SREE CHITRA TIRUNAL INSTITTUE FOR MEDICAL SCEINCES & TECHNOLOGY, TRIVANDRUM, KERALA

Clinical Attachment for M.Tech. Clinical Engineering Students at SCTMST

Introduction

As an essential part of the M. Tech. Clinical Engineering Prorgramme, the students will have to undergo a clinical attachment in the SCTIMST hospital. The purpose of this clinical attachment would be to

- Expose students to the clinical environment and to provide general awareness of routine activities of a hospital.
- Understand basic methods and logical processes used by clinicians to investigate and diagnose a clinical problem.
- Learn the language of clinicians and learn to interact with them effectively
- Undertake an exercise aimed at identifying problems faced in a typical clinical environment and propose innovative/novel solutions to these problems.

One clinician from each department would be assigned to the students as a mentor, who would coordinate the visits of students in the respective departments and also discuss and analyse their experiences on a regular basis. The mentors would also carry out continuous assessment. The students would also attempt to identify a few problems, which could be solved through good clinical engineering practice such as by implementing effective equipment management, safety evaluation and preventive maintenance.

This document provides the list of topics covered by each department as well as the time table for rotation of students through all the departments.

Clinical Mentors

1. Dr. P. K. Dash, Anaesthesiology (Overall Coordinator)
2. Dr. C. Kesavdas, IS &IR (Overall Coordinator)
3. Dr. S. Harikrishnan, Cardiology
4. Dr. Baiju Dharan, CVTS
5. Dr. S. Sajith, Neurology
6. Dr. Easwer, Neurosurgery

Dr. Dash will also coordinate with paramedical departments

Exam format:

1. Students would write a daily journal based on what they would see during the day in a reasonable detail. They can also make a note of questions, which they would

ask, and the answers given or even the questions, which they thought, they would ask on subsequent days.

2. Each student should identify a project; prepare a proposal including technical details (literature survey, proposed technical solution, etc) as well as execution details such as human resource requirement, budget calculation, and Time schedule.
3. Oral exam will involve project proposal presentation.
4. Objective questions from each department would be included in the question paper for a short written exam.

DEPARTMENT OF CARDIOLOGY

COURSE CONTENTS OF JOINT M. TECH CLINICAL ENGG.

TRAINING IN CARDIOLOGY DEPARTMENT

DURATION -- 3 WEEKS
HOURS PER DAY – 3.5
NUMBER OF DAYS – 15
TOTAL HOURS – 52.5

TOPICS TO BE COVERED

I. INTRODUCTORY LECTURES

Hour 1

1. Objectives of the training in cardiology.
2. Course contents – Theory, Practical
3. Approach to Cardiac patients.
4. Approach to Ill Patients / Elderly Patients / infants / small children

II. CARDIAC ANATOMY

Hour 2,3

1. Anatomy of Heart: Surface anatomy, gross anatomy, cardiac chambers, valves, and blood vessels.
2. Arteries, Veins, Lymphatics
3. Coronary circulation and coronary venous drainage
4. Conduction System of Heart – Part I

5. Cardiac Anatomy and Cardiac Function – Circulatory System

III. CARDIAC PHYSIOLOGY

HOUR 4

1. Normal Cardiac Cycle
2. Cardiac Cycle, Circulation, Tissue Perfusion – Unified Concept
3. Circulation in Health and Disease: Cardiac Output, Blood Pressure, Heart Rate / Pulse

HOUR 5

4. Heart Sounds, Murmurs
5. Stethescope, phonocardiography

HOUR 6

6. Blood pressure
7. Measurement of Blood Pressure: Technique: Sphygmomanometer

HOUR 7

8. Oxygen Saturations: Physiology of Oxygen Transport
9. Blood Gases – Technique and Various Parameters

IV. CARDIAC PATHOLOGY / PATHO PHYSIOLOGY

Hour8

1. Atherosclerosis, Coronary artery disease and Myocardial Infarction

Hour 9

2. Valvular Heart Disease including Rheumatic Heart Disease

Hour 10

3. Congenital Heart Disease: Acyanotic and cyanotic, Shunts, R-L, L-R

HOUR 11.

4. Pathophysiology of Heart Disease in General
    - ❖ Myocardial Failure
    - ❖ Pump Failure
    - ❖ Circulatory Failure
    - ❖ Impact on other organ systems- Eg. Kidney

Hour 12.

5. Monitoring Patients with Heart Disease
    - ❖ Clinical Monitoring gadgets

- ❖ Invasive Monitoring, CVP, Intra Arterial BP, PA Wedge Pressure, Cardiac Output

ELECTROCARDIOGRAPHY

Hour 13,14. (Includes ECG lab visit)?

1. Basics and Principle
2. ECG Machines: Functions, Frequency Response, Recording Speed, Sensitivity, Standardisation, Stylus Lag (Heat Stylus)
3. Electrodes - Lead Placements
4. Normal ECG: Wave Form and intervals
5. ECG changes in heart disease – overview.

Hour 15,16 (Includes visit to the Stress test lab)

EXERCISE ECG

1. Exercise Physiology
2. Equipments / Types of Exercise ECG
3. Lead Placement – Rationale, Limitation
4. Monitoring during Ex. ECG: Clinical / ECG / Parameters
5. Exercise ECG Protocol: Indications / Advantage and Disadvantage
6. 2 Step / Bicycle Ergometer, Other Stress Tests: Thallium, stress echo
7. Nuclear scans – Guest Lecture CMC

Hour 17,18,19,20 (Includes demonstration in Echolabs and Cathlabs)

ECHO CARDIOGRAPHY

1. Principle of Echo Cardiography
2. TRANSDUCERS
3. M-Mode Echo Study: 2D Echo Study:
4. Doppler principle – Doppler echo including tissue doppler and color
5. Echo for Cardiac Function
6. Echo in Heart Disease:
7. Contrast Echocardiography:
8. Stress Echocardiography:
9. 3D Echocardiography
10. TRANS ESOPHAGEAL ECHO
    - ◈ Transducer: Maintenance, Sterilization, Handling etc.

11.Intra Vascular Ultrasound, Intracoronary Doppler wire, Tissue Doppler

12. OCT, Intravascular MRI, Assesment of vulnerable plaque. Raman spectroscopy.

HOURS 20-25 (INCLUDES LIVE PROCEDURES IN CATHLAB)

CARDIAC CATHETERISATION - INTRODUCTION

1. Cardiac Catheterisation: Laboratory Setup / Types of Procedures

2. Sterile Techniques in Cath lab –Re-use of catheters
3. Equipments: Cath-Lab Equipments
    - Defibrillator / Temp. Pacemaker / IABP
    - Programmed Stimulators, Pacing System Analyser
    - Hemodynamic Recorders
    - Transducers
    - Recording of Pressure Wave Form:
4. Hazard Management
    - Radiation Protection
    - Injury Prevention: Electrical /Mechanical
5. Equipment Maintenance
6. Cine Angiography: Cine Filming, Cine Film Processing and Cine Film Viewing, cine film library, Digital work stations, QCA, 3D Re-constructions, rotational angio,
7. Contrast Media

HOURS 26

CARDIAC CATHETERISATION LABORATORY – PART- II

1. Cardiac Catheterisation Procedure: Diagnostic Studies
2. Cardiac Catheterisation Procedure: Therapeutic / Interventional Procedures
3. Acquisition of Cath Data: Cardiac Output / Oximetry and Shunts
4. Acquisition of Cath Data: Pressures and Wave Forms; Analysis
5. Angiography: - Pressure injectors

Hour's 27- 33. – Includes Practical sessions in cathlabs

CARDIAC CATHETERISATION LABORATORY – PART-III

Hardware – Materials, manufacturing and problems

(Should concentrate on materials, expected characteristics, types of wires, necessity of different types, scope for improvement)

1. Venous and Arterial Check Flow Sheaths, Manifolds,
2. Guide Wires and Dilators
3. Puncture Needles (Vascular Access Needles)
4. Woven Dacron Catheters: GL, NIH, Lehman, Woven Dacron Electrode Catheters
5. Flow Directed Catheters (Swan Ganz Type) Balloon Angio Catheters
6. Polyurethane Catheters: Pig Tail, Judkins, Coronary, Amplatz Coronary, Brachial Coronary, Sones Catheters

7. Guide Wires: Short, Normal Length, Exchange Length 'J' Tipped Movable Core, Tips, Deflectable Types
8. Valvuloplasty Catheters, Atrial Septostomy Catheters
9. Coronary Angioplasty: Guide Catheters, Guide Wire, Balloon Dilatation Catheters, Indeflators, Y Connectors
10. Rotablator, DCA, Thrombectomy devices, Distal and proximal protection devices.
11. IABP

IMPLANTS

12. Stent design, stent materials –

    Types of polymers, methods of drug delivery,
    Types of drug, mechanism of action,
    Effects of various DES,
    Scope for improvement,
    Threat of late stent thrombosis, measures to prevent,
    Newer designs, scope for improvement

13. Details regarding cardiac devices

    - Nitinol devices
    - PTFE Devices
    - Stainless steel devices T

    Types of devices available, scope for improvement, latest
    In the line, newer concept

. Mechanical heart valves

Hours 34-42 – Includes sessions in EP Lab and Pacemaker Clinic

PACING AND ELECTROPHYSIOLOGY

1. Arrhythmias: Brady and Tachy Arrhythmias
2. Indication For Temporary / Permanent Pacing Technique:
3. Temporary Pacing – External and Internal pacing- Devices
4. Permanent Pacing: VVI, AAI Pacing (Single Chamber Pacing)
5. Permanent Pacing: DDD, other Modes of Pacing
6. Pacemakers – Devices, scope for improvements
7. Pacemaker Clinic: Management of Pacemaker Patients, programmers

8. Holter Monitoring – Devices, Techniques, Holter Analysis – HRV, ST Analysis, Arrhythmia analysis.
9. Intracardiac Electrogram – Technique, Analysis, Intervals etc.
10. Electrophysiological Studies
    Equipment, catheters
11. Radio Frequency Ablation.
    Equipment, catheters
12. Implantable Cardioverter Defibrillator
    Devices available, Problems, Scope for improvement

Hours 43-45

Cardio-pulmonary Resuscitation

1. Cardiac Arrest
2. Resuscitation
3. Defibrillators – Devices available, scope for improvement

Hour 46

1. Preventive Cardiology
2. Molecular Cardiology

Hour 47

3. Cardiology and integration with radio-diagnosis
    a. MRI
    b. CT Scan

Hour 48

Need of research in various aspects of cardiology and options

4. Future of cardiology

HOURS 49-51

Submission and discussion of potential research proposals with the faculty of department of cardiology – 3 proposals – one hour each

Hours 52

Review and assessment

DEPARTMENT OF NEUROLOGY

Course contents of MTech Clinical Engineering: Training in the Department of Neurology

Duration : 3 weeks

Hours per day : 3

Number of days :15

Total Hours :45 Hrs

Topics

I. Introductory Lecture (Hrs 1-2)

1. Objectives of training in Neurology.
2. Understanding the Subject
3. Introducing to clinical situations.
4. Approach to Neurological illness
5. Applied Engineering

II.Neuroanatomy (Hrs 3-4)

1. Structural Organization of Nervous system.
   -Concept of CNS, PNS, ANS etc.
2. Brain
3. Spinal Cord
4. Peripheral Nerves, Somatic & Visual innervations
5. NM junction and Muscle
6. Blood supply to brain & Spinal cord.

III.Neuro Physiology (Hrs 5-6)

1. Functional organization of Brain
2. Cognitive Neurology- functional Organization
3. Motor system – Pyramidal and extra pyramidal
4. Regulation and maintenance of balance- cerebellum
5. Sleep
6. Somantic / visceral function regulation
7. Brain metabolism
8. Neuro endocrinology
9. Neuroplasticity

IV.Neuropathology/ Pathophysiology

Common Neurological diseases: introduction (Hrs 7-8)

1. Epilepsy
2. Stroke
3. Movement disorders
4. Cognitive disorders
5. Neuromuscular disorders
6. Sleep disorders

V. OPD visit (Hrs 9-10)

VI. **Postings in Neurophysiology lab: will include interaction with Technologists also (Total 8 Hrs)**

EEG: (Hrs 11-12)

1. Electrical activity of brain: Physiological basis.
2. Electrical fields and recording technique
3. Engineering principles
4. Electrodes, conductive gels
5. Analysis to display of EEG
6. Artifacts – origin

VEEG: Principles

Evoked Potentials (Hrs 13-14)

Visual Evoked (VEP) Potentials

1. Basic Visual pathway
2. Gen.principles
3. Mechine and recording

Brain stem Auditary Evoked Potentials (BAEP)

1. Basic auditory pathways
2. Principles
3. Recording principles

(SSEP) Somato sensory Evoked Potentials

1. Basic neuronal circuits
2. Recording Principles

NCV and EMG (Hrs 15-16)

1. Basic physiology revision
2. Machine components, electrodes, EMG needles
3. Stimulation and recording technique of NCV and
4. Electromyography

Neuro sonology: (Hr 17)

Principles of US Doppler, HITS
Applications
Transducers

Transcranial magnetic stimulator: (Hr 18)

Principles
Research/Diagnostic applications

<u>Postings in Neuro specialties</u>

Epilepsy: 2 days (Hrs 19-22)

- Pathophysiology
- Clinical types
- Concept of refractory epilepsy
- Investigative modalities - Invasive monitoring, electrodes,
- Treatment options- Epilepsy surgery, VNS, TMS

Stroke: 2 days (Hrs 23-26)

- Pathophysiology
- Athrosclerosis
- Vasulitic, rare causes
- Investigative modalities
- CT, MRI, CTA, MRA, TCD, TMS
- Patient Monitoring continuous:
  - Arterial BP, CVP
  - EEG
  - Pulse Oximetry
  - Role of Intervention, Surgery

Movement disorder: 2 days (Hrs 27-30)

- Pathophysiology
- Common movement disorders
- Investigative modalities
- Treatment principles
- DBS, TMS

Cognitive and Behavioral neurology: 2 days (Hrs 31-34)

- Common diseases
- Pathophysiology
- Investigative modalities, fMRI
- Treatment principles

Neuro muscular Neurology and demyelination: 2 days (Hrs 35-38)

- Pathophysiology of common disease
- Investigative modalities
- Treatment including Plasma exchange

Neuro critical care: 1 day (Hrs 39)

- Common neurological diseases warranting ICU care
- Monitoring devices in ICU:
  - Pulse oximatry
  - Ventilations
  - ABP monitoring
  - CVP monitoring
  - EEG monitoring
- Devices in ICU:
  - Plasma exchange machines

Sleep Neurology: 1 Day (Hrs 40)

- Common disorders of sleep
- Polysomnography

- Actigraphy
- MSLT

Research potentials in various fields of neurology: 1 Day (Hrs 41-42)

Submission and discussion of research proposals: 1 Day (Hrs 43-44)

Evaluation of Posting- feed back and suggestions for improvement: (Hr 45)

DEPARTMENT OF CVTS

CURRICULUM FOR CLINICAL ENGINEERING STUDENTS

Conducted Lectures (15 hours)

1. History of Cardiac surgery (1 hour)
   Evolution of the specialty and the people who have made significant contributions. Special emphasis on the technical challenges in the earlier era and how it was overcome.
2. Cardiopulmonary Bypass (2 hours)
   Hour 1
   The circuitry, assembly and functioning of the components of the CPB. The monitoring devices used in CPB
   Hour 2 :
   The conduct of CPB, emphasis on possible human errors in the conduct of CPB and available safety gadgets to minimize it.
3. An overview of Congenital Heart disease and its surgical treatment (2 hours)
   A quick review through the various congenital heart diseases (which was dealt with in the cardiology course), their physiologic consequences and the surgical options and its rationale.
   Hour 1 : Acyanotic
   Hour 2 : Cyanotic
4. An overview of Ischaemic Heart disease and techniques of surgical revascularization
   (1 hour)

Review of the diagnostic tools and techniques of surgical revascularization. Emphasis on the gadgets used in OPCAB and minimally invasive revascularization

5. An overview of surgical management of Valvular Heart diseases and Heart valve prostheses (2 hours)
   A review of pathophysiology of various valvar lesions of the heart and the surgical options
   Hour 1: In addition, a discussion on the evolution of various prosthetic heart valve designs, the prosthetic heart valves in clinical use currently, special emphasis on Chitra valve.
   Hour 2: Bio prosthetic and biologic heart valves, emphasis on techniques of procurement and cryopreservation of homograft valves. Includes an overview of the use of the gadgets required for a homograft valve bank.
6. An overview of the surgical diseases of the lung and mediastinum (1 hour)
   A synopsis of general thoracic surgery, emphasis on various gadgets used in diagnosis and treatment viz, bronchoscope, thoracoscope, and video assisted thoracoscopic surgery. Discussion on the design and functioning of chest drainage systems.
7. Vascular Surgery (1 hour)

An introduction to the various vascular surgical procedures, emphasis on the various tools used intra operatively and in the diagnosis and follow up.

8. Surgery for cardiac arrhythmias (1 hour)
   An overview of surgical treatment of cardiac arrhythmias including clinical use of pacemakers, Implantable defibrillators and radiofrequency ablators.
9. Mechanical circulatory support & Thoracic organ transplantation (1 hour)
   An overview on the current scenario of the clinical use of short and long term mechanical support, like ECMO, various ventricular assist devices and total artificial heart. A short discussion on thoracic organ transplantation
10. Post Operative care of cardiac surgical patients (1 hour)
    A review of the tools of the post operative monitoring including invasive and non invasive assessment of cardiac output and evolving modalities
11. Nursing care of cardiac surgical patients (1 hour)
    A review of day-to-day care of cardiac surgical patients and the clinical use of gadgets like alpha beds, patient warmers, incubators, and physiotherapy aids etc. *(Will be dealt with by one of the senior specialist nurses in ICU)*
12. Future directions in cardiac surgery (1 hour)
    An overview of the status of research across the globe and possible paths ahead.

The student spends 15 days of posting in department of CVTS as follows

1. Congenital Heart Operating Theatre (5 days)

   2 days: Spends with the surgical team, tries to understand the steps and technical details of each procedure, they observe. The student is expected to interact with the consultant surgeon and/or assistant surgeon at the end of the procedure.
   2 days: Spends and interacts with the perfusion team to understand the design, role and functioning of the various components of the CPB. Again, they are expected to interact with the consultant surgeon at the end of the procedure.
   1 day: spends and interacts with the theatre nursing team to understand the various techniques of sterilization and the theatre maintenance protocol.
2. Adult Cardiac surgery OT (including thoracic &vascular) (5 days)

   Time divided between the surgical, perfusion and nursing teams as above.
3. Congenital Heart ICU: 2 days

   Observes the patient care and the functioning of the various gadgets used in the ICU. The student is expected to interact with the resident in charge of ICU and the nursing staff to gather ideas for improving the currently used gadgets of monitoring and treatment.

The student is expected to visit the ICU at least once, outside the usual working hours to understand the urgency and intensity of care required in a post operative cardiac surgical setup.

4. Adult cardiac surgical ICU: 2 days

   Same as above
5. Cardiac surgery out patients and ward: 1 day

   Observes the functioning of these areas, interacts with the patients and their families.

DEPARTMENT OF NEUROSURGERY

CURRICULUM FOR M. Tech. CLINICAL ENGINEERING STUDENTS

1. Organisational Anatomy of brain and spinal cord-
A bird's eye view of the structural aspects of brain and spinal cord. This helps the candidate understand the anatomical landmarks and terminology used in neurosciences. Also allied with this does a brief explanation of the functional attributes of each of the structures constitute the neural system?

2. Common Brain tumors- an Introduction –
Neurosurgery, to a large measure addresses the surgical treatment aspects of tumors of brain, spine and the nerves constituting the nervous system. This lecture will focus on the characteristics of common brain tumors and their surgical management.

3. Neuronavigation –
One of the problems encountered by the neursourgeon while operating on the brain and spinal cord is the difficulty in knowing where one is while operating. It is important to cause minimum disruption of the normal tissue during surgical procedures. Navigating aids help the surgeon's precision while traversing inside the brain and enhances confidence in rendering minimum injury to surrounding tissue as well as accurately delineate tumors and other lesions. It is the surgeon's GPS !!

4. Spinal Instrumentation –
The spine is often considered, as a mechanical device and diseases of the spine often requires correction of biomechanical alterations that happen with the disease. Mechanical devices like plates and screws, artificial discs, rods etc accomplish this. A peek into the correction of spinal deformities using mechanical instruments.

5. Intra-operative monitoring –
The success of operative procedures on the brain and spinal cord is based on inflicting minimum damage to the normal. This is possible only with a constant feedback during surgery from the anatomical structures around the site of surgery. Intra operative monitoring involves " eavesdropping" for cues from neural structures for signals that suggest potential damage or compromise and prevent further loss. This ensures safer neurological outcomes.

Special Topics

1. Robotics
2. Simulators in Neurosurgery
3. Neural networks
4.Surgery in space

DEPARTMENT OF IS & IR

COURSE CONTENTS OFM. TECH CLINICAL ENGG.

DURATION -- 2 WEEKS

HOURS PER DAY – 3.5

NUMBER OF DAYS – 10

TOTAL HOURS – 35.0

TOPICS TO BE COVERED

V. INTRODUCTORY LECTURE

Hour 1

1. Objectives of the training in radiology.
2. Course contents – Theory, Practical
3. Approach to patients in interventional radiology.
4. Need for imaging in clinical medicine and surgery

VI. Equipments in radiology department & their clinical use

Hour 2 each (Total 16 hrs)

1. Conventional X ray, Computed Radiography, Digital radiography, Portable Xray
2. X ray Film, Film –Wet processing, Automatic processor
3. PACS
4. Fluroscopy, Image intensifier, DSA
5. Ultrasound, portable ultrasound
6. CT & Contrast media
7. MRI & Contrast media
8. Laser & Radiofrequency ablation, Optical Imaging

VII. Radiation Protection & MRI Safety

HOURs – 4

10. Hazards of Radiation
11. Dosimetry
12. Quality control of Radiation equipments
13. MRI safety

VIII. Interventional Radiology

HOURs – 2 hours each (8 hours)

1. Interventional radiology- Non neuro (Indications & procedure)
2. Interventional Radiology- Neuro (indications & procedure)

3. Catheters, Guidewires, other tools for Interventions
4. Selection of patient & post procedure management

IX. Image processing

Hours- 1 hour

1. MIP, SSD (both CT & MRI), Volume rendering, DTI, fMRI, Cardiac imaging, segmentation, coregistration, texture analysis

VI. Imaging protocols in few diseases & decision-making

Hours- 2 hrs

1. Stroke, peripheral vascular disease, Epilepsy, Interstitial lung disease etc

VII. Workflow in a Radiology Department

Hours -1

Reception of patient, performance of procedure, reporting, discussion with referring physician

VIII. Final 2 hours:

Research in Radiology and future options, discussion on molecular imaging

Submission and discussion of potential research proposals with the faculty of department of radiology

Review and assessment

DEPARTMENT OF ANAESTHESIOLOGY

M Tech Clinical Engineering : Clinical attachment

Duration 3 weeks

Days 18 Days

Hours 54 Hours

1. Introduction to Anaesthesiology and Critical Care

Anaesthesiology is an independent medical speciality since 1846. It aims at relieving pain in all surgical and many non-surgical patient groups.

Critical care is a growing branch of medicine taking care of seriously ill patients.

2. Types of Anaesthesia and agents used for Anaesthesia

Patient requirement of anaesthesia varies with the type of surgery and general condition. Drugs and methods vary accordingly and will be discussed in this session.

3. Anatomy relevant to Anaesthesiology

Knowledge of anatomy of various systems especially respiratory, cardiovascular and nervous system are essential for administering smooth and safe anaesthesia.

4. Oxygen therapy and respiratory Support

Oxygen is the primary drug for delivery of anaesthesia. Atmospheric Oxygen is inadequate under anaesthesia and many conditions when patients are sick.

Respiratory support aims at helping patient in adequate delivery of oxygen, removal of carbon dioxide and assist in the work of breathing.

5. Cardiovascular Monitoring

During administration of Anaesthesia cardiovascular system is particularly vulnerable and gross variations particularly in heart rate and blood pressure is common. They are indirect indicators of adequacy of anaesthesia and patient's adaptation to surgical insult hence needs to be monitored continually.

6. Respiratory Monitoring and Blood gas Analysis

Respiratory status monitoring includes both clinical and laboratory assessment using blood gas estimation. As respiratory drive is depressed under anaesthesia, it is important to know the support required to maintain appropriate gas exchange.

7. CNS and Neuromuscular Monitoring

The main impetus of anaesthesia is on central nervous system. Hence the level of anaesthesia is to be maintained between too little and too much. Un fortunately this is only indirect assessment till date.

8. Airway equipments

Anaesthesia in majority of cases is administered through inhalational route and this is via artificial airways. We shall discuss details of such device used.

9. Breathing Circuits and Anaesthesia Machine

The conduit between the driving machine and artificial airway is known as breathing circuit. Physical principles of flow and pressure achieved through them and detailed functioning of the source machine will be discussed.

10. Equipments for Drug Delivery including catheters

In a good number of cases anaesthesia is delivered by non-inhalational route. Accurate delivery of drugs is possible through precision pumps. The conduit through the drugs are delivered are thin disposable invasive catheters. Their design and properties will be discussed.

11. Artificial Ventilation

Mechanical ventilation is one of the important therapies in intensive care units. We shall discuss the instruments involved and principles of artificial ventilation in this session.

12. Anaesthesia Outside Operating Rooms

Anaesthesia service is increasingly being provided to patients outside operating rooms both in cardiology and radiology units. They pose special challenge due to the very different environment, many times hostile both to patients and physicians.

13. Resuscitation and Defibrillation

Unfortunately everything does not go, as we desire. When cardiac and respiratory system stop functioning all of a sudden a situation of emergency arises. The procedures to revive vital functions come under the broad definition of Resuscitation. Defibrillator is a device widely used to control chaotic cardiac activity under control will be discussed here.

14. Pulmonary Function Testing

Functional aspect of the lung depends on the airway, lung tissue, and chest wall. These tests are used to find out the component responsible for impaired function if there. They are useful in predicting the respiratory risk involved in administering anaesthesia and undertaking surgery.

15. Physics related to anaesthesia including Ultrasound devices

Working with equipments used in operating room and ICU requires understanding their working principles with regards to mechanics, optics and acoustics. Day by day they are becoming more and more complex.

16. Complications of Anaesthesia

No therapeutic procedure is without complications including anaesthesia. They vary from simple skin reaction to death. It is important to avoid them as for as practicable.

17. Designing an operating room or Intensive care unit

As responsible administrator, it is our duty to design operating room and ICUs optimally with regard to space, lighting, electrical outlets and ergonomics. Budget maybe a constraint but safety should not be compromised.

Clinical Rotations for Operation Theatres			
2010	**G1**	**G2**	**G3**
Oct-11	An1	CS1	NS1
Oct-12	Ns1	An1	CS1
Oct-13	Cs1	Ns1	An1
Oct-14	An2	CS2	NS2
Oct-15	NS2	An2	CS2
Oct-18	CS2	NS2	An2
Oct-19	An3	CS3	NS3
Oct-20	NS3	An3	CS3
Oct-21	CS3	NS3	An3
Oct-22	An4	CS4	NS4
Oct-25	NS4	An4	CS4
Oct-26	CS4	NS4	An4
Oct-27	An5	CS5	NS5
Oct-28	NS5	An5	CS5

Oct-29	CS5	NS5	An5
Nov-01	An6	Cs6	An7
Nov-02	Cs6	An6	cs7
Nov-03	An7	cs7	cs6
Nov-04	cs7	an7	an6
Nov-08	An8	Cs8	An9
Nov-09	Cs8	An8	cs9
Nov-10	An9	cs9	cs8
Nov-11	cs9	an9	an8
Nov-12	An10	Cs10	An11
Nov-15	Cs10	An10	cs11
Nov-16	An11	cs11	cs10
Nov-18	cs11	an11	an10
Nov-19	An12	Cs12	An13
Nov-22	Cs12	An12	cs13
Nov-23	An13	cs13	cs12
Nov-24	cs13	an13	an12