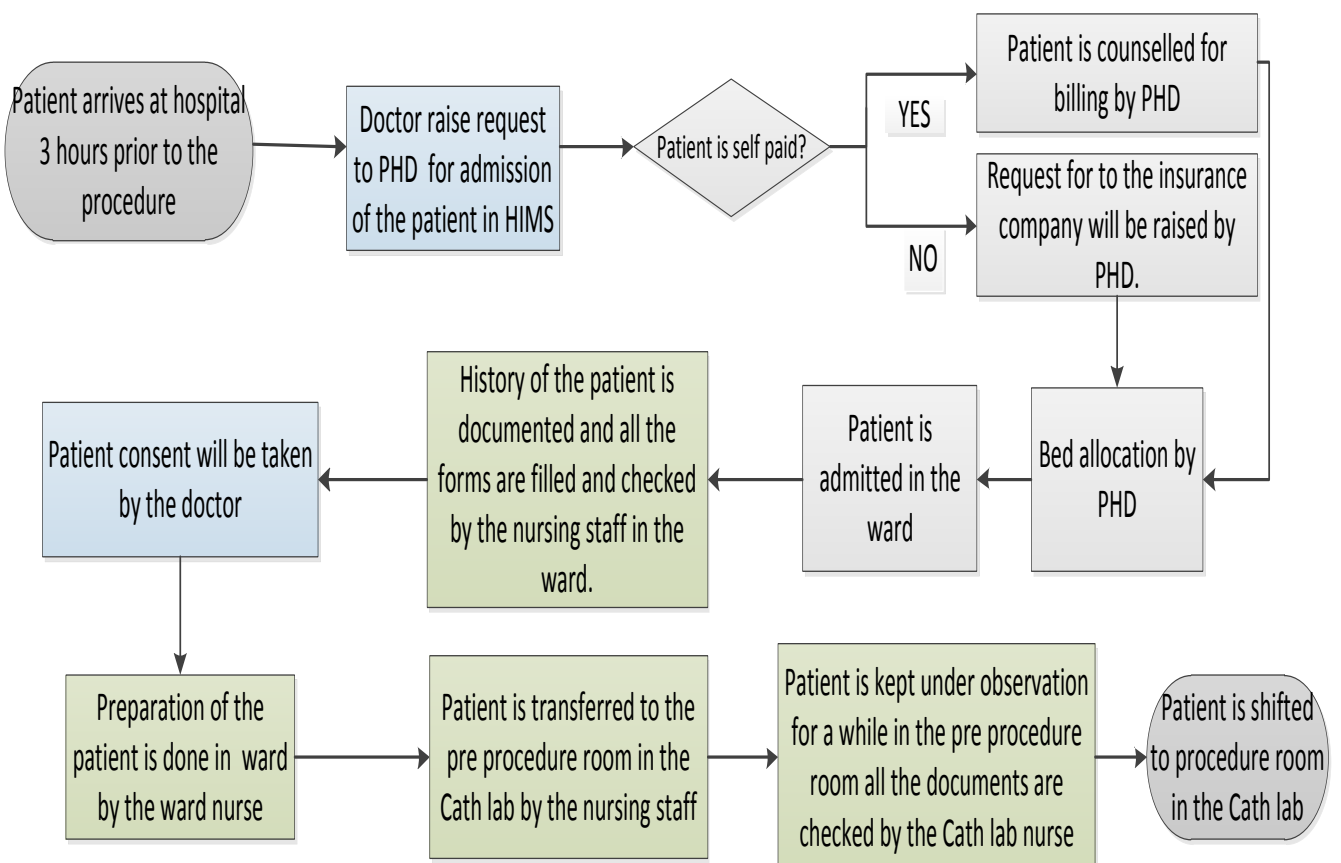
Desining the process flow for the Admission of the Out - patient to Cath lab

OUTPATIENT PROCESS FLOW

PHASE I



PHASE II

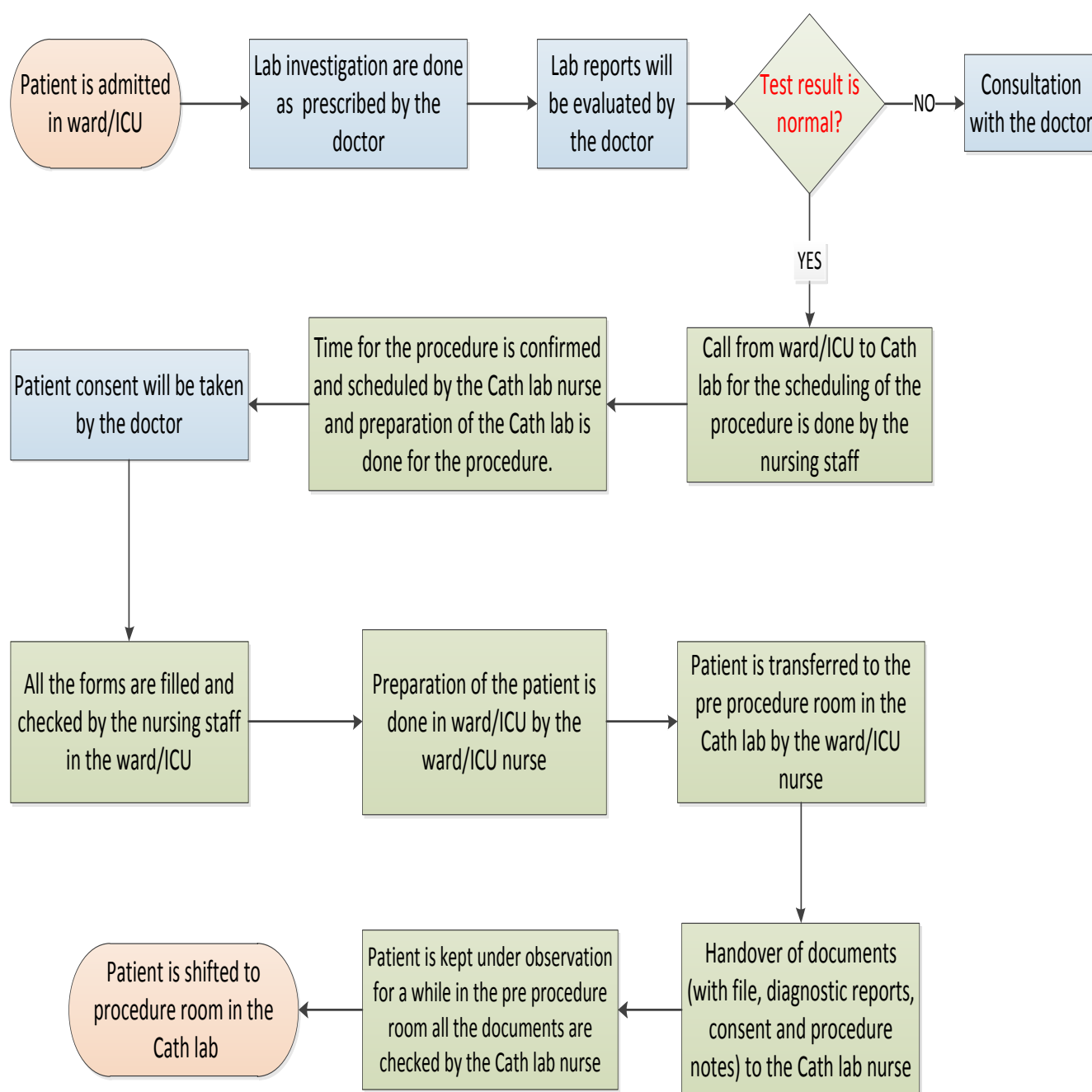


1.3 Process flow for the In - Patient :

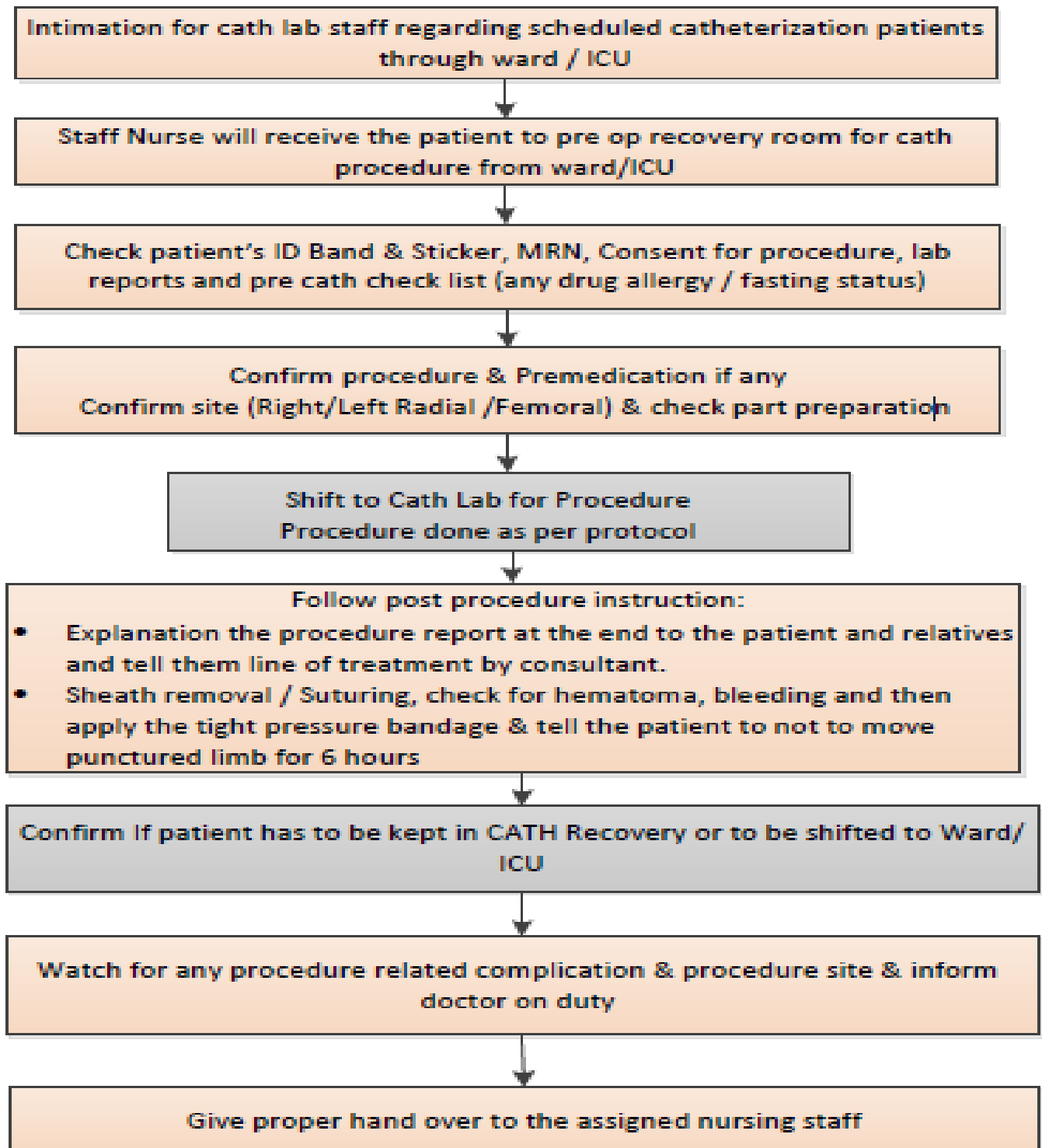
Patient already admitted in the ICU or ward are inpatient. All the required investigation and pre medication required for the surgery is initiated prior to the procedure in the ward or ICU.

Inpatient transfer from the floor to the procedure room is designed in order to avoid any potential delays during the process.

Desining the process flow for the Admission of the In - patient to Cath lab



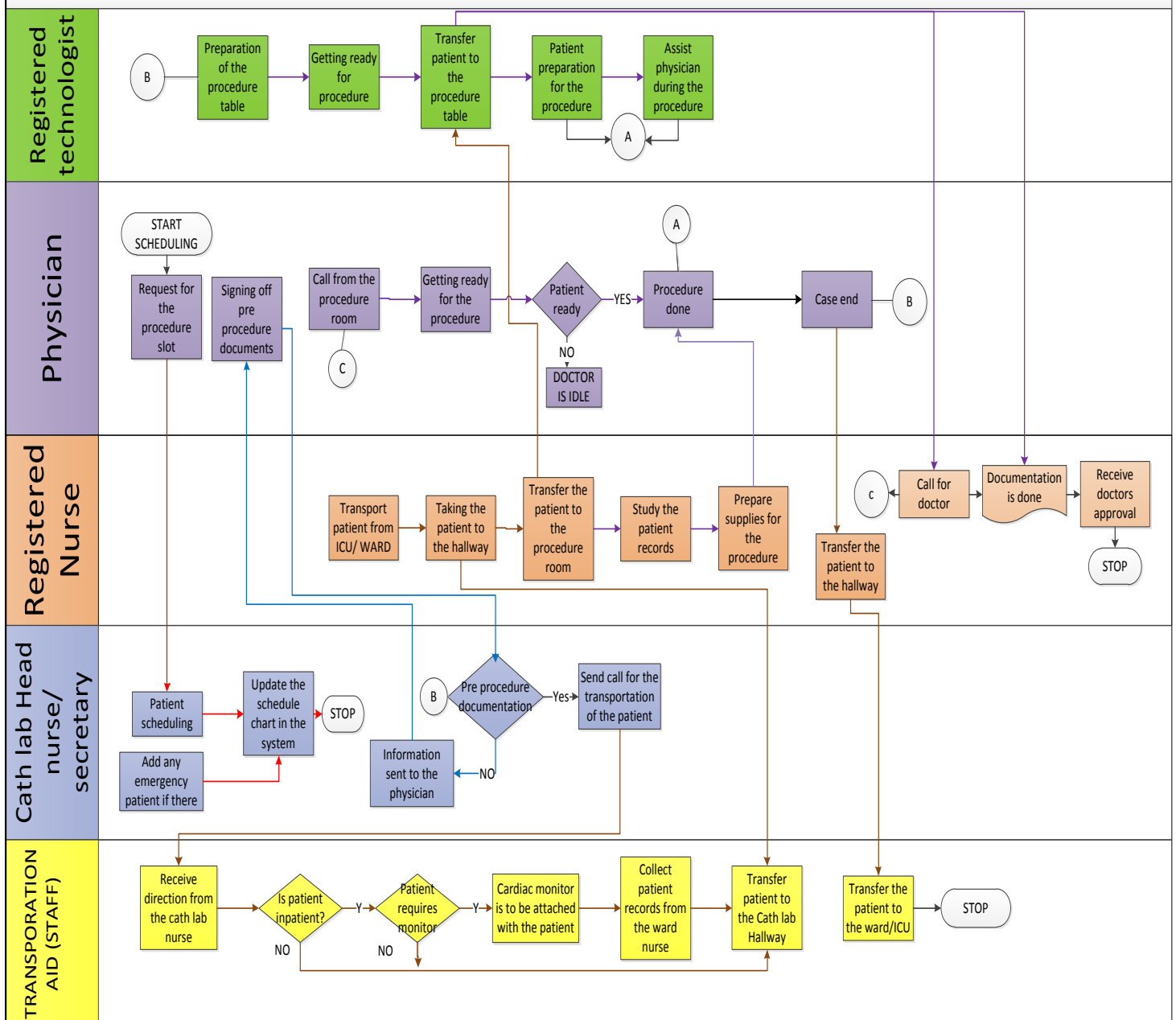
Clinical pathway for the elective procedure in the Cath lab



Cross functional workflow of the Cath lab

This flow chart shows the cross functional view for workflow of the Cath lab which defines and includes the **duties and responsibilities** of each functional staff of the Cath lab:

- Registered Technologist
- Physician
- Registered Cath lab Nurse
- Cath lab in charge
- Transportation aid staff

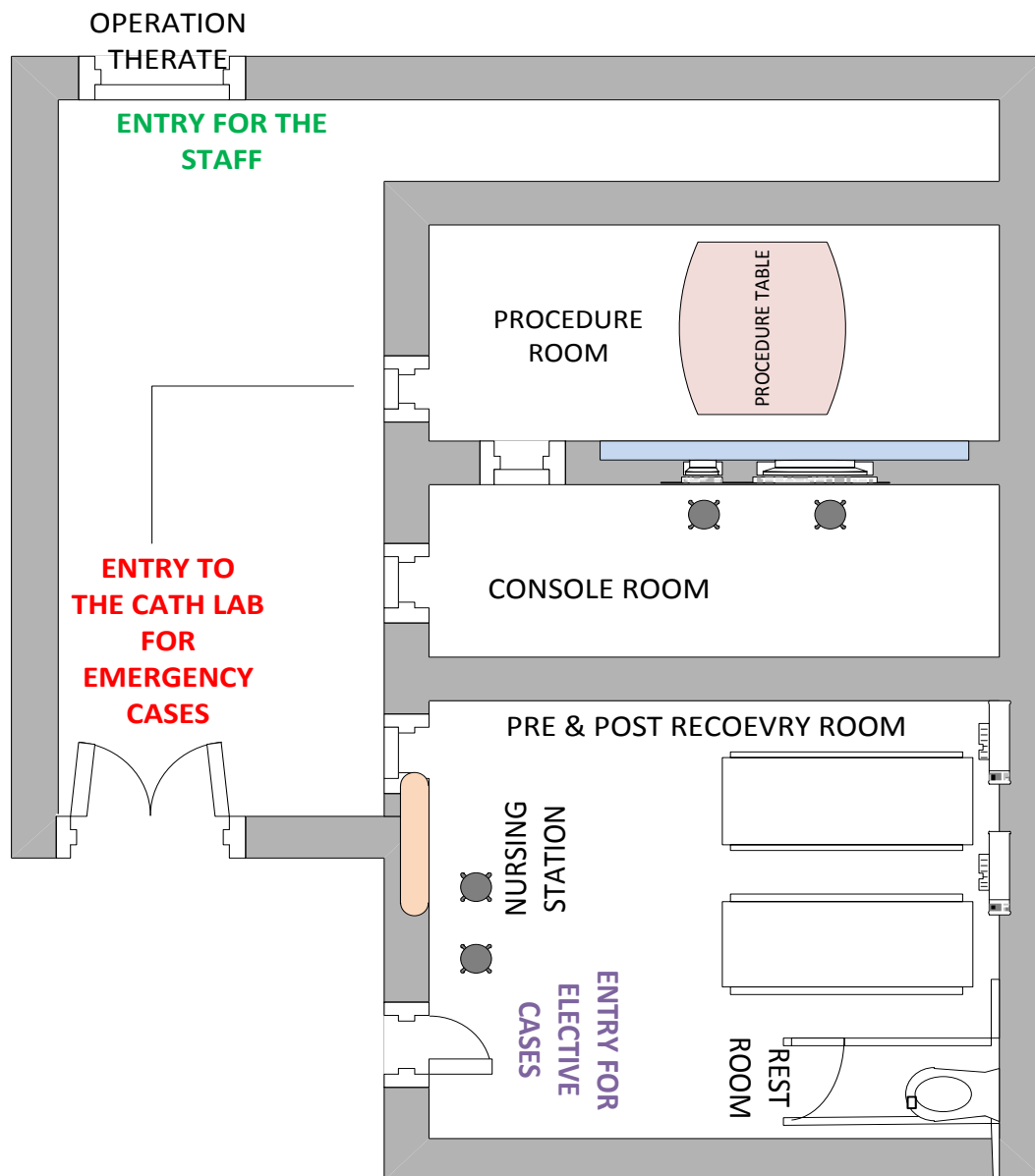


LAYOUT OF THE CATH LAB

Cath lab is located the first floor of the hospital which is connected with operation theatre.

Layout of the Cath lab is designed to understand the flow of the:

1. **Doctor and Cath lab staff:** The entry for the staff and doctors has been designed from the operation theatre.
2. **Emergency patients:** They can be directly shifted from the main entrance to the procedure room.
3. **Elective patient:** The cases which are not urgent or emergency, are first observed in the pre procedure/ recovery room for observation and then shifted to the procedure room.



Phase II

DOCUMENTATION OF THE CARDIAC CATHETERIZATION LAB SERVICE MANUAL

DOCUMENTATION OF THE CARDIAC CATHETERIZATION LAB **SERVICE MANUAL**

Cardiac catheterization lab service manual is created to serve both as a reference document and a training resource. The manual touches upon the structural and functional aspects of the department. It covers the procedures integral to effective and efficient delivery of services. It also summarizes the quality indicators, forms in use and reporting formats. This manual is designed as a living document in line with on-going business direction and growth.

This manual provides guidelines to be followed in the Cath lab for general operations and management of the services to aid in patient care delivery. This manual is a ready reference of the practical, useful information of immediate clinical relevance. It includes a collection of standards and guidelines that is assembled for the better understanding and operation of the department.

Cardiac catheterization lab service manual includes:

- **Introduction of the Department :**

The setting up of the hospital requires utmost care and attention since it deals with the life of innumerable people. The cardiac catheterization laboratory (Cath lab) facilitates with the staff and technology to support advanced coronary, valvular, and structural heart disease therapies. The latest interventional devices and supporting diagnostic tools are in routine use.

Our expertise in cardiac care helps us in caring for patients with heart disease by providing complete all-round care. This manual describes routine operations that are carried out in cardiac catheterization laboratory at Thumbay Hospital, Dubai

- **Role of the Cardiac catheterization laboratory:**

Cath Lab plays an important role in any multispecialty hospital, to provide a high quality diagnostic and interventional service for patients requiring cardiac investigation and intervention with the help of the imaging equipment used to visualize the arteries of the heart and the chambers of the heart and treat any stenosis or abnormality found; hence the Cath lab plays a pivotal role in the functioning of the hospital.

- To offer prompt, efficient and competent service to the patients at all times.
- To carrying out an in-depth investigation of patient condition taking into account patient's complete medical history, therefore strategizing a tailored treatment and top recovery plan for each.
- To endorse the highest quality care to patients undergoing invasive procedures in cardiac catheterization laboratories
- To follow the written standards, orientation guidelines, position statements and highest clinical competence.
- To maintain good departmental administrative policies and procedures.
- Adhere to standards of courtesy established by the hospital.

- **Scope of Services :** Diagnostic or therapeutic interventions provided:
 - Coronary and bypass graft angiography.
 - Ventricular angiography
 - Abdominal and thoracic aortography
 - Coronary Angioplasty
 - Rotational Atherectomy
 - Physiological Assessment (FFR - QFR) and Intra-Coronary Imaging (IVUS - OCT)
 - Renal angiography and angioplasty
 - Peripheral angiography and intervention
 - Temporary Pacemaker
 - Pacemaker simple and dual chamber
 - Implantable loop recorder (REVEAL)
- **Quality Record Forms:** Informed consent form for Coronary Angiography / Coronary Angioplasty
- **Quality Indicators:**
 - Time in & time out
 - Door to balloon for primary PCI
 - Amount of contrast used
 - Any complications
 - Bleed
 - Vasovagal shock
 - Requirement of Blood Transfusion
 - Procedure related complication
- **Responsibilities and duties:**
 - It is been designed to ensure that all hospital's policies are properly implemented.
 - Co-ordination with other units & departments.
 - Maintains good relations with the patients, customers, admitting consultants and workers in the hospital.
 - Full control for gaining the best expected harmony as a professional department and team in order to get the best medical care and service to the patients.
 - Rapid response to check any complaint related to the department (from patients, consultants, workers).
 - Preparing for ethical Committee, monthly report with contact and notification of consultants in case of medical problems, complications or malpractice.
 - Contact with consultants to inform them about promotions and hearing from them about their ideas, problems and suggestions.
 - Preparing for the monthly department Staff Meeting. Covering the absenteeism of director of the department.
 - Solving all emergency medical problems for any patient inside the hospital when requested as an assistant for a consultant.
 - Helping the department in the establishment and arrangement for up to date clinical

protocols, department's equipment, supplies, drugs, & man professional team & dealing with any deficiency in equipment's

- **Departmental Policies & Procedures:**

All the necessary and important policies needed in the department and procedure that require guidelines are documented in the manual with reference to the doctor, nursing staff, Cath lab technicians and other departments involve in the functioning of the Cath lab.

- **Which includes:** Process, Procedure and Documentation of the policy and procedure to be directed in the Cath lab for the following:

- Cardiac Cath Policy
- Pre-Cath preparation
- Receiving of patient to Cath lab
- Laboratories services and equipment
- Scheduling of procedure
- Preparation of sterile trolley
- Patient positioning
- Haemodynamic monitoring
- Management of patient undergoing Cardiac Cath procedure
- Cleaning of Cath lab
- Recording a CD
- Safety Management
- Patient Transfer
- Primary intervention protocol
- Coronary angiography(CA)
- Percutaneous coronary intervention (PCI)
- Conditions associated with cardiac arrest
- Allergic disease in the Cath lab
- Removal of femoral arterial catheters
- Internal Instructions for Cath Lab

Discussion:

The cardiac catheterization lab service manual was documented for the better understanding and for general operations and management of the services to aid in patient care delivery with expert opinions and experiences of specialist interventional cardiology, Cath lab staff, quality assurance team and other department. Document reference was also taken from Thumbay Hospital, Ajman.

The document has been shared for reference in the **Appendix 1.**

A REPORT ON:

TIME LINE STUDY FOR THE FIRST CASE IN CARDIAC CATHETERIZATION LAB

INTRODUCTION

On 1st of May, 2018 first procedure was done in the cardiac catheterization lab in Thumbay Hospital, Dubai.

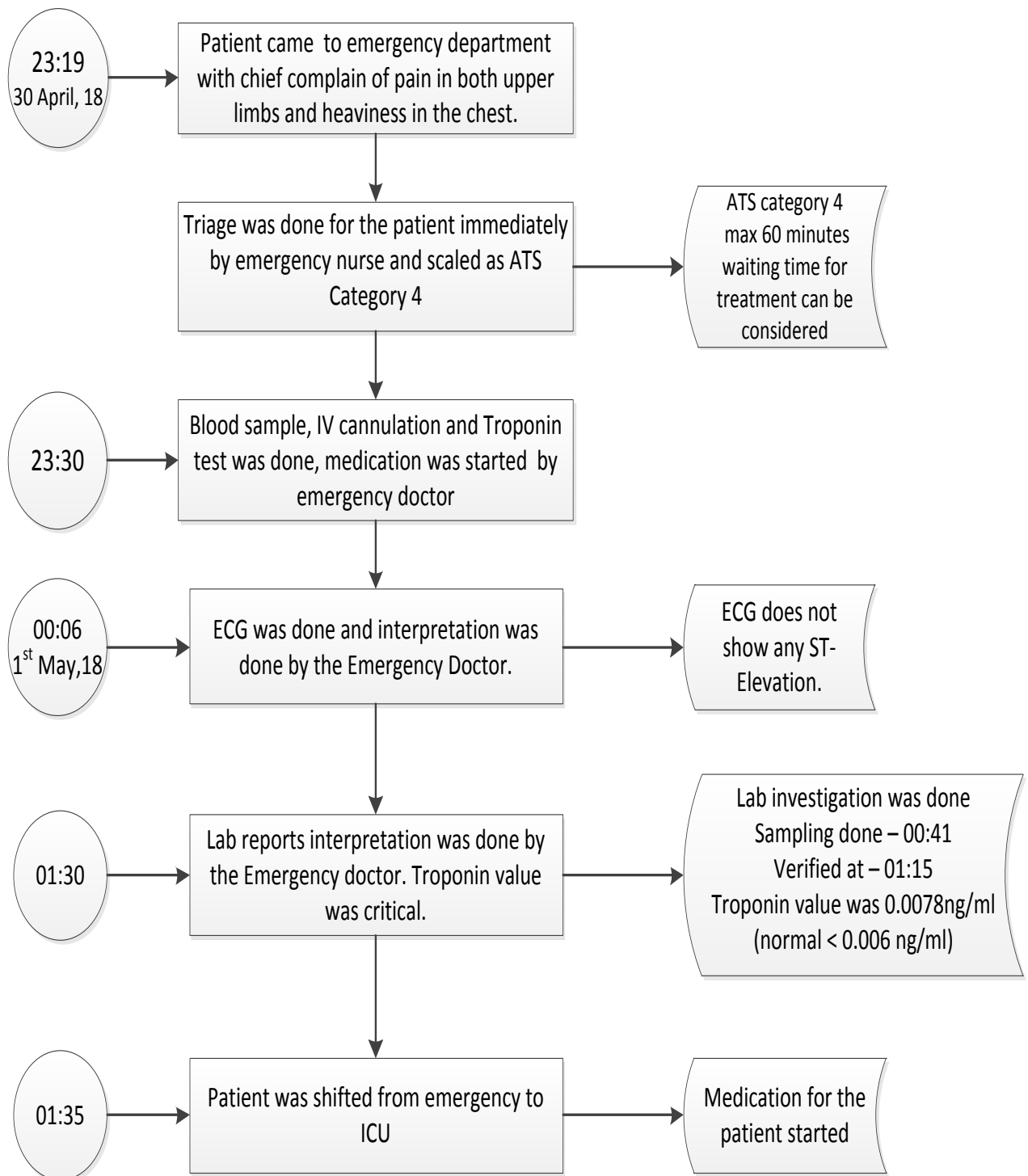
- Case detail: Coronary angiography and angioplasty to left circumflex artery was done.
- Case was elective and patient was admitted in the ICU.

Limitation:

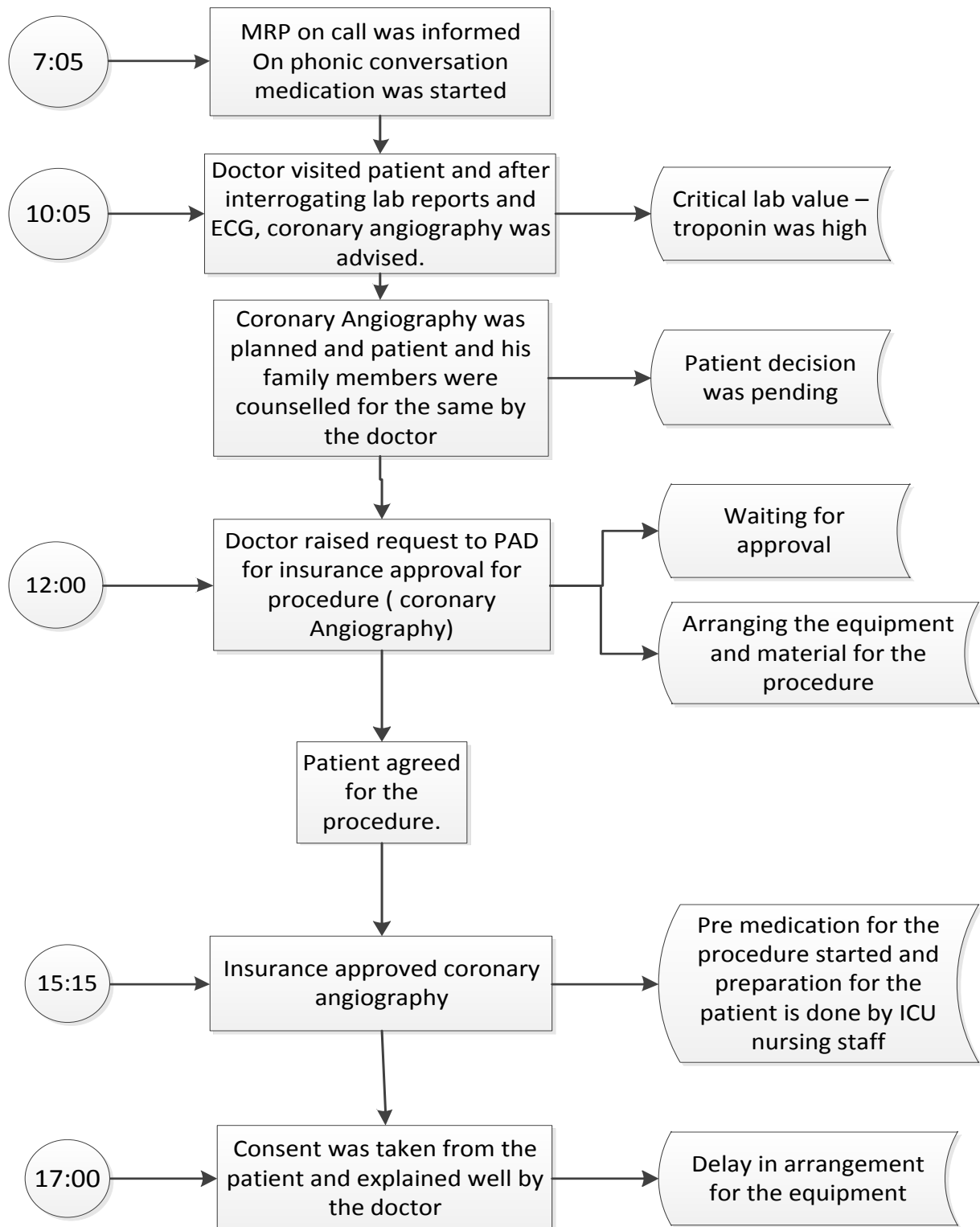
- As it was the first case in Cath lab which was not planned therefore equipped material was not present. It needs to be arranged from the Thumbay Hospital, Ajman which causes delay.
- Current procedural terminology procedure not agreed for the procedures of the Cath lab is not yet initiated.
- Software and documentation updating is still in process.

1. Time line study for the patient in emergency department

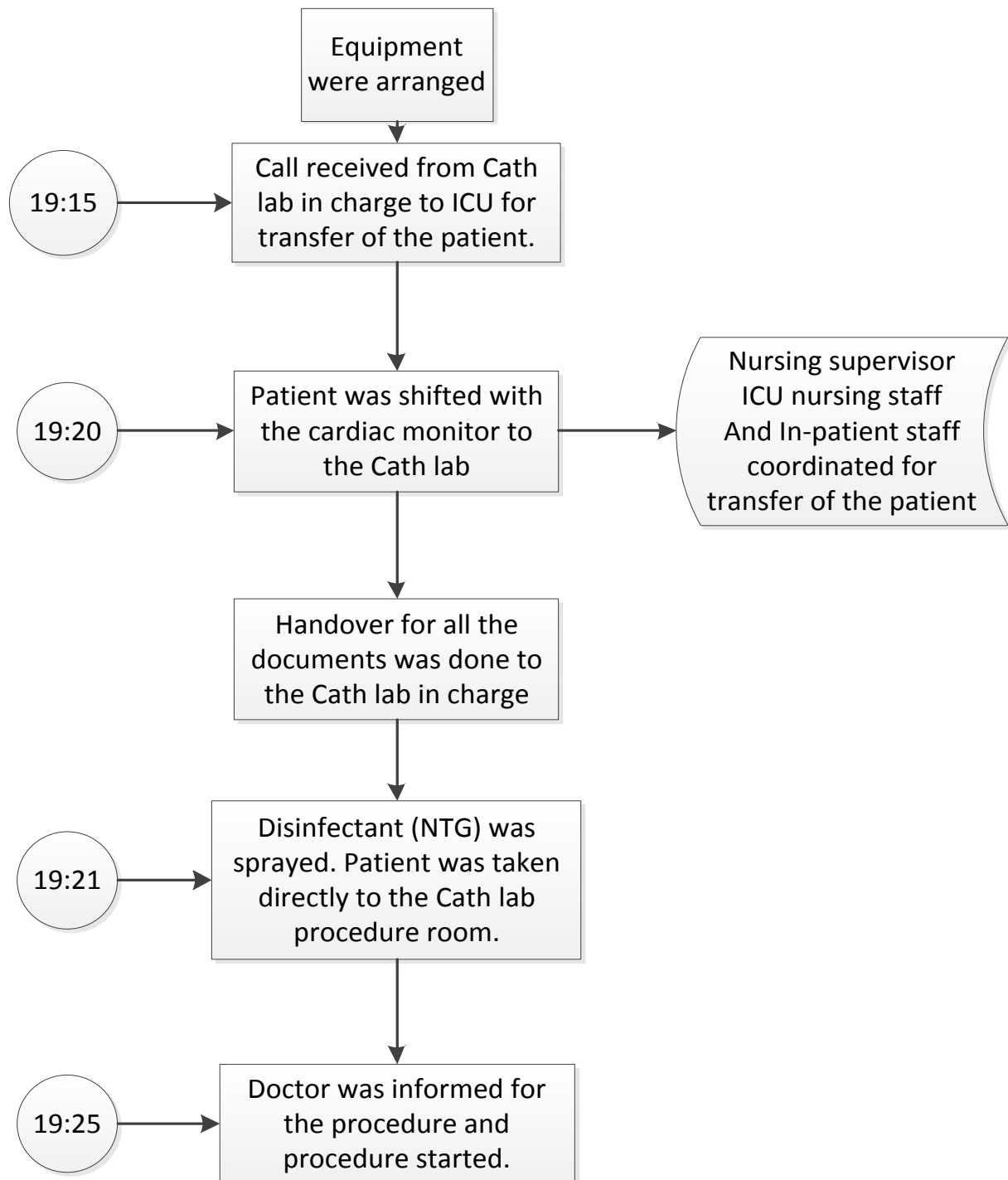
- Patient was admitted in the emergency department and was shifted to ICU after investigation



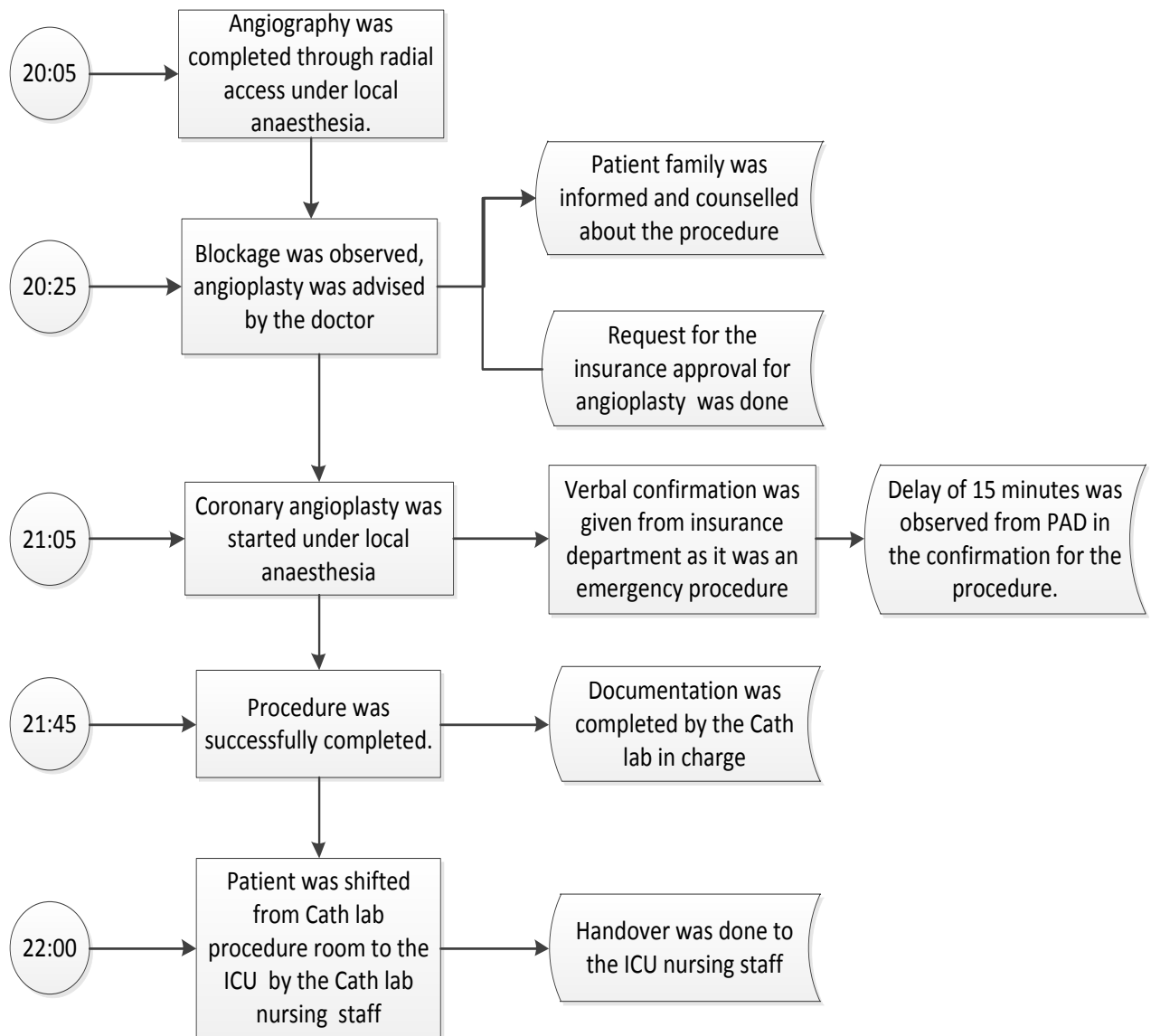
2. Time line study for the patient in the ICU



3. Time line study for the patient in the Cath Lab:



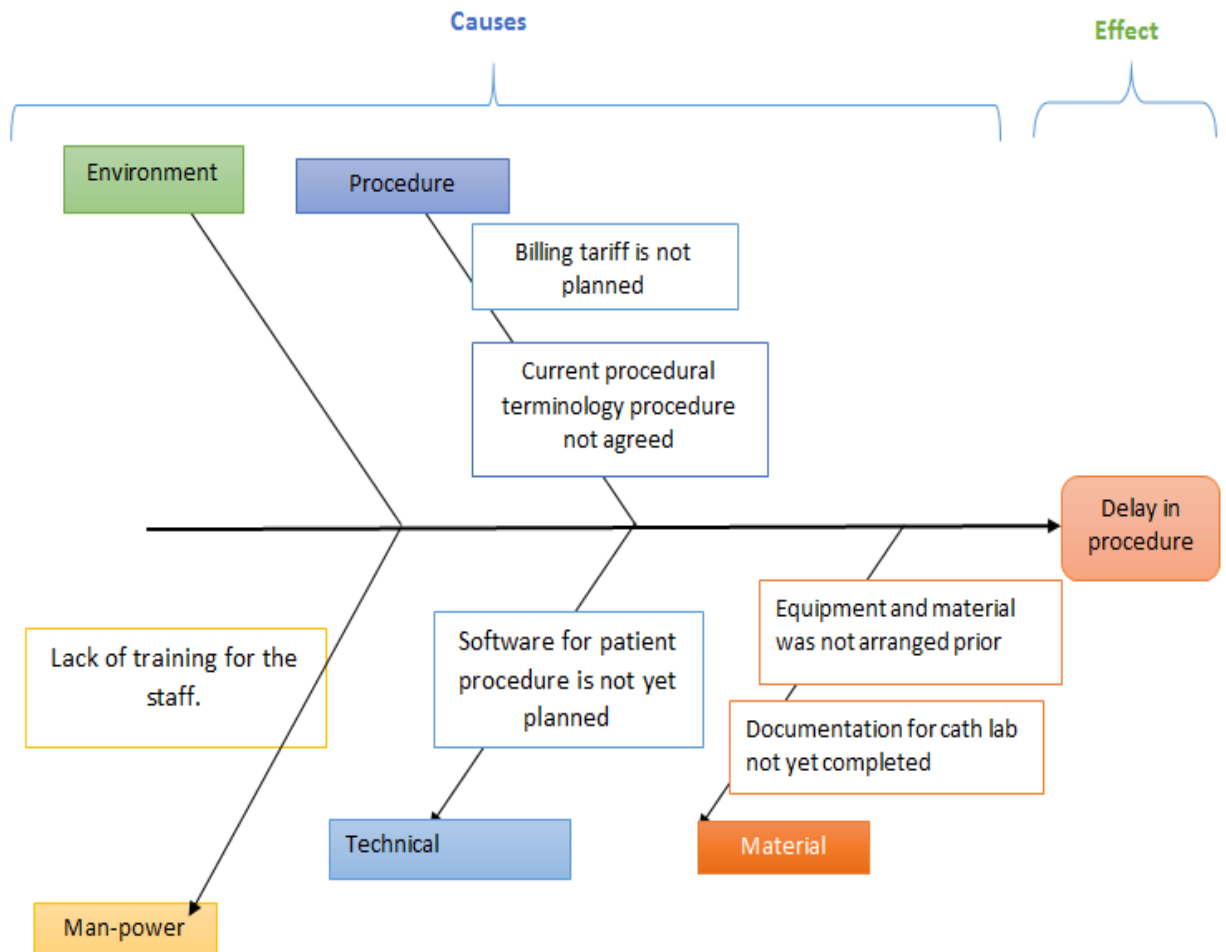
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Observations:

- Delay for 5 to 6 hours observed in the arrangement of equipment.
- Delay of 15 minutes in the verbal confirmation for insurance approval for the emergency procedure.
- Documentation for the patient was not completed.
- Process flow for the transportation of patient from was not followed.

Root cause analysis for the first case:



Recommendation:

- Training to the staff should be given regarding process flow
- Understanding for the manual and other documents require training for the staff.
- Current procedural terminology procedure and tariff should be planned for the billing.
- Equipment arrangement and inventory management planning required.

Appendix.1.



Cardiac Catheterization Laboratory Services Manual

1. Introduction of the Department

The setting up of the hospital requires utmost care and attention since it deals with the life of innumerable people. The cardiac catheterization laboratory (Cath lab) facilitates with the staff and technology to support advanced coronary, valvular, and structural heart disease therapies. The latest interventional devices and supporting diagnostic tools are in routine use.

Our expertise in cardiac care helps us in caring for patients with heart disease by providing complete all-round care. This manual describes routine operations that are carried out in cardiac catheterization laboratory at Thumbay Hospital, Dubai.

2. Role of the Cardiac catheterization laboratory

Cath Lab plays an important role in any multispecialty hospital, to provide a high quality diagnostic and interventional service for patients requiring cardiac investigation and intervention with the help of the imaging equipment used to visualize the arteries of the heart and the chambers of the heart and treat any stenosis or abnormality found; hence the Cath lab plays a pivotal role in the functioning of the hospital.

- To offer prompt, efficient and competent service to the patients at all times.
- To carrying out an in-depth investigation of patient condition taking into account patient's complete medical history, therefore strategizing a tailored treatment and top recovery plan for each.
- To endorse the highest quality care to patients undergoing invasive procedures in cardiac catheterization laboratories
- To follow the written standards, orientation guidelines, position statements and highest clinical competence.
- To maintain good departmental administrative policies and procedures.
- Adhere to standards of courtesy established by the hospital.

3. Purpose

The directive of the Cardiac Catheterization Laboratory is to provide state-of-the-art invasivediagnostic and / or therapeutic procedures for patients with cardiovascular disease.

This SoP provides guidelines to be followed in the Cath lab for general operations and management of the services to aid in patient care delivery. This manual is a ready reference of the practical, useful information of immediate clinical relevance. It includes a collection of standards and guidelines that is assembled for the better understanding and operation of the department.

4. Scope of Services

Diagnostic or therapeutic interventions provided:

- Coronary and bypass graft angiography.
- Ventricular angiography
- Abdominal and thoracic aortography
- Coronary Angioplasty
- Rotational Atherectomy
- Physiological Assessment (FFR - QFR) and Intra-Coronary Imaging (IVUS - OCT)
- Renal angiography and angioplasty
- Peripheral angiography and intervention
- Temporary Pacemaker
- Pacemaker simple and dual chamber
- Implantable loop recorder (REVEAL)

5. Quality Record Forms:

Informed consent form for Coronary Angiography / Coronary Angioplasty.

6. Quality Indicators

Time in & time out
Door to balloon for primary PCI
Amount of contrast used
Any complications
Bleed
Vasovagal shock
Requirement of Blood Transfusion
Procedure related complication

7. Pre-Cath preparation

- Purpose

1. To ensure that Cath lab is ready for use.
2. To ensure that patient understands the nature and expected outcome of procedure.

- Procedure

1. Ensure cath lab table is ready (covered with sheet) and all consumables and equipment are

kept ready for use.

2. If patient is ambulatory, provide a foot stool to get on to the cath table with help from the staff.
3. Prepare the patient for the expected duration of the procedure; it will involve lying on hard table for about 15 minutes to 1½ hour during the procedure.
4. If patient comes on bed and patient is able, ask him to move by himself to the cath table and if unable to do so, transport the patient on the cath table with the help of a roller.
5. Establish ECG, NIBP and SPO2 monitoring of the patient after explaining to the patient. ECG, NIBP and SPO2 have to be continuously monitored during the entire procedure. Care must be taken that the electrodes and lead wires do not interfere with the movement of the image intensifier.
6. Mild sedation to be administered to the patient as per doctor's orders.
7. If the oxygen saturation is 90% or below, oxygen should be administered via face mask / nasal prongs to the patient and the consultant informed of the same.
8. Once on the cath table, patient should be instructed by the circulatory nurse to carry out deep breathing or holding the breath for a brief moment and coughing on request. With deep inspiration, the diaphragm descends, preventing it from obstructing the view of the coronary arteries in a few radiographic projections.
9. Circulatory nurse should check the baseline peripheral pulses, record BP and document. Also check if the area is prepared.
10. Scrub nurse should counsel and reassure patient. Counseling should include directions to move head from side to side and brief details about the procedure. Also explain that a warm sensation might be experienced during contrast injection.
11. Connect the contrast media and keep it ready for use. In case of known allergies, high serum creatinine level, low ejection fraction, non-ionic contrast media should be used.
12. Ensure light indicator outside the main door is switched on to show procedure is in progress.
13. **Preparing patient to experience certain sensations during the catheterization.**
 - a. Ask the patient to express his fears and anxieties about the procedure.
 - b. Inform patient that an occasional pounding sensation may be felt in chest.
 - c. He / she may be asked to cough or breathe deeply especially after the dye is injected.
 - d. He / she may be asked to breathe deeply and hold the breath, in between the procedure.
 - e. He / she may have a feeling of warmth in the body especially on face, which leaves within seconds.
 - f. He / she may be asked to remain flat with the effected leg, straight for about six to eight hours.

- **Documentation**

1. Nurses progress notes

8. Receiving of patient to Cath lab

- **Purpose**

To provide a safe and efficient means for the nursing staff to identify the patient prior to acceptance into cath lab

- **Procedure**

1. The cath nurse is to request the patient (if conscious) to state his / her name in full. This is to be done in front of the ward nurse.
2. Patient ID wrist band must be visually checked along with the ward nurse across the case file.
3. The completed consent form is checked. All patients who undergo any procedure must have a written consent prior to any pre medication administered. Verbal consent is accepted in case of the emergency.
4. Pre cath checklist should be completed and signed by the ward staff and checked by the cath staff with signature.
5. Check any history of known allergy and allergy to iodine containing substances, such as sea food or contrast agents.
6. Consideration should be given to patients with communication difficulties.
7. Take over a brief clinical history of patient from the handing over nurse
8. Check patency of IV line and check the date of insertion.
9. Check the NPO status of patient. The patient should be at least four hours NPO prior to procedure.
10. Patients with renal insufficiency should be adequately hydrated pre and post procedure.
11. Provide physical assistance to ambulatory patient if required. Non ambulatory patients should be transported by trolley or wheel chair.

- **Documentation**

1. When receiving nurse ensures that all required documentation is correct and complete.
2. Both the nurses (ward & cath nurse) sign on the pre cath checklist

9. Responsibilities and duties:

- Ensures that all hospital's policies are properly implemented.
- Co-ordination with other units & departments.
- Reporting to the COO regarding the legal, ethical & medico-legal rules in the Cath Lab department.
- Reporting to the COO regarding all workers in the cath. department, observing, acting and interacting with the degree of quality (Medico-legal-Service) of their duties and attitudes.
- Maintains good relations with the patients, customers, admitting consultants and workers in the hospital.

- Full control for gaining the best expected harmony as a professional department and team in order to get the best medical care and service to the patients.
- Rapid response to check any complaint related to the department (from patients, consultants, workers).
- Preparing for ethical Committee, monthly report with contact and notification of consultants in case of medical problems, complications or malpractice.
- Contact with consultants to inform them about promotions and hearing from them about their ideas, problems and suggestions.
- Preparing for the monthly department Staff Meeting. Covering the absenteeism of director of the department.
- Solving all emergency medical problems for any patient inside the hospital when requested as an assistant for a consultant.
- Helping the department in the establishment and arrangement for up to date clinical protocols, department's equipment, supplies, drugs, & man professional team & dealing with any deficiency in equipment's

Authorities: Follow-up for all Nursing in the unit, including patients' well-being

Education: -Graduate and postgraduate of accredited faculty of medicine, Must have At least 5 years of master degree in cardiology.

Experience: -At least of 5 years having a good medical and managing experience in Intensive care work, Clinical cardiology, cardiac catheter.
 - Expert in hospital rules and paperwork.

Training: -Well trained in Clinical Cardiology, ICU, and Cardiac Catheter work.
 -Managing experience.
 -*Coronary angiography and percutaneous coronary intervention.*

Skills: -Up to dated, being alert and following the most recent Protocols procedures
 -Having a good attitude and moral and ethical way in dealing with the Hospital directors & patients.

10. CardiacCathPolicy:

This manual is created to serve both as a reference document and a training resource. The manual touches upon the structural and functional aspects of the department. It covers the procedures integral to effective and efficient delivery of services. It also summaries the quality indicators, forms in use and reporting formats. This manual should be treated as a living document in line with ongoing business direction and growth.

A variety of different procedures are now available in the cardiac catheterization laboratory (CCL). These include, but are not limited to hemodynamic evaluation, coronary and bypass graft angiography, abdominal and thoracic aortography, (PCI), peripheral angiography and intervention, cervical-cerebral angiography and interventions for structural heart disease. Depending on local needs, some laboratories may be used for electrophysiology diagnostic and therapeutic procedures with device implantation plus other non-vascular interventional procedures.

The standards herein relate to the core functions of all CCLs, specifically diagnostic cardiac

studies and percutaneous coronary intervention (PCI). Separate standards exist specifically for carotid artery stenting and are being developed for other procedures such as peripheral angiography and interventions, valvular interventions and structural heart disease interventions performed in the modern CCL. Each facility must document that they have the resources to safely perform the procedure offered in their laboratory. These vary with the type of CCL as defined below:

Patient Management Policy

1. Assure electric QC has been completed on the equipments and the instruments.
2. Disinfect the cath lab and equipment by thorough cleaning with 0.5% germicidal solution (Bacillocid).
3. Turn on X-ray equipment, generators. Take a test run preferable a flouro and acquisition.
4. Turn on haemodynamic monitoring equipment.
5. Turn on the defibrillator and do self-check test.
6. Check all equipment (IABP, ACT, Pressure Injector, Infusion pump, Syringe pump). If any malfunctions are observed report the problem to the Bio medical engineer.
7. Check the crash cart and document the same on the crash cart checklist.
8. Ensure that sufficient medical consumables are available prior to the start of procedure.
9. Maintain a temperature log of the generator room, console room and procedure room.

Documentation

1. Crash Cart Checklist
2. Temperature Log

11.Full service laboratories:

They are defined as those offering a wide variety of diagnostic and interventional procedures with on-site cardiac surgical services to accept patients requiring immediate surgery because of clinical instability or complications of procedures. Full-service laboratories operate 24/7,365 days/year.

1. **Lab Related** - Check Electrical supply to equipment
 - a. Daily quality check of equipment's
 - i. Philips ALLURA Xport FD 20
 - ii. Witt physio monitoring and information system
 - iii. Data scope IABP machine
 - iv. Heart start XL Plus Defibrillator
 - v. Temporary Pace maker
 - vi. Refrigerator temp. log
 - vii. Xcelera workstation

- b. Crash Cart
- i. Emergency Medicine stock
- ii. Expiry date
- c. Inventory of medical devices and hard wares & other necessary things on every day and monthly basis
- i. Stents and Balloons
- ii. Catheters and guide wires
- iii. Contrast
- iv. Medicines and other consumables
- d. Catheter and other Hard wares
- e. One use catheter

12. Scheduling of procedures

- **Purpose**

To ensure that procedures are taken in a timely manner with no delays.

- **Procedure**

1. Scheduling of procedures should be done in the following order of priority - Day cath patients, ICU and Recovery Room patients, Wards. This order can be superseded in case of an emergency only. Patient's spiritual needs should also be taken into consideration.
2. Based on information from Wards on readiness of patient procedures to be performed
3. Procedures planned during the day should be posted in order of criticality and intimation received. After scheduling, respective units should be accordingly informed of the same.
4. On receiving information, following details should be entered in the Cathlab appointment book - Ward, patient name, age, sex, procedure, Hospital ID, Consultant.
5. In case of postponement or cancellation of procedure, the same should be entered in the appointment book.

- **Documentation**

1. Appointment Book

13. Preparation of sterile trolley

Purpose

To be prepared for procedure

Procedure

1. Wash hands well.
2. Clean the instrument trolley with 0.5% germicidal solution (Bacillocid) before and after each case.
3. Place the sterile pack on the instrument trolley taking care that the pack should be away from the body and open it in a sterile technique.

4. Ensure sterile field is maintained. A sterile field is maintained by:
 - a. Placing only sterile items within the sterile field.
 - b. Opening, dispensing or transferring sterile items without contaminating them.
 - c. Handle sterile items with a sterile gloved hand.
 - d. Consider all items below the level of the waist to be unsterile.
 - e. Not allowing sterile personnel to reach across unsterile areas or vice versa or to touch unsterile items.
 - f. Do not cough or sneeze over a sterile field.
5. Place general consumables (syringes, infusion set, gloves etc.) and cath consumables (sheath, catheters, guide wire etc.) on the sterile trolley.
6. Take care not to spill any solution like Beta dine or heparinized normal saline on the trolley while pouring in the sterile stainless steel bowl.
7. Once a sterile trolley is prepared, no other personnel other than the scrubbed personnel to move in front of the sterile field.

14.Surgical scrub

- **Purpose**

Surgical hand wash must be performed pre procedure by cath personnel to eliminate transient bacteria and to reduce resident hand flora. The warm, moist conditions inside surgical gloves provide an ideal environment for the growth of microorganisms.

- **Procedure**

1. Remove all jewelry on hands and wrists.
2. Cover all cuts, burns and skin break.
3. Adjust the elbow tap so that water flows at a medium speed (not too slow or too fast) and wash thoroughly hands, fingertips, forearms to 5cm above the elbows in order to remove dirt and decrease number of transient bacteria and resident skin flora.
4. Clean under each fingernail and around the nail bed prior to performing the first surgical scrub of the day. Keep nails short and do not wear artificial nails or fingernail polish.
5. Holding hands up above the level of the elbow, apply antimicrobial agent to hands and forearms up to the elbows. Using a circular motion, begin at the fingertips of one hand and lather and wash between the fingers, continuing from fingertip to 5 cm above the elbow. Repeat this process for the other hand and arm. Continue rubbing for 3-5 minutes.
6. Rinse each arm separately, fingertips first, holding hands above the level of the elbow.
7. Using a sterile towel, dry the fingertips to 5 cm above the elbow. Use one side of the towel to dry the first hand and the other side of the towel to dry the second hand.
8. Keep hands above the level of the waist and do not touch anything before putting on sterile gown and surgical gloves.

15.Wearing and removal of surgical gloves

Putting on surgical gloves: (open method)

1. Prepare a large, clean, dry area for opening the package of gloves. Perform surgical antisepsis and ask someone (e.g., circulating nurse) to open the package of gloves.
2. Open the inner glove wrapper, exposing the cuffed gloves with the palms up.
3. With right hand pick up the left hand glove by the cuff, touching only the inside portion of the cuff (the inside is the side that will be touching your skin when the glove is on).
4. While holding the cuff in one hand, slip your other hand into the glove. (Pointing the fingers of the glove toward the floor will keep the fingers open). Be careful not to touch anything, and hold the gloves above your waist level.
5. Pick up the right hand glove by sliding the fingers of the gloved hand under the cuff of the second glove. Be careful not to contaminate the gloved hand with the ungloved hand.
6. Put the second glove on the ungloved hand by maintaining a steady pull through the cuff. Adjust the glove fingers and cuffs until the gloves fit comfortably.

Removing surgical gloves:

1. Grasp the cuff of the left hand glove and pull it partway off. The glove will turn inside out. Keep the first glove partially on before removing the second one to protect you from touching the outside of a glove with your bare hand.
2. Leaving the first glove over your fingers, grasp the second glove near the cuff and pull it partway off. Keep the second glove partially on.
3. Pull off the two gloves at the same time, being careful to touch only the inside surface of the gloves with your bare hand and make sure not to result in splashes in the environment.
4. Gloves are disposed immediately in the appropriate lined bin. Wash hands immediately after gloves are removed.

Changing gloves:

1. Gloves get unsterile and need to be changed - after touching the outside of gloves with a bare hand, after touching anything that is not sterile or high level disinfected, when gloves develop holes, tears, or punctures.

16. Patient positioning

Purpose

1. To perform a safe and efficient procedure.
2. To have the optimum exposure and access to the operative site.

Requirements

1. The requirements for positioning of the Cardiac Cath Laboratory patient are a key factor for Cath performance of a safe and efficient procedure. The patient's position shall provide optimum exposure and access to the operative site, shall sustain circulatory and respiratory function, shall not compromise neuromuscular structures and shall afford as much comfort to the patient as possible.
2. The patient shall be assessed prior to the procedure for the following:
 - a. Age
 - b. Height & Weight
 - c. Skin Condition

- d. Nutritional status
- e. Physical limitations
- f. Neuropathic
- g. Pre-existing disease and conditions
- h. Type of procedure

Procedure:

1. Supine position – this is the most common position used. Patients are usually anesthetized in the position and modifications are made after the induction of local anesthesia.
2. The position of the head shall place the cervical, thoracic and lumbar vertebrae in a straight, horizontal line.
3. A pillow may be placed under the small of the back to prevent strain on the back, to prevent strain on the back muscles and ligaments.
4. A small pad or pillow placed under the head allows the muscles to relax and prevent neck strain.
5. Hips shall be parallel.
6. Legs are placed parallel and uncrossed to prevent compromised circulation and nerve damage. The legs shall be slightly separated so that skin surfaces are not in contact.
7. The heels may need to be padded foam protectors, if the procedure will be extended or the patient's condition warrants it.
8. Arms are usually placed on arm boards, at less than a 90-degree angle to the body. The palms shall be turned upwards to diminish the pressure on the brachial and ulnar nerve. Foam protectors may be used to pad the elbows if necessary. Table pads and arm board pads must be of the same height.
9. Performing Allen Test

17. Main Job Tasks

1. Takes the nursing history, summarizes data, and states nursing diagnoses/ patient care needs.
2. Observes and records signs, symptoms, and behaviors, including the physiological status of patients; reports assessment changes, to the concerned authority.
3. Follows policy and delivers designated nursing interventions to assigned patients that are consistent with the stated medical plan of care.
4. Performs admission, discharge and transfer procedures, and assists others with patient's activities and care.
5. Executes physician's orders for all assigned patients; safely and properly administers medications and treatments.
6. To be responsible for collection of specimens when ordered, ensuring correct labeling.

7. To be responsible for preparing assigned patients for programmed medical procedures.
8. To participate in specialist's rounds and assist by giving relevant information as regards to nursing observations made on the residents.
9. To supervise the cleanliness of assigned area or the ward.
10. Carry out routine check at each handover that all equipment's are in working order.
11. To ensure that all items used for residents inclusive of medications, surgical supplies are duly recorded and charged.
12. To carry out inventory on surgical items and equipment for each week.
13. Maintain resident's safety by taking preventive measures against accidents.
14. Accurately records and reports incidents.
- 15.

18. Haemodynamic monitoring

Purpose

1. Improves cath lab workflow by automating and streamlining processes
2. Automatically populates the final cath report with hemodynamic data
3. Simplifies tasks in the cath lab with an intuitive user interface
4. Hemodynamic status monitoring and analysis modules enable users to monitor patient progress
5. Real-time procedure notes charting continually keeps clinical records up-to-date
6. Real-time customizable vitals chart, including pain status and conscious & sedation data, enables users to accurately monitor patient status and respond to quickly meet patient needs
7. Final hemodynamic report, including all data gathered during the procedure, helps to keep clinicians informed of patient needs
8. Hemodynamic parameters (NIBP, Pulse, HR, Temp, ECG- 12 channel, Invasive Blood Pressure, Intracardiac shunt calculation) at automated intervals and enter them in the notes.

Hemodynamic monitoring equipment:

Hemodynamic monitoring equipment is essential to the cardiac angiography suite and several products are available for consideration. However, if the vendor's hemodynamic equipment is not user-friendly, does not have database capabilities and is not upgradeable, while every hemodynamic system records waveforms, calculates shunts, gradients and other required parameters, there is a wide spectrum of capabilities among products for data entry, report generation, data basing and integration with hospital information systems.

19. Management of patient undergoing Cardiac cath procedure

Pre-Procedure

1. The physician is responsible for obtaining patient consent for the procedure. In the event that consent is not completed prior to the patient leaving the unit, the cath lab nurse will notify the physician who will obtain consent in the Cath lab.
2. For diabetic patients Insulin to be given at ½ usual dosage where applicable Glucophage: Check with Dr. regarding the dose morning of procedure (may receive the dose if no renal insufficiency) Hold Glucophage 24hours post procedure (CHECK WITH DOCTOR)
3. Continue Heparin until procedure
4. Continue Aspirin / Clopidogrel
5. Continue all cardiac medications
6. Coumadin discontinued 3 days prior to procedure Contrast :
check with Dr. regarding pre-medication night before and morning of procedure.
7. Direct anticoagulant XARELTO , Pardaxa, ELIQUIS, Stop 48 h before the procedure
8. Ensure all laboratory work ordered and sent to the lab.
9. Ensure patient has patent IV cannula (if radial approach –IV should be in left arm)
10. Remove all jewelry
11. Patient / family education

Post-Procedure

1. Arterial / Venous Sheaths Removed:
 - a. Obtain the following information from the cath lab
 - b. Results of catheterization and intervention
 - c. Time procedure completed
 - d. Amount of dye used
 - e. Amount of fluid given intra-procedure
 - f. Amount of sedation given and mental status
 - g. Methods of hemostasis (i.e. angioseal, per close, femostop & manual etc.) and time placed, removed, clipped.
 - h. Antiplatelet medications given (Aspirin, Clopidogrel, Ticagrelor, Eptifibatide, Tirofiban, Abciximab,) and the time infusion began.
 - i. Significant events (i.e. ischemic pain, bleeding, hypotension, etc.)
 - j. Check vital signs (HR, BP, and RR) every 15 minutes for 1st hour and every hour for 4 hours and then every 4 hours.
 - k. Assess procedure site and pulses every 15 minutes for 1 hour, every hour for 4 hours and then every 4 hourly.
 - l. Check orders for I V fluids post-procedure. Place fluid on Infusion pump. The Normal Saline hung during the procedure is the first liter of fluid. Label bags with date / time
 - m. Ensure cardiac monitor in place and alarms set.
 - n. Send a diet order form to Café for patient diet.

- o. Ensure that the initial assessment nursing is completed.
 - p. Check medication orders- administer the doses not given during the procedure. If Stent is placed, ensure clopidogrel or Ticagrelor is given in Cath lab.
 - q. Determine length of bed rest as per post cath / interventions orders. The length of bed rest varies depending on method of hemostasis (usually 4 to 6 hours) and is started at the time compression is completed (i.e. angioseal clipped, femostop off, end of procedure, etc.)
 - r. Ensure bed in low position. Call bell, and urinal within reach.
 - s. Or patient comfort elevate head end to 30° and bed in reverse trendelenburg. Stress importance of keeping procedure leg straight. May turn to affected side (log roll) with pillow support.
 - t. Reinforce that patient calls the nurse if feeling warmth and moistness at the procedure site, anal pain and / or before getting out of bed
 - u. If patient was on Heparin pre-procedure, check with Doctor and obtain order to discontinue or restart Heparin.
 - v. If patient is on IV Nitroglycerine, check with Doctor and obtain order to continue or wean infusion.
 - w. Hold Glucophage 24 hours post procedure.
2. Arterial / Venous Sheaths in Place
 - a. Follow above guidelines.
 - b. IV fluid should be infused via pump through venous cannula.
 - c. Arterial sheath MUST ALWAYS HAVE Hemodynamic flush system set-up and transducer.
 - d. Blood Pressure may be taken from arterial line if there is an adequate waveform and it correlates with cuff pressure.
 - e. Ensure IV fluids and Atropine are available at bedside during removal of sheath
 - f. Assist the Doctor during sheath removal
 - g. During removal of sheaths (high risk of vasovagal), HR and BP are checked every 5 minutes for 15 minutes.
 - h. When manual compression is applied, check HR, BP, groin, and pulses every 15 minutes for 1 hour, and then every ½ hour until compression is completed.
 - i. When compression is completed (or device removed), then patient is on bed rest and immobilize the punctured limb for 6 hours.
 3. Groin Care
 - a. Once hemostasis is achieved, apply sterile dressing to procedure site using a gauze and dynaplast.
 - b. Dressing remains in place for 24 hours
 - c. Avoid frequent removal of Elastoplast tape.
 - d. When oozing is noticed from the Elastoplast, remove the dressing and then give manual compression of the procedure site. (Never give compression over the dressing).

Documentation

1. Cardiac Cath flow Sheet

2. Progress Notes

Complications to watch for:

1. Angina (Indication of ischemia, vessel closure, thrombosis of stent)
 - a. Symptoms: Patient's anginal equivalent (Chest pain / pressure, jaw pain, arm pain, breathlessness, diaphoresis, etc.)
 - b. Treatment: Call Doctor immediately and obtain 12 lead ECG and give Angised Sublingual
2. Bleeding
 - a. Symptoms: Increased heart rate, decreased blood pressure. Bleeding from procedure site, retroperitoneal bleeding; flank or back pain, nausea, vomiting, vasovagal reaction
 - b. Treatment: Compression pressure at procedure site:
 - i. Manual compression to be given with gloved fingers (no gauze / dressing above and at puncture site).
 - ii. Call Doctor immediately
 - iii. Administer IV fluids as ordered
 - iv. Check Hematocrit
 3. Hematoma
 - a. Symptoms: Swelling, pain at puncture site
 - b. Treatment: Mark site with marker
 - i. Inform the Doctor
 - ii. If hematoma is expanding then apply pressure above and at procedure site.
 4. Vasovagal Reaction
 - a. Occurs most frequently during compression after sheath removal. (May be indicative of retroperitoneal bleed)
 - b. Symptoms - Significant decrease in heart rate and blood pressure associated with symptoms of nausea, diaphoresis, yawning
 - c. Treatment: Place patient in Trendelenberg position and inform the Doctor.
 - d. Give Normal Saline at 500 cc / hr for symptomatic systolic BP<80 Hg
 - e. For symptomatic HR < 40 bpm: Administer Atropine 0.6 mg IV push (Atropine should not be pushed slowly) and continues to monitor the patient.

20. CORONARY ANGIOGRAPHY (CA)

Process

- a. Technician Role
- b. Wear lead apron, lead goggles, thyroid collar and personal monitor badge (TLD badge).
- c. Enter patient details in the patient data entry monitor and Haemodynamic monitor.
- d. Connect the arterial blood pressure to the transducer. Ensure line is flushed and free of air and zero the transducer.

- e. In case of radial artery access the wrist should be adequately "cocked" to facilitate arterial access. This can be accomplished with either small, well-rolled gauze or a splint-like device.
- f. The arm board should allow for access at approximately a 45- degree angle from the patient and then allow the arm / wrist to be placed next to the hip.
- g. Provide required angulations for the procedure.
- h. Recognizing the view and the vessel
- i. In an RAO view the ribs go down to the right of the image, which is on the right of the spinal cord.
- ii. In an LAO view the ribs go down to the left of the image which is on the left of the spinal cord.
- iii. The circumflex is the vessel closest to the spine in every image.
- iv. The LAD is the vessel that travels towards the apex, it is usually the longest vessel, and it has septals coming off 90 degrees.
- Monitor continuous ECG, SPO2 and arterial blood pressure during the procedure and caution the consultant in case of variations.
- Provide cath consumables as per the requirement of consultant during the procedure and document the same on the Patient Material Requisition Form.
- In case of intravascular devices (Stents, pacemakers, closure devices or coils), the device package should be opened only when the Consultant requests for the device. Before opening, reconfirm on the type and size before finally opening the package.
1. Nursing Role

Wear lead apron, thyroid collar and personal monitoring badge (TLD badge).

- a. Scrub Nurse
 - i. The staff assigned to assist the cardiologist will do a surgical scrub, gown and glove.
 - ii. The scrubbed nurse will clean the procedural site by painting an antibacterial solution such as Betadine solution and both groins are prepared to provide easy access to the other side for patients with peripheral vascular disease and obstructive disease preventing catheter advancement or sudden instability during procedure requiring an IABP. A sterile drape (Double whole sheet) should be placed, starting at the patient's upper chest and extending to the foot, taking into consideration that two fenestrations are placed over both groins. In case of radial access painting with antibacterial solution to be done from elbow to the tip of the fingers
 - iii. For radial access patients preferable to prep the groin in case of access failure or the need for urgent IABP or a temporary venous pacemaker.
 - iv. Never leave cotton balls, cotton wool, or gauze sponges soaking in the antiseptic solution.
 - v. Never dip cotton or gauze into the antiseptic container. Instead, pour some antiseptic into a small container, dip the cotton or gauze into this small container, and discard the unused antiseptic solution (after completion of patient preparation) into the waste receptacle for liquids.
 - vi. Never leave antiseptic in opened containers.
 - vii. Assist the doctor as per requirement.

- viii. The scrubbed nurse should also monitor sedation in case patient has been sedated – level of consciousness, respiration and SPO2.
- b. Circulatory Nurse
 - i. The condition of the patient and the procedure details should be documented in the progress notes by the circulatory nurse.
 - ii. Monitor ECG, SPO2 and arterial blood pressure during procedure and caution the consultant in case of variations.
 - iii. Monitor for rigor and act immediately by administering the prescribed anti histamine and corticosteroid and document in the progress notes and medication administration chart.
 - iv. Document use of consumables during the procedure in the patient material requisition form.
 - v. In case of right heart catheterization done the blood samples need to be sent to the laboratory for analysis.
 - vi. Inform receiving ward / unit of the transfer of patient before transferring of patient.
 - vii. In case of radial artery access it is preferable that the peripheral cannula be started in the contra lateral arm so as to allow adequate flow even when a haemostasis device is in place. If a peripheral cannula must be placed in the arm on the side of the intervention, it should be placed proximal to the wrist (preferably at the level of the elbow).
 - viii. An Allen's test, or preferably oximetry / plethysmography, should be documented by the consultant and / or nursing staff.
 - ix. To perform the Allen's Test, both the radial and ulnar arteries should be occluded so as to notice obvious pallor of the hand. Pressure on the ulnar artery is then removed (while maintaining pressure on the radial site).
 - x. An abnormal test occurs when the color of the hand does not return within 8 seconds.
 - xi. In those patients who require a second procedure through the same radial site it may be helpful to perform a Reverse Allen's Test. In this situation, the physician releases pressure over the radial artery rather than the ulnar. This may detect proximal radial artery disease/occlusion that may be asymptomatic. Patients with an abnormal Reverse Allen's Test should not undergo a repeat transradial procedure from this radial site.

Documentation

- 1. Progress notes

21. PERCUTANEOUS CORONARY INTERVENTION (PCI)

Purpose

- 1. To protect from wrong treatment.
- 2. To ensure that patient understands the nature and expected outcome of procedure.

Pre Procedure

- 1. Assessment
 - a. On admission take vital signs. Repeat vital signs hourly for indoor patients especially on special drips.
 - b. Assess patient's knowledge of the proposed procedure, plan of care and educate as required.
 - c. Instruct the patient to remain fasting usually for 4 to 5 hours, before the procedure.

- d. Document pulses and ensure EKG is in chart
- 2. Investigations
 - a. Take blood for PT/PTT, CBC. Notify the M.D. for INR >2(1.5 for IJ access), platelets <150
 - b. Report abnormal electrolytes and provide for supplement as ordered.
- 3. Medications
 - a. Ensure that cardiac medications are taken including ASA if PTCA is anticipated. ASA may be held if the patient is preoperative (check with doctor).
 - b. Provide anti-anxiety medications only after consent.
 - c. Normal saline with 20G or larger cannula and ensure patency. A stopcock at the IV extension site is valuable for IV
- 4. Pre Procedure preparations:
 - a. Bilateral groin preparation unless brachial or IJ access is indicated.
 - b. Foley's catheter placement for CHF or known difficulty voiding supine.
 - c. Pre procedure patient teaching to be given.

Post Procedure

- 1. Assessment
 - a. Vital signs
 - b. Groin and peripheral pulses
 - c. Document every ten minutes until sheath is removed and vital sign every five minutes during compression.
- 2. Medications
 - a. Ensure ASA taken.
 - b. A Calcium channel blocker may be ordered pre rotabators.
 - c. A second line should be placed if any GpIIb IIIa inhibitors or other platelet inhibitors, to be given as per order.
- 3. Post Procedure Care
 - a. A C T should be checked every hour during the procedure.
 - b. Ensure all documentation is complete prior to transfer or discharge.
 - c. Ensure clothing and discharge forms are sent with patients
 - d. Complete patient and family health teachings
- 4. Special considerations
 - a. All sheaths that will not be removed immediately need to be sutured and dressed prior to arrival in the unit.
 - b. Pressurized heparin flushes in place and transduce arterial line.
 - c. Leg immobilizers can be used to assist in leg positioning.

Documentation

- 1. Consent form
- 2. Pre cath checklist

- Nurse's progress notes.

22. Cleaning of cath lab

- Sweeping should not be done in the cath lab
- Preparation of germicidal solution (Bacillocid) for cleaning should be done by taking 2.5 litre of water and adding 12.5 ml of germicidal concentrate (the strength would become 0.5%)
- Dusting should be done with 0.5% germicidal solution (Bacillocid) that is a thorough wipe down of all surfaces, articles and equipment at the start of the day.
- Wet mop floor of the lab with 0.5% germicidal solution (Bacillocid) should be done at the start of the day, after each procedure and at the end of the day. Discard solution each time after mopping.
- All waste bins should be lined with the coloured bags (refer to infection control manual) at the start of the day and as and whenever they are $\frac{3}{4}$ full.
- Segregated waste in bins should be emptied as frequently as necessary.
- Once a week the cath lab machine cabinets should be vacuumed and scrubbing of the lab done.
- Sterile instrument and linen packs should be sufficient for the day's procedures and emergencies.
- Sufficient scrub suits should be available at all times.
- Air conditioning should be checked and maintenance department be informed in case of malfunction.

Cleaning schedule

Frequency	Task
At the beginning of the day 7:30 HRS	On floors and all horizontal surfaces, cath procedure table, instrument trolley, crash cart, work area, counters, office furniture, equipment - with a duster dampened with water and germicidal solution in a bucket to remove visible dust and lint that have accumulated over night.
Between patients	On cath procedure table, instrument trolley and any other potentially contaminated surfaces in the cath lab with a duster dampened with a disinfectant solution
	Immediately clean blood spills or other body fluids with the items present in the spill kit.

	Clean visibly soiled areas of the floor, walls, or ceiling with a mop or duster dampened with a disinfectant solution
	Segregate waste in the appropriate lined bin and discard when containers are ¾ full.
At the end of the day	Clean all surfaces – including counters, tables, sink, lights, and door handles– with detergent, water and disinfectant solution then dry. Pay particular attention to cath procedure table and instrument trolley, making sure to clean the sides, base, and legs thoroughly.
	Clean the floor with a mop soaked and squeezed in a disinfectant solution.
Every week	thoroughly scrub the cathlab, console room, wash area, viewing room and changing room with water and detergent solution
	Empty the storage shelves, wipe them, dry them, and then restack.

Documentation

1. Cleaning Checklist.

23. Recording a CD

Procedure

1. On receiving information, from the customer care assistant that the patient requires a CD, the cath staff should enquire on the cath number, the date of procedure and the receipt number.
2. The technician should check if the patient's procedure is on the workstation. If not, retrieve data from the master disk and transfer the same to the local storage.
3. Open the CD writer rack, insert a blank labeled CD with patient name, cath number, date of procedure and procedure name.
4. Select the patient from local storage; click the option on screen as write CD.
5. In between the writing of a CD no patient's images should be viewed on the local storage.
6. When CD writing is complete, a message confirming the same appears on the screen.
7. The CD should be checked on a regular computer for functionality.
8. Hand over the recorded CD to the customer care assistant / patient companion and document the same in the CD book.

Documentation

1. C D Book .

24. Safety Management

- a. Identification of right patient for right procedure
- b. On arrival of the patient to cathlab for procedure the Cath lab nurse should ask the patient his/her name.

- c. Cath lab Nurse should confirm the patient name and inpatient number on the case file and identification band which is on the patient's wrist.
- d. Confirm the type of procedure from the unit nurse, appointment book and case file.
- e. Once the patient is placed on the cath table the scrubbed nurse should ask the patient his name again.
- f. Prevention from falls
- g. Patient should not be left unattended on the cath table or the hold area.
- h. Patients who are able to move on to the bed by themselves should be asked to do so while two cath lab personnel are standing on either end to support the patient.
- i. Patients who are not able to move by themselves should be transported on the bed with the help of a roller.
- j. Arm rest should be placed on either side for support.
- k. Transfer procedure
- l. Patient should be transferred to the cath table or trolley by two members of the cath team in order to prevent injury.
- m. One person should stabilize the trolley as close to the table or the other trolley. The patient should then be instructed in how to move (if alert and physically capable). The second person should stand on the opposite side of the table to receive the patient and prevent falls.
- n. Environmental controls
- o. Standard (universal) precautions should be followed for all patients.
- p. Cleansing should be done after each procedure.
- q. Air borne contaminants can be reduced by traffic restriction and proper air conditioning.
- r. Frequent hand washing and use of hand disinfectant pre and post any task should be carried out.
- s. Emergencies
- t. Patient should have a patent I V line on the left arm/ 20 G/ avoid radial and cubital puncture site on the left and the right wrist.
- u. Health care providers are required to know CPR.
- v. Crash cart should be available at all times.
- w. During endotracheal intubation, all loose teeth should be removed.
- x. Safety of personnel
- y. Annual health checkup of all the personnel in cath lab is essential
- z. In service education
- aa. Scheduled monthly in service education program should be carried out for nursing personnel.
- bb. Departmental orientation and on the job training of new and old staff should be done.
- cc. Body Mechanics
- dd. Lifting should be done by bending the knees while transferring the patient.
- ee. A roller can be of significant value in preventing strains when moving unconscious or obese patients.

- ff. Fatigue factors
- gg. Integration of individual motions and thoughtful organization of the days total work load can greatly influence ones job performance and endurance.
- hh. Needles stick and sharps injury protocol
- ii. According to the infection control manual.
- jj. Radiation Safety
- kk. To ensure radiation risk is minimized to both patients and staff, the following steps should be taken -
- ll. To lower the exposure, time spent in radiation area should be minimized. Other activities should be delayed until after cine imaging is completed and every effort should be taken by the operating cardiologist to minimize fluoroscopy and cine screening time in the cath lab.
- mm. Number of magnified views using digital imaging should be reduced and image intensifier placed as close to the patient as possible.
- nn. Most of the radiation exposure comes from extended use of fluoroscopy rather than brief cine runs and therefore the staff or operator should reduce the distance between the X ray tube and himself/herself.
- oo. Steep angulations for instance left anterior oblique cranial views may result in up to 6 times more radiation than right anterior oblique caudal views and should be used only when required.
- pp. Proper collimation and shielding is important to reduce exposure.
- qq. Use of lead aprons and thyroid shields should be mandatory.
- rr. Personnel should wear monitoring badge when ever x-ray are emitted, badge should be worn under the lead apron (0.5 mm Pb equivalent thickness) at the chest level and once in three months the cards should be sent for dose evaluation.
- ss. Only essential staff shall be in the cath lab during radiation exposure.
- tt. An investigation should be undertaken when any employee records a cumulative dose during the year which exceeds -
- uu. Interventional Cardiologist and Radiologist
- vv. Conventional Radiology
- ww. Radiographers
- xx. Non radiographic /Radiological staff (nurses, technicians)
- yy. A record of the investigation should be kept for at least 2 years. The investigation level for eye and extremity doses will be 15 mSv and 50 msv respectively.
- zz. All doses are reported in (1mSv = 100mRem)
- aaa. Annual effective dose in any calendar year shall not exceed 30 mSv, cumulative effective dose constraint for five year shall not exceed 100 mSv.
- bbb. During pregnancy the dose should not exceed 2 mS

Documentation

- TLD Badge monitoring file

25. Patient Transfer:

Purpose

To establish guidelines for speedy and safe transfer of patient

Transfer to ICU

1. All PTCA patients, patients with a sheath awaiting PTCA, interventional procedures, left main disease, severe triple vessel disease, unstable patients and paediatric procedures should be shifted to ICU.
2. On receiving bed from ICU, wheel the bed into cath lab.
3. Transfer the patient from the table to the bed with the help of a roller for patients who are unable to move by themselves.
4. Connect the patient to the transport monitor. The nurse / doctor must have a clear view of the monitor at all times.
5. Portable oxygen cylinder must be connected to the mask or nasal prongs of the patient if required.
6. Cover the patient and ensure side rails are up.
7. Inform the ICU staff about shifting as well as the number of arterial lines to be set up.
8. Cath lab nursing staff should transport patient to the ICU and hand over patient to ICU staff.
9. If patient has been intubated, the ventilator should be sent to ICU, the patient need to be ambled with oxygen and ventilator connected to the patient in ICU. Oxygenation should be monitored with continuous pulse oximeter.
10. Cath lab technician should be responsible for the IABP machine during transport.

Transfer to the ward

1. Inform the ward staff to come and receive the patient.
2. Ensure that the progress notes are complete by both doctor and nurse prior to shifting to the ward.
3. Cath Flow sheet needs to be completed and handed over to the ward nurse.
4. While handing over, check the puncture site for oozing and haematoma.
5. Confirm the presence of pedal pulses.
6. Instruct the ward staff to watch for bleeding or haematoma from the puncture site and inform consultant immediately.
7. Instruct the ward nurse to ensure that the patient's limb is kept straight for 6 hours.

Ambulation: Assess readiness to ambulate:

1. If systolic blood pressure greater than 150 mmHg or less than 90 mmHg, there must be a consultants order to ambulate.
2. Use caution with patients who received anticoagulation, thrombolytic, or antiplatelet medications. There must be no bleeding or expanding hematoma at puncture site.
3. Distal pulses are present.
- 4.

Patient / Family Education

Post - procedure monitoring / assessment.

1. Patient may experience mild oozing from incision site. Bruising of the procedural site may last for approximately 2 weeks.
2. Local groin tenderness may last approximately 1 week.
3. A 1-2 centimeter (cm) firm area at access site may last up to 6 weeks.
4. Support the area manually with light pressure when coughing, sneezing, etc.
5. No heavy lifting (anything greater than 10 pounds) for one week.
6. Report any sensation of wetness at the site while on bed rest and during initial ambulation period.
7. Wound Care: Gently clean site daily using soap and water while standing. Dry thoroughly. Keep access site clean and dry. Inspect site daily for one week.
8. Patient may shower. No hot tub, baths, or swimming until the wound is completely healed.
9. Patient may drive after 48 hours.
10. Instruct patient to notify consultant immediately for:
 - a. Significant bleeding from the site which does not resolve within 10 minutes of manual compression;
 - b. Increased swelling of groin or leg;
 - c. Unusual pain at access site or affected lower extremity;
 - d. Signs and symptoms of infections: redness, warm to touch, drainage, fever, or chills.

Documentation

1. Progress notes

Patient Identification

ID Band check ID stickers & files is responsibility of everyone.

Confidentiality and Privacy

Always to respect the privacy and anonymity of its users, including (the names, Addresses, email addresses or any other contact information, personal or medical data) provided to us by our customers in their registrations and communications with us is securely stored and not shared with any third party.

Consent and patient information:

Is an obligatory process, Patient has full rights to be informed by any inquiries and to be updated by the sequences accordingly whatever investigations, interventions or plans.
Obligatory training regarding consent criteria is a must for everyone in the department

Training Programme:

With co-operation with education Department, annual based training is obligatory for all.

Programme includes:
-Updated Protocols
-Vascular Hemostasis.
-Medication Policy.
-Hospital Orientation.

26. PRIMARY INTERVENTION PROTOCOL

D2B Team (DOOR TO BALLOON TEAM) (STEMI ALERT)

1. Pre-hospital Staff: EMS
2. Registration Personnel: Clerk or Triage Nurse
3. Initial Patient Care Provider: EMT, Primary ED Nurse, ED Charge Nurse
4. Emergency Medicine Physician
5. Activator of “STEMI Alert” Page: ED Switchboard or Hospital Operator
6. Primary, Non-physician, Patient Care Provider
Primary ED Nurse
Specific STEMI Alert Nurse, Charge Nurse, or NP/PA
7. Initial Cardiology Care Provider: Cardiology on Call Physician, Cardiology Fellow, Cardiology Nurse Practitioner/Physician’s Assistant
8. Support Staff
Phlebotomist
Radiology Technologist
Daytime Catheterization laboratory charge person
Cardiology research personnel
Hospital admitting
Other-transport, pharmacy etc.
9. Interventional Cardiologist
10. Cardiac Catheterization Laboratory Staff

The D2B Team should also include performance improvement or quality improvement staff, as Well as representatives from hospital leadership as a link to senior management.

Description of Roles and Responsibilities

1. Pre-hospital Staff: EMS

Notify ED of possible STEMI Alert patient
Transmit or provide interpretation of ECG as appropriate
Provide pre-hospital therapy per protocol or medical command as indicated

2. Registration Personnel: Clerk or Triage Nurse

Assure timely registration & room assignment for patients with suspected acute cardiac presentation
Identify patient as a possible STEMI Alert.
Request rapid assessment/assistance when uncertain of STEMI Alert status

3. Initial Patient Care Provider: EMT, Primary ED Nurse, ED Charge Nurse

Respond as “first priority” to patients identified as possible STEMI Alert
Perform rapid initial assessment with ECG and give to ED physician with the goal of STEMI diagnosed/confirmed within 10 minutes of patient arrival
Communicate with phlebotomy team or obtain appropriate laboratories

Initiate from ED physician STEMI Alert orders
Initiate STEMI Alert Collection Form
Initiate STEMI Alert Checklist
Initiate STEMI Alert Checklist Time Entry Form
Assure adequate staff availability

4. Emergency Medicine Physician

Respond with “first priority” to potential STEMI Alert ECG with STEMI diagnosed/confirmed within 10 minutes of arrival
Perform rapid patient assessment to establish patient appropriateness for STEMI Alert status
Communicate immediately with cardiologist regarding potential delays are to be avoided, if patient assessment uncertain
Activate STEMI Alert protocol
Finish patient assessment as appropriate
Implement STEMI Alert and standard orders

5. Activator of “STEMI Alert” Page: ED Switchboard or Hospital Operator

Ensure all involved in STEMI Alert program have pager for single-page system, if possible
Send specific pages to the Cardiology first call , Interventional Cardiologist, and Cath.Lab Staff
Notify hospital admissions for bed availability.
Include patient transport, phlebotomy, radiology, and research nurses, if applicable
Document all pages and call back times
Utilize back-up call lists for non-responders after third page or 10 minutes of nonresponse
Contact Emergency Medicine Physician if Interventional Physician and back-up are not available
Contact Interventional Attending if Catheterization Laboratory Staff and back-up are not available

6. Primary, Non-physician, Patient Care Provider: Primary ED Nurse, Specific “STEMI Alert” Nurse, Charge Nurse, NP/PA

Complete STEMI Alert Standard Orders with appropriate medicine administration
Complete ED portion of STEMI Alert Data Collection Form
Complete ED portion of STEMI Alert Checklist
Complete ED portion of STEMI Alert Time Entry Form
Notify family of STEMI Alert process and contact social services or pastoral services as needed for family support
Other tasks to be completed as designated among cardiology fellow, specified STEMIAlert NP/PA, or additional nursing support:
Verify contact of all personnel with page activator
Obtain patient consents, as appropriate
Assure medication availability after hours, if needed
Assist in the completion of above data forms
Assist with patient assessment and family needs from ED through cath. Lab.with discussion with physician as appropriate
Assure transport availability
Communicate with Cardiac Catheterization Laboratory Staff as needed
Assure bed availability post-procedure

7. Initial Cardiology Care Provider: Cardiology on Call Physician, Cardiology Fellow, Cardiology Nurse Practitioner/Physician’s Assistant

Respond to ED for STEMI Alert patients
Review case with Emergency Medicine Physician and assess patient
“De-activate” STEMI-Alert if appropriate

Obtain history, physical examination with attention to prior cardiac history, bypass grafting or stent placement, contrast allergy and vascular access issues
Obtain laboratory values, chest X-ray, etc.
Obtain procedure consents
Discuss case with family as needed
Arrange for additional support staff if patient care dictates: perfusion staff if need for intra-aortic balloon pump, or other consults as appropriate
Assure arrival of the Cardiac Cath. Lab. Staff and discuss case with interventional attending

“STEMI Alert” Checklist

Goal: D2B Time of < 90 minutes for non-transfer STEMI patients

If patient arrives by ambulance,

- # ECG obtained and rapid assessment conducted by EMS in ambulance
- # ECG transmitted from ambulance to ED (if available)
- # EMS sent ECG and physical assessment findings to ED to confirm STEMI

If patient arrives at hospital in personal car and/or ambulance without ECG,

- # Triage nurse performed rapid assessment, brief history, and obtained ECG for patients with typical complaints of chest pain and less typical signs of MI (e.g., in women and diabetics)
- # ECG and physical assessment findings communicated to ED physician to confirm STEMI *For all patients,*
- # 2L Oxygen administered per nasal cannula
- # ASA 81 mg x 4 tablets chewed (preferred) administered in ambulance unless already contraindicated
- # Consider morphine sulfate administered for pain
- # Intravenous Fluids started at KVO
- # Lab work drawn: cardiac markers, CBC with platelets, INR, basic metabolic panel, and lipid profile

STEMI diagnosis to activating Cardiac Cath Lab team should be less than 5 mins.

- # ED Physician notified hospital operator to send group page to Interventional Cardiologist & Cath Lab Team
- # Interventional Cardiologist responded to page within 5 minutes
- # Cardiac Cath Lab Team responded to page within 5 minutes
- # ED Physician verified with hospital operator that pages confirmed

Activation of Cardiac Cath Lab Team to arrival should take less 30 min

- # ED Physician explained diagnosis, CA. PCI to patient and family before Interventional Cardiologist arrival
- # Informed consent obtained for diagnostic cath and PCI from patient (if not given narcotics) or next of kin
- # Appropriate data collected, including vital signs, height and weight, pulmonary assessment, cardiac auscultation, peripheral pulse assessment, time of symptom onset, allergies, prior cardiac procedure history, time last date, description of chest discomfort, and family members present
- # Heparin administered in ED
- # Admitting team notified of impending need for critical care and/or step down bed
- # Staff prepare catheterization site (femoral, brachial, or radial), if cath lab not yet ready
- # ED and Cardiac Cath Lab Team shared responsibility – staff communicate among the team with the first available staff transporting the patient when the cath lab is “ready”

Cardiac Cath Lab Team arrival to intervention should be less than 35 mins.

- # Interventional Cardiologist confirmed “ready to go” within 30 minutes of page
- # Cardiac Cath Lab Team confirmed “ready to go” within 30 minutes of page
- # Cardiac Cath Lab “On Call Lab” left in a “ready state” for emergencies with supplies, trays, catheters, pumps, etc. fully stocked in case of a STEMI
- # Pre-mixed medications readily accessible to cath lab (e.g., dopamine, dobutamine, nitroglycerin, heparin)
- # ED and Cardiac Cath Lab Team shared responsibility – staff communicate among the team with the first available staff transporting the patient when the cath lab is “ready”
- # ED nurse and cath nurse completed nursing hand-off
- # Patient family sent to waiting area and pastoral care notified by ED nurse
- # Patient documentation accompanied patient to the cath lab
- # Patient lab results called to cath lab as soon as completed
- # Interventional Cardiologist scrubbed-in while patient positioned on table
- # Nurse and Technical Staff positioned patient on table, connected monitors, prepped and draped patient, and provided ongoing assessment of patient during procedure
- # Angiography of infarct related artery (IRA) performed first to allow selection and Preparation of interventional equipment while non-IRA imaged
- # Guide catheter and interventional guide wire prepped and ready for decision to proceed with PCI
- # Angioplasty balloon and/or coronary stents prepped and ready
- # Heparin administered to keep ACT

Immediate post- Intervention

- # Completed post-intervention documentation to include: IRA, type of intervention performed, total contrast dose, procedure results, etc.
- # Family notified
- # Patient transported to appropriate unit and nursing hand-off completed

27. Advanced Cardiac Life Support CODE BLUE HINTS

1. Stay calm, check your own pulse!

Familiarize yourself with the equipment on your ward(s) or hospital.

In preparation for a possible code blue, identify specific roles for different members of your team (e.g. assign one person to chest compressions, another to establish central IV access, etc).

Remember the basics: CPR, defibrillation, airway management (don't get caught up in memorizing drug dosages).

2. **Always identify yourself** as the code leader.
3. **Talk out loud** through the thinking process and algorithms
4. On starting the code, **appoint specific people to specific tasks:**
 - Get crash cart/defibrillator/backboard.
 - Get information and chart.
 - Establish airway (bagmask, intubate).
 - Establish IV access, check pulse.
 - Perform chest compressions.
 - Get ABG, check labs.
 - Nursing (give meds, place leads, etc).
 - Pharmacist (deliver meds).

5. Applying **monitorleads** to patient

6. If performing chest compressions:

Remember to get a backboard under the patient.

The optimal rate is 100 times a minute. Your job when performing compressions is to circulate the patient's blood effectively (important for cerebral perfusion and for circulation of medications).

7. Defibrillator/monitor:

Always check lead placement and check asystole or a questionable rhythm in 2 leads.

When defibrillating with paddles, use 25 lbs. of pressure.

Do not shock a systole. Take time to confirm that the rhythm is not coarse VF.

8. For **tachycardia**, ejection fraction guides treatment (try to find in patient's chart).

9. **Remember the five H's and the five T's** for PEA and asystole:

5 H's: hypovolemic, hypoxia, hydrogen ion (acidosis), hyper/hypokalemia, hypothermia.

5 T's: tablets (drugs), tamponade, tension PTX, thrombosis (coronary), thrombosis (PE).

10. **No high dose epinephrine.**

11. Don't forget to **check code status** prior to starting ACLS (make sure of the right chart)

CONDITIONS ASSOCIATED WITH CARDIAC ARREST

Condition	Clinical Setting	Treatment
Acidosis	Diabetes, diarrhea, drugs, toxins, prolonged resuscitation, renal failure, shock/sepsis, preexisting acidosis.	Ensure adequate CPR, oxygenation, ventilation. Hyperventilate. If pH < 7.20 consider HCO ₃ .
Hypothermia	EtOH, burns, CNS disease, debilitated, homeless, or elderly pt, drowning, drugs, toxins, endocrine disease, exposure, trauma, spinal cord disease.	If severe (< 30°C), limit initial Shocks for VF/VT to three. Active internal warming and resuscitation. Goal is to first get T > 30°C, Then restart ACLS.
Hypovolemic	Hemorrhage, diabetes, GI loss, shock, major burns, trauma.	Fluids, PRBC's, look for site of loss if applicable.
Hypoxia	Consider in all patients with cardiac arrest.	Ensure adequate CPR, oxygenation, ventilation, correct ETT placement.

Hypokalemia	EtOH, diabetes, diuretic use, drugs, toxins, profound GI loss, hypomagnesemia.	If < 2.5 mEq/L and associated with cardiac arrest, give 2 mEq/min IV up to 10-15 mEq and reassess.
Hyperkalemia	Renal failure, dialysis patients, metabolic acidosis, drugs, toxins, hemolysis, rhabdomyolysis, massive tissue injury.	10% calcium chloride 5-10 ml IV slow push (don't give if hyperkalemia due to dig toxicity). 1 amp D ₅₀ IV. 10 U regular insulin IV.
HypoMg	EtOH, DKA, severe diarrhea, diuretics, burns, drugs.	1-2 g IV MgSO ₄ IV over 2 minutes.
Myocardial infarction	Consider in all patients with cardiac arrest and especially those with pre-existing CAD or risk factors.	Consider thrombolytics, emergent cardiac catheterization, or urgent CABG.

Cardiac Tamponade	Hemorrhagic diathesis, post MI, pericarditis, trauma, post-cardiac surgery.	Administer fluids. Obtain bedside echo if possible. Surgical intervention if appropriate.
Poisoning	EtoH, unusual behavioral or metabolic presentation, exposure, psychiatric disease, classic toxicological syndrome.	Send tox screen, consult toxicologist. Treat suspected ingestion. Prolonged resuscitation may be appropriate.
Pulmonary Embolism	Hospitalized patient, recent surgery, per partum, history of DVT, risk factors for DVT.	Administer fluids, pressors as needed attempt to confirm diagnosis. Consider thrombolytic or urgent surgical intervention.
Tension Pneumothorax	Placement of central line, mechanical ventilation, lung disease, thoracentesis, trauma.	Needle decompression: 14 gauge angiocath at 2 nd ICS, MCL. Chest tube placement.

28. Allergic disease in the cath lab

There has been a dramatic increase in the incidence of allergic diseases over the past few years. Several experts have postulated a relationship between this increase and environmental influences, the so-called Western lifestyle or the hygiene hypothesis. This theory assumes that in the West we live in such a clean, healthy environment that we are not exposed to as many pathogens as we have been in the past. Our lack of exposure is not only due to excessive cleanliness, but also to the vaccines we receive and the use of antibiotics for minor illnesses in early life. The thinking is that this protection in early life may ultimately make us more vulnerable to allergic reactions as we get older. Whether this line of reasoning is true or not is unknown. For instance, a major concern in the United States is an increased incidence of allergic asthma, especially among poor African-Americans. This increase cannot be explained by the hygiene hypothesis alone and in reality; it is probably a combination of factors that is responsible for this current epidemic.

Anaphylaxis and Anaphylactic Reactions

Anaphylaxis is a hypersensitivity reaction, mediated by antibodies, although some may be mediated by complement. It requires previous exposure to the offending agent. For example, you've been exposed before, say to penicillin, and had an allergic reaction. If you get exposed to penicillin again, you will have an anaphylactic reaction. These reactions develop within minutes of re-exposure to a sensitizing antigen.

Another type of reaction, an *anaphylactic* reaction, is not mediated by an antigen/antibody complex, but is clinically indistinguishable from an anaphylactic reaction. One example is contrast agents. If your patient has what we typically describe as an anaphylactic reaction to the contrast agent, it really is an anaphylactic reaction. However, the treatment is the same.

The annual incidence of anaphylaxis is unknown. In the U.S., the FDA estimates the incidence at 30 per 100,000. The international incidence is approximately 154 per one million hospitalized patients per year.

Signs and symptoms. Both types of reactions are related to the release of chemical mediators from mast cells that result in systemic vasodilatation, increased capillary permeability, and airway constriction, causing the clinical signs of hypotension, bronchospasm, and angioedema all the things you've seen and don't want to see happen in your cath lab. The location of the mast cells determines which organs are affected.

Etiology: Contrast media is, of course, number one. Today, with conventional contrast agents, total adverse reactions are estimated at 5–8%. Systemic reaction to contrast media is estimated to occur in about 1 of every 500 patients.

In addition to latex, patients can also have anaphylactic reactions to ordinary medications, such as aspirin or non-steroidal anti-inflammatory agents. If your patient is on a beta-blocker, you could have more trouble treating them should they have an (admittedly rare) anaphylactic reaction. Beta-blockers may increase the incidence and severity of anaphylaxis and can actually produce a paradoxical response to epinephrine.

Who's at risk for a reaction? Anaphylactic reactions are neither dose-related nor immediate. A few months ago, there was an 18-year-old with familial cardiomyopathy who was undergoing a diagnostic cath and had an anaphylactic reaction. The patient had hardly received any contrast agent at all, so the reaction was not dose-related and was not immediate. He violated all the rules, reacting about 30 minutes into the procedure. The patient ended up having an emergency tracheotomy in the lab as a result of the intense bronchospasm and laryngeal edema.

At potential risk are patients with prior anaphylactic reactions. Watch out for patients with such history and look out for the so-called allergic patient patients who have a history of atopy.

These are patients with asthma or patients who tell you bee stings make them swell.

Latex allergies:

1. Persons with industrial exposure, even if they report no allergies, are at higher risk for latex reaction.
2. Of course, healthcare workers are also at risk, because we work in a latex environment. Whether you wear the latex gloves or not, if somebody's wearing latex or using latex equipment, latex is in the air, and you're being exposed.

It's also recommended that we question everyone for a history of latex allergy:

Have you ever blown up a balloon and had hives or swelling?

Is there any local swelling or itching after any exposure to rubber?

All high-risk patients should be offered testing for latex allergy. This should be done by an immunologist or allergist who's very familiar with this process and who has resuscitation equipment nearby, because there have been very bad reactions reported to latex testing. Routine testing at this stage is not recommended for low-risk patients.

All procedures for this population should then be performed in a latex-free environment. This means no latex gloves or latex accessories should come into direct contact with the patient. Any patient with spinal bifida needs to be in a latex-free environment or any patient with a positive history, which includes an immediate hypersensitivity reaction associated with latex. Patients with eczema associated with latex glove use should be put into the high-risk category.

Pretreatment: Pretreatment with high-risk patients even before you get them into the latex-free environment may or may not be useful. The usual benadryl, maybe steroids, are recommended, although it's not mandatory. Remember, even though you now have a latex-free environment, there is still latex in the air.

The choice of steroid is not critical. Antihistamines include the 1st generation H-1 blocker diphenhydramine (benadryl). Cimetidine is a H-2 blocker, and a questionable one for this indication. This is because a contrast agent reaction is not an IgE-mediated response. It shouldn't make a difference whether or not you give cimetidine, but most facilities do, and our lab does also. When we identify a patient who has a contrast allergy, they're given benadryl and cimetidine, and then, of course, they're targeted for the low-osmolar non-ionic contrast.

What happens in a contrast reaction? Hopefully, you have never seen a contrast reaction, but if you've been around long enough, you will. Exposure generally occurs within 20 minutes. The clinical signs and symptoms include: a drop in blood pressure, tachycardia all the usual things that tell you you're in trouble. Watch out for patients who have pacemakers (more and more of our population), and patients who are on beta-blockers. With the beta-blockers, you might miss the onset of the reaction because they can't mount compensatory tachycardia. Symptoms can progress rapidly.

Treatment includes:

1. Epinephrine, immediately.
2. Antihistamines.
3. Large-fluid boluses (more than you think is possible). Within 10 minutes, about 40-50% of blood volume is diverted because of massive vasodilatation.
4. Crystalloids may help.
5. Inhaled salbutamol or epinephrine may help.
6. High-dose steroids.

30. REMOVAL OF FEMORAL ARTERIAL CATHETERS

Equipment Needed:

- 1- Sterile tray with suture removal scissors.
- 2- Chlorhexidine 2%.
- 3- 2- 4x4 gauze squares.
- 4- Transparent dressing.
- 5- Bedside stool (if required).

- 1.) Check ACT to reduce risk of bleeding. If prolonged or patient has altered coagulation (e.g. received TPD), notify the physician.

NOTE: prior to removal of a femoral line sheath obtain order to remove.

- 2) Obtain a bedside stool if required to ensure that nurse is positioned above the femoral artery when applying pressure. Direct, downward pressure is required to compress the artery.

- 3) Cleanse site with 2% chlorhexidine and remove any sutures.

Chlorhexidine 2% is the recommended agent for disinfecting vascular access sites at LHSC because:

- It has anti-staphylococcus properties that are equal to alcohol..
- Is less irritating to the skin than iodine preparations.
- Has longer residual action than alcohol.

- 4) Gently withdraw catheter while applying direct pressure with the sterile gauze. Direct alignment improves body mechanics and pressure application

- 5) Inspect catheter for clots and ensure entire catheter has been removed. Clots can form on catheter tips: these can embolize to the distal extremity.

The nurse should be positioned directly over the femoral artery using his/her body weight to provide direct pressure.

IN THE EVENT OF CATHETER FRACTURE:

Apply direct pressure over the site and notify the physician immediately. If the catheter fragment is palpable, apply additional pressure distal to the catheter. Catheter fragment embolism can occlude distal extremity circulation, urgent surgical excision is required.

- 6) Hold direct, manual pressure for a minimum of 5 -10 minutes. Carefully check the site. If oozing Continues, compress for 5 more minutes before checking again. Hold direct pressure for a minimum of 5 minutes after evidence of bleeding has stopped.

NOTE: for femoral line sheath removal, 20 minutes or more of pressure might be required.

Ensure bleeding had stopped before discontinuation of pressure. Prolonged and direct pressure is required to stop bleeding from an artery. Inadequate hemostasis can lead to retrograde bleeding. Hematomas can cause impaired circulation to the distal extremities and are painful for the patient.

- 7) When bleeding has stopped, apply a 2x2 gauze or 6transparent dressing over the site. The transparent dressing products against entry of pathogens while allowing observation of the site.

- 8) Immobilize the leg. A sandbag can be used to remind the patient not to flex the hip. An ankle restraint can be used to promote immobilization. Sandbags WILL NOT stop bleeding: they are used to restrain the leg and to remind the patient not to flex the hip. Immobilizing the leg can minimize the risk for bleeding.

- 9) Keep the patient flat without hip flexion for a minimum of 6 hours (longer bed restriction should be considered for patients with increased bleeding risks).

The patient may have a pillow under his head, but not be allowed to lift their head or flex their hip. A sand bag can be applied to remind the patient not to flex the hip (but will not provide any hemostasis). Avoid the use of the mechanical vibrator during the period of ended.

Transfers to floor .Do not transfer the patient until the bed rest period has ended.

Hip flexion or abdominal straining can increase femoral artery pressure and risk for bleeding.

Evaluation of the complication rate in patients following implementation of a 2 hour bed rest protocol post cardiac catheterization supported a reduction in the duration of bed rest from 6 - 2 hrs. The potential for the mechanical vibrator to increase the risk for bleeding has not been established.

However, it is reasonable to avoid activities that might theoretically increase bleeding risk.

Immobilization of the leg during the bed rest period is important, transfer requires movement from one bed to another. The patient requires close monitoring of the site and distal extremity and the nurse, patient ratio on the floor may be insufficient.

10) DO NOT APPLY A PRESSURE DRESSING. CESSATION OF ARTERIAL BLEEDING REQUIRES DIRECT PRESSURE, A PRESSURE DRESSING CAN INCREASE PATIENT DISCOMFORT AND DELAY THE DETECTION OF BLEEDING. Pressure dressing because increased nausea, back pain, groin pain and urinary complications in patients treated with pressure dressings versus no pressure dressing. There was no difference in bruising between groups; the group with pressure dressings had less bleeding (that required manual pressure). However, bleeding occurring later in the pressure dressing group.

11) Assess site for bleeding and evaluate distal extremity for colour, circulation and motion q 5 Minutes x 30 minutes, q 30 minutes x 2 then q 1hx4. Apply direct pressure if bleeding is detected.

Report any changes to the physician immediately and document in clinical record. Bleeding of bruising is an important complication following arterial catheter removal.

Impaired circulation to the distal extremity can occur secondary to migration of a thrombus or catheter fragment. Hematoma formation or vascular injury. Urgent medical intervention may be required to restore limb perfusion.

12) Document removal in AI record (CCTC). Kardex, graphic record (flow sheet) and vascular line tracking record (UC). To communicate

Internal Instructions for Cath Lab

Patient's File

Full patient's file data including pre-prior and post Cath data including mandatory Cath Investigation, history, preparation, precautions, consultant's orders, consultations, transfer data, Plan and any event occurred.

Signed by cardiologist. A new Cath lab sheet and notes were updated to be reviewed and Patient care, performance and clinical protocols following.

Patient's Care:

To be assessed by points for each file and formulated to percentage at end for each cardiologist.

1-Booking.

- Secretary is the only responsible for booking.
- Cardiac Cath secretary or in charge Cath residents (after contact secretary) are the only persons responsible for booking cardiac Cath schedules and time tables.
- Cardiac Cath secretary is the only responsible(or in charge resident) for transfer (to and from) Cath lab and communication with the other departments.
- Priority is for emergency cases (Primary interventions or life saving conditions) (assessed by in-charge resident).
- 60 minutes is the accepted time for booking with maximum 30 minutes delay
Whatever due to consultant or procedure delay.
- Followed cases would excused for delay and schedule changed automatically
Accordingly.
- If Consultant delay is more than 30 minutes the procedure postponed to be after the last booked case.
- Any Cancellation must be arranged with the In-Charge resident to check medical condition and patient safety.

2-Procedure Report

- Hospital form and Logo are obligatory.
- A hand written draft by the consultant till his documentation signature on the print out report.
- Patient must receive the report& CD before discharge

Cath Lab Technician

- 1-Identify patient data and give a serial Cath number
- 2-Alert secretary and CathLab Nurse by serial Cath number.
- 3-Cath machine, Pressure monitoring during procedure.
- 4-CD Film Recording.
- 6-A monthly backup DVD copy sent to secretary.
- 7-Daily Check for Cath machine &Software.(Assih-CAR-PRO-00).
- 8-Monthly check and test for aprons and radiation safety measures.
- 9-Notify Supervisor &Biomedical by any Technical problem (assih-BM-0000)
- 10-Arranging Maintenance schedules with Supervisor &Biomedical.
- 11-Daily check to CDs, dye and materials.
- 12-Sending a CD copy to the secretary with Cath number and a handwritten draft for report by consultant & after doing a test on external PC.

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