



Syllabus
MD / MS / MDS / MHA
at the AIIMS



All India Institute of Medical Sciences
Ansari Nagar, New Delhi-110029

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M D / M S / M D S / M H A
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All India Institute of Medical Sciences

New Delhi - 110 029

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PREAMBLE

The Health Survey and Development Committee, popularly known as the Bhore Committee, in its report published in 1946, recommended very strongly the establishment of a national medical centre at Delhi which will concentrate on training of highly qualified teachers and research workers in order that a steady stream of these could be maintained to meet the needs of the rapidly expanding health activities throughout the country. After the attainment of independence the Union Ministry of Health proceeded to implement this challenging idea and a magnificent grant of one million pounds by the Government of New Zealand through the Colombo Plan helped to translate the idea into reality. An act of Parliament in 1956 established the All India Institute of Medical Sciences as an autonomous institution of National importance and defined its objectives and functions.

The prime concern of the Institute is to develop patterns of teaching in undergraduate and postgraduate medical education in all the branches so as to demonstrate a high standard of medical education to all medical colleges and other allied institutions in India. This educational experience is imparted in an atmosphere of research.

By virtue of the Act, the Institute grants its own medical degrees and other academic distinctions. The degrees granted by the Institute under the All India Institute of Medical Sciences Act are recognised medical qualifications for the purpose of the Indian Medical Council Act and, notwithstanding anything contained therein, are deemed to be included in the first schedule of that Act, entitling the holders to the same privileges as those attached to the equivalent awards from the recognized Universities of India respectively.

The AIIMS imparts postgraduate degrees in major specialities of medical sciences i.e.

M D (Doctor of Medicine)

1. Anaesthesiology
2. Anatomy
3. Biochemistry
4. Biophysics
5. Community Medicine
6. Dermatology and Venereology
7. Forensic Medicine and Toxicology
8. Laboratory Medicine
9. Medicine
10. Microbiology
11. Nuclear Medicine
12. Obstetrics & Gynaecology
13. Ophthalmology
14. Pathology
15. Pediatrics

16. Pharmacology
17. Physiology
18. Physical Medicine & Rehabilitation (PMR)
19. Psychiatry
20. Radio-Diagnosis
21. Radiotherapy

M S (Master of Surgery)

22. Surgery
23. Otorhinolaryngology (ENT)
24. Orthopaedics

M D S (Master of Dental Surgery)

25. Prosthodontics
26. Orthodontics
27. Conservative Dentistry and Endodontics
28. M H A (Master in Hospital Administration)

The syllabus has been developed in consultation with the faculty of the concerned departments and further scrutinized by the Academic Section under the supervision of the Dean.

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ANAESTHESIOLOGY — M D

The course content should include a fund of acquired information and the strategy evolved for acquiring the information. Most useful information should be included taking into account the limits of the time available. The contents should ensure that the candidate acquires basic skills and attitudes in the subject. It should discipline the thinking habit for problem solving and discovery of new knowledge in the field.

To this Extent the Course Content should Include Certain Facts

- a) A thorough knowledge of the pharmacokinetics and pharmacodynamics of anaesthetic drugs and adjuncts.
- b) Knowledge of cardiovascular, respiratory neurological, hepatobiliary, renal and endocrine homeostasis and related drugs as relevant to patients undergoing anaesthesia.
- c) Relevant anatomy, physiology and biochemistry.
- d) A basic idea of the relevant physical principles involved in the construction and functioning of equipment used in anaesthesia and monitoring.
- e) Knowledge to attain expertise of the commonly used techniques in general, regional and local anaesthesia.
- f) A clear-cut concept of unconsciousness and its implications.
- g) Relevant knowledge about chronic intractable pain and its management.
- h) Relevant knowledge to manage patients in intensive therapy unit.
- i) Relevant knowledge of medical Statistics
- j) Knowledge & Expertise in Cardiopulmonary resuscitation.

The Course content should also include ways and means of stimulating the thought processes of the candidate and ensure that the candidate can critically acquire new information from books, journals, lectures, seminars and discussions. It should include ways and means of developing reflective thinking and problem solving by critically analysing events during anaesthesia. Interpretation of these data and logical reasoning should lead to application of facts and principles in practice.

It is needless to emphasise that the course content should ensure that the candidate acquires the necessary aptitude and motor skills to become a competent anaesthesiologist, learn the art of teaching

students, nurses and paramedical staff and carry out a simple research project.

1st Year Theory

Should cover the following:

- a) Anatomy – Diaphragm, larynx and upper and lower airway, learn relevant, anatomy for regional anaesthesia and venous cannulations. Some Anatomical areas of interest to the anaesthetist are Orbit of the Eye, Base of skull, Vertebral Column, spinal cord, and meninges, axilla, 1st rib, Intercostal space.
- b) Principles of physics and use of equipment in anaesthesia
 - i) Anaesthesia machine - checking the machine and assembly of necessary items.
 - ii) Airway equipment including Tracheostomy./ Equipments for airway management - mask, LMA, fiberoptic laryngoscopes; other devices like Combi tube etc.
 - iii) Breathing systems continuous flow systems, draw over system - Assembly and checking.
 - iv) Monitoring in Anaesthesia with concepts of minimal monitoring.
 - v) Safety in Anaesthesia Equipments.
 - vi) Medical gases - storage and central pipeline system.
- c) Physiology
 - i) Theories of mechanism of production of Anaesthesia.
Respiratory, cardiovascular, hepatobiliary, renal and endocrine system. Pregnancy, Blood Groups, Muscle & N M Junction, ECG, Regulation of temperature & Metabolism, Stress response. cerebral blood flow and ICP.
- d) Pharmacology
 - i) General pharmacological principles.
 - ii) Concepts of pharmacokinetics and pharmacodynamics.
Uptake and distribution of inhaled anaesthesia agents.
Drug interaction in Anaesthesiology.
Drugs used in Anaesthesia, Drugs used for treatment of diseases and interaction of these .
- e) Theoretical background of the commonly used anaesthetic techniques of general and regional anaesthesia viz.
 - i) GA - Intravenous, Inhalational, Endotracheal etc. using spontaneous and controlled mode of ventilation.
 - ii) RA - Spinal, epidural and local.
- f) Biochemistry relevant to fluid balance & Blood Transfusions, Artificial Blood. & Perioperative fluid therapy.
Acid base homeostasis in health and diseases.
- g) Documentation and medico-legal aspects of anaesthesia.
Stress the importance of accurate documentation.

- h) Theoretical background on disorders of:
 - i) Cardiovascular system.
 - ii) Respiratory system
 - iii) Hepatobiliary system.
 - iv) Urinary system.
 - v) Endocrine system, Pregnancy.
- i) Cardiopulmonary Resuscitation; Theories of cardiac pump, thoracic pump
Thoracic pump and defibrillation.
Resuscitation of a patient with overdose of drug/poisons. Management of unconscious patients.
Resuscitation of a severely injured patient.
- j) Neonatal resuscitation.
- k) Introduction to Research methodology, Random clinical trials etc. Basics of biostatistics.
- l) Preoperative assessments and medication - general principals.
- m) Introduction to anatomical, physiological, pharmacological and biochemical aspects of pain and pain management.
- n) Introduction to artificial ventilation.
- o) Oxygen therapy
- p) Introduction to the operation theatre, recovery rooms (concepts of PACU), ICU.
- q) Recovery from anaesthesia.
- r) Shock - pathophysiology, clinical diagnosis and management.
- s) Pulmonary function tests - principles and applications.
- t) Effect of positioning.

2nd Year Theory

- a) Relevant anatomy of each system
- b) Physics of equipment used in anaesthesia
Medical gases - gas plant, central pipeline Scavenging system.
Reducing valves
Anaesthesia machine, Humidifiers
Flow meters
Vaporizers - Characteristics and functional specifications.
Breathing systems - Assembly, functional analysis, flow, Minimum monitoring standards requirements, APL and flow directional valves.
- c) Sterilization of equipment.
- d) Computers, Utility, computer assisted learning and data storage. Computerised anaesthesia records.
- e) Pharmacology of drugs used in cardiovascular, respiratory endocrine, renal diseases and CNS disorders.

- f) Acid-base and electrolyte balance and.
- g) Interpretation of blood gases and other relevant biochemical values, various function tests and basics of measurement techniques, ECG
Paediatrics – Prematurity, Physiology, anatomy of neonate NS adult
- h) Principles of monitoring equipment used for assessment of
 - i) Cardiac function viz. Rhythm, pulse, venous and arterial pressures, cardiac output,
 - ii) Temperature
 - iii) Respiratory function viz., Rate volumes, compliance, resistance, blood gases.
 - iv) Intracranial pressure, depth of anaesthesia and
 - v) Neuromuscular block.
- i) Working principles of ventilators.
- j) Special anaesthetic techniques as relevant to outpatient anaesthesia, hypotensive anaesthesia, anaesthesia in abnormal environments and calamitous situations.
- k) Anaesthetic management in special situations - Emergency, ENT, Ophthalmology, Obstetrics, Obstetric analgesia, Plastic, Dental, Radio-diagnosis and Radiotherapeutic procedures and patients with systemic diseases.
- l) Medical statistics relevant to data collection, analysis, comparison and estimation of significance.
- m) Journal clubs.

SECOND YEAR

1. Principles of paediatric anaesthesia. management of neonatal surgical emergencies, RA in infants.
 2. Associated medical disorders in surgical patients - anaesthesia implications and management.
 3. Basics of orthopaedic anaesthesia.
 4. Day care anaesthesia.
 5. Rural anaesthesia - anaesthesia for camp surgery.
 6. Anaesthesia for otorhinolaryngology with special emphasis on difficult airway management.
 7. Blood and blood component therapy. Anaesthetic implications in coagulation disorders.
 8. Monitored anaesthesia care.
 9. Anaesthetic implication in Diabetic mellitus, thyroid and parathyroid disorders, phaeochromocytoma, cushings disease etc.
 10. Management of acid-base disorders
 11. Principles of geriatric anaesthesia
 12. Anaesthesia outside the OR and in special situation
- Principle of management in Trauma, disorders and mass casualties

3rd Year Theory

- a) Anaesthesia for patients with severe cardiac, respiratory, renal and hepatobiliary disorders posted for unrelated surgery.

- b) Management of patients in shock, renal failure, critically ill and/or on ventilator.
- c) Chronic pain therapy and therapeutic nerve blocks.
- d) Selection, purchase, maintenance and sterilization of anaesthesia and related equipment.
- 1. Principles of anaesthetic management of neuro/ cardiac/ thoracic / vascular/ Transplantation/ burn and plastic surgery.
- 2. Principles of neonatal ventilation and critical care.
- 3. Principles of human resources and material management.
- 4. General principles of medical audit
- 5. Principles of one lung anaesthesia

ATTITUDE DEVELOPMENT

The student should develop attitudes that lead to:

- 1. Life long learning and updating
- 2. Sympathetic Communication with relatives
- 3. Sympathetic Communication with patients
- 4. Appropriate communication with colleagues to function in a group in OR/ICU
- 5. Become a teacher for Technicians, Nurses, and paramedical staff. And teach undergraduates.
- 6. Ability to discuss. Participate in case discussion and scientific presentations

Ability to function as a leader in the Operating room

SKILL DEVELOPMENT

Requirement of Practical Training by Junior Resident

It is felt that at the end of a 3-year training course a candidate should have the knowledge and ability to:

- 1. Plan and conduct anaesthesia, recovery, and postoperative pain relief for elective and emergency surgery related to all surgical specialties.
- 2. Carry out basic life support (BLS) and advanced life support (ALS) and train medical and paramedical staff in BLS and ALS.
- 3. Manage unconscious patients : Airway management and long term management of unconscious patient.
- 4. Manage patients admitted to an intensive care unit.
- 5. Manage patients suffering from chronic intractable pain.
- 6. Organize the Hospital environment to manage mass casualty situation
- 7. Critically review and acquire relevant knowledge from the journals about the new development in the speciality.
- 8. Should be able to participate in anesthesia audit.

Major stress will be on practical training. The Goals of postings both the general goals and of specific sub speciality postings will be fulfilled by rotating the junior resident in various operating theatres,

Intensive Care, Pain Clinic, Emergency Room (Casualty) Out Patient Department and Peripheral anaesthesia Facilities. The recommended period of stay in each area is as follows:

<i>Speciality</i>	<i>Months</i>
General Surgery	4
Urology	1
Eye	2
ENT	2
Dental	1
Orthopedics/Trauma	3
Gynecology	2
Obstetrics	2
Pediatrics	2
Burns/Plastic	1
CTVS	2
Neurosurgery	2
ICU	3
Pain	2
Recovery	1
Organ Transplant	1
Peripheral Theatre (Radiology, Radiotherapy ECT Cardiac Cath.)	1
Elective	1

The student will be instructed in preoperative preparation of the patients and discussion of the intraoperative problems of cases being conducted on the day. During these postings the students will initially observe and then perform various procedures and conduct the anesthetic procedure as listed. Each procedure observed and performed will be listed in the logbook. Which will be signed by attending faculty.

The trainee will undergo a graded training in the following manner:

Orientation: At the beginning of 3 Years each student should be given an orientation to the hospital operation theatre and subject of anaesthesia. The candidate shall be assigned thesis guides so as to help them prepare protocols.

Introductory lectures should be aimed to familiarize the student with the a) basic anaesthesia delivery equipment and Monitors and important principles of physics that govern the functions of these equipments. b) Intravenous Anaesthetic drugs and Inhalation agents. c) Patient evaluation, interpretation of laboratory investigation as applied to the care of the patients planning and conduct of general anaesthesia, and postoperative care. The faculty should do the teaching. Students should be taught basic and advanced cardiac life support. The student should be familiarized about the principle of the sterilization and universal precautions. They should be able to ask for consultation when necessary.

The students are encouraged and taught to search literature to be able to write a thesis protocol.

1st Year Objectives

The first year resident should be taught expertise in the management of ASA I and II cases. To start with they will observe and slowly become independent in giving general anaesthesia and spinal anaesthesia to ASA I & II cases for minor and major surgery, under graded supervision. They should be posted to the following specialties doing the first year gynecology, General Surgery, Orthopedic, ENT, Recovery Room, Urology.

2nd Year Objectives

The student should be taught to give general anaesthesia regional anesthesia to ASA I, II, III & IV under supervision they should be able to give extradural block (EDB), Spinal Block, and Peripheral Nerve Blocks under supervision. Should learn pediatric and trauma life supports and maintain skills for basic and advanced cardiac life support.

It is advised that they may be posted in the following specialties Obstetrics, Dental Surgery, Eye, ICU, Pain Clinic and Peripheral Theatres.

The student should be able to be able to analyze data and write a thesis. Should be able to present scientific data.

3rd Year Objectives

The student should be able to plan and administer anaesthesia to all patients under graded supervision including patients for cardiac, Neurosurgery, Pediatric surgery and for all major surgery. The aim at the end is to be competent and independent soon after the third year of junior residency in providing anaesthesia to elective and emergency cases. The junior resident should be able to manage critically ill patient treat intractable pain. They should also know how to organize mass casualty. The curriculum should be able to provide 1 month of elective posting.

Minimum Procedures/Cases to entered in the log book.

Regional

SAB	=	30 SAB
EDB	=	30 including continuous EDB
Caudal	=	10
Sciatic/Femoral	=	5 + 5
Bier Block	=	5
Ankle Block	=	5
Stellate Ganglion	=	3 (observe)
Brachial Plexus	=	5 observe 10 do
Sympathetic Block	=	5 (Observe)
Trigger Point injection	=	5
Other peripheral N. Block	=	10
Ophthalmic Blocks	=	5 (observe)
Field Block	=	5

Anaesthesia for:

Open Heart	=	3 – 5 observe
Closed Heart	=	5 observe
Craniotomy	=	5 observe
Spinal Surgery	=	5 observe
Joint Replacement	=	5 observe
Anesthesia for organ transplant	=	5 observe (desirable)

Procedures

Internal Jugular Cannulation	=	5 + 5 do/observe
External Jugular Cannulation	=	5
Subclavian Vein Cannulation	=	5 + 5 do/observe
Peripheral Central Line	=	15
Arterial Line Cannulation	=	10

Conduct of Cases

ASA I	=	100
ASA II	=	50
ASA III	=	30
ASA IV	=	10
Labour Analgesia	=	5
Organ Transplant	=	5 observe

DETAILED CURRICULUM FOR POSTINGS**I. GENERAL GOALS OF ALL POSTINGS****II. Objectives:**

- A. Learn to perform preoperative evaluation
 1. Learn to collect and synthesize preoperative data and to develop a rational strategy for the perioperative care of the patient. Outpatients: Develop skills in obtaining medical information from sources outside our institution, that is, other hospital and private physicians.
 2. Learn a thorough and systematic approach to preoperative evaluation of patients with systemic diseases. Perform preoperative medical evaluations of patients undergoing many different types of operations, both of inpatients and outpatients but especially elderly patients with complex medical illnesses such as alcoholism, chronic obstructive pulmonary diseases, congestive heart failure, coronary artery disease, hepatic failure, hypertension, myocardial infarction, renal failure, and stroke etc.
 3. Learn to prioritize problems and to present cases clearly and systematically to attending consultants.
 4. Develop working relationships with consultants in other specialities to assist in preoperative evaluation.

Learn to get a good consultation.

5. Learn to interact with preoperative patients and develop effective counseling techniques for different anesthetic techniques and perioperative procedures. Learn to assess and explain risk of procedure and take informed consent.
- B. Learn anesthetic techniques and skills and understand operate different equipment used by anaesthetist, develop optimum plans depending on patients condition. Know the special considerations and techniques required to anesthetize patient in locations inside and outside of the operating room, for example, the Cardiac Catheterization Laboratory, Electroconvulsive Therapy, Genitourinary Clinic, Magnetic Resonance Imager, Radiology & Radiotherapy.
1. Perform the anesthesia machine check and prepare basic equipment necessary for all anesthetic cases.
2. Prepare drug table: select appropriate drugs for a case and develop a good system for arranging the drug and work tables.
3. Place standard monitors, for example, electrocardiogram, noninvasive blood pressure device, precordial stethoscope, neuromuscular blockade monitor, pulse oximeter, and capnograph.
4. Learn proper techniques of preoxygenation.
5. Learn how to induce anesthesia, both routine induction and rapid sequence induction, and the pertinent mechanical skills and choice of drugs
6. Perform airway management by knowing various procedures and equipment:
They should know how to use/do
 - i) Direct laryngoscopy using curve and straight blade
 - ii) Laryngeal mask airwayThey should be familiar with
 - a. Fiberoptic techniques
 - b. Light wand techniques
 - c. Blind techniques
 - d. Combitube
7. Failed Intubation or difficult airway algorithms
 - a. All techniques for endotracheal intubation
 - b. Additional techniques such as retrograde wire intubation and surgical cricothyroidotomy both of which will be learned on a mannequin.
8. Awake intubation
 - a. Topical/Local anaesthesia for airway
 - b. Airway nerve block, for example, superior laryngeal nerve and glossopharyngeal nerve block
9. Learn anesthetic maintenance: appropriate choice and use of anesthetic drugs and adjuvant drugs such as muscle relaxants and how to monitor their effects
 - a. Assessment of Anesthetic depth.
 - b. Assessment of volume status

- c. Replacement of intraoperative fluid losses
 - d. Appropriate use of blood and blood products
 - e. Effect of different types of surgical procedures on anesthetic management, for example, effects of aortic cross-clamping
 - f. Appropriate use of intraoperative laboratory tests blood gas coagulation tests etc.
10. Become skilled in catheterizing or cannulating the following vessels for sampling blood, measuring concentrations or pressures, or administering drugs of fluids:
- a. Veins: all ages and all sizes
 - b. Arteries: radial and other sites
 - c. Central vessels: internal jugular, subclavian, and “long-arm” routes
11. Become skilled in using and interpreting the following routine noninvasive and invasive monitors intraoperatively and others:
- a. Electrocardiogram with ST-segment analysis
 - b. Noninvasive blood pressure
 - c. Capnograph: values and changes in values and waveform.
 - d. Pulse oximetry: values and changes in values
 - e. Neuromuscular blockade monitor
 - f. Invasive arterial pressure: waveform and changes in the waveform
 - g. Central venous pressure: values and waveform
 - h. Pulmonary artery pressure: Values and waveforms, pulmonary capillary wedge tracing
 - i. Cardiac output
 - ii. Mixed venous oxygen saturation
 - iii. Evoked potential
 - iv. transesophageal echocardiography: basic understanding
12. Become skilled in techniques for regional anesthesia
- a. Brachial plexus blockade: interscalene, supraclavicular, axillary techniques with and without nerve stimulator for localization
 - b. Spinal anesthesia (including continuous spinal where appropriate)
 - c. Epidural anesthesia: lumbar, caudal, and thoracic.
 - d. Lower extremity blockade: femoral, sciatic, and lateral femoral cutaneous nerves
 - e. Upper extremity blockade: ulnar, median, and radial nerves
 - f. Bier block
 - g. Cervical plexus block
13. Become skilled in discontinuing anesthesia and monitoring emergence from anaesthesia
- a. Reversal of neuromuscular blockade

- b. Determination of appropriate time for extubation
- c. Monitoring of airway function during and after emergence
- 14. Become familiar with/skilled in perioperative pain management
 - a. Postoperative epidural infusion (opiates, local anesthetics)
 - b. Patient-controlled analgesia
 - c. Adjunctive nerve blockade
- 15. Become skilled in use of techniques for conscious sedation and monitored anaesthesia care
 - a. Selection of patients for conscious sedation
 - b. Selection of drugs for use in conscious sedation
 - c. Monitoring techniques helpful in controlling depth of sedation
 - d. Recognition of when conscious sedation has become unconscious sedation
- 16. Know how to successfully resuscitate, and develop skill of Basic Life support and Advance Cardiac Life support.
- 17. Work with other members of the OR team, including surgeons and nurses, to optimally care for surgical patients, especially develop communications skill.

ANAESTHESIA OUT SIDE OPERATING ROOM

1. Radiology and interventional neuroradiology: Know special anaesthetic considerations in these settings:

- a. Dye allergies
- b. Embolization
- c. Examination for magnetic resonance imaging (MRI)
 - i. Monitoring
 - ii. Equipment options in the MRI suite
 - iii. General anesthetic/sedation techniques

2. Electroconvulsive shock therapy (ECT)

- a. Preoperative
- b. Anesthetic techniques and drug effects on seizure duration
- c. Hemodynamic responses and appropriate treatment

3. Cardiac catheterization

- a. Preoperative evaluation of children
- b. Anesthetic consideration
 - i. Children
 - ii. Electrophysiologic tests/radiofrequency ablation Cardioversion

4. UROLOGY SERVICE (This service may be in OPD or OT)

Become skilled in anesthetic techniques applicable to the Genitourinary Clinic

- a. Transurethral resection of the prostate: recognize and treat hyponatremia; know different anesthetic options and advantages and disadvantages of each
- b. Irrigation fluid options: know advantages and disadvantages of each
- c. Anesthetic techniques for extracorporeal shock wave lithotripsy
- d. Anesthetic considerations for percutaneous placement of nephrostomy

III. Evaluation to Determine Goal Achievement

- a. The resident will be evaluated every 3 months end posting by all attending consultants who worked with them. The attending physicians complete a Departmental Resident Evaluation Form, which is reviewed by the Clinical Competence Committee. informs them of any problems identified. and serious problems will be discussed with them immediately after they occur.
- b. Residents will complete a log book. After each posting it will be checked and signed by the faculty concerned.

Trauma & Resuscitation

All residents must achieve basic and advanced cardiac life support, advanced trauma life support, and pediatric life support training. They should start with the training of Airway breathing circulation (ABC) training and master the skills repeatedly and then procedure to advanced life support.

I. GOALS OF TRAUMA/TRAUMATISED PATIENT AND DISASTER MAAGEMENT

- a. Acquire Improve ability to evaluate & triage the patient and formulate anesthetic plans, especially in the trauma patient.
- b. Acquire ability to administer operative anesthesia safely and rapidly.
- c. Acquire ability to identify, prevent and care for postoperative complications.
- A. Manage anesthesia for severely traumatized patients by doing the following as rapidly as possible:
 1. Evaluation/documentation
 2. Placement of intravascular catheters
 3. Airway intubation
 4. Choose among anesthetic options and induce and maintain anesthesia safely

POST ANESTHESIA CARE UNIT (PACU)

1. Goals

Understand the importance, purpose, and components of the anesthesia record and the report from the anaesthetizing anesthesiologist.

Use information about the patient that is received and observed on admission to the PACU and during care there for the following purposes:

1. To create a care plan
2. To score the patient's condition according to the Aldrete system
3. To assess the patient's recovery and condition for a safe discharge or transfer

Observe, recognize, and learn to treat the most commonly occurring problems likely to arise in the Postanesthesia Care Unit (PACU). Understand the parameters patients must meet for safe discharge from the PACU to the following:

1. home
2. inpatient ward
3. intensive care unit

Detection of Hypoxemia and Oxygen therapy should be learned in this posting Should be recognize.

1. Airway integrity and compromise.
2. Arrhythmia
3. Hypertension
4. Hypotension
5. Pain prevention and relief.
6. Nausea and vomiting
7. Decreased urine output
8. Emergence delirium
9. Delayed emergence from anesthesia
10. Shivering
11. Post obstructive pulmonary oedema

III. Evaluation to Determine Goal Achievement (End posting summative)

INTENSIVE CARE UNIT

I. Goals

Understand the spectrum of critical illnesses requiring admission to ICU recognize the critically ill patient who needs intensive postoperative care from the patient who does not require such care.

PRINCIPLES OF MANAGING A CRITICALLY ILL MEDICAL PATIENT

Cardiovascular

Recognition and acute management of Shock (all forms) Cardiac arrhythmias Cardiogenic pulmonary edema Acute cardiomyopathies Hypertensive emergencies, myocardial infarction.

Respiratory

Recognition and acute management of Acute and chronic respiratory failure Status asthmaticus Smoke inhalation and airway burns Upper airway obstruction, including foreign bodies and infection Near drowning Adult respiratory distress syndrome. Use of Pulmonary function tests including bedside spirometer.

Renal

Recognition and acute management of Fluid and electrolyte disturbances.

Should be able to prescribe fluids in Renal failure Acid-basis disorders. Should be able to prescribe drugs based on Principles of Drug dosing in renal failure Should know when to use Dialysis/hemofiltration.

Central Nervous System

Recognition and Acute management of Coma, Drug overdose know Glasgow Coma Scale Metabolic and Endocrine, emergencies like Diabetic ketoacidosis Hypoadrenal crisis, pheochromocytoma.

Infectious disease

Recognition and acute management of hospital acquired and opportunistic infections, including acquired immunodeficiency syndrome. Should know how to protect against cross infection Infection risks to healthcare workers.

Hematologic disorders

Recognition and acute management of Defects in hemostasis Hemolytic disorders should be able to prescribe component therapy based on the results of Coagulation profile.

Thrombotic disorders should be able to diagnose Deep Vein thrombosis and know Principles of Anticoagulation and fibrinolytic therapy.

Know the indications of Plasmapheresis for acute disorders, including neurologic and hematologic diseases.

Gastrointestinal disorders

Should be able to recognize and manage Gastrointestinal bleeding hepatic failure should be able to prescribe prophylaxis against stress ulcer bleeding.

A. Should be able to do the following (ideally) at the end of the posting:

1. Radial arterial catheters and other sites as necessary
2. Central venous catheters
 - a. Subclavian route
 - b. Internal or external jugular route
3. Pulmonary artery (PA) catheters (Observe only)

B. Understand and interpret the following PA catheter variables, initiate appropriate therapy in response to changes in them:

1. PA waveform
 - a. Normal
 - b. Pathologic
 - c. PA wedge
2. Mixed venous oxygen saturation
3. Right ventricular ejection fraction
4. Thermodilution cardiac output
 - a. Technological basis for cardiac output measurements
 - b. Factors producing errors in cardiac output measurements

- C. Manage cardiovascular instability
 - 1. Know different fluid therapy options and when to use them
 - 2. Know the different inotropic drugs and when to use them
 - 3. Know how to use invasive monitoring devices to guide therapeutic use of fluids and inotropic drugs
- D. Manage respiratory failure and postoperative pulmonary complications
 - 1. Know how to use arterial blood gas and ventilatory variables to evaluate postoperative patients with respiratory failure
 - 2. Understand the operation of mechanical ventilators including different ventilatory modalities and how each is best used for management of respiratory failure and noninvasive) including modes complications and modes of weaning
Principles & application of Oxygen therapy.
- E. Pathophysiology and Clinical manifestation of septicemia and its treatment
 - 1. Recognize sepsis in the postoperative patient including all the typical hemodynamic findings
 - 2. Know the appropriate tests to diagnose sepsis, including diagnostic tests
 - 3. Use various monitoring devices to assist in managing sepsis; specifically understand the optimization of oxygen delivery to tissues in the septic patient and the appropriate management of fluids and vasopressors to accomplish these goals.
 - 4. Know the different classes of antibiotics and antifungal agents and their use in treating sepsis
- F. Deliver appropriate nutritional support
 - 1. Learn about the use of enteral nutrition in the patient who cannot tolerate input per os
 - 2. Learn about the use of parenteral nutrition in the critically ill surgical patient
 - 3. Interact with nutrition support services in planning nutrition for the critically ill patient
- G. Provide effective pain management and sedation postoperatively
 - 1. Learn the appropriate use of pain management modalities in the ICU including:
 - a. Patient-controlled analgesia
 - b. Epidural and subarachnoid narcotics
 - 2. Learn the use of sedative/hypnotic drugs in the ICU for:
 - a. For Patient on Ventilator

Principles of Transplantation

Care of Immunosuppression Infections in the immunocompromised patient Should know Organ rejection.

Monitoring and Biostatistics

Should be able to use Prognostic indices such as acute physiology and chronic health evaluation, therapeutic intervention scoring system and know the concept of audit

Ethical and legal aspects of critical care

Know the legal importance of

Should be able to take informed consents not resuscitate orders; (DNR) withdrawing of therapy

Psychosocial Issues

Should be able to communicate with distressed relatives

Should be able to give the correct picture of a critical patient, but with compassion in view of critical nature of the illness

Should be able to Transport a critically ill patient/ resuscitate patient with acute traumatic injury

PEDIATRIC TRAINING

Should be able to

Recognize and manage cardiovascular and respiratory failure in a critically ill child

Evaluate manage the critically ill neonate

Prescribe appropriate dose of all drugs and fluid and electrolytes in a child

Core procedural skills for residents. In addition to practical training in the following procedural skills, the resident must have an understanding of the indications, contraindications, complications & pitfalls of these interventions. Due to the variability of individual training programs, practical experience may be limited for some procedures

Cardioversion

Pulmonary artery catheterization

Trancutaneous pacing

Draining of tension Pneumothorax

Insertion of chest drain

Conventional and Percutaneous Tracheostomies

CARDIOVASCULAR ANESTHESIA

I. Goals

- A. Understand cardiac physiology Develop knowledge of cardiovascular anesthesia (anesthesia for the patient with cardiovascular disease). Choose appropriate anesthetic techniques for patients with different types of cardiovascular disease and the skills for lifelong continuing education.
- B. Develop technical and monitoring skills necessary for cardiovascular anesthesia
- C. Administer anesthesia for a wide variety of cardiothoracic Cases and develop interest in further learning
- D. Perform a thorough preoperative assessment of the patient undergoing cardiovascular surgery
- E. Know intraoperative anesthetic management for the patient undergoing cardiopulmonary bypass. Know how cardiopulmonary bypass is instituted and discontinued Understand cardiopulmonary bypass and discuss the mechanical aspects of it as follows:
 1. Different types of pumps - pulsatile and nonpulsatile
 2. Physiology of hypothermia and cardiac and cerebral protection
 3. Effects of bypass on volumes of distribution and clearance of anesthetic drugs and anesthetic maintenance, including amnesia
- D. Know how and why to use of inotropic support, vasodilators, and antiarrhythmic drugs that may be

necessary before but are especially necessary after cardiopulmonary bypass

- E. Develop and understanding of the major issues involved in the perioperative care of the child with congenital heart disease
 - B. Insert vascular catheters or cannulas for adult and pediatric patients and obtain measurements from them as follows:
 - 1. ArteriesInternal jugular vein and the subclavian vein
Pulmonary artery (Swan-Ganz) catheters and initiate appropriate therapy in response to changes in the following pulmonary artery (PA) variables:
 - a. Waveform
 - b. Normal tracing
 - c. Pathologic tracing
 - c. Pulmonary artery wedge tracings
 - 2. Mixed venous oxygen saturation
 - 3. Theromodilution cardiac output
- observe/know about a Transesophageal echocardiography (TEE) probe and interpret TEE images
- F. Manage care during cardiac surgery as follows:
 - 1. Blood replacment
 - 2. Monitoring the effect of heparin
 - 3. Postcardio;ulmonary bypass coagulopathyRationale for various therapies such as aprotinin designed to prevent Coagulopathy
- G. Know following procedures and anesthetic implications:
 - 1. Aortic repairs
 - 2. Congenital repairs - pediatric
 - 3. Coronary artery bypass grafting and valves - adults
 - 4. Electrophysiology
 - 5. Thoracic surgery
 - 6. Transplantation - heart and lungs
- H. Work as a team member with fellow anesthesiologists, surgeons, perfusionists, and nurses
- I. Maintain good clinical judgment under stress and act quickly and accurately in diagnosis, interpretation, and treatment of intraoperative problems
- Evaluation to Determine Goal Achievement.

NEUROANESTHESIA

I. Goals

- A. Administer anesthesia safely to patients with neurologic disease who are undergoing neurologic or

non-neurologic surgery, diagnostic procedures requiring anesthesia, or nonsurgical interventions requiring anesthesia.

- B. Understand the basic concepts of central nervous system (CNS) physiology as they relate to neuroanesthesia, specifically, mastery of autoregulation of blood flow, blood flow response to CO₂, blood flow response to cerebral oxygen (CMRO₂) and glucose (CMRglu) metabolic rates, and cerebrospinal fluid physiology.
- C. Know the effect(s) of commonly used anesthetic agents and adjuvant agents, for example antihypertensives, on cerebral physiology.
- D. Understand the anesthetic implications of the most common neurosurgical procedures, that is, what is likely to happen during neurosurgery that will affect anesthetic management.
- E. Understand the basic concepts behind electrophysiologic monitoring of the brain and spinal cord.
- F. Understand how concurrent medical illnesses affect anesthesia during neurologic surgery.

II. Objectives

- A. Review the medical history and physical examination of patients; assess their major neurosurgical problem. Evaluate the patients Glasgow Coma Scale as well as other medical problems that may affect anesthetic care; and know what information about nervous system function and pathology as important to the anesthesiologist.
 - 1. Recognize both the adult and pediatric patient with poor elastance of increased intracranial pressure (ICP).
 - 2. Evaluate the patient with subarachnoid hemorrhage and intracranial aneurysm by means of the Hunt-Hess and Fischer gradings systems; recognize preoperative vasospasm; and anticipate which patients are likely to require special techniques such as barbiturate protection, hypotension, induced hypertension, or temporary vessel occlusion.
 - 3. Differentiate between radiculopathy and myelopathy and understand the anesthetic implications of each, that is, which patients require awake intubation and positioning.
 - 4. Know the basic differences between the following types of brain, spinal cord, and metastatic tumors of the CNS and their association with edema and intraoperative blood loss. Know the anesthetic implications of:
 - a. Acoustic neuroma, Ependymoma, Gliomas, Meningioma, Pituitary tumours
 Understand the following different types of spinal operations as well as their anesthetic implications:
 - a. Anterior cervican discectomy and fusions, anterior cervical corpectomies, posterior cervical fusions, laminectomies, and foramenotomy, Laminectomies for excision of spinal cord tumors, both intrameullary and extramedullar, Lumbar laminectomies, microdiscectomies, corpectomies, and fusions with instrumentatio, Thoracic laminectomies and discectomies.
 - 6. Anticipate premedication for and anesthetic considerations during electrocorticography
 - 7. Anticipate airway and sedation requirements for stereotactic neurosurgical procedures conducted with either general anesthesia or monitored anesthesia care

Perform the following specific procedures and monitoring techniques necessary to care for the neurosurgical patient.

1. Choose appropriate premedication and agents for anesthetic induction and maintenance based on a knowledge of their effects on cerebral physiology and on neuropathology
2. Choose and place the following monitors and monitoring devices for use during spinal and intracranial surgery:
 - a. Arterial line, central venous (CVP) or pulmonary artery (PA) pressure catheters by all approaches, especially the basilic or cephalic veins
 - b. observe/know about Precordial Doppler and interpretation of sounds
3. Perform techniques for awake intubation and positioning of the neurosurgical patient with either an unstable neck or myelopathic signs and symptoms
 - a. Assess when awake intubation and positioning are needed
 - b. Intubate an awake patient such that coughing or movement are minimal
 - c. Master anesthesia for awake intubation, including but not limited to, superior laryngeal and glossopharyngeal nerve blocks and transtracheal injection of lidocaine
4. Detect and treat air embolism during neurosurgery:
 - a. Know use of monitors to detect air embolism and what monitoring patterns are associated with air embolism.
 - b. Recognize the relative risks of different procedures and positions for air embolism.
5. Know general principles of positioning the patient for neurologic surgery and the advantages and disadvantages of each position:
 - a. Lateral
 - b. Prone
 - c. 3/4 prone
 - d. Supine-head turned
 - e. Sitting - theoretical knowledge only because this position is no longer used at our institution
6. Know anesthetic effects on the electroencephalogram (EEG) and evoked potentials and basic implications of and appropriate responses to changes in each.
7. Understand the basic indications and techniques, and, if possible, perform the following special procedures used during neuroanesthesia:
 - a. Induced hypotension
 - b. Induced hypertension
 - c. Moderate HypothermiaBarbiturate cerebral protection, Cardiopulmonary bypass and circulatory arrest — theoretical knowledge only in most instances.
8. Know the differential diagnoses and treatment alternatives of intraoperative intracranial hypertension (“tight brain”).
9. Reverse general anesthesia rapidly with a minimum of hemodynamic change to allow early postoperative assessment of the patient and recognize when failure to emerge from anesthesia is not likely an anesthetic effect.
10. Know the management of Head Trauma, and its anesthetic management

III. Evaluation to Determine Goal Achievement

- A. Preparation for case and ability to carry out plan discussed the night before:
 - 1. Recognition of intraoperative problems and communication with the attending; ability to appropriately respond to changing clinical situation; clinical judgment
 - 2. Mechanical skills of placing lines and positioning the patient
 - 3. Application of basic and clinical science knowledge and skills to the neurosurgical patient
- B. The neuroanesthesia group will meet at the conclusion of each rotation and an overall performance evaluation will be made based on the above criteria ED.

PAIN MANAGEMENT

I. Goals

- A. Differentiate among the different chronic pain states, for example, reflex sympathetic dystrophy and neuropathic or myofascial pain, and know what treatments are effective for each.
- B. Know the types of drugs that relieve pain and their efficacy, indications, side effects and contraindications and use.
- C. Know the laboratory tests, radiologic studies, and psychological tests used to help differentiate chronic pain syndromes.
- D. Learn to perform a thorough, directed history and physical examination, which will emphasize and facilitate the diagnosis of different pain states.
- E. Know the multidisciplinary approach to pain management.
- F. Know when it is appropriate to refer patients to different specialists for definitive or adjunctive therapy, for example, neurosurgery, orthopedic surgery, neurology.
- G. Manage acute and perioperative pain syndromes proficiently.

II. Objectives

- A. Learn the anatomy of the sympathetic nervous systems, specifically, the anatomy of the epidural and subarachnoid spaces and the location of sympathetic and parasympathetic ganglia
- B. Perform blocks and techniques in administering them that are commonly used to manage acute and chronic pain as follows (Please note: Some of these blocks may not be performed in a given month because of the patient population available during that month):
 - 1. Epidural steroid injection (all levels)
 - 2. Long-term epidural catheterization
 - 3. Blocks Should observe and know about the following blocks:
 - a. Celiac plexus
 - b. Infraorbital nerve
 - c. Intercostal nerve
 - d. Lumbar sympathetic
 - e. Stellate ganglion
 - f. Facet blocks

4. Complications associated with each blocks and appropriate treatment of each
- C. Know the cutaneous dermatomal mappings
- D. Diagnose myofascial pain syndromes and perform trigger point injections
- E. Know the different modalities of physical therapy that may relieve both acute and chronic pain and learn how to obtain such therapy
- F. Know the indications for stimulation techniques such as transcutaneous electrical nerve stimulation (TENS), dorsal column stimulation, and deep brain stimulation
- G. Know the acute pain and cancer pain guidelines:
 1. Treatments the WHO Treatment Ladder
 - a. Drugs: analgesics, opiates, sedatives, and stimulants
 - b. Nerve blocks
 - c. Neurolysis, surgical and chemical
 2. Routes of administration and risk and benefits of each epidural
 - a. Intramuscular
 - b. Intrapleural
 - c. Intravenous
 - d. Oral
 - e. Patient controlled
 - f. Subcutaneous
- H. Diagnose and know how to treat the following pain syndromes:
 - a. Diabetic neuropathy
 - b. Inflammatory states such as bursitis, carpal tunnel syndrome, skeletal pain, and tendonitis
 - c. Phantom limb pain
 - d. Post-herpetic neuralgia
 - e. Reflex sympathetic dystrophy
 - f. Trigeminal neuralgia
 - g. Low back pain

III. Evaluation to Determine Goal Achievement

PEDIATRIC

I. Goals

- A. Administer anesthesia safely for routine surgical, diagnostic, and therapeutic procedures.
- B. Recognize and treat postanesthesia problems
- C. Recognize when you or your institution cannot provide adequate care for a particular problem

II. Objectives

A. Preoperative

Neonatal anatomy and physiology applied to conduct of anesthesia.

1. Review the chart, take an adequate history, assess the major systemic problems, identify special problems such as latex allergy or apnea related to prematurity, and develop a plan of care.
2. Recognize and cope with the emotional problems of parents and child, and attempt to alleviate them.
3. Know the principles of and medications used for preoperative sedation.
4. Induce anesthesia in an distraught or uncooperative child.
5. Recall and state the anatomic, physiologic, and pharmacologic differences and similarities in the major organ systems between children and adults.
6. Transport safely a sick pediatric patient to the operating room and be able to state and perform the solutions to any problems which may arise in the following areas:
 - a. Heat maintenance
 - b. Cardiovascular stability
 - c. Ventilation
 - d. Oxygenation
7. Record and estimate preoperatively blood volume, hourly fluid requirements, estimated fluid deficit, third space loss, red cell mass at the patient's hematocrit, acceptable red cell mass loss, and acceptable blood loss.

B. Intraoperative

1. Know appropriate endotracheal tube sizes - cuffed and uncuffed.
2. Induce and maintain anesthesia by inhalation, intravenous, intramuscular, and rectal routes and know the differences in effects of various anesthetics between adults and pediatric patients.
3. Administer mask or laryngeal mask airway anesthesia when appropriate.
4. Maintain the airway of an anesthetized pediatric patient and intubate the trachea without trauma in 98% of cases within 1 minute.
5. Perform awake intubation.
6. Recognize abnormal airways and maintain them during anesthesia.
7. Describe the appropriate management of laryngospasm.
8. Recognize the following signs of hypoxias: bradycardia, poor color, poor venous filling, distant heart tones, and abnormal electrocardiogram.
9. Understand the various forms of breathing circuits used in pediatric anesthesia and them appropriately.
10. Apply consistently and interpret data from a blood pressure cuff, electrocardiogram, oximeter, capnograph or mass spectrometer, and a thermistor.
11. Know the indications of use of a heat lamp and heated humidifier when appropriate Answer questions concerning the importance of thermoneutrality in pediatric by demonstrating the use and abuse of the following, Heat lamp, Heat blanket, Heat humidifier, Room temperature.
13. Master the techniques of halothane and isoflurane/nitrous oxide/oxygen/muscle relaxant anesthesia.
14. Determine and discuss when deep or awake extubation is appropriate and apply the proper approach.
15. Understand and apply the basic concepts of neuromuscular blockade in children, know when anesthesia is adequately reversed, and know the differences between dose/effect in infants and children as compared to adult patients.

16. Apply the principles of fluid and blood replacement during anesthesia.
17. Understand the benefits and risks of regional anesthesia, including spinal anesthesia and regional analgesia for postoperative pain.

C. Postoperative

1. Transport safely and manage immediate postoperative care in the following areas: ventilation, oxygen administration, temperature control, cardiovascular monitoring, fluid balance, and pain relief.
2. Recognize postoperative croup and treat it.
3. Understand postanesthesia apnea, factors associated with it, the appropriate duration of monitoring, and treatment.

D. Special problems

1. Manage the following in pediatric patients undergoing anesthesia and surgery:
 - a. Blood replacement
 - b. Drug administration and anesthetic requirement (minimum anesthetic concentration)
 - c. Fluid and electrolyte balance, glucose requirement, and renal maturation
 - d. Hypocalcemia
 - e. Hypoglycemia
 - f. Metabolism
 - g. Temperature control
 - h. Vitamin K administration
2. Care of patients in the following special circumstances:
 - a. Special problems
 - i. Congenital heart disease
 - ii. Epiglottitis
 - iii. Malignant hyperpyrexia
 - iv. The child with the anatomically difficult airway (e.g. Pierre Robin syndrome)
 - b. Special procedures
 - i. Bronchoscopy (in particular for foreign body aspiration)
 - ii. Tonsillectomy (in particular for the rebleeding tonsil)
 - iii. Computerized axial tomographic scan and magnetic resonance imaging
3. Know and experience management of a pediatric patient with a full stomach
4. Identify the following various problems in pediatric patients and handle them:
 - a. Diaphragmatic hernia
 - b. Omphalocele and gastroschisis
 - c. Pierre-Robin syndrome
 - d. Pyloric stenosis
 - e. Tracheoesophageal fistula
5. Understand pediatric resuscitation, drugs and doses used for it, and defibrillation

III. Evaluation to Determine Goal Achievement

OBSTETRIC

I. Goals

- A. Learn how the physiology of normal pregnancy alters the response to anesthesia
- B. Learn pertinent aspects of fetal and placental physiology
- C. Learn what obstetricians may require from anesthesiologists
- D. Learn how pregnancy creates special problems for the anesthesiologist learn the nature of high-risk obstetrics and how special medical problems alter the approach to obstetric anesthesia
- E. Participate in morbidity mortality conference and ongoing research

II. Objectives

- F. Learn how to evaluate the neonate and principles of neonatal resuscitation
- G. Learn how drugs affect the neonate
- H. Learn how to communicate effectively with obstetricians and with labor and deliver nurses.
- A. Obtain pertinent information from the history and physical examination of the obstetric patient to assess major systemic problems
- B. Understand obstetric physiology and pharmacology as follows:
 - 1. Alteration of maternal physiology during pregnancy
 - 2. Effects of anesthesia, both general and regional, on human uteroplacental blood flow and of adjunctive medications such as vasopressors and vasodilators on uterine blood flow
 - 3. Perinatal pharmacology and placental transfer of drugs
 - 4. Effects of epidural and systemic medications on labor and delivery
 - 5. Learn all anesthetic techniques suitable for managing normal labor pain including:
 - a. Epidural local anesthesia
 - b. Epidural opiate anesthesia
 - c. Inhalation analgesia
 - d. Intravenous analgesia
- C. Understand epidural and spinal analgesia and anesthesia as follows:
 - 1. Anatomy and physiology of the epidural space and spine
 - 2. Techniques of needle placement including midline and paramedian approaches
 - 3. Pharmacology of local anesthetics
 - 4. Complications and side effects
- D. Know common problems encountered in continuous epidural infusion and how to prevent and treat them
- E. Know how to use of intraspinal opiates in obstetrics:
 - 1. Physiology and pharmacology

2. Benefits for labor, deliver and postoperative pain
 3. Side effects
- F. Understand the advantages of regional and general anesthesia for cesarean section
 - G. Know the risk factors, prevention, and treatment of maternal aspiration
 - H. Evaluate difficult airways and know how to prevent the problems associated with them and to manage failed intubation
 - I. Be familiar with recent advances in obstetric anesthesia
 1. The effect of epidural anesthesia on labor and deliver
 2. Drug interaction
 3. The epidural test dose
 4. Anesthesia for pre-term delivery
 - J. Recognize high-risk factors in obstetric patients and how they affect anesthetic management as follows:
 1. Morbid obesity and anesthesia: Problems and management
 2. Preeclampsia: Basic considerations and controversy in management
 3. Neurologic disease and pregnancy
 - K. Understand anesthetic choices for the pregnant patient with heart disease
 - L. Identify and manage common medical emergencies in the post-parturient
 - M. Know how the late 20th century social problems affect anesthetic care, such as perinatal human immunodeficiency virus infection and maternal substance abuse
 - N. Manage maternal anesthesia and the stressed fetus
 - O. Know current fetal monitoring techniques and how to interpret the information they provide

III. Evaluation to Determine Goal Achievement

REGIONAL ANESTHESIA

I. GOALS

- A. To teach anesthesia residents the art and sciences of regional anesthesia understand the anatomy, pathophysiology, and appropriate management of complications and side effects of regional anesthetic techniques, - the test doses; total spinal, subdural blocks - assessment and treatment; Risks of spinal, epidural hematoma and abscess - assessment and treatment; Postdural puncture headache - assessment and treatment; Pneumothorax- assessment and treatment; Physiologic side effects: sympathectomy, phrenic nerve block, intercostal nerve block - assessment and treatment; Peripheral nerve injury - assessment and follow up.
- B. To understand general principles of local anesthetic pharmacology, including the pharmacodynamics and pharmacokinetics of various local anesthetics. This includes onset duration, motor/sensory differentiation, and toxicity profile of various local anesthetics and allergy its treatment:
- C. To understand the principles and indications for various local anesthetic adjuvants including:

Epinephrine, phenylephrine, narcotics, sodium bicarbonate, carbonation, hyaluronidase, alpha agonists, anticholinesterases.

- D. To be familiar with the relevant anatomy for regional techniques, including: Spinal canal and its contents, neural plexuses of the limbs, major autonomic ganglia.
- E. Be familiar with the physiologic changes associated with spinal and epidural anesthesia.
- F. Understand the indications for and the contraindications to regional anesthetic techniques including central neuraxis blocks, peripheral nerve blocks, sympathetic nerve blocks.

B. COGNITIVE SKILLS

At the completion of this rotation residents should be able to demonstrate the following skills.

1. Rational selection of regional anesthesia technique and choice of local anesthetic for particular patient encounters.
2. Ability to assess adequacy of regional anesthesia before the start of surgery, and demonstrate appropriate plans for supplementation of inadequate blocks.
3. Provide effective anxiolysis and sedation of patients by both pharmacologic and interpersonal techniques.
4. Select appropriate monitors for specific patient encounters, and document performance of regional anesthetic adequately.

III. EVALUATION TO DETERMINE GOAL ACHIEVEMENT

SKILLS SHEET FOR RESIDENTS ON THE REGIONAL ANESTHESIA ROTATION

Demonstrate ability to perform/familiarity with the following regional anesthesia techniques:

- Brachial plexus blockade
- sciatic nerve block
- femoral nerve block, or 3-in-1 block
- Caudal block – adult and pediatric
- ankle block
- epidural block/Catheter
- spinal subarachnoid block
- Biers block
- others

OBJECTIVES OF DENTAL ANESTHESIA

Understand the principles of conscious sedation

Principles of anesthesia in a dental Chair

Local Blocks For Dental Surgery

OBJECTIVES OF TRANSPLANT ANESTHESIA

Know the basic Principles of anesthetizing An immunocompromised Patient Principles of anesthetising

patient with end stage renal/liver disease Warm/Cold ischemic Time

OBJECTIVES FOR OPHTHALMOLOGY POSTING

1. Give anesthesia for intra and extraocular surgery
2. To anesthetize premature babies for ROP surgery.
3. To give Monitored Anesthesia Care to learn to sedate patients for MAC
4. To give Ophthalmic nerve blocks.

OBJECTIVES FOR ENT POSTING

1. To give topical anesthesia for awake intubation.(nasal and oral)
2. To give local block for Tonsillectomy
3. Local anesthesia for tracheostomy..
4. Local block for thyroid surgery TO give anesthesia for MLS
5. To give anesthesia for Laser surgery of airway.
To give anesthesia for vascular malformations /tumours of noses

APPENDIX — I

Text books:

1. Miller RD, ed. Anesthesia, 5th ed.
2. Wylie Churchill Davidson
3. Nunn and Utting
4. Stoelting RK, Miller RD, eds. Basics of Anesthesia

APPENDIX (CARDIAC)

Text books:

1. JA Kaplan: Cardiac Anesthesia J Benum of: Anesthesia for Thoracic Ssurgery
C Lake: Pediatric Cardiac Anesthesia

APPENDIX (NEURO ANAESTHESIA)

Text books include:

1. Cucchiara and Michenfelder: Clinical Neuroanesthesia, Churchill-Livingstone
2. Cottrell and Smith: Anesthesia and Neurosurgery, 3rd ed, CV Mosbyd
3. Millelr: Aanesthesia, 4th ed, Churchill-Livingstone; chapters 21, 38, and 56
4. Kirby and Gravenstein: Clinical Anesthesia Practice, WB Saunders; chapters 22, 4, and 73
5. Russell and Rodichok: Primer of Intraoperative Neurophysiologic Monitoring, Butterworth and Heinemann

APPENDIX (PEADIATRIC ANAESTHESIA)

Text books:

1. Gregory GA: Pediatric Anesthesia, 2nd ed
2. Steward D: Handbook of Pediatric Anesthesia, MD

APPENDIX (ICU)

1. ICU Book Paul Marino
2. Critical Care by Joseph Civetta, Robert W Taylor and Robert Kirby publisher Lippincott

APPENDIX (PAIN)

1. Bonica: The Management of Pain
2. Cousins and Bridenbaugh: Neural Blockade in Pain Management
3. Raj: Practical Management of Pain

ASSESSMENT METHODS

Assessment is a vital part of any course and it is element where there is frequently considerable doubt. There are 2 major components:

- A) Formative Assessment:** Ongoing evaluation during the course –
During each posting/ Module/ End Unit
- B) Summative Assessment:** Final assessment after 3 years and/at the end of each semester
Assessment

FORMATIVE ASSESSMENT/(Ongoing Evaluation)

Formative assessment will be conducted during each posting/module/unit. This will include the following:

TECHNICAL SKILLS COMPETENCY EVALUATIONS:

- Methods to be used
- 1) Performing anaesthetic management on real patients (check lists of each skill and competency including log book evaluation)
 - 2) Simulators
 - 3) Objective Structured Clinical Examination (OSCE)

This evaluation will be done either in the OT or ICU or PAC or Postoperative wards.

PROBLEM SOLVING CASES:

- Method to be used
- 1) Case presentations (evaluation by Peers)
 - 2) Simulated case cards

3) OT discussions

4) OSCE

ORAL SKILLS – Attitudinal Development:

Method to be used 1) Ability to present seminars, discussion in class room (evaluation by Peers)

2) Talking to patients in pre-anaesthesia rounds

3) Operation theatre Management

CARDIOPULMONARY RESUSCITATION:

Method to be used 1) Mannequins demonstration

2) Check lists for evaluation

3) OSCE

C P R evaluation will be repeated at the end of each semester

SUMMATIVE ASSESSMENT (FINAL ASSESSMENT) and End Semester assessment

1) THEORY (Subject contents already outlined in curriculum)

Should consist of

a) Structured Essay Questions (SEQs)

b) Short Answer questions (SAQs) minimum of 10 SAQs will be Mandatory (in all four papers taken together)

c) Problem Solving Questions

d) Multiple choice Questions (MCQs) MCQs of different types

Shoule be included atleast in one of the 4 papers. The use of MCQs is recommended for formative/end semester evaluation.

Final Theory papers: 4 Papers

		Marks
Paper I	Basic Sciences as applied to Anaesthesiology, including ethics, statistics, Quality assurance, medicolegal Aspects.	100
Paper 2	Anaesthesia in relation Associated Systemic	100
Paper 3	Anaesthesia in relation to subspecialities such As cardiac, neuro, obstetrics and pediatrics etc.	100
Paper 4	Intensive care Medicine, Pain Medicine and Recent advances in Anaesthesiology	100

2) PRACTICAL

4 components:

Marks

The practical examination should be structured and objective as possible

1 long case 40 min 100

A) Clinical Cases

2 Short cases 15 min each 40 each

Structured Assessment (Long Case)

- | | |
|--|----|
| 1. Oral skills/presentation | 10 |
| 2. Diagnosis/investigations | 10 |
| 3. Preanaesthetic Preparation | 20 |
| 4. Anaesthetic management | 40 |
| 5. Post operative complications & management | 20 |

B) OSCE: At least 10 OSCE stations with checklists 20

For objective assessment marks

C) VIVA-VOCE (Structured)

TOTAL MARKS: 200

- | | |
|--|----|
| 1. Problem solving situations | 40 |
| 2. Drugs/Anaesthetic | 40 |
| 3. Equipments for Anaesthesia/In. Care | 40 |
| 4. Investigations } ECG/Xrays/MRI | 40 |
| Endoscopy etc. | |

D) 1. CPR Assessment on Mannequins 40

Total Marks

Theory (Papers 1-4) 400

Practical (Cases, OSCE, Viva Voce) 400

Grand Total **800**

The candidate will be required to secure minimum 50% marks in theory and 50% marks in clinicals and viva-voce separately, which is mandatory for passing the whole examination. Candidate failing in theory will not qualify to take practical examinations. There should be enough gap between theory and practical Exam. As recommended by MCI rules.

Final Assessment Marks Weightage

30% : Internal (Formative) Assessment & Thesis

70% : Summative Assessment

The committee recommends that three external and three internal examiners should conduct the clinical examination. A maximum of 4 candidates should be examined per day and if there are more than 4 candidates the examination should be conducted on 2 consecutive days.

THESIS

Objectives

1. The student would be able to demonstrate capability in research by planning and conducting systematic scientific inquiry & data analysis and deriving conclusion.
2. Communicate scientific information for health planning.

Guide for thesis

1. Chief guide will be from the department of Anaesthesiology
2. Co-guide(s) will be from the department or from other disciplines related to the thesis.

Submission of thesis protocol

It should be submitted at the end of six months after admission in the course.

1. Protocol in essence should consist of:
 - a. Introduction and objectives of the research project.
 - b. Brief review of literature.
 - c. Suggested materials and methods, and (scheme of work)
 - d. Statistician should be consulted at the time of selection of groups, number of cases and method of study. He should also be consulted during the study.
 - e. Bibliography
2. The protocol must be presented in the department of Anaesthesiology before being forwarded to the Research Committee of the Institute.
3. Protocol will be approved by the research committee appointed by the Dean/Principal to scrutinise the thesis protocol in references to its feasibility, statistical validity, ethical aspects, etc.

Submission of thesis

1. The thesis shall relate to the candidate own work on a specific research problem or a series of clinical case studies in accordance with the approved plan.
2. The thesis shall be written in English, printed or typed on white bond paper 22 × 28 cms with a margin of 3.5 cm. bearing the matter on one side of paper only and bound with cloth/rexine, with the title, author's name and the name of the College printed on the front cover.
3. The thesis shall contain: Introduction, review of literature, material and methods, observations, discussions, conclusion and summary and reference as per index medicus.

Each candidate shall submit to the Dean four copies of thesis, through their respective Heads of the Departments, not later than six months prior to the date of commencement of theory examination in the subject.

Evaluation of thesis

1. The thesis shall be referred by the University evaluation to the Examiners appointed by the University. The examiners will report independently to the Controller of Examinations and recommend whether the thesis is-

- a) approved
 - b) returned for improvements as suggested or
 - c) rejected
2. The thesis shall be deemed to have been accepted when it has been approved by atleast two external examiners and if the thesis is rejected by one of the external examiners it shall be referred to another external examiner (other than the one appointed for initial evaluation) whose judgement shall be final for purposes of acceptance or otherwise of the thesis.
 3. Where improvements have been suggested by two or more of the examiners, the candidate shall be required to re-submit the thesis, after making the requisite improvements, for evaluation.
 4. When a thesis is rejected by the examiners, it shall be returned to the candidate who shall have to write it again. The second thesis, as and when submitted shall be treated as a fresh thesis and processed.
 5. Acceptance of thesis submitted by the candidate shall be a pre-condition for his/her admission to the written, oral and practical/clinical part of the examination.

Provided that under special circumstances if the report from one or more examiners is not received by the time, the Post-graduate examination is due, the candidate may be permitted provisionally to sit for the examination but the result be kept with held till the receipt of the report subject to the condition that if the thesis is rejected then the candidate in addition to writing a fresh thesis, shall have to appear in the entire examination again.

6. A candidate whose thesis stands approved by the examiners but fails in the examination, shall not be required to submit a fresh one if he/she appears in the examination in the same branch on a subsequent occasion.

ANATOMY — M D

OBJECTIVES

At the end of the three years post-graduate training programme in Anatomy the student should be able to:

1. Acquire in depth knowledge of structure of human body from the gross to the molecular level, and correlate it with the functions.
2. Comprehend the principles underlying the structural organization of body and provide anatomical explanations for disturbed functions.
3. Acquire knowledge of basic principles of normal growth and differentiation. Understand critical periods of human growth and development as well as ontogeny of all the organ systems of body. Analyze the congenital malformations, know the etiological factors including genetic mechanisms involved in abnormal development and their effects on functions.
4. Have comprehensive knowledge of the basic structure and correlated function of the nervous system in order to understand altered state in the various disease processes.
5. Plan and implement teaching programmes for under-graduate medical students. Be familiar with and be able to use different teaching methods and modern learning resources for under-graduate teaching. Plan and conduct evaluation of under-graduate teaching.
6. Develop/acquire an attitude of scientific enquiry and learn contemporary research techniques. Be familiar with recent scientific advances, identify lacunae in the existing knowledge in a given area and be able to plan investigative procedures for research, analyze data critically and derive logical conclusions.

LEARNING ACTIVITIES, TRAINING AND EVALUATION

During the course students have formal teaching and are trained for teaching and research

I Didactic Teaching

Topics in gross anatomy, microanatomy, embryology, neuroanatomy, histochemistry, and genetics, along with related practical sessions.

II Training

Communication skills – journal club, seminars

Hands on experience — techniques in micro, neuro, gross anatomy, embryology, histochemistry, genetics, electron and confocal microscopy.

Teaching experience — taking UG classes : demonstrations and practicals for two semesters (one academic year)

Educational technology — preparation of AV aids for teaching, posters/manuscripts for presentation in conferences/workshops and publication in journals. Setting objective questions – SAQs, MCQs and OSPE. Prepare teaching modules & museum specimens, casts. Participation in organization of symposia/workshops.

III Research

Thesis – progress monitoring every semester.

Presenting paper/poster at conferences/Preparing manuscripts for documentation.

Thesis work presentation.

Thesis submission at the end of 2&1/2 yrs.

IV Evaluation of Training

Written/practical assessment every semester. Feedback on teaching/training programmes.

M D ANATOMY EXAMINATIONS

Final examination at the end of the course has theory, practical and viva-voce.

THEORY

Paper-I : Gross Anatomy with evolution and Comparative Anatomy. Gross Anatomy will include functional Anatomy. (Section-1)

Paper-II : Microscopic Anatomy, Developmental Anatomy and Genetics. (Section-2)

Paper-III : Neuroanatomy including development and microscopic structure (Section-3)

Paper-IV : Applied Anatomy. (Section-4)

PRACTICAL AND VIVA

1. Histological techniques, identification light and electron microscopic structure of tissues of body.
2. Slides, specimens of developmental anatomy, genetics, neuroanatomy to assess comprehensive knowledge in these areas.
3. Viva voce on gross anatomy, living anatomy, sectional anatomy and neuroanatomy, developmental anatomy.

SECTION –1

GROSS ANATOMY

COURSE CONTENT

Anatomy of entire body – Structure in detail and functional correlation.

Seminars, written assignments, group discussions on selected topics on regional anatomy.

PRACTICALS

1. Dissection of entire body
2. Anatomical techniques:

Fixation and preservation of dead bodies, preparation of museum specimens, preparation of bones, preparation of corrosion casts and plastination

SECTION – 2

DEVELOPMENTAL ANATOMY

COURSE CONTENT

Gametogenesis, fertilization, implantation and placenta, early human embryonic development, general embryology; development of organ systems and associated common congenital abnormalities, Physiological correlations of congenital anomalies.

PRACTICAL

Models, specimens of early human development and slides of chick and pig embryos to correlate avian and mammalian early development with human development. Specimens of congenital malformations.

HISTOLOGY AND HITOCEMISTRY

COURSE CONTENT

1. Cell Biology: Cytoplasm – Cytoplasmic matrix, cell membrane, cell organelles, cytoskeleton, cell inclusions, cilia and flagella.
Nucleus – nuclear envelope, nuclear matrix, DNA and other components of chromatin, protein synthesis, nucleolus, nuclear changes indicating cell death.
Cell cycle, mitosis, meiosis, cell renewal. Cellular differentiation and proliferation.
2. Tissues of Body: Light and electron microscopic details and structural basis of function, regeneration and degeneration. Confocal microscopy.
3. The systems/organs of body – Cellular organization, light and electron microscopic features, structure-function correlations, and cellular organization.

PRACTICAL

Preparation of tissues for histological sections, light microscopy and its applications, histological staining-routine & special, electron microscopy and its applications, identification of normal and abnormal organelles in electron micrographs, three dimensional interpretation, artifacts identification.

IMMUNOLOGY

COURSE CONTENT

Immune system and the cell types involved in defense mechanisms of the body. Gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs in the body. Biological and clinical significance of the major histocompatibility complex of man including its role in transplantation, disease susceptibility/resistance and genetic control of the immune response. Common techniques employed in cellular immunology and histocompatibility testing. Molecular hybridization and PCR technology in immunology research particularly mechanism of antigen presentation, structural and functional relevance of the T cell receptor, genetic control of the immune response,

molecular basis of susceptibility to disease.

PRACTICAL

Techniques of DNA preparation, electrophoresis and southern blot hybridization.

GENETICS

COURSE CONTENT

1. Human Chromosomes - Structure, number and classification, methods of chromosome preparation, banding patterns. Chromosome abnormalities, Autosomal & Sex chromosomal abnormalities – syndromes, Molecular and Cytogenetics.
2. Single gene pattern inheritance: Autosomal & Sex chromosomal pattern of inheritance, Intermediate pattern and multiple alleles, Mutations, Non Mendelian inheritance, Mitochondrial inheritance, Genomic imprinting, parental disomy.
3. Multifactorial pattern of inheritance: Criteria for multifactorial inheritance, Teratology, Structure of gene, Molecular Screening, Cancer Genetics – Haematological malignancies, Pharmacogenetics.
4. Reproduction Genetics- Male and Female Infertility, Abortuses, assisted reproduction, Preimplantation genetics, Prenatal diagnosis, Genetic Counselling, Ethics and Genetics.

PRACTICALS

DNA Isolation from peripheral blood lymphocytes, Polymerase Chain Reaction (PCR), Fluorescence In-Situ Hybridization (FISH), Chromosomal Analysis.

SECTION –3

NEUROANATOMY:

COURSE CONTENT

Brain and its environment, Development of the nervous system, Neuron and Neuroglia, Somatic sensory system, Olfactory and optic pathways, Cochleovestibular and gustatory pathways, Motor pathways, Central autonomic pathways, Hypothalamo-hypophyseal system, Cross sectional anatomy of brain and spinal cord.

PRACTICALS

Identification of structures in sections of brain stem and spinal cord at different levels. Staining nervous tissue using Nissl's staining. Discussions on clinical problems related to neurological disorders and anatomical explanation for the same.

SECTION – 4

APPLIED ANATOMY AND RECENT ADVANCES

COURSE CONTENT

Clinical correlations of structure and functions of human body. Anatomical basis and explanations for clinical problems. Applications of knowledge of developmental, micro, neuro anatomy to comprehend deviations from normal. Recent advances in medical sciences which facilitate comprehension of structure function correlations and applications in clinical problem solving.

Recommended Books

- | | |
|---|--|
| 1. Gray's Anatomy
38th edition, 1995 reprint in 2000
Churchill Livingstone | Williams et al |
| 2. Wheaters Functional, Histology 4th ed.(2000)
Churchill Livingstone | B. Young and J.Heath
www.med.uc.edu.embryology |
| 3. Histology: A text & atlas
3rd edition (1995) Williams & Wilkins | M.H.Ross, E.& L.J. |
| 4. Medical Embryology
8th edition William and Wilkins | Jan Langman |
| 5. Genetics in medicine
6th edition, 2001
W.B. Saunders & Co. Philadelphia, London | J.S.Thompson &
M.W. Thompson |
| 6. Human Neuroanatomy
9th edition, 1996 | Stuin J and Carpenter MB |
| 7. Clinical Neuroanatomy
for Medical Students
Willian and Wilkins 5th edition, 2001 | Richard S. Snell |

BIOCHEMISTRY — M D

GOAL

The main goal of the post graduate education in Biochemistry is to enable a student understand, envisage and explain life processes as molecular events and apply his knowledge and skills in clinical problem solving and scientific research.

OBJECTIVES

At the end of the 3 years training in Biochemistry, the PG student is expected to

KNOWLEDGE

Demonstrate his understanding of the

1. Concepts and principles of general biochemistry.

This includes molecular motif of a living cell, structural and functional hierarchy of biomolecules and their structure-function relationships. Biochemistry of human nutrition, metabolism, metabolic interrelationships, metabolic homeostasis, molecular and cell biology, body defense against xenobiotics and pathogens, principles of various laboratory estimations, instrumentations and rationale underlying biochemical laboratory investigations.

2. Fundamentals of biostatistics

SKILLS

1. Conduct Biochemical laboratory investigations and experimentations relevant to clinical management and biomedical research. Analyze, interpret and evaluate the data. Rationalize their application in clinical management and experimental research.
2. Plan & conduct lecture, practical demonstrations, tutorial classes and small group discussions on clinical problems for undergraduates students of medical and allied disciplines.
3. Be familiar with literature survey/computer skills.
4. Critically review & comment on research papers and give oral presentation.
5. Prepare research protocols, conduct experimental studies analyze and solve clinical and experimental problems.

METHODOLOGY

Following methods are used to facilitate learning and training of MD students.

1. **Post graduate lectures, tutorials, seminars:** To update on various aspects of basic and clinical biochemistry & impact of molecular biology on advances in medicines.
2. **Journal club:** To develop (a) skills of analysis, evaluation and presentation of research papers (b) familiarity with approaches and methodologies of research and (c) to update on new development/emerging trends in biochemistry.
3. **Practical exercises:** At least once in a week, under the supervision of a faculty.
4. **Thesis:** Each PG student will carry out research work under the supervision of a faculty member of the Deptt. Of Biochemistry. The thesis will be submitted to AIIMS and will be evaluated by two suitable experts in that area/field. The acceptance of the thesis will be a prerequisite for the candidate to be allowed to appear in the final exam.
5. Participation in UG laboratory practical teaching and problem based tutorials as a team with faculty incharge & senior residents of the department to gain in depth learning, teaching and tutoring experience.
6. **Specialized training in Clinical Biochemistry:** 2 months posting in the clinical biochemistry laboratory to learn sample collection, quality control methods, setting up of a clinical biochemistry laboratory, specialized assays, statistical analysis of data.

THEORY EXAMINATION

Paper I: General and Clinical Biochemistry and Enzymology

Duration 3 hrs, Marks 100

(Section 1)

Paper II: Metabolism, Bioenergetics, Nutrition, Vitamins and Hormones

Duration 3 hrs. Marks 100

(Section 2)

Paper III: Molecular biology, immunology, cancer

Duration 3 hrs, Marks 100

(Section 3)

Paper IV: Techniques in Experimental Biochemistry, Recent Advances in Biochemistry and Molecular Biology.

Durations 3 hrs, Marks 100

(Section 4)

SECTION - 1

PAPER I: General and Clinical Biochemistry Enzymology and biostatics.

General Biochemistry: Cell structure, its biochemical make up and functions, membrane structure and functions, cytoskeleton, structure and functions of proteins, muscle and plasma proteins, hemoglobin, biochemistry of blood clotting, body fluids and their importance in clinical biochemistry .

Enzymes: Principles and mechanisms of enzymatic catalysis, enzyme kinetics and regulation of enzyme activity.

Clinical biochemistry: Serum enzymes and isoenzymes – their diagnostic value. Analysis and significance of clinically important analytes in blood, urine and CSF. Quality Control in clinical biochemistry, instrumentation in clinical laboratory.

Liver, kidney and gastric function tests. pH, buffers and acid base balance, metabolic acidosis and alkalosis, respiratory acidosis and alkalosis.

Biostatistics and research methodology, their application in research and clinical chemistry, types of study designs, data analysis, correlation & agreement analysis methods, risk analysis methods, calculation of adequate sample size for various study designs, students 't' test, paired 't' test, chi-square test and Fisher's exact test, Non-parametric tests of significance, Statistical aspects of diagnostic tests, Multivariate analysis methods, One way and two way analysis of variance and multiple range tests, Commonly used statistical software for the analysis of bio-medical data.

Quality Control

Journal club and seminars.

SECTION - 2

PAPER II: Metabolism, Bioenergetics, Nutrition, Vitamins and Hormones.

Bioenergetics and intermediary metabolism: Metabolism of carbohydrates, lipids, proteins, amino acids, porphyrins, purines, pyrimidines, their regulation dysregulation and inter-relationships. Inborn errors of metabolism, genetic disorders. Principles of bioenergetics, electron transport chain and oxidative phosphorylation.

Nutrition, mineral metabolism and trace elements, water and electrolyte balance.

Vitamins: Fat and water soluble vitamins their chemistry action functions and deficiency. Role in free radical homeostasis. Biochemistry of free radicals.

Hormones: chemistry, mechanism of action and their role in regulation of metabolism and physiological functions consequence of hormonal dysfunction.

SECTION - 3

PAPER III: Molecular Biology, Immunology, Cancer.

Biochemistry and molecular biology of cancer – growth factors and oncogenes.

Nucleic acids – replication, transcription, protein biosynthesis and gene regulation: Genetic code, mutations and mutants, DNA repair. Purines and pyrimidines – biosynthesis and degradation, cell – cell interaction, adhesion molecule, signal transduction, receptor-structure and regulation, cloning, construction of genomic libraries, strategies for screening DNA libraries.

Immunology: Structure functions, classifications and synthesis of immunoglobulins, antigen-antibody reaction, mechanisms and regulation of immune responses. Complement system, hypersensitivity, immune-tolerance, immunity to infection, autoimmunity & auto immune diseases, tumor immunity, genetics of immune response, transplantation, experimental system used in immunology, vaccination and immunization strategies, hybridoma technology. Apoptosis, telomeres and telomerase, cytokine network, immunodiagnostics.

SECTION - 4

PAPER IV: Techniques in Experimental Biochemistry, and Recent Advances in Biochemistry and Molecular Biology.

General Laboratory Techniques and procedures, pH meter, balances.

Centrifugation, sub-cellular fractionation

Purification of an enzyme and study of its kinetics

Chromatography

Electrophoresis techniques immune-diffusion and Isoelectric focusing, HPLC

Immunoassay techniques, Immuno-electrophoresis, immunoblotting and ELISA.

Spectroscopy techniques, including NMR.

Radioactive Isotopes their application in biomedical research and clinical diagnosis and measurements of radioactivity, tracer techniques, autoradiography and microassays like RIA, ELISA, estimation of hormones etc.

Molecular diagnostics, recombinant DNA technology and its applications.

Microscopy – light microscopy electron microscopy and confocal microscopy

Cell Culture

Environmental biochemistry and detoxification

Genomics, proteomics and array technology

Clinical biochemistry

Practical examination: Duration 2 days, Marks 200

Practicals: Fractionation of proteins, purification and kinetic analysis of enzymes (LDH/Alkaline, phosphatase) from a suitable source, separation and molecular weight determination of proteins by SDS-PAGE, cell culture, lymphocyte separation, Invitro carcinogenesis (cytotoxicity and survival assay), estimation of progesterone/hormone levels in human blood by RIA/ELISA, separation of lipoproteins by electrophoresis, Estimation of LDL and HDL cholesterol in serum, clinical biochemistry, immunodiffusion techniques, Western blotting, Southern blotting, preparation of competent E.Coli cells, transformation and plasmid DNA by agarose gel electrophoresis), PCR, RT-PCR, DNA fingerprinting by RARD analysis. Affinity purification of IgG by protein A sepharose column chromatography, DNA-protein binding, determination of binding constant, scatchard plot and co-opertivity test, purification of synthetic polypeptide by column chromatography. Diffential, densitygradient, ultracentrifegation, radioactivity measurements.

Students will attend the weekly biochemistry practicals for the undergraduates.

Oral examination

1. Thesis work presentation and discussion.
2. General viva voce and practical bench viva.

Books recommended

1. Biochemistry Ed Lubert Stryer. W.H. Freeman and Company, New York.
2. Principles of Biochemistry. Ed Lehninger, Nelson and Cox. CBS publishers and distributors.
3. Harper's Biochemistry. Ed. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell. Appleton

and Lange, Stamford, Connecticut.

4. Textbook of Biochemistry with Clinical Correlations. Ed. Thomas M. Devlin. Wiley-Liss Publishers.
5. Genes VI. Ed Benjamin Lewin. Oxford University Press.
6. Tietz Textbook of Clinical Chemistry. Ed Burtis and Ashwood. W.B. Saunders Company.
7. Principles and techniques of practical biochemistry. Ed Keith Wilson and John Walker. Cambridge University Press.
8. Biochemistry. Ed Donald Voet and Judith G. Voet. John Wiley & sons, Inc.
9. Molecular Cloning - A Laboratory Manual. J. Sambrook, E.F.Fritsch and T.Maniatis. Cold Spring Harbor Laboratory Press.
10. Molecular Cell Biology, H. Lodish, A. Berk, S.L.Zipursky, P. Matsudaira, D. Baltimore, J. Darnell.

BIOPHYSICS — M D

PREAMBLE

The MD (Biophysics) course serves to interface the various disciplines – biology, medicine, physical sciences and computer applications. The students undergo training in an environment of advanced research in various aspects biophysics. They receive a sound theoretical knowledge coupled with a demanding practical application. By the end of the course, the student is confident to discuss and dissect any aspect biophysical problem related to clinical sciences.

OBJECTIVES

The course aims to impart to the students

1. a sound theoretical perspective of biophysics
2. practical skill to use biophysical techniques
3. capability to evaluate any published work
4. capability to carry out independent research

SALIENT FEATURES

1. regular lectures by the faculty on the basics and current aspects of biophysics
2. group discussions to critically evaluate the work
3. seminars to review and update the developments in biophysics
4. thesis embodying advanced research
5. computer training and applications
6. use of bioinformatic tools

EXAMINATION

1. Theory examination

Paper – I

Paper – II

Paper – III

Paper – IV

2. Practical Examination

One experiment in any of the biophysical techniques taught - one day

3. *Viva voce* Examination

Thesis presentation

Bench *Viva voce*

General *Viva voce*

The detailed curriculum to achieve the above objectives is detailed below. It contains four sections of theoretical course and one section of practical course. Besides these, the students require to complete a thesis in any of the research activities of the faculty. To help in acquiring theoretical knowledge, additional resources are indicated in appendix – 1.

I. ALLIED BIOPHYSICS

II. BIOPHYSICAL TECHNIQUES

III. CELLULAR AND MOLECULAR BIOPHYSICS

IV. APPLIED BIOPHYSICS

V. LABORATORY EXPERIMENTS

VI. THESIS

APPENDIX - 1

PAPER I

ALLIED BIOPHYSICS, MOLECULAR PHARMACOLOGY, BIOSTATISTICS, BIOMECHANICS AND MEDICAL INFORMATICS

MOLECULAR PHARMACOLOGY

Definition and determination of important pharmaco-kinetic, parameters, pharmacokinetic basis of individual difference in response to drugs, pharmacokinetic properties, pharmacophore identification, influence of structural modifications on pharmacokinetic properties. Mode of action of drugs, quantitative structure-activity relationship, present and future aids to drug-design.

Hormones and Drugs

Structure and conformation of drugs and receptors, drug-receptor binding forces, haemoglobin as a model receptor, steroid conformation, receptor binding and hormone action, structural aspects of drug-nucleic acid interactions.

BIOMECHANICS

Basic concepts of fluid dynamics, Bernoulli equation and its applications, streamline flow, Reynolds number, viscous flow, effects of gravity and external acceleration on circulation.

BIOSTATISTICS

Mean, Mode, Dispersion, SD, Correlation & Regression, T-Test, chi-square test, F-test and ANOVA (theory) how to enter data, edit/modify data, transform data, descriptive statistics i.e. how to calculate

mean, SD, range etc., Frequency distribution, Hypothesis tests for means and proportions, ANOVA, scatter plot, correlation matrix, Regression, probability dist.

MEDICAL INFORMATICS

Medical data collection, storage and analysis of hospital data using computers, computers in medical instrumentation and diagnosis.

PAPER II

BIOPHYSICAL TECHNIQUES AND COMPUTER PROGRAMMING

BIOPHYSICAL TECHNIQUES

Spectroscopic Techniques

Basic principles, instrumentation and applications of visible, ultraviolet, infra-red, optical rotatory dispersion, circular dichroism and Raman spectroscopies. Basic principles of nuclear magnetic resonance, nuclear Larmor precession in the applied magnetic field, precessing nucleus in an oscillating radio frequency field, spin-spin and spin-lattice relaxations, introduction to continuous wave and Fourier transform NMR, applications of NMR spectroscopy to biomolecules.

Principles and instrumentation of electron spin resonance, spin hamiltonian and its use to study biomolecules, spin probes and their uses, principles of Mossbauer spectroscopy, quadrupole splitting, isomer chemical shift and magnetic hyperfine splitting, applications of Mossbauer spectroscopy in medicine and biology.

Electron Microscopy

Basic principles, procedures and applications in biology and medicine.

X-Ray Diffraction Techniques

Methods of recording the X-ray diffraction patterns: rotation method, Weissenberg method, precession method, precession rotation method and diffractometer methods. Methods of protein structure analysis, crystallization of proteins, symmetry in molecules and crystals, Principle of X-ray diffraction, isomorphous replacement, molecular replacement method.

Separation Techniques

Basic principles and application of electrophoresis, centrifugation and chromatography.

Molecular Modelling

Basic principle of modeling, Modeling by energy minimization technique, Concept of rotation about bonds, Energy minimization basic technique for small molecules. Ramachandran plot, Torsional space minimization. Energy minimization in Cartesian space. Molecular mechanics basic principle. Molecular dynamics basic principles.

COMPUTER PROGRAMMING

Basic principles of Digital Computers, flow chart, constants & variables, Arithmetic operations and expressions, statements, Arithmetic assignment statements, labeling and unconditional GOTO, computed and assigned GOTO statements, IF statements, simple I/O, DO statements, arrays, standard functions, programming style, writing simple programs.

PAPER III

CELLULAR AND MOLECULAR BIOPHYSICS

CELLULAR BIOPHYSICS

Organization and structure of prokaryotes and eukaryotes, plasma membrane, organelles, nucleus and cytoplasm, functions of membranes, organization and replications of, transcription, translation and regulation of gene expression in malignancy, differentiation, cell cycle.

MOLECULAR BIOLOGY

Central Dogma, Genetic code, gene and operon, Structure of DNA and RNA, extrachromal elements, plasmids, selectable markers, gel electrophoresis, polymerase chain reaction (PCR), cloning PCR products, expression vectors, DNA sequence analysis, cDNA libraries, genomic libraries, applications of molecular biology methods, using internet resources in molecular biology.

MOLECULAR BIOPHYSICS

Nature of Chemical Bonds

Introduction to chemical bonds, relation between bond type and structure of molecules, small molecular groups in biology, their structure and binding properties.

Protein Structure and Function

Nature and function of globular proteins, basic principle of protein structure, amino acids, peptide structure, secondary structure of polypeptides and proteins, tertiary structures of haemoglobin, myoglobin, trypsinogen, trypsin, collagen and membrane proteins, interactions of proteins with small molecules and ions.

Nucleic Acids

Watson-Crick structure of DNA, polymorphism of DNA, helix coil transition and DNA and melting point, DNA super coiling and nucleosome structure, protein-DNA recognition, crystallographic study of oligonucleotides, structure of t-RNA.

Lipids

Structure of lipids, phase changes in lipids, their role in pathogenesis of atherosclerosis, gall stone formation, structure of membranes, membrane receptors, transport across membranes.

Contractile proteins

Role of contractile proteins in cell function and muscle contraction.

PAPER IV

APPLIED BIOPHYSICS:IMAGING TECHNIQUES, RADIATION BIOPHYSICS, NUCLEAR MEDICINE, BIOELECTRICITY

IMAGING TECHNIQUES

Ultrasound, nuclear magnetic resonance and positron emission tomography, computerized axial tomography, whole body scanner, dose calibrators, gamma scintillation camera, digital imaging techniques, acquisition, analysis and processing of data from Gamma camera, enhancement, tomographic reconstruction, display and recording of the image.

RADIATION BIOPHYSICS

Production and types of radiations, radiation measurement units, interaction of radiation with matter, detection of radiation by ionization chamber, G.M. counter, proportional counter, liquid scintillation counter, radiation protection, molecular effects of radiation on membranes, cytoplasmic organelles, macromolecules, factors modifying effects of radiation, repairs of radiation induced damage.

WEAK FIELD EFFECTS

Effects of electromagnetic field, microwaves and gravitational fields on living systems

RADIOPHARMACEUTICALS

Production of radio-nuclides by reactors, cyclotrons and particle accelerators, use of radio nuclide generators, elements of radio-chemistry.

DIAGNOSTIC USES OF RADIONUCLIDES

In vivo imaging and functional studies of brain, thyroid, heart, biliary, liver, kidney, spleen, tumors, bones and abscesses.

Use of imaging devices and external detectors for organ imaging; time dependent and differential functional studies, use of physiological gating techniques for functional studies, methodology and quality control of competitive binding and radio immunoassay, procedures for the measurement of peptide hormones, drugs and other biological substances, basic principles of radionuclide therapy in thyrotoxicosis, carcinoma of thyroid.

BIO-ELECTRIC POTENTIALS

Principle and interpretations of electro-encephalogram, electro-cardiogram, and electro-retinogram.

PAPER V

LABORATORY EXPERIMENTS

1. Determination of unit cell constants using Weissenberg method.
2. Single crystal X-ray diffraction patterns from protein crystals using precession method.
3. Writing of small computer program for calculating mean and standard deviations.
4. PCR Experiment
5. Determination of Molecular Weight by SDS
6. DNA Electrophoresis.
7. Isolation of plasmid DNA.
8. Simulate ten base pairs of DNA in B-form with given sequence and determine the specified distances and angles.
9. To simulate alpha helix/beta sheet of protein with given sequences and determine specified angles and distances.
10. To plot phi-psi map for a given tripeptide.
11. To fit a set of data points in a straight line.

PAPER VI**THESIS**

The students are required to submit a thesis by research to the Institute six months before the final examination. External examiners will evaluate the thesis. An approval of the thesis is essential for the candidate to take the final examination.

APPENDIX – 1

Internet usage for data retrieval from various databases

Internet for various software usage

Internet usage for data retrieval in research, molecular biophysics, molecular structure, pharmacology journals: structural studies in all journals, in particular PNAS (USA), Nature, JMB, Biochemistry, JBC, EMBO, Science, Acta Crystallogr. D.

COMMUNITY MEDICINE — M D

DEPARTMENTAL OBJECTIVES

Goal of teaching and training of postgraduates in Community Medicine is directed towards achievement of the goal of “Health for All”. Aim of postgraduate training is to prepare the students to be –

- Teachers
- Researchers & Epidemiologists
- Health Planners, Organizers and Administrators
- Workers in the Community
- Other service Personnel in this specialty

Towards this end, by the completion of his/her training, the Postgraduate student be :

1. Aware of physical, social, psychological, economic and environmental aspects of health and disease in individual, family and community.
2. Able to apply the clinical skills to recognize and manage common health problems including their physical, emotional, social and economic aspects at the individual and family levels
3. Able to manage deal with medical emergencies at the community level.
4. Able to identify, plan and manage the health problems of the community he/she serves. To achieve this, he/she will be able to :
 - 4.1. Organize epidemiological research studies in various aspects of health. For this, he/she should be able to design a study, collect data, analyse it with appropriate statistical tests and make a report.
 - 4.2. Identify the health needs and health demands of the community and prioritise the most important problems and help formulate a plan of action to manage them under National Health Programmes guidelines including population control and family welfare programme. He/she should be able to assess and allocate resources, implement and evaluate the programmes.
 - 4.3. Demonstrate ability of organizing prevention and control of communicable and non-communicable diseases.
 - 4.4. Organize health care services for special groups like mothers, infants, under-five children, school children, handicapped children and juvenile delinquents etc.

- 4.5. Organise health care in case of disasters and calamities.
- 4.6. Able to work as an effective member of the health team and as a team leader.
- 4.7. Able to co-ordinate with and supervise other members of the health team and maintain liaison with other agencies.
- 4.8. Able to plan and implement health education programmes.
- 4.9. Able to promote community participation especially in areas of disease control, health education and implementation of national programmes.
- 4.10. Aware of the national priorities and the goals to be achieved to implement primary health care.
- 4.11. Able to act as an effective teacher and trainer of Community Medicine.

What follows is only one aspect of the Curriculum. It does not include the Methods of Instructions and the Evaluation Tools.

COURSE CONTENTS

I. CONCEPTS IN HEALTH

1. Definition of health; appreciation of health as a relative concept; determinants of health.
2. Characteristics of agent, host and environmental factors in health and disease and the multifactorial etiology of disease.
3. Understanding of various levels of prevention with appropriate examples.
4. Indices used in measurement of health.
5. Health situation in India : demography, mortality and morbidity profile and the existing health facilities in health services.
6. Difficulties in measurement of health.
7. National Health Policy

II EPIDIMIOLOGY

1. Use of epidemiological tools to make a community diagnosis of the health situation in order to formulate appropriate intervention measures.
2. Epidemiology : definition, concept and role in health and disease.
3. Definition of the terms used in describing disease transmission and control.
4. Natural history of a disease and its application in planning intervention.
5. Modes of transmission and measures for prevention and control of communicable and non-communicable disease.
6. Principal sources of epidemiological data.
7. Definition, calculation and interpretation of the measures of frequency of diseases and mortality.
8. Common sampling techniques, simple statistical methods for the analysis, interpretation and presentation of data frequency distribution, measures of central tendency, measures of variability, statistical tests of significance and their application.

9. Need and uses of screening tests.
10. Accuracy and clinical value of diagnostic and screening tests (sensitivity, specificity, & predictive values).
11. Epidemiology of communicable and non-communicable diseases of public health importance and their control.
12. Epidemiological basis of national health programmes.
13. Awareness of programmes for control of non-communicable diseases.
14. (a) Planning and investigation of an epidemic of communicable diseases in a community setting.
(b) Institution of control measures and evaluation of the effectiveness of these measures.
15. Various types of epidemiological study designs.
16. The derivation of normal values and the criteria for intervention in case of abnormal values.
17. Planning an intervention programme with community participation based on the community diagnosis.
18. Applications of computers in epidemiology.
19. Critical evaluation of published research.

III EPIDEMIOLOGY OF SPECIFIC DISEASES

The specific objectives of selected communicable diseases of public health importance for which National Disease Control/Eradication Programmes have been formulated are described here. For other diseases, the individual teacher would formulate the objectives while drawing the lesson plans. The idea of formulating objectives for a few diseases is to highlight their importance and to emphasise certain learning outcomes.

Infective hepatitis, ARI, T.B. Malaria, Filariasis, STDs & AIDS, Diarrhoeal diseases, Kala Azar, Mental Health, Coronary heart disease, Blindness, Hypertension, Leprosy, Accidents, JE, VPDs, Plague, Chickenpox etc.

1. Extent of the problem, epidemiology and natural history of the disease.
2. Relative public health importance of a particular disease in a given area.
3. Influence of social, cultural and ecological factors on the epidemiology of the disease.
4. Control of communicable and non-communicable disease by :
 - 4.1. Diagnosing and treating a case and in doing so demonstrate skills in :
 - (i) Clinical methods
 - (ii) Use of essential laboratory techniques
 - (iii) Selection of appropriate treatment regimes.
 - (iv) Follow-up of cases.
 - 4.2. Principles of planning, implementing and evaluating control measures for the diseases at the community level bearing in mind the relative importance of the disease.
5. Institution of programmes for the education of individuals and communities.
6. Investigating a disease epidemic.
7. Knowledge of the National Health Disease Control Programmes.
8. Level of awareness of causation and prevention of diseases amongst individuals and communities.

9. Control of communicable and non-communicable diseases by diagnosing and treating a case and in doing so, demonstrate skills in :
 - 9.1. Instituting measures, where necessary, for preventing disabilities/deformities.
 - 9.2. Rehabilitation of the patient
10. Training of health workers in disease surveillance, control and treatment, health education.
11. Managerial skills in the areas of
 - (i) Planning and organization of health services.
 - (ii) Supervision,
 - (iii) Collection and compilation of data,
 - (iv) Maintenance of records,
 - (v) transmission of data.

IV BIOSTATISTICS

- 1.1. The scope and uses of biostatistics.
- 1.2. Collection, classification and presentation of statistical data.
- 1.3. Analysis and interpretation of data.
2. Obtaining information, computing indices (rates and ratio) and making comparisons.
3. Apply statistical methods in designing of studies.
 - (a) Choosing of appropriate sampling methods and sample size.
 - (b) Applying suitable test of significance
 - (c) Use of statistical tables.

V ENTOMOLOGY

1. Role of vectors in the causation of diseases.
2. Steps in management of a case of insecticide toxicity.
3. Identifying features of and mode of transmission of vector borne diseases.
4. Methods of vector control with advantages and limitations of each.
5. Mode of action, dose and application cycle of commonly used insecticides.

VI ENVIRONMENTAL SANITATION

1.
 - (a) Awareness of relation of Environment to Health.
 - (b) Awareness of the concept of safe and wholesome water.
 - (c) Awareness of the requirements of a sanitary sources of water.
 - (d) Understanding the methods of purification of water on small scale with stress on chlorination of water
 - (e) Various biological standards.
2. Concepts of safe disposal of human excreta.
3. Physical, chemical standards; tests for assessing quality of water.
4. Disposal of solid waste, liquid wastes both in the context of urban and rural conditions in the

community.

5. Problems in the disposal of refuse, sullage and sewage.
6.
 - (a) Sources, health hazards and control of environmental pollution.
 - (b) Influence of physical factors – like heat, humidity, cold, radiation and noise – on the health of the individual and community.
 - (c) Standards of housing and the effect of poor housing on health.

VII REPRODUCTIVE & CHILD HEALTH (RCH)

1. Need for specialised services for women and children.
2. Magnitude of morbidity and mortality in these groups in a given area.
3. Local customs and practices during pregnancy, childbirth and lactation.
4. Concepts of “high risk” and “MCH Package”, child survival and Safe Motherhood, Integrated Child Development Services Scheme and other existing regional programmes.
4. Under-5 : morbidity, mortality, high risk and care.
6. Monitoring of growth and development and use of Road to Health Chart.
7. Immunization
 - all aspects (Basics of immunization; immunizing agents; administration, storage and transportation of vaccines; cold chain, side effects & complications etc.)
 - Newer vaccines
8. Organization, implementation and evaluation of programmes for mothers and children as per National Programme guidelines.
9. Role of Genetics in Community Health and Genetic Counseling at Primary Care Level.
10. National Policy in children.

VIII DEMOGRAPHY & FAMILY PLANNING

1. Definition of demography and its relation to Community Health.
2. Stages of the demographic cycle and their impact on population.
3. Definition, calculation and interpretation of demographic indices like birth rate, death rate, growth rate, fertility rates.
4. Reasons for rapid population growth in the world, especially in India.
5. Need for population control measures and the National Population Policy.
6. Identify and describe the different family planning methods and their advantages and shortcomings.
7. Principles of Counselling; Client satisfaction.
8. Medical Termination of Pregnancy Act.
9. Organisational, technical and operational aspects of the National Family Welfare Programme and participation in the implementation of the Programme. Target Free Approach.
10. Give guidelines for MTP and infertility services.
11. Recent advances in contraception.
12. National Population Policies.

IX HEALTH PLANNING AND MANAGEMENT

1. Explain the terms ; public health, public health administration, regionalisation, comprehensive health care, primary health care, delivery of health care, planning, management, evaluation, National Health Policy, Development of Health Services in India and various committee reports.
2. Components of health care delivery.
 - (i) describe the salient features of the National Health Policy concerning :
 - (a) provision of medical care; (b) primary health care and Health for All; (c) health manpower development; (d) planned development of health care facilities; (e) encouragement of indigenous systems of medicine.
 - (ii) explain the process of health planning in India by demonstrating awareness of :
 - various important milestones in the history of health planning including various committees and their recommendations.
 - the health systems and health infrastructure at centre, state district and block levels.
 - the inter-relationship between community development block and primary health centre.
 - the organisation, function and staffing pattern of community health centre, primary health centre, rural health centre and sub-centre etc.
 - the job descriptions of health supervisor (male and female); health workers; village health guide; anganwadi workers; traditional birth attendants.
 - the activities of the health team at the primary health centre, Community health centre, district hospital.
3. Familiarity with management techniques : define and explain principles of management; explain broad functions of management; personnel and materials management.
4. The components of health care delivery,. For this, he should;
 - Appreciate the need for International Health Regulations and Disease surveillance.
 - Be aware of the constitutional provisions for health in India.
 - Enumerate the major divisions of responsibilities and functions (concerning health) of the union, local and the state governments.
 - Appreciate the role of national, international voluntary agencies in health care delivery.
5. Explain general principles of health economics and various techniques of health management e.g., cost-effectiveness, cost-benefit etc.

X – NUTRITION

1. Nutritional problems of the country; Role of nutrition in Health & Disease.
2. Common sources of various nutrients and special nutritional requirement according to age, sex, activity, physiological conditions.
3. Nutritional assessment of individual, families and the community by selecting and using appropriate methods such as : anthropometry, clinical, dietary, laboratory techniques.
4. Compare recommended allowances of individual and families with actual intake.
5. Plan and recommend a suitable diet for the individuals and families bearing in mind local availability of foods, economic status etc.

6. Common nutritional disorders : protein energy malnutrition, Vit. A deficiency, anemia, iodine deficiency disorders, fluorosis, food toxin diseases and their control and management.
7. National Nutritional Policy.
8. National programmes in nutrition and their evaluation.
9. Food adulteration : prevention and control.

XI SOCIOLOGY

1. Conduction of a clinico-social evaluation of the individual in relation to social, economic and cultural aspects; educational and residential background; attitude to health, disease and to health services; the individual's family and community.
2. Assessment of barriers in health behaviour and identification of obstacles to good health, recovery from sickness and to leading a socially and economically productive life.
3. Development of a good doctor – patient relationship, public relations and community participation for health sectors.
4. Identification of social factors related to health and disease in the context of urban and rural societies.
5. Impact of urbanisation on health and disease.

XII SCHOOL HEALTH

1. Problems of school and adolescents; Objectives of the School Health Programme.
2. Activities of the Programmes like :
 - (a) Carrying out periodic medical examination of the children and the teachers.
 - (b) Immunisation of the children in the school.
 - (c) Health Education
 - (d) Mid-day meals.
3. Obtaining participation of the teachers in the school health programme including maintenance of records; defining healthful practices; early detection of abnormalities.
4. Organization, implementation, supervision and evaluation of School Health Programme.

XIII OCCUPATIONAL HEALTH

1. Relate the history of symptoms with the specific occupation including agriculture.
2. Identification of the physical, chemical and biological hazards to which workers are exposed to while working in a specific occupational environment.
3. Diagnostic criteria of various occupational diseases.
4. Preventive measures against these diseases including accident prevention.
5. Various legislations in relation to occupational health.
6. Employees State Insurance Scheme.

XIV HEALTH EDUCATION (INFORMATION, EDUCATION, COMMUNICATION)

1. Communicate effectively with individuals, family and community using tools and techniques of information, education, communication. To do so, the student should :
 - (a) Appreciate principles of communication and barriers to effective communication.

- (b) Principles, methods and evaluation of health education.
 - (c) List various methods of health education with their advantages and disadvantages.
 - (d) Select and use appropriate media (simple audiovisual aids) for effective health education.
2. Use every opportunity for health education of the individual, family and the community.

XV URBAN HEALTH

1. Common health problems (Medical, Social, Environmental, Economic, Psychological) of urban slum dwellers.
2. Organisation of health services for slum dwellers.
3. Organisation of health services in urban areas.

XVI TEACHING & TRAINING

1. Able to act as a good teacher/facilitator. For this, he/she will require –
 - knowledge of general principles of teaching/learning, methods of instructions, methods of evaluation.
 - Knowledge of various teaching aids (including a.v.aids) and skills to use them correctly.

SKILLS

PART – II: GENERAL SKILLS

The postgraduate student should be able to :

1. Elicit the clinico-social history to describe that agent, host and environmental factors that determine and influence health.
2. Recognise and assist in management of common health problems of the community.
3. Apply principles of epidemiology in carrying out epidemiological studies in the community.
4. Work as a team member in rendering health care.
5. Carry out health education effectively for the community.

PART – II : SKILLS IN RELATION TO SPECIFIC TOPICS

1. Communication

The student should be able to communicate effectively with family members at home; patients at clinics or at homes; individuals, family or a group for health education; peers at scientific forums.

2. Team activity

Work as a member of the health team; in planning and carrying out fieldwork like school health.

3. Environmental sanitation

Collect water samples for microbiological evaluation; chlorination of water; estimate the chlorine demand of water; estimate the residual chlorine of water; insecticides: their proper storage and use in control of vectors.

4. Communicable and Non-communicable diseases (including social problems)

- (a) Eliciting clinico-social history and examining the patient for diagnosis and treatment.

- (b) Collection of appropriate material for microbiological, pathological or biochemical tests.
- (c) Fixing, staining, and examining smears – peripheral blood smear for malaria and filariasis, sputum for AFB; slit skin smears for leprosy; Hb estimation; urine and stool examination.
- (d) Assessing the severity and/or classifying dehydration in diarrhoea, upper respiratory tract infection, dog bite, leprosy.
- (e) Adequate and appropriate treatment and follow-up of leprosy, malaria, filariasis, rabies, upper respiratory tract infections, diarrhoea and dehydration.
- (f) Advice on the prevention and prophylaxis of common diseases like vaccine preventable diseases, tetanus, malaria, filariasis, rabies, cholera, typhoid, intestinal parasites.
- (g) Use of proper screening methods in early diagnosis of common diseases.
- (h) Take necessary steps in disease outbreak/epidemics/natural disasters – investigation of epidemic, food poisoning; notification; organising medical care following disasters.

5. Reproductive and Child Health

- (a) Antenatal – examination of the mother; application of the risk approach in antenatal care.
- (b) Intranatal – conducting a normal delivery; early recognition of danger signals in intranatal period; referral of cases requiring special care.
- (c) Postnatal – assessment of the mother and new born, advice about appropriate family planning method; promotion of breast-feeding; advice on weaning.
- (d) Assessment of growth and development of the child – use of ‘road to health’ card; recording important anthropometric assessments of the child; giving immunisation to the child; identifying high-risk infant.

6. Statistics

- (a) Choose proper sample, sampling method and sample size.
- (b) Apply appropriate tests of significance to make a correct inference.

7. Nutrition

- (a) Conducting a diet survey.
- (b) Community survey and clinical diagnosis of nutritional deficiencies : vitamin A deficiency, iodine deficiency, malnutrition.
- (c) Making recommendations regarding diet.

8. Occupational Health

- (a) Inspection of work sites
- (b) Recommendation in improving work sites.
- (c) Medical examination of workers.

9. Health Care of the Community

- (a) Ensuring community participation in health care.
- (b) Arranging intersectoral coordination where necessary
- (c) Working in liaison with other agencies involved in health care in various National Health Programmes.

10. Health Management

- (a) Be an effective team leader.
- (b) Guide and train workers.
- (c) Supervision of workers and programmes.

11. Family Planning : Counselling on appropriate methods.

: Organize, Implement, Supervise & Evaluate Family Welfare Programme in an area.

12. Managerial Skills**13. Teaching Skills**

DERMATOLOGY AND VENEREOLOGY — M D

Dermatology including Venereology (STD) and Leprology is one of the important basic clinical speciality. Considerable advances have taken place in the understanding of dermatological disorders and their treatment. Leprosy is still a public health problem of considerable magnitude in the country. The STDs are showing worldwide increase in incidence with new dimensions added to it.

There is a dearth of trained personnel in the speciality. Very few medical college in the country impart sufficient knowledge about these diseases at Undergraduate level and Postgraduate courses are not available in all medical colleges.

AIIMS, New Delhi is known for its excellence in all specialities, particularly in achieving high academic standards. The curriculum of MD Dermatology has been made designed matching the other clinical specialities at the Institute. An attempt has been made to give a comprehensive training to the postgraduates including basic subjects and recent advances.

OBJECTIVES

At the end of this training a candidate should be able to

1. Diagnose and manage independently common skin diseases, sexually transmitted diseases and leprosy.
2. Manage independently and efficiently all medical emergencies related with skin, leprosy and venereal disease.
3. Adopt preventive measures at individual and community levels against communicable skin, venereal diseases and leprosy.
4. Teach requisite knowledge and laboratory skills to other medical/paramedical team members.
5. Adopt a compassionate attitude toward towards the patients (and their families) under his/her charge.
6. Critically evaluate and initiate investigation for solving problems relating to skin, venereal diseases and leprosy.

SKILLS TO BE LEARNT

1. History taking for dermatology, venereology and leprosy

2. Describe cutaneous findings in dermatological terms in a systematic way.
3. Evaluate and manage the common diseases in dermatology and have a broad idea how to approach an uncommon diseases.
4. Evaluate and manage STD cases
5. Evaluate and manage HIV positive cases
6. Systemic examination relevant for dermatologic condition
7. Maintain basic skills like pulse, blood pressure chest and cardiac auscultation learnt in MBBS
8. Care of dermatologic emergencies like TEN, Pemphigus, necrotic ENL, angioedema, drug reactions etc.
9. Management of pediatric cases with skin diseases
10. To achieve adequate skills for tests done in side laboratory in day-to-day practice and be familiar with other sophisticated investigations.

POSTINGS

The first year junior residents shall be posted indoor for 8 months exclusively. For the remaining 28 months the students will rotate through outdoor, side laboratory, minor OT, speciality clinics, i.e. leprosy, STD, psoriasis, pigmentation, allergy and dermatosurgery.

Dermatology Ward	– 8 months	
General Skin OPD	– 16 months	
Minor OT	– 4 months	
Side Laboratory	– 4 months	
STD Clinic	– 4 months	Afternoon weekly speciality clinics
Psoriasis clinic	– 28 months	
Pigmentation clinic	– 28 months	
Leprosy clinic	– 28 months	
Allergy clinic	– 28 months	
Dermatosurgery clinics	– 28 months	

The postings will be spread over the entire period. During postings 2nd and 3rd year residents or senior residents will give cover to first year residents and have active involvement in the diagnosis, investigations and treatment of the admitted patients.

Teaching Programme	Weekly
Teaching wards rounds	1
Clinical case conference	1
Seminars	1
Journal club	1
Case presentation and discussion In Leprosy, STD, Psoriasis, Pigmentation and allergy, Dermato-Surgery clinics	10
Dermatopathology conference	1 weekly

In addition all residents are required to attend Tuesday afternoon sessions of clinical case rounds and clinical grand rounds (a combined activity of the AIIMS).

COURSE CONTENT-ANNEXURE II

Research activity

The candidate will be required to undertake independent research work or associate himself/herself with on-going departmental research work.

Internal assessment

This will be carried out every three months by means of written test and practical with viva examination every six months. It would include dermatopathology and dermatosurgery.

Thesis

Each student is expected to write thesis under the guidance of one or more faculty members as per the institute rules. The work is carried out over and above routine duties. The thesis topic and its progress is discussed in departmental faculty meeting. The protocol to be submitted within 6 months of joining and thesis submission within 2 ½ years of joining the 3 year course.

Evaluation

1. Weekly by senior resident and consultant for regularity, patient care, records and library search.
2. End of ward posting by consultant/senior resident
3. Quarterly- with theory, clinical and viva by all consultants of the department. Ten percent total weightage will be given to internal assessment in the final.
4. Final MD examination with 2 external examiners

Examination pattern

The examination shall be held in the months of May and December or on such dates as may be decided by the Dean of the Institute and it shall be open to all candidates who have completed the prescribed course of study and submitted their thesis work. The examinations shall consist of 1.

Theory papers 4 (each of 3 hours duration) and 100 marks each.

Title of the paper

Paper I : Basic sciences, anatomy, physiology, biochemistry, pathology etc. in relation to the speciality

Paper II : Principles of dermatology diagnosis and therapeutics

Paper III : Venereology and Leprology, Principles of diagnosis and therapeutics

Paper VI : Dermatology in internal medicine, including applied clinical aspects, therapeutics, pathology, immunopathology, bacteriology and recent advances.

All papers would have following format

Essay – One long question of 30 marks and 6-7 short notes on covering the prescribed course (10-12 marks each)

All questions have to be attempted with no choice

Board of examiners

Practical and clinical examination

External examiners – 2 – Dermatologists as per the institute guidelines

Internal examiners – 2 – Dermatologist as per the institute guidelines

1. Practical and/or clinical examination will be held on 1-2 days

Semi-Long case	4	Dermatology	–	2
		Venereology	–	1
		Leprology	–	1

Spots: 10-12 Spot same for each candidate

2. Viva voice examination for General dermatology, Venereology and Leprology

3. Dermatopathology slides four to six

Syllabus

Main subjects to be covered

1. Dermatology
2. Venereology
3. Leprosy
4. Dermatopathology
5. Dermatosurgery (including lasers)

Dermatology

1. Fundamental
 - History taking and examination of dermatological patient
 - Type of skin lesions
 - Distribution patterns
 - Aids in diagnosis of skin diseases etc.
2. Structure and development skin
3. Biochemistry and Physiology of epidermis and its appendages including
 - Melanin synthesis
 - Keratinization
 - Pathophysiologic reactions of skin
 - Basic immunology

Skin Diseases

1. Disorders of Keratinization and epidermal proliferation
2. Disorders effecting skin appendages, hair, nail, sebaceous glands, sweat glands and apocrine glands etc.

3. Neoplastic disorders of skin
4. Gendodermatosis
5. Vesiculo bullous diseases, e.g. pemphigus, pemphigoid, erythema multiforme, dermatitis herpetiformis etc.
6. Dermatitis:- exogenous – contact dermatitis, patch testing, endogenous – atopic acquired endogenous nummular
7. Disorders of pigmentation
8. Disorders of collagen and connective tissue
9. Disorders of hair, nail sweat glands, sebaceous glands, apocrine glands, mastocytosis etc.
10. Disorders of mucous membranes, stomatological disorders
11. Disorders involving genitalia
12. Disorders due to physical agents, heat, cold, light, radiation etc.
13. Disorders due to chemical agents – reactions to chemicals, occupational dermatosis
14. Pyodermas
15. Fungal infections-superficial and deep
16. Viral infection
17. Parasitic infestations, insect bites etc.

Dermatology in relation to internal medicine

Nutritional diseases – protein and vitamin deficiencies

Metabolic disorders

1. Diabetes mellitus
2. Amino acid metabolism
3. Porphyrin metabolism
4. Lipoidosis
5. Dysproteinemias and agammaglobulinemias etc.
6. Carcinoid syndrome
7. Glycolipid lipoidosis
8. Calcinosis cutis
9. Histiocytosis
10. Hematological systems-reticulosis-leukemia etc.
11. Gastro – intestinal system
12. Endocrinal system
13. Neurocutaneous disorder
14. Psychocutaneous disorders

Allergic disorders

1. Anaphylaxis – urticaria / angioedema

2. Serum sickness
3. Reactions drug etc.

Venereal disorders

1. Anatomy of male and female genitalia
2. Syphilis and other treponematoses, immunology, pathology, diagnosis,
3. Treatment, control etc.
4. Gonococcal urethritis and complications
5. Lymphogranuloma venereum
6. Chancroid
7. Granuloma inguinale (Donovanosis)
8. Other disorders involving male and female genitalia
9. STIs and control
10. STI and Reproductive health
11. Epidemiology of STIs,

AIDS

Transmission, prevention, clinical manifestations, prophylaxis of opportunistic infections, Anti-retroviral therapy, treatment in HIV+ve STD cases.

Leprosy

1. Epidemiology
2. Pathogenesis
3. Pathology
4. Diagnosis – clinical features, classifications, laboratory aids
5. Reactive phase – Ocular involvement, Bone involvement
6. Treatment of leprosy and reactions
7. Leprosy control and rehabilitation etc.

Dermatosurgery

The course would consist of lessons in basic techniques of dermatosurgery or various diseases and laser.

For Vitiligo

- Punch grafting
- Split skin grafting
- Dermabrasion and suction blister grafting
- Tattooing

For Acne

- Dermabrasion

- Scar revision
- Chemical peeling

For Melasma

- Chemical face peels with glycolic and trichloroacetic acid

For Nevi and Keloid etc.

- Cryosurgery
- Excision
- Electrosurgery
- Use of CO2 laser

Teaching methods for Dermatosurgery

Teaching methods would include at least 10 theory lectures in the form of seminars and journal club.

Practical demonstration of techniques by a faculty member of a representative case of each disease would be part of their Minor OT posting, dermatosurgery clinic (3 months). They would also be required to assist during the procedures.

Examination

Theory – The subject is included in paper IV of the theory examination and at least one short note would be from the dermatosurgical procedures.

Practical – They would be subjected to questions on various dermatosurgical procedures and instruments related to these procedures during their viva voce examination.

Teaching Methods for Dermatopathology

- 10 theory lectures in form of seminar, journal club
- Dermatopathology discussion every week.

Examination – Theory the subject is included in paper IV of theory examination and there would be at least one short note.

Practical – Dermatopathology slides to be discussed in practical examination and viva voce.

FORENSIC MEDICINE AND TOXICOLOGY — M D

PROGRAMME GOALS

This programme aims at training a competent expert in Forensic Medicine and Medical Toxicology.

PROGRAMME OBJECTIVES

This programme aims at training an expert in Forensic Medicine & Medical Toxicology who at the end of the training will be able to:

1. Identify and define the existing as well as future Medico-legal problems as they emerge in the community and work to resolve such problems by planning, implementing, evaluating and modulating Medico-legal services.
2. Undertake Medico-legal responsibilities and discharge Medico-legal duties, which arise in day-to-day general practice as well as in hospitals.
3. Keep himself/herself abreast with all recent developments and emerging trends in the field of Medical Ethics and the Law.
4. Evaluate his professional activities, educational needs and select appropriate learning resources periodically.
5. Deal with general principles and practical problems related to forensic, clinical, emergency, environmental, medico-legal and occupational aspects of Toxicology.
6. Impart education in Forensic Medicine and Toxicology to under-graduate and post-graduate students with the help of modern teaching aids.

STUDENT ELIGIBILITY CRITERIA AND SELECTION METHOD

1. Medical Graduates with MBBS or equivalent medical degree from a recognized University in India after the completion of their internship and who are registered with the Indian Medical Council are eligible to apply.
2. Selection of students will be as per the existing regulations of the All India Institute of Medical Sciences, New Delhi.

SPECIFIC OBJECTIVES

At the end of the MD course, a post-graduate student should be able to:

1. Perform Medico-legal autopsy independently with required physical assistance, prepare report and derive inferences.
2. Interpret histo-pathological, microbiological, radiological, chemical analysis, DNA analysis and other investigative reports for Medico-legal purposes.
3. Depose as an expert witness in a Court of Law on Medico-legal matters.
4. Describe relevant legal/court procedures applicable to Medico-legal/medical practice.
5. Identify, examine and prepare reports on Medico-legal cases.
6. Identify and discharge all legal responsibilities in Medico-legal matters.
7. Plan, Organise and supervise Medico-legal work in general/teaching hospitals.
8. Interpret, analyse & review Medico-legal reports prepared by other Medical Officers.
9. Collect, preserve and despatch various trace evidences to the concerned authority.
10. Identify and articulate medical ethics in relation to the patient, profession, society, state and humanity at large.
11. Interpret and advice authorities on matters related to Medical Ethics and the Law.
12. Discharge his duties in respect of forensic, clinical, emergency, environmental, medico-legal and occupational aspects of Toxicology.
13. Plan, Organise and manage Toxicological Laboratory services.
14. Provide information and consultation on all aspects of toxicology to professionals, industry, Government and public at large.

CONCEPTUAL FRAMEWORK

TIMES IN YEARS



3	UNIT 2	ORGANISED	FINAL ASSESSMENT
		T	
2½	POSTING FOR	E	
	• AUTOPSY WORK	A	SUBMISSION
	• CLINICAL FORENSIC MEDICINE	C	OF THESIS
	• ALL ASPECTS OF TOXICOLOGY (COLLECTION, PRESERVATION, TRANSPORTATION, ANALYSIS OF BIOLOGICAL SAMPLES)	H I N G	
2			
1½	• DNA FINGER-PRINTING	T	
	• RESEARCH, ANALYSIS AND PRESENTATION OF DATA	S H E E	
	• MEDICO-LEGAL WORK IN CASUALTY DEPT	S S I	
	• TOXICOLOGY LAB WORK	I S	
	• ATTEND COURT SUMMONS	O N S	
1	UNIT 1	AND	
	• CLINICAL FORENSIC MEDICINE	S	
	• ORIENTATION TO BASIC MEDICAL SCIENCES.	E M	
	• AUTOPSY WORK	I	
	• ATTEND COURT SUMMONS	N A R S	
½	UNIT 0		
	• INTRODUCTION TO GENERAL PRINCIPLE OF FORENSIC MEDICINE & TOXICOLOGY,	CONTINUOUS GUIDANCE	
	• DEVELOPMENT OF BASIC AUTOPSY SKILLS		THESIS PROTOCOL SUBMISSION
	• THESIS-TOPIC SELECTION		
0			
	• DOCUMENTATION		
	• JOINING FORMALITIES		

MODULE

UNIT 0 (UPTO 6 MONTHS)

- A.
 - 1. Orientation Programme
 - 2. Basic autopsy skills.
 - 3. General Principles of Forensic Medicine.
 - 4. Introduction to Medical Toxicology.
- B. Organised Teaching Session.
 - 1. Attend and participate in undergraduate classes.
- C. Posting for autopsy work, Clinical Forensic Medicine and Toxicology
- D. Orientation to Organisation and functioning of Toxicology Lab.
- E. Preparation of Thesis protocol.
- F. Introduction to advanced techniques – DNA Fingerprinting.

UNIT 1 (6 – 12 MONTHS)

- A. Clinical Forensic Medicine work for practical experience in Medico legal procedures and on the job practical training in the Medico-legal aspects of emergency medicine, radiology and other clinical disciplines.
- B. Orientation to the applied aspects of Anatomy, Physiology Biochemistry, Microbiology, Pathology, Blood Bank, Psychiatry and Central Forensic Science Laboratory.
- C. Organized teaching session.
 - 1. Undergraduate classes (Attend & participate)
 - 2. Journal review/Review of latest advances - once a fortnight
 - 3. Autopsy case discussion & Gross Autopsy Conference - once a fortnight
 - 4. Clinical forensic medicine case discussion - once a fortnight
 - 5. Seminars - once a week
 - 6. Toxicology conference - once in a month
- D. Thesis Work and other research work.
- E. Posting for Autopsy work, Clinical Forensic Medicine and Toxicology Laboratory.
- F. Attend Court summons for cases conducted by themselves or when deputed where an expert is required to depose by Court of Law.

UNIT 2 (12-36 MONTHS)

- A. Organized teaching session.
 - 1. Attend and participate in undergraduate classes.
 - 2. Journal review - once a fortnight
 - 3. Autopsy case discussion - once a fortnight
 - 4. Clinical forensic medicine case discussion - once a fortnight

- 5. Seminars - once a fortnight
- 6. Toxicology conference - once in a month
- B. Submission of Thesis six months prior to examination.
- C. Posting for autopsy work, clinical Forensic Medicine and Toxicology laboratory to continue.
- D. Attend court summons for cases conducted by themselves or when deputed where an expert is required to depose by Court of Law.

SUBJECT CONTENT

I. ORIENTATION PROGRAMME

- A. Familiarisation with the philosophy and guiding principles of MD Forensic Medicine and Toxicology course at AIIMS.
- B. Identify the programme goals, specific objectives and conceptual framework for his/ her course.

II. BASIC AUTOPSY SKILLS

- A. Outline & demonstrate the principles and objectives of postmortem examination, formalities and procedures of medico-legal autopsies in accordance with existing conventions and the law.
- B. Describe and demonstrate the methods of preservation of viscera.

III. General principle of Forensic Medicine and Toxicology

- A. Identify the role of anatomy, physiology, biochemistry, microbiology, pathology, blood bank, psychiatry, radiology, forensic science laboratory and other disciplines of medical science to logically conclude in Medico-legal autopsies and examination of Medico-legal cases.
- B. Describe the basic principles of the techniques used in toxicological laboratory namely TLC, GLC, ASS, HPLC, and Breath Alcohol Analyzer.
- C. Process biological samples for DNA fingerprinting.
- D. Execute the skills and knowledge mentioned in objectives of Forensic Medicine for MBBS course at AIIMS.

IV. MEDICAL ETHICS & LAW (MEDICAL JURISPRUDENCE)

- A. Describe the history of Forensic Medicine
- B. Describe the Legal and Medico-legal system in India.
- C. Describe medical ethics and the law in relation to medical practice, various declarations, Medical Council of India, disciplinary control, duties of a registered medical practitioner, consent, confidentiality, medical negligence and consumer protection act.
- D. Describe medical ethics and law in relation to organ transplantation, biomedical human research and experimentation, human rights and citizen charter.
- E. Describe the ethics and law in relation to artificial insemination, abortion, antenatal sex, fetus, genetics, and euthanasia.
- F. Interpret the ethics and law applicable to the animal experimentation.
- G. Describe ethics in relation to aged, women and children.
- H. Describe medical ethics and law in relation to nursing and other medical services.

V. CLINICAL FORENSIC MEDICINE

- A. Examine, assess legal implications and prepare report or certificate in cases of physical assault, suspected drunkenness, sexual offences, consummation of marriage and disputed paternity .Collect, preserve & despatch the specimen/material to the concerned authority and interpret the clinical and laboratory findings which are reported.
- B. Examine injured person, prepare Medico-legal report and initiate management.
- C. Determine the age of a person for medico-legal purpose.
- D. Examine a person and assess disability in industrial accidents and diseases.
- E. Perform examination and interpret findings for medico legal purposes in cases pertaining to pregnancy, delivery, artificial insemination, abortion , sterilization, impotence & AIDS.
- F. Describe normal and abnormal sexual behaviour and its medico-legal implications.
- G. Examine and assess the medical fitness of a person for insurance, government service, sickness and fitness on recovery from illness.
- H. Examine medico-legal problems related to clinical disciplines of Medicine & allied subjects, Paediatrics, Surgery & allied subjects, ENT, Ophthalmology, Obstetrics & Gynaecology, Dermatology and Anesthesiology.

VI. FORENSIC PSYCHIATRY

- A. Explain the common terminologies of Forensic importance in Psychiatry.
- B. Describe the Medico-legal aspects of Psychiatry and mental health.
- C. Describe medico-legal aspects of Drug addiction.
- D. Describe role of Psychiatry in crime investigation, punishment and trial.
- E. Describe the civil and criminal responsibilities of an insane person.

VII. MEDICAL TOXICOLOGY

- A. Describe the law relating to poisons, drugs, cosmetics, narcotic drugs and psychotropic substances.
- B. Examine & diagnose the poisoning cases and apply principles of general management and organ system approach for the management of poisoning cases.
- C. Describe the basic principles of toxicokinetics and toxicodynamics of poisonous substances.
- D. Describe the toxic hazards of occupation, industry, environment and the principles of Predictive Toxicology.
- E. Collect, preserve and despatch the material for analysis, interpret the laboratory findings and perform the Medico-legal formalities in a case of poisoning.
- F. Demonstrate the functioning of TLC, GLC, HPLC, ASS and Spectro-photometer.
- G. Demonstrate the methods of identification and analysis of common poisons prevalent in this region.
- H. Describe the signs, symptoms, diagnosis and management of common acute and Chronic poisoning due to –
 - (a) Corrosives
 - (b) Nonmetallic Substances
 - (c) Insecticides and Weed Killers

- (d) Metallic Substances
- (e) Vegetable and Organic irritants
- (f) Somniferous Compounds
- (g) Inebriant substances
- (h) Deliriant Substances
- (i) Food contamination/adulteration..
- (j) Substance causing Spinal and cardiac toxicity
- (k) Substances causing Asphyxia (Asphyxiants)
- (l) Household toxins
- (m) Toxic envenomation
- (n) Biological and Chemical warfare.

VIII. FORENSIC PATHOLOGY

- A. Apply the principles involved in methods of identification of human remains by race, age, sex, religion, complexion, stature, hair, teeth, anthropometry, dactylography, foot prints, hairs, tattoos, poroscopy and superimposition techniques.
- B. Perform medico-legal postmortem and be able to exhume, collect, preserve and despatch specimens or trace evidence to the appropriate authority.
- C. Diagnose and describe the pathology of wounds, mechanical and regional injuries, ballistics and wound ballistics, electrical injuries, neglect and starvation, thermal injuries, deaths associated with sexual offences, pregnancy, delivery, abortion, child abuse, dysbarism and barotraumas.
- D. Describe patho-physiology of shock & neurogenic shock.
- E. Describe the patho-physiology of asphyxia, classification, medico legal aspects and postmortem findings of different types of asphyxial deaths.
- F. Diagnose and classify death, identify the signs of death, postmortem changes, interpret the autopsy findings, artefacts and results of the other relevant investigations to logically conclude the cause, manner (suicidal, homicidal and accidental) and time of death.
- G. Manage medico-legal responsibilities in mass disasters involving multiple deaths like fire, traffic accident, aircraft accident., rail accident and natural calamities.
- H. Demonstrate postmortem findings in infant death to differentiate amongst live birth, still birth and dead born.
- I. Perform postmortem examination in cases of death in custody, torture and violation of human rights.
- J. Perform postmortem examination in cases of death due to alleged medical negligence as in Operative and Anaesthetic Deaths.

IX. FUNDAMENTALS OF FORENSIC SCIENCES

- A. Describe the general forensic principle of ballistics, serology, analytical toxicology and photography.
- B. Interpret the scene of crime.
- C. Examine – bloodstains for blood grouping, seminal stains & hair for medico-legal purpose.

X. Basic Sciences and Allied Subjects

- A. Anatomy- Anatomy of parts and organs of the body which are important from the medico-legal aspect.
- B. Physiology & Biochemistry- Mechanism of phenomenon that are important in the body from the medico legal viewpoint.
- C. Pathology- Pathophysiology of vital processes and response mechanisms that modulate tissue and organ reaction to all forms of injury and have a bearing on ante mortem and postmortem appearance in Medico legal cases, assessment of the duration of injuries and co-relate trauma and disease.
- D. Dentistry- Adequate knowledge of dentistry for solution of Medico legal problems like age determination.
- E. Radiology- Adequate knowledge of Radiological procedures for solution of medico legal problems.

TEACHING – LEARNING EXPERIENCES

- A. Undergraduate classes
- B. Posting for
 - 1. Autopsy work
 - 2. Clinical Forensic Medicine
 - 3. Clinical toxicology
 - 4. Allied subjects
- C. Journal review
- D. Autopsy Case Discussion
- E. Clinical Forensic Medicine Case Discussion
- F. Seminar on Clinical & Autopsy case problems
- G. Problem solving discussion on cases for expert opinion.

THESIS FOR FORENSIC MEDICINE & TOXICOLOGY**Objectives**

- 1. The student should be able to demonstrate capability in research by planning and conducting systematic scientific inquiry & data analysis and deriving conclusion.
- 2. Communicate scientific information for health planning.

Guide for Thesis

- 1. Chief guide should be from the Department of Forensic Medicine & Toxicology.
- 2. Co-guide(s) can be from other disciplines related to the thesis.

Submission of Thesis Protocol

It should be submitted within four months after admission in the course.

- 1. Protocol in essence should consist of:
 - (a) Introduction and objectives of the research project.
 - (b) Brief review of literature.

- (c) Suggested materials and methods, and
 - (d) Bibliography
2. The protocol must be presented in the Department of Forensic Medicine & Toxicology before being forwarded to the office of the Dean.
 3. Protocol will be approved in accordance with the existing regulations of the AIIMS, New Delhi.

Submission of Thesis

1. Thesis will be submitted six months prior to examination.
2. Thesis in essence should consist of
 - (a) Introduction
 - (b) Review of literature
 - (c) Aims and objectives
 - (d) Material and methods
 - (e) Results
 - (f) Discussion
 - (g) Summary and Conclusions
 - (h) Bibliography

Evaluation of Thesis

Thesis will be evaluated in accordance with the existing regulations of the AIIMS, New Delhi.

ASSESSMENT

Assessment of candidates on completion of MD course will be carried out in accordance with the existing rules and regulations of the AIIMS, New Delhi.

All candidates will be examined and evaluated under the following Heads:

- Theory - Will consist of four papers as under:
- Paper I - Basic Sciences and allied subjects as applicable to Forensic Medicine & Toxicology.
- Paper II - Clinical Forensic Medicine, Forensic Psychiatry and Medical ethics & law (Medical jurisprudence).
- Paper III - Forensic Pathology & Medical Toxicology.
- Paper IV - Applied aspects of clinical disciplines, Forensic Sciences and recent advances in Forensic Medicine and Toxicology.

Practical Examination (Two days)

Day 1

- **Thesis Presentation** - For assessment of research capability.
- **Presentation of a Topic (Seminar)** - To evaluate teaching ability.
- **Clinical Cases** - (Any 4) Age estimation, Injury report, Examination of an insane person to evaluate criminal/civil responsibility, Examination of an intoxicated person, Examination of a suspected case of poisoning (Acute/ Chronic), Disputed paternity case, Sexual offences.

- **Spots** - (10) Histopathology slides, Photographs, ligature material, X-Rays, Soft tissue specimens, Bones, Poisons and Weapons.
- **Toxicology Exercises** - (Any 4) TLC, GLC, HPLC, AAS, Spectrophotometer and Electrophoresis.
- **Spot tests** - For common poisons and identification of stains (Semen, Blood, Saliva)

Day 2

- Postmortem Examination.
- Expert Second Opinion.
- Grand Viva Voce.

LABORATORY MEDICINE — M D

I. COURSE DESCRIPTION

1. Name of the Course

Doctor of Medicine (MD) in Laboratory Medicine.

2. Duration of the Course

Three Years full-time residency

3. Recognition of the Course

Obtained from different Statutory Bodies at A .I. I. M. S

Also recognized by Medical Council of India

4. Eligibility for Admission

The essential qualification shall be MBBS Degree of any Indian University/Deemed University/Autonomous Institutions etc., as recognized by the Medical Council of India (MCI) or any other qualification of a foreign university that is recognized by the MCI and the concerned university as equivalent to the MBBS Degree.

5. Method of Selection

As per other MD course of AIIMS

6. Total number of Candidates

Not more than two per each semester to be admitted to the course and a total number in three years not exceeding twelve at any given time.

II. PROLOGUE: INTRODUCTION TO THE CURRICULUM

The Laboratory services by tradition are practiced under the heading of 'Clinical Pathology' in most of hospitals / medical institutions in our country. These services are divided into 4 subdivisions: **clinical biochemistry, clinical pathology, clinical hematology, and clinical microbiology**. With advancement of technology, like automation and shift of various new investigations from research laboratory to routine laboratory, the management of laboratory investigations has acquired a new dimension and has now been grouped under a new discipline 'Laboratory Medicine'. Further, this new discipline has been slowly encompassing much other important subdivisions used for diagnostic investigations. Thus, the

discipline of Laboratory Medicine is soon becoming an important wing of patient care services not only in terms of screening and diagnosis of diseases but also in monitoring the course of the disease and management of patient.

This discipline encompasses three major objectives, namely, (1) Test Selection (2) Operational Aspects, (3) Interpretation of results. However, at present throughout most of the country this discipline is entrusted only with operational aspect i.e., performing the tests. However, it has been now becoming evident that the discipline of Laboratory Medicine, in close and active collaboration with clinical disciplines, has a larger role to play in terms of other two objectives namely test selection and interpretation of results. Other important aspects of this discipline are (i) quality assurance (ii) understanding of instrumentation including automation and their maintenance (iii) active participation in Medical Audit.

III. THE NEED AND SCOPE FOR SUCH CURRICULUM

A. The Need

At present, this important discipline which is most relevant in patient care system exists in a very primitive condition in almost all the hospital / medical institutions as well as in tertiary care centers in our country. Further, the individuals trained in only one of the subdivisions are asked to look only at the operational aspect and manage this discipline. In the process innovation and application of newer technology for patient care services is practically nonexistent. The quality assurance programs and proper instrumentation are either nonexistent or not practiced. The situation is worse, if not all the same, in the mushrooming private Laboratories. Therefore, it is felt to *transform* the present 'state of affair' to the necessary 'state of art'. There is a National imperative to take a lead in this matter. Even in our Institute, this discipline has remained in a primitive state compared to several other specialties and super-specialties which have developed and are now occupying a prime position in the country. It is, therefore, extremely essential to train a breed of medical specialists in the discipline of Laboratory Medicine who can actively and constantly interact with clinical colleagues for evolving a relevant and rational diagnostic approach and thereby improving the patient care services.

The separate department of Laboratory Medicine has been created in the Institute in 1988. Its different faculty members are well trained and are from different subdivisions, like pathology, hematology, microbiology and biochemistry. At present the department is also adequately equipped to impart the requisite training to the students towards obtaining a M. D. degree in Laboratory Medicine. The department of Laboratory Medicine, since 1997, has been engaged in offering a postgraduate course leading to M.D. degree in Laboratory Medicine at the Institute. The institute has always taken a lead in starting courses in newly established and set a trend for other medical institutions to follow.

B. The Scope

The state of affairs regarding the discipline of Laboratory Medicine mentioned above is largely due to non-availability of trained personnel in all aspects of Laboratory Medicine (including quality control and instrumentation). This trend can be reversed once the postgraduates with special training with proportionate weightage in all aspects of this discipline are available and join the mainstream of medical institutions and hospitals of our country to plan and manage a multidisciplinary laboratory in patient care system. The postgraduates in Laboratory Medicine will emerge also as 'teacher' in Laboratory sciences.

There is also a large need of such trained personnel in private hospitals run by public sector and those who are in general medical Laboratory practice in order to bring the private laboratory service in consonance with National Quality Assurance Program.

There is already a move to create the new discipline of Laboratory Medicine in most hospitals and Medical Institutions in our country. Tata Memorial Hospital, Bombay, and Safdarjung Hospital, Delhi, have already opened up the Department of Laboratory Medicine. In further, the postgraduates with M.D. in Laboratory Medicine could be absorbed in such departments.

IV. AIM AND OBJECTIVES

The Aim of this curriculum is to train medical professionals who will be capable of planning and managing a multidisciplinary Laboratory attached to patient care systems, with the following objectives:

1. To acquire the knowledge of pathophysiology of diseases involving Biochemical, Hematology, Microbiological, Endocrinological & Immunological aspects.
2. Test Selection & Interpretation of results in context of a clinical condition along with concerned clinical specialty.
3. The operational knowledge for performing the laboratory investigations which include:
 - (a) Instrumentation
 - (b) Methodologies
 - (c) Quality Assessment and Assurance
4. The requisite knowledge of:
 - (a) Independent management of clinical Laboratory
 - (b) Safety Measures in a Patient-care Laboratory
 - (c) Cost Effectiveness of Tests
 - (d) Personnel Management

V. OBJECTIVE DETAILS

A. Broad objectives to be achieved at the end of the course

Cognitive Domain

1. Diagnosis of routine and complex clinical problems on the basis of Laboratory investigations.
2. Interpret laboratory data in relation to clinical findings with reasonable accuracy.
3. Advice on the nature of appropriate specimens and the tests necessary to arrive at a diagnosis in a difficult or problematic case.
4. To be able to identify non-correlation and the causes of death due to diseases.
5. Should be able to teach Laboratory Medicine to undergraduates, postgraduates, nurses and paramedical staff including laboratory personnel.
6. To carry out research on laboratory science related topics.
7. Maintain accurate records of tests results for reasonable periods of time so that these may be retrieved as and when necessary.
8. Make and record observations systematically that is of use for archival purpose and for furthering the knowledge of Pathology.
9. Able to systematically write a paper and publish in a relevant journal.
10. Able to present a paper in a conference through an oral presentation and poster presentation.

11. Should be able to identify problems within and outside the laboratory pertaining to reliable test result and offer solutions thereof so that a high order of quality control is maintained.
12. Should be capable of effectively disposing laboratory waste to ensure minimization of risk to infection and accidents to laboratory personnel.
13. Able to supervise and work with subordinates and colleagues in a laboratory.
14. Subject himself/herself to continuing education and constantly update his/her knowledge of recent advances in Laboratory Medicine and allied subjects.

Psychomotor Domain

1. Able to perform most of the routine tests in a Laboratory including gross sampling of specimens, processing, and instrumentation.
2. Able to collect specimen by routinely performed non-invasive out-patient procedures such as venepuncture, finger-prick, and bone-marrow aspiration. It is implied that the complications of these procedures and handling of complications are apparent. Further, whenever necessary must be able to provide appropriate help to colleagues performing an invasive procedure.
3. Should be familiar with the operation, function and routine maintenance of equipment.

Affective Domain

1. Should be able to function as a part of a team that is essential for the diagnosis and management of a patient. He/she should therefore develop an attitude of cooperation with his/her colleagues so necessary for this purpose. It is implied that he/she will, whenever necessary, interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
2. Always adopt ethical principles and maintain proper etiquette in his/her dealings with patients, relatives and other health personnel.
3. Respect the rights of the patient including the right to information and second opinion.
4. Should seek and give second opinion only where necessary and is requested for.
5. Provide leadership and inspire members of the team with whom he/she is involved with in the fields of diagnostic, teaching and research.
6. Develop communication skills not only to word reports and professional opinions but also to interact with patients, relatives, peers and paramedical staff.

B. Specific Learning Objectives

At the end of the training in M. D. Laboratory Medicine, the candidate will be able to:

1. Discuss the etiology and the pathophysiological basis of diseases in children and adults.
2. Explain the salient aspect of epidemiology, clinical presentation and prognosis of these disorders.
3. Discuss rationality of the treatment and diagnosis of the above disorders.
4. Make rational and relevant selection of tests (biochemical/ hematological/ microbiological etc.)
5. Perform the specified important tests belonging to physiology, biochemistry, microbiology, pathology, hematology & immunology disciplines with a high order of mastery.
6. Plan and manage a large multidisciplinary laboratory services
7. Supervise and train technical staff of the laboratory

8. Modify/develop and establish newer techniques belonging to all subspecialties of laboratory medicine.
9. Simultaneous exercise on quality assessment and quality assurance in all laboratory services.
10. Explain the underlying principle and design of important laboratory, instruments, their use as well as maintenance of the same.
11. Take safety measures in performing tests.
12. Assess cost-effectiveness of laboratory tests including budgeting and auditing.
13. Design and implement research plans in the field of laboratory medicine.

VI. SYLLABUS (COURSE CONTENT)

Curriculum is a course of study especially in a University. The curriculum for a postgraduate course leading to the highest non-research degree in any subject is extremely difficult to compile. To put it bluntly, the candidate is expected to know everything! This obviously looks impractical. Even an entire lifetime is not sufficient to master a subject. Therefore a practical and a common sense approach is required. With this in mind this curriculum for MD course was constructed.

The course content will include the following aspects :

1. Organization of Laboratory
2. Quality Assurance
3. Instrumentation
4. Clinical Biochemistry
5. Clinical Pathology
6. Clinical Hematology
7. Clinical Microbiology
8. Clinical Immunology
9. Clinical Physiology
10. Clinical Pharmacology
11. Technology
12. Clinical Medicine

THE DETAILS OF SYLLABUS

1. Organization of the Laboratory

- (i). Spatial organization, flooring, ventilation, drainage, disposal of waste
- (ii) Lab. Safety – Prevention of Physical, Chemical & Biological Hazards. First Aid in Lab. Accidents. Legal aspects
- (iii) Financing, Budgeting and Cost accounting.
- (iv) Management of Laboratory stores.
- (v) Special reference to glasswares, chemicals & dangerous poisonous chemicals.
- (vi) Personal Management and Training of technical staff
- (vii) Streamlining of 'in-put' and 'output' of lab. Specimen collection and dispatch of report
- (viii) Computerization of laboratory services.

- (ix) Legal aspect of laboratory services.

2. Quality Assurance

- (i) Source of errors in laboratory results
 - Pre-instrumental
 - Instrumental
 - Post-instrumental
- (ii) Methods of detection of errors
- (iii) Corrective measures to minimize the errors
- (iv) Methods of documentation of the whole procedures
- (v) Onward transmission of the knowledge and skill to the other laboratory
- (vi) Preparation of internal 'control'
- (vii) Proficiency testing programme
- (viii) Participation in E.Q.A.P. & Preparation of Biological Standards

3. Instrumentation

To know the:

- (a) Principle of functioning
- (b) Major parts
- (c) Operational aspect
- (d) Preventive maintenance, and
- (e) Calibration/standardization, if applicable of the following instruments

A. Minor Instruments

- (i) Different types of Shaker, roller Mixer, Cyclomixer etc.
- (ii) Thermometer
- (iii) Different kinds of refrigerators
- (iv) Incubators
- (v) Ovens
- (vi) Water-baths
- (vii) Distillation plant
- (viii) Electrolyte analyzer
- (ix) Deionizer
- (x) Autopipettes
- (xi) Ph Meter
- (xii) Autodispensors
- (xiii) Analytical Balances

B. Major Instruments

- (i) Photoelectric Colorimeter

- (ii) Spectrophotometer
- (iii) Centrifuge machines of different types cold center fuse
- (iv) Blood Cell Counter, semi automated or fully automated
- (v) ELISA Reader
- (vi) Autoanalysers – Fully automated, semi-automated
- (vii) Flame photometer
- (viii) Blood Gas Analyser
- (ix) Electrolyte Analyser
- (x) Microscopes: Light, Fluorescent, Dark ground, Phase contrast, Electron microscope
- (xi) Electrophoresis apparatus

C. The principle and working manual of following techniques

- (i) Chromatography of different kinds
- (ii) Flow Cytometry
- (iii) Beta and Gamma Counting
- (iv) HLA typing
- (v) Radionucleotide Studies
- (vi) Some common Biotechnology Methods
- (vii) Immuno assays

4. Clinical Biochemistry

(a) Physical Chemistry

Theory (Knowledge)

- (i) Mol wt, Atomic wt, Eq. wt, Periodic table. Water of crystallization, Colloid, Crystalloid, Osmolality, Osmolarity, Specific gravity etc.

Practical (Skill)

- Preparation of standard, normal & molar solution
- Preparation of buffers
- Preparation of Laboratory reagents
- Handling of corrosives, poisonous chemicals

(b) Clinical Biochemistry

Theory (Knowledge)

1. Chemistry, identification, synthesis, determination, separation, metabolism, and disorders of carbohydrate metabolism. Diabetes Mellitus, Hypoglycemia
2. Structure, synthesis, function and physiological significance of proteins. Hypo- and Hyperproteinemia

3. Amino acids & related metabolites
4. Glycoproteins, proteoglycans and collagen
5. Porphyrins
6. Lipids, lipoproteins, apoproteins. Their metabolism and their physiological and pathologic significance
7. Enzymology: Regulations & diagnostic values of enzymes & isozymes in health and disease
8. Acid-base and electrolyte imbalance
9. Tumor-markers
10. DNA-RNA chemistry & current perspectives on their significance in human disease
11. Vitamins, & Trace elements and other important metals
12. Chemistry of various body fluids
13. Toxicology & health hazards

Practical (Skill)

- (i) Manual method of estimation of sugar, urea, bilirubin protein (total and fractional) creatinine, cholesterol, uric acid, amylase, acid and alkaline phosphatase.
- (ii) Automated method of estimation of:
 - (a) Above chemicals
 - (b) SGOT, SGPT, LDH, CPK, Uric acid, Calcium, Phosphate etc.
- (iii) Blood pH & arterial gases
- (iv) Electrolytes
- (v) Blood gases and pH.
- (vi) Lipids, apo-proteins and lipoproteins
- (vii) Tumor markers
- (viii) Chemical analysis of body fluids
- (ix) Practical on Quality assurance in a clinical chemistry laboratory

Students are supposed to be familiar with various Profiles of investigations, e.g., Cardiac. Renal, Liver profile etc.

Counseling: Pre-test and Post-test counseling of the patients.

(c) Endocrine Chemistry

Theory (Knowledge) & Practical (Skill)

- (i) Hormones: chemistry, metabolism, physiology and pathology
- (ii) Endocrine Function Tests (Theory & Practical)
- (iii) Hormone Assay
- (iv) Ligand Binding Assays

Counseling: Pre-test and Post-test counseling of the patients

5. Clinical Pathology (Clinical microscopy of body fluids)

Theory (Knowledge) and Practical (Skill)

- | | | |
|---|---|-------------------------|
| i. Urine | : | Physical |
| ii CSF | : | Chemical and |
| iii Peritoneal, pleural, pericardial fluids | : | Microscopic examination |
| iv Amniotic fluid | : | |
| v Sputum | : | |
| vi Semen Analysis | : | |
| vii Synovial fluids | : | |

Counseling: Pre test and Post test counseling of the patients.

6. Clinical Haematology & Transfusion Medicine

A. Clinical Hematology

Theory (Knowledge)

- (i) Detection and typing of anemia
- (ii) Polycythemia
- (iii) Neutrophilia, Eosinophilia, Basophilic, Lymphocytosis, Neutropenia, Lymphopenia, Agranulocytosis.
- (iv) Leukemia diagnosis, classification, clinicopathological correlation.
- (v) Thrombocytosis, thrombocytopenia, platelet function.
- (vi) Investigation of bleeding disorders.
- (vii) Automation in hematology
- (viii) Bone marrow physiology and pathology.

Practical (Skill)

- (i) Collection, transport and processing of blood samples for different hematological investigation.
- (ii) Performance of routine hemogram, Hb, TLC, DLC, ESR.
- (iii) Preparation staining and interpretation of peripheral blood smear.
- (iv) Aspiration of bone marrow, preparation of touch smear and bone biopsy. Staining and interpretation of marrow.
- (v) Cytochemistry of blood smear and bone marrow smear and their interpretation.
- (vi) Serum iron, folate and B12 estimation
- (vii) Hemolytic studies e.g. osmotic frangibility, sick living HbF, HbA2, Coombs test.
- (viii) Leucocyte function test.
- (ix) Screening coagulation and DIC studies. BT, CT, PT, APIT, Clotsohabitability.
- (x) Investigation of prothrombotic states. Protein C, Antithrabin III, Lupus anticoagulant.
- (xi) Demonstration of common blood parasites.

Counseling: Pre-test and Post- test counseling of the patients.

B. Transfusion Medicine*Theory (Knowledge)*

It is expected that students should possess knowledge of the following aspects of Transfusion Medicine.

- (i) Basic immunohematology
- (ii) ABO and Rh groups
- (iii) Clinical significance of other blood groups
- (iv) Transfusion therapy including the use of whole blood, RBC concentrates and Blood component therapy
- (v) Rationale of pre-transfusion testing
- (vi) Transfusion transmitted Infections
- (vii) Adverse reactions to transfusion of blood and components
- (viii) Quality control in blood bank

Practical (Skill)

- (i) Selection and bleeding of donors
- (ii) ABO and Rh grouping
- (iii) Resolving ABO grouping problems by secretor status in saliva and expanded panel
- (iv) Demonstrate familiarity with Antibody screening by
 - (a) LISS (Low-ionic salt solution)
 - (b) Enzymes
 - (c) AHG (Anti-Human Globulin)
- (v) Steps to be taken if the above are positive
- (vi) Demonstrate familiarity with Cross-matching by
 - (a) LISS (Low-ionic salt solution)
 - (b) Enzymes
 - (c) AHG (Anti-Human Globulin)
- (vii) Steps to be taken if there is incompatibility
- (viii) Preparation of blood components i.e. Cryoprecipitates, Platelet concentrate, Fresh Frozen Plasma, Single Donor Plasma, Red Blood Cell concentrates
- (ix) Demonstrate familiarity with Antenatal and Neonatal work
 - (a) Direct antiglobulin test
 - (b) Antibody screening and titre
 - (c) Selection of blood for exchange transfusion
- (x) Demonstrate familiarity with principle and procedures involved in
 - (a) Resolving ABO grouping problems
 - (b) Identification of RBC antibody
 - (c) Investigation of transfusion reaction

- (d) Testing of blood for presence of
 - 1. HBV (Hepatitis B Virus Markers)
 - 2. HCV (Hepatitis C Virus Markers)
 - 3. HIV (Human Immunodeficiency Virus markers)
 - 4. VDRL

(xi) Investigation of hemolytic jaundice of adult and new born.

Counseling: Pretest and Post test counseling of the patients.

7. Clinical Microbiology

Theory (Knowledge)

- (i) Medically important microbes in general. Their general behaviors, life history, metabolism, genetics and mode of infection.
- (ii) Epidemiology of infectious diseases
- (iii) Hosp. Acq. Infection/Nosocomial infection
- (iv) Medically important parasites
- (v) Medically important viruses
- (vi) Medically important fungi
- (vii) Systemic Microbiology:
 - Gastroenteritis and bacterial food poisoning, Septicemia, wound infection, burn, U.T.I., R.T.I., C.N.S. infection, meningitis, encephalitis, STDs/AIDS, opportunistic infection, congenital infections and infections in vulnerable groups e.g. AIDS, Cancer, Geriatrics, Premature babies, Pregnancy etc.
- (viii) Immunity to microbial disease
- (ix) Vaccines for infectious disease
- (x) Laboratory acquired infections
- (xi) Diagnosis & Prevention of infection
- (xii) Lab. Safety:
 - Blood borne disease including-Viral Hepatitis & AIDS Air borne infections
 - Universal precautions
 - Principals of Bio-safety
- (xiii) Medico-Legal aspects of infectious diseases including postmortem findings and evidence based opinion on criminal cases in regard to infections/vaccines.

Practical (Skill)

- (i) Methods of collection and transportation of specimen and techniques used for clinical samples:
 - Blood
 - Bone marrow, Splenic, Liver, LN aspirates
 - CSF, Pus from closed cavities & open wounds

Urine
Stool
Semen
Sputum
Saliva,
Swabs (nasal, pharyngeal, rectal, conjunctival etc.)

- (ii) Principles of Microscopy (all types)
- (iii) Commonly used stainings in microbiology: Grams, Romanowsky, A.F.B, Kinyoun's, Albert's special stains for spores, capsules, inclusion bodies, parasites & fungi
- (iv) Culture Media: their preparation, inoculation, and uses.
- (v) Antibiotic sensitivity testing including automation in Microbiology and Interpretation of antibiograms
- (vi) Immunological techniques e.g. Widal, VDRL, CFT, ID, ELISA, IFA, RIA, IPO, etc. In-vitro demonstration of CMI, Complement cycles, Blast transformation, Monoclonal antibodies, skin test and others.
- (vii) Biochemical tests for microbial diagnosis
- (viii) Serotyping of microbes.
- (ix) Bed side tests: FNA, intradermal tests, cord blood, lumbar puncture etc.
- (x) Animal inoculation studies
- (xi) Egg inoculation, cell culture studied for the diagnosis of viral & other microbial infection.
- (xii) Human parasites including Protozoa, Nematodes, Cestodes and Trematodes and their diagnosis by gross, microscopic and serological techniques.
- (xiii) Fungal infections in human and their diagnosis.
- (xiv) Hospital infection surveillance.

Counseling: Pretest and Post test counseling of the patients.

8. Clinical Immunology

Theory (Knowledge)

- (i) Physiology of Immune System
- (ii) Hypersensitivity Reactions
- (iii) Autoimmune Diseases
- (iv) Transplantation Immunology
- (v) Host-Parasite interaction

Practical (Skill)

- (i) Demonstration of T and B cell.
- (ii) Functional evaluation of T and B cell.

- (iii) Immunoglobulin estimation
- (iv) Serological techniques
 - CFT
 - Agglutination test) with particular, reference
 - IHA) to ANF, RF, CRP, Microbial
 - Elisa) serology
- (v) Radioimmunoassay
- (vi) Immunohistochemistry, Immunofluorescence and Immunoelectorn microscopy
- (vii) Immunoglobulins in health and disease
- (viii) Complements in health and disease

9. Clinical Physiology

ORGAN FUNCTION TESTS:

Theory (Knowledge) and Practical (Skill):

- (i) Liver function test
- (ii) Kidney function test
- (iii) Gastric function test
- (iv) Pancreatic function test
- (v) Splenic function test
- (vi) Tests for malabsorption
- (vii) Resp. function test
- (viii) Cardiac function test

10. Clinical Pharmacology

Theory (Knowledge) and Practical (Skill):

DRUG ASSAYS

11. Technology

- (i) Molecular biology - Structure of DNA & RNA
 - Genetic configuration of commonly used
 - Genomic vectors/host and their uses in molecular biology
 - Blotting technology
 - DNA hybridization
 - RNA hybridization
 - Polymerase Chain Reaction in various diseases
 - LCR Ligase Chain Reaction
 - TMA
 - MASBA (Nucleic acid sequence based analysis)
 - Micro-assay technology

- (ii) Histopathology technique, Cytopathology technique
- (iii) Histochemistry technique
- (iv) Chromosomal analysis
- (v) HLA typing
- (vi) Bioassays
- (vii) Bio-chips
- (viii) Nano-technology
- (ix) Cell culture technology
- (x) Basic immunological technology

12. Clinical Medicine

- (i) Independently history taking, examination and assessment of the patients, formulation of panel of tests, sending samples and requisition forms to the central or satellite lab services. The patient may be in the OPD, casualty, general or private wards, intensive care units, operation theatre of different specialties of Medicine.
- (ii) They are expected to participate and do post-test and pre-test counseling with patients or their relatives.
- (iii) Clinico-pathological correlation of laboratory results.
- (iv) Constant interaction with the clinical resident to make them aware of:
 - (a) the pre-instrumental sources of error in laboratory result
 - (b) Limitation of laboratory results in patient management.

VII. EXPOSURE TO RESEARCH

All efforts are made so that research methodology is apparent at the end of the course. It is an accepted norm at AIIMS that students submit a Thesis six months prior to examination as a partial fulfillment to the award of the degree of MD (Laboratory Medicine). Students are also encouraged to present papers in conferences and publish papers in peer reviewed journals. Due emphasis is laid on the importance of obtaining ethical clearance from appropriate committees for both animal and human studies.

A separate course for training in research methodology may not be necessary. Skills is usually acquired largely depending on the topic of research. The following points are guidelines to what may be expected of the student at the end of the course.

1. Recognize a research problem – basic or applied.
2. Clearly state the objectives in terms of what is expected to be achieved in the end.
3. Plan rational approaches with appropriate controls with full awareness of the statistical validity of the size of experimental material.
4. Carry out most of the technical procedures required for the study.
5. Accurately and objectively record on systematic lines the results and observations made.
6. Analyse the data with the aid of an appropriate statistical analysis, if necessary.
7. Interpret the observations in the light of existing knowledge and highlight in what ways the study has advanced existing knowledge on the subject and what further remains to be done.

8. Take photomicrographs, of a quality fit for publication in an international journal.
9. Write the thesis or a scientific paper in accordance with the prescribed instructions, as expected of international standards.

VIII TRAINING METHODS

The training programme is designed to enable the student to acquire a capacity to learn and investigate for himself, to synthesize and integrate a set of facts and develop a faculty to reason. The curriculum programme and scheduling of postings are done in such a way that the student are given opportunities to embrace the above broad objectives.

The student himself accomplishes much of the learning. Interactive discussions are preferred over didactic sessions.

The student are blend as an integral part of the activities of an academic department that usually revolves around three equally important basic functions of teaching, research and service.

The following is a rough guideline to various teaching/learning activities that are employed.

1. Collection of specimens.
2. Sampling of specimens.
3. Instrumentation
4. Discussion during routine activities such as during signing out of cases.
5. Presentation and work-up of cases including the identification of special stains and ancillary procedures needed.
6. Clinico-pathological conferences.
7. Intradepartmental and interdepartmental conferences related to case discussions.
8. Conferences, Seminars, Continuing Medical Education (CME) Programmes.
9. Journal Club.
10. Research Presentation and review of research work.
11. Guest and in-house lectures.
12. Participation in workshops, conferences, and presentation of papers etc.
13. Laboratory work.
14. Use and maintenance of equipment
15. Maintenance of records
16. Teaching undergraduates and paramedical staff.

IX. Structured Training Programme

(Time Schedule of Posting during Residency)

Interaction with Clinical counterparts

It needs to be emphasized that the Department of Laboratory Medicine caters for both Routine and Emergency (round the clock) services to the main hospitals as well as to the various centers. During the course of 3 years and particularly during their emergency posting the students are expected to interact with clinical disciplines continuously during the ward round. Pre-test and post-test counseling of the patients are advised.

Weekly Intradepartmental Case discussion

There will be weekly intradepartmental rounds and case discussion on selected cases whose investigations have been done over the week in different sections of the laboratory, particularly with the following departments, Medicine, Pediatrics, Surgery, Gastroenterology, Endocrinology, Gynae and obstetrics, Neurology, Casualty and ICU.

Weekly combined round and grand round

In weekly combined round and grand round of the AIIMS the residents of Laboratory Medicine will actively participate for discussion on the investigative aspects of the case presented.

A. Duration of posting in different sections of Laboratory Medicine: (26 months)

Orientation in three sections	03 months (One month in each section)
Emergency Laboratory/Casualty	06 months
Clinical Microbiology & Fluid and excretion Laboratory	05 months
Hematology	05 months
Clinical Chemistry	05 months
Thesis	02 months

In thesis, special emphasis will be laid on quality assurance, management of lab, medical audit and development of newer and simpler technology.

B. Posting in other specialty of AIIMS Labs : (10 months)

Blood Bank	:	2 months
Hematology Department	:	2 months
Pathology	:	2 months
Microbiology Deptt.	:	2 months
R. I. A. Lab., HLA lab, Clinical Immunology Lab & Biotechnology lab, Nuclear Medicine	:	2months

X. THE DETAILS OF EVALUATION AND CONDUCTING EXAMINATIONS

A standardized scheme of evaluation is adopted to assess the candidates in any teaching programme. Both formative and summative evaluations are followed.

Internal (Formative) Assessment

Internal Assessment in fact is done everyday to assess the training and to identify the weakness as well as the strength of the candidate. Thus appropriate corrective methods can be adopted at the right time so that a well-trained and competent laboratory specialist worthy of a postgraduate degree is available for the society.

1. However a formal assessment is recorded at the end of every posting and reviewed every six months.
2. Research work is assessed or reviewed every six months. The protocol and the final results are presented to the entire department.

3. For evaluation of presentations, evaluation sheets may be incorporated for the purpose of assessment. The following points are usually considered in the scheme such as seminars and journal clubs:

- (i) Choice of article/topic (unless specifically allotted)
- (ii) Completeness of presentation
- (iii) Clarity and cogency of presentation
- (iv) Understanding of the subject and ability to convey the same
- (v) Whether relevant references have been consulted
- (vi) Ability to convey points in favour and against the subject under discussion
- (vii) Use of audio-visual aids
- (viii) Ability to answer questions
- (ix) Time scheduling
- (x) Overall performance

In the case of specific posting similar points may be assessed with regard to knowledge and skills.

It is also usual that the candidates are assessed on the AFFECTIVE aspect of the training particularly with regard to the following:

1. Ability to get along with colleagues
2. To conduct with patients and nursing staff in a dignified way

During Formative Assessment Grading are done in one of the following ways:

- (i) Awarding actual marks
- (ii) Awarding scores:

0	=	Poor
1	=	Below average
2	=	Average
3	=	Above average
4	=	Good
- (iii) Awarding grades:

A+	=	90% – 100%
A	=	80% – 89%
A–	=	75% – 79%
B+	=	70% – 74%
B	=	60% – 69%
B–	=	50% – 59%
C	=	< 50%

The grades are endorsed by more than one faculty member or an average obtained by pooling the grades of different faculty members. This is conveyed to the candidate periodically (at least once in every six months) so that the candidate knows where he or she stands.

FINAL (Summative) ASSESMENT

The final examination is held at the end of three years of the training programmes. This would include

assessment of the thesis and a formal examination on the theoretical and practical aspects of the specialty of Laboratory Medicine.

Examiners

At present for conducting the postgraduate Examination at AIIMS, there are four (4) examiners two Internals and two Externals. As laboratory medicine encompasses a multidisciplinary forum, the care will be taken to select examiners who are specialized in different aspect of laboratory investigations so that the entire spectrum is covered during final examination.

1. The thesis/dissertation are evaluated by at least two external examiners well versed in the topic studies. It is therefore recommended that thesis/dissertation be submitted for evaluation six months prior to the theory and practical examinations. The results of the evaluation are made available prior to the practical examinations.
2. The examination will include:
 - A. Theory
 - B. Practical
 - C. Viva Voce

A. THEORY

4 Theory papers of 100 marks each

Paper I (Basic Pathology and Clinical Pathology)

Etiology and Pathogenetic Mechanisms of diseases.

Basic pathological processes. Degeneration, Necrosis, Inflammation, Circulatory disturbances, Disorders of Growth including Neoplasia, Metabolic disorders, Organ failure etc.

Factors which determine the course of diseases, and genesis of complications

Various diagnostic techniques to arrive at diagnosis and laboratory follow up of diseases

Physiology and Pathology of Immune system. Complement function, Hypersensitivity reaction, Immune complex diseases, Autoimmune disease. Transplantation pathology

Tissue typing. HLA and disease

Chromosomal and Genetic disorders:

Antenatal Diagnosis of diseases

Radionuclide Studies

Organ Function tests in different Pathological conditions:

Gastric function test,

Pancreatic function test

Liver function test

Intestinal function test. Malabsorption syndrome

Kidney function test

Endocrine function tests.

Placental function test

Pregnancy test and related investigations

Tumor Markers: Diagnostic and Prognostic values

Collection, Transport and Examination of Body fluids

Physical chemical and microscopic examination of Urine, Cerebrospinal fluid, Pleural, Peritoneal and Synovial fluids.

Examination of Semen

Examination of Sputum

Examination of Fistula's fluid.

Examination of Amniotic fluid

Flow cytometry: Technique and applications

Some diagnostic techniques for Anatomic pathology

FNAC technique, Papanecoulau and Giemsa stain

Technique of grossing, different histopathological staining techniques, Frozen section.

Immune histochemistry and immunofluorescent techniques.

Exposure to technique of electron microscopy

Learning the Essence of histopathological reporting

Cytology to distinguish benign from malignant lesions

Recent Advances in Clinical Pathology

Quality Assurances in general: Principle and Methods

Laboratory Organization, Management, Laboratory Safety, Purchase procedure and Development

Paper II (Clinical Biochemistry)

Biochemical basis of disease (Molecular Medicine).

Carbohydrate: Digestion, Absorption, Metabolism.

Classification, Identification, Estimation and Disorders of metabolism.

Proteins: Digestion, Absorption, Metabolism

Classification, Structure, Biosynthesis and Disorders of amino acids and proteins metabolism.

Lipids and Lipoproteins: Digestion, Absorption, Metabolism, Estimation and diagnostic significance.

Apoproteins. Disorders of Lipid Metabolism

Inborn errors of Metabolism

DNA and RNA chemistry, Structure, Biosynthesis ,gene expression

Enzymes: Kinetics, cofactor, inhibitors and diagnostic enzymology.

Isoenzymes of clinical importance

Blood gases and Acid base imbalances

Estimation and importance of Serum and Urine electrolytes, Various electrolyte imbalances

Serum tumor markers: Biochemistry

Hormones: Chemistry and Metabolism. Estimation of thyroid, reproductive and protein and other hormones

Porphyrins

Trace elements, vitamins etc.

Immunology

Immunoglobulins, lymphokines, leukotrienes , prostaglandins, complement system

Immunotechniques

Chemistry of Body fluids like, CSF, urine, pleural and peritoneal fluids.

Clinical chemistry of digestive system: gastric, pancreatic and intestinal juices and various estimation

Analytical Instruments in a clinical chemistry laboratory including Microtechniques

Automation: Steps, types, advantages, disadvantages, limitation and scope (advances)

Quality Assurance in a clinical chemistry laboratory.

Laboratory Safety

Recent advance in techniques and in clinical chemistry

Paper III (Clinical Microbiology and Immunology)

Systemic and taxonomic classification of medically important bacteria, viruses, fungi and Parasites

Principles of Metabolism, Molecular biology of bacteria

Sterilization, collection, transportation and processing of fecal, urine, semen, sputum, blood and other body fluids for various investigations.

Epidemiology of Infectious Diseases including molecular epidemiology

Hospital Acquired Infections and their control including universal precautions and prevention of infection in health care workers.

Systemic Microbiology.

CNS infections including meningitis and encephalitis, Respiratory tract Infections including pulmonary tuberculosis, Gastroenteritis and hepatobiliary infection, Infections of Cardiovascular system, urinary tract infections, Sexually transmitted diseases including HIV/AIDS, Torch complex and tegumentary infections.

Immunity of Microbial infections both cellular and humoral, including various cytokines.

Principles and development of Vaccines and adjuvants including Extended Programme of Immunization

Antibiograms

Various methods of Infectious disease diagnosis including conventional, serological, molecular and animal inoculation techniques.

Quality Assurance

Automation in Clinical Microbiology laboratory

Recent Advances in Microbiology and Immunology

For example,

Newly Emerging infectious Disease

Recent advances in molecular biology: NASBA, Ligase Chain Reaction (LCR), Polymerase Chain Reaction (PCR), Fluorescent In-situ-Hybridization (FISH),

Gene Sequencing

Vaccine development to prevent HIV infection

Sigma factor in tuberculosis

Chemokines in HIV infection

Third generation cephalosporins

Multidrug resistance in *Mycobacterium*

Paper IV (Hematology and part of Transfusion Medicine)

Syllabus for Hematology

Normal Hemopoiesis

Anemia, causes, types, diagnosis, monitoring

Polycythemia

Hemoglobinopathies, Thalassemia and Porphyria

Leucocytosis causes and various types, Leukopenic state.

Leucocyte functions

Leukemia, diagnosis, classification, clinicopathological correlation.

Thrombocythemia, Thrombocytopenia, Platelet function disorders.

Myeloproliferative and Lymphoproliferative disorders

Investigation of Bleeding disorders. DIC studies

Bone marrow physiology and pathology

Examination and assessment of Bone marrow for different hematological disorders

Blood and Bone marrow parasites

Macrophage disorders

Hematological abnormalities in Systemic disorders

Quality assurance in Hematology

Automation in hematology

Recent Advances in Hematology

Syllabus for Blood banking (Transfusion Medicine)

Selection of Donors and Collection of blood and its storage

Screening for Transfusion-mediated diseases

Grouping and cross matching

Major and minor blood groups.

Various transfusion reactions, their investigations.

Investigation of Hemolytic Jaundice of adult and new born.

Blood Components: Preparation, Storage and Use

Quality assurances.

Recent Advances

B. PRACTICAL EXAMINATION is conducted for two days:

Date & Time	Exercise	Resident I	Resident II
First day			
09-10 AM	Clinical Pathology case discussion		
10-11 AM	Microbiology sample processing		
11-12 AM	Microbiology slide spotting		
12-01 PM	Transfusion Medicine Practical		
1.00-1.30 Lunch			
1.30-2.30 PM	Hematology & Path. slide drill		
2.30-3.15 PM	Cl. Chemistry Ex. 1		
3.15-4.00 PM	Cl. Chemistry Ex. 2		
4.00-4.45PM	Cl. Chemistry Ex. 3		
4.45-5.30 PM	Cl. Chemistry Ex. 4		
	Continue Micrbiol. Processsing		
Second Day			
9.15- 9.45 AM	Bleeding disorder Exercise & Practical		
9.45-10.30 AM	Prothrombine Time/Platelet count		
10.30-11.00AM	CSF Exercise and analysis		
11.00-11.45AM	Urine examination		
11.45-12.30 PM	Stool Examination		
12.30-1.30 PM	Serology Exercise		
1.30-2.15 PM Lunch			
2.15-3.00 PM	Microbiol. processing follow up		
3.00-5.00 PM	Grand Viva		

C. VIVA VOCE

During two days of practical examination viva voce will be conducted on selection, operational and interpretative aspects of tests performed. **Grand viva** will be on day 2 at the end for 2 hours.

Grading

The Candidate is declared as 'Pass' or 'Fail'

XI. RECOMMENDED READING MATERIALS**Periodicals**

1. The American Journal of Clinical Pathology
2. Indian Journal of Pathology and Microbiology
3. National Medical Journal, India

4. Archives of Pathology and Laboratory Medicine
5. Laboratory Medicine
6. Journal of Clinical Pathology
7. Laboratory Investigation
8. The American Journal of Pathology
9. The American Journal of Hematology
10. British Journal of Hematology
11. Blood
12. Seminars in Hematology
13. Seminars in Diagnostic Pathology
14. Journal of Clinical Microbiology
15. The Journal of Parasitology
16. Parasitology
17. Tuberculosis
18. Virology
19. Year Book Series
20. Recent Advances Series
21. Reviews in biochemistry
22. J. Biol. Chemistry
23. Hepatology
24. Biochemistry
25. J. Immunol Methods
26. Nature
27. Science

Books

1. Clinical Diagnosis and Management by Laboratory Methods, *Henry JB*, WB Saunders. (Indian Edition, Eastern Press, Bangalore).
2. Clinical Laboratory Medicine, Editor *Kenneth D. McClatchey*, Lippincott Williams & Wilkins.
3. Laboratory Medicine Test Selection and Interpretation, Ed. Joan H. Howanitz & Peter J. Howanitz. Churchill Livingstone.
4. An Introduction to Clinical Laboratory Science, *Clerc*.
5. Widmann's Clinical Interpretation of Laboratory Tests, *Sacher*.
6. Clinical Laboratory Science Education & Management, *Wallace*.
7. Most Commons in Pathology and Laboratory Medicine, *Goljan*.
8. Advances in Pathology and Laboratory Medicine, *Graham*.
9. Interpretation of Diagnostic Tests, *Wallace*.

10. Delmar's Guide to Laboratory & Diagnostic Test, *Deniels*.
11. A Manual of Laboratory & Diagnostic Tests, *Fischbach*.
12. General Pathology *JB Walter, MS Israel*. Churchill Livingstone, Edinburgh.
13. Robin's Pathologic Basis of Disease *Ramzi S. Cotran, Vinay Kumar, Stanley L Robbins* WB Saunders Co., Philadelphia.
14. William's Hematology *Beutler E, Lichtmann MA, Collier BS, Kipps TJ*, McGraw Hill, New York.
15. Postgraduate Hematology *Hoffbrand AV, Lewis SM, Tuddenham EGD*, Butterworth Heinemann, Oxford.
16. Wintrobe's Clinical Hematology, *Lee GR, Foerster J, Lupeus J, Paraskevas F, Gveer JP, Rodgers GN*, Williams & Wilkins, Baltimore.
17. Practical Hematology, *Dacie JV, Lewis SM*, Churchill Livingstone, Edinburgh.
18. Bone Marrow Pathology, *Bain BJ, Clark DM, Lampert IA*, Blackwell Science, Oxford.
19. Leukemia Diagnosis – A guide to the FAB Classification, *Bain BJ*, JB Lippincott, Philadelphia.
20. Fundamental of Clinical Chemistry, *N. W. Teitz* WB Saunders Company, Philadelphia.
21. Varley's Practical Clinical Biochemistry, *JR Mc Murray, DM McLaunchlan*, Heinemann Professional publishing, Oxford.
22. A New Short Textbook of Chemical Pathology, *Baron*.
23. Glossary of Biochemistry and Molecular Biology, *Glick*.
24. Diagnostic Microbiology, *Bailey & Scott's*.
25. Principles of Bacteriology, Virology and Immunity, *Topley & Wilson's*.
26. Medical Microbiology, *Mackie and McCartney*.
27. Medical Microbiology and Immunology, *Levinson, Jawetz*.
28. Genes, *Benjamin Lewin*.
29. Immunology, *Roitt, Brostoff, Male*, Bailliere Tindall, Churchill Livingstone, Mosby, W.B. Saunders.
30. Harrison's Principles of Internal Medicine, McGraw Hill.

XII. EPILOGUE

1. At the end it is better said that no curriculum is Final. It requires constant updating and change commensurating with the changing need of the Institution and the Country.
2. Maintenance of a logbook for the Residents is probably the best way to keep track of their record of training. The Department of Laboratory Medicine is in the process of preparing this Logbook.
3. What we envisage is the TRANSFORMATION of Laboratory Science in such a way that MD Laboratory Medicine remains its basic post graduate degree followed by superspecialization with DM degree in Histopathology/Cytology, Hematology, Microbiology, Clinical Chemistry etc. (Reference: Hospital Administration, (1997), 34 (1&2), pp. 51-57.

MEDICINE — M D

GENERAL GOALS OF THE RESIDENCY TEACHING - TRAINING PROGRAM IN MEDICINE

The main goal of the training program is to produce physicians with the necessary knowledge, skill and attitude to diagnose and manage in a cost effective manner, a wide range of clinical problems in internal medicine as seen in the community or in secondary/tertiary care setting. Special emphasis is placed on the relatively common and treatable disorders. Possession of clinical skills required for making a diagnosis is given utmost importance.

As a result of training in General Internal Medicine, the physician should become competent in the use of the various diagnostic tests, and interpret their results intelligently, keeping in mind their costeffectiveness.

In addition, a physician trained in General Internal Medicine should have learnt adequate skills in communication and teaching. Although maximum emphasis in the training program is given to the acquisition of skills necessary for diagnosis, management and prevention of medical disorders, it is considered desirable for the Junior Residents to be familiar with the fundamentals of research methodology. In order to be considered a competent internist, a resident in medicine must posses humanistic qualities, attitudes and behavior necessary for the development of appropriate patient-doctor relationship.

SPECIFIC AIMS AND OBJECTIVES OF THE JUNIOR RESIDENT TRAINING PROGRAM IN INTERNAL MEDICINE

As a result of the training under this program, at the end of 3 years of postgraduate training, a resident must acquire the following knowledge, skills and competencies:

1. A thorough knowledge of epidemiology, natural history, pathological abnormalities, clinical manifestations, and principles of management of a large variety of systemic medical disorders of adults and elderly, affecting any organ system.
2. A thorough knowledge of the practical aspects and methods of prevention and protection against nosocomial infections from (i) patient-to-patient (ii) patient-to-health care worker HCW) (iii) HCW-to-patient; in any health care setting.
3. Thorough knowledge, skill and competence to diagnose correctly and manage rationally a wide

range of clinical problems of general internal medicine, using traditional methods of recording an accurate and thorough history and performing a detailed physical examination.

4. Skills and competence to conduct himself/herself ethically during the process of collecting the relevant data base, and be able to establish a healthy doctor-patient relationship by maintaining a sympathetic attitude and upholding the dignity () of the patient. He/she must have learnt the skills of promoting verbal communication with the patient and winning his/her confidence.
5. Skill and competence to choose and interpret correctly the results of the various routine investigations necessary for proper management of the patient. While ordering these investigations, a resident must be able to understand the sensitivity, specificity and the predictive value of the proposed investigation, as well as its cost-effectiveness in the management of the patient.
6. Skills and competence to perform commonly used diagnostic procedures, namely, lumbar puncture, bone marrow aspiration/biopsy, liver/nerve/muscle/skin/kidney/pleural biopsy, fine needle aspiration cytology of palpable lumps, pleural/pericardial/abdominal/joint fluid aspiration; take an electrocardiogram tracing, and be able to interpret their findings.
7. Skill and competence to choose and interpret correctly the results of specialized investigations including radiologic, ultra-sonographic, biochemical, haemodynamic, electro-cardiographic, electro-physiological, pulmonary functional, hematological, immunological, nuclear isotope scanning and arterial blood gas analysis results.
8. Skill and competence to provide consultation to other medical and surgical specialities and subspecialities, whenever needed.
9. Skill and competence to function effectively in varied clinical settings, namely, ambulatory care, out-patient clinic, in-patient wards, or emergency/critical care.
10. Skill and competence to take sound decisions regarding hospitalization, or timely referral to other consultants of various medical subspecialities recognizing his limitations in knowledge and skills in these areas.
11. Proficiency in selecting correct drug combinations for different clinical problems with thorough knowledge of their pharmacological effects, side-effects, interactions with the other drugs, alteration of their metabolism in different clinical situations, including that in the elderly.
12. Skill and competence to administer intensive care to seriously ill patients in collaboration with specialists from other areas. Should have acquired adequate skills in cardiopulmonary resuscitation, endotracheal intubation, setting up a central venous line, using a defibrillator, and providing basic ventilator support. The resident in medicine must become familiar with the basic monitoring equipments in the critical-care area of the medicine ward, and should be able to interpret the information provided by the correctly.
13. Skill and competence to advise on the preventive, restorative and rehabilitative aspects of medicine, including those in the elderly, so as to be able to counsel the patient correctly after recovery from an acute or chronic illness.
14. Skill and competence to understand research methodology in clinical medicine and to undertake a critical appraisal of the literature published in various medical journals and be able to apply the same in the setting in which the resident is working.
15. Skill and competence to work cohesively in a team of medical and paramedical personnel and maintain discipline and healthy interaction with the colleagues.

16. Skill and competence to communicate clearly and consciously, and teach other junior residents, medical students, nurses and other paramedical staff, the theory as well as the practical clinical skills required for the practice of medicine.

Training Program : Schedule

The Junior Residents in medicine under go the following rotation-training during their 3 years' course towards M D (Med.):

(i)	Medicine Units	:	6 months in each unit (Total: 18 months)
(ii)	Nephrology	:	2 months
(iii)	Gastroenterology	:	3 months
(iv)	Casualty	:	2 months
(v)	EHS	:	2 months
(vi)	Cardiology	:	4 months
(vii)	Neurology	:	4 months
(viii)	Endocrinology	:	1 months
	Total	:	36 months

MEDICAL UNITS

To simplify the functioning and for ensuring that all the faculty members of the department participate equally in the general internal medicine teaching and patient – care program, the 75 beds of the department of Medicine have been divided in three functional clinical units (Medicine Unit I, II and III). Ten of these beds have facilities for critical care (presently [December 1994] under construction, should become intensive care of the patients etc. These beds, available for use by all the 3 units, have been placed in ward C2. Each unit consists of 4-6 faculty members, 2 senior residents, 5-6 junior residents, and 1-4 intern at any given time.

FUNCTIONS OF THE MEDICAL UNITS

The clinical units in the department of medicine have the following main functions:

1. Provide casualty - emergency consultation coverage for all the patients attending AIIMS-Casualty with problems of general internal medicine on days when the units is “On - Call”. The same medical unit also provides emergency consultation service for the patients of AIIMS hospital and attached “Centres” who may require general internal medicine consultation.
2. Provide coverage for the Out-patient service in the forenoons, and on fixed days in a week.
3. Provide In-patient admission and management facilities to all the patients who get admission from the out-patient, casualty-emergency or get transferred to general medicine beds from other clinical areas of the hospital; on the days when that medical unit is “on-call”.
4. Although the 3 clinical units in medicine function in close co-ordination, and cooperation, each unit has independent beds (except the critical care beds which will be shared by all the 3 units). These units are entirely independent as far as the patient-care is concerned.

Responsibilities learning activities of Junior Residents

The daily routine for a medicine resident starts at 8.00 am everyday. On Wednesday and Saturday it may be earlier as journal club is held on Wednesday, and Saturday being a half day.

Residents' responsibilities may be discussed under the following headings.

1. O.P.D. Services
2. In-patient care
3. Academic activities

OPD Services

Each resident posted in the medicine department would have two OPD days/week. (see 5.2 for allocation of OPD days).

OPD starts at 9.00 am every day except Sundays and holidays. Residents must be in their OPD cubicle by 9.00 am sharp. It is advisable not to change the cubicle repeatedly as this practice makes it difficult for patients attending for follow up.

The following guidelines may be helpful for optimal and efficient functioning in the medical OPD.

- Residents should see patients one-by-one on first come first service basis to avoid confusion.
- They should evaluate each patient and write the observations on the OPD card with date and signature.
- OPD card is a legal document, hence one should be careful about what one writes on the card.
- Investigations should be ordered as and when necessary using prescribed forms. All investigation form should be carefully and completely filled. Short history, findings and clinical assessment should be clearly outlined on forms meant for radiology, pathology and nuclear medicine.
- Resident should consult the senior resident/consultant in case of any difficulty regarding diagnosis and the management of any case.
- Patient requiring admission according to JR's assessment should be sent to the senior resident on duty for evaluation.
- Patient requiring immediate medical attention should be sent to the casualty services with details of the clinical problem clearly written on the card. Consultant/senior resident on duty in OPD should be fully apprised of the case in person. Ideally, the resident should also brief casualty medical officer regarding the case. All haemodynamically unstable patients should preferably be escorted to the casualty by the resident.
- Only if the patient merits a specialist opinion should the patient be referred to the specialty OPD with the objective of referral and resident's opinion clearly written on the card.
- Patients with chronic illness may be referred to specialty clinic, if required, for further management and follow up and not for routine diagnostic work up, which should preferably be done in the medical OPD itself.
- Patients should be clearly explained as to the nature of the illness, the treatment advice and the modus operandi for getting the investigation done.
- Routine investigation reports reach the investigation file of each room. Reports of X-ray, scans, and pathology investigations reach the sister-in-charge usually by 4-6 days time.
- Resident should specify the date and day when patient has to come for follow up.
- Medical representative should be entertained only after completing OPD work.
- Following are available with the sister-in-charge of OPD
- Instrument(s) (e.g. blood pressure apparatus) issued from the sister should be returned before the OPD.

- BP instruments, torch, tongue depressor, weighing machine special investigation forms (e.g. Histopathology and FNAC forms etc.)
- Emergency first-aid kit.

In-Patient Care

The usual doctor-patient ratio for in-patient services is 1:4-6 which may vary depending on the strength of the residents in the unit. Each Junior resident is responsible and accountable for all the patients admitted under his care.

The following are the general guidelines for the functioning of the junior residents in the ward.

- Detailed work up of the case and case sheet maintenance.
- To organize his/her investigations and collect the reports, if necessary.
- Bedside procedures for therapeutic or diagnostic purpose.
- Presentation of a precise and comprehensive overview of the patients in clinical rounds to facilities discussion with SRs and consultant.
- To obtain opinion of specialists of other medical disciplines, if considered necessary by the senior resident and/or consultant.
- To evaluate the patient twice daily (and more frequently if necessary) and maintain a progress report in case file along the lines mentioned above.
- To establish rapport with the patient for communication regarding the nature of illness and further plan of management *.
- To write instruction about patients' treatment clearly in the instruction book along with time, date and the bed number with legible signature of the resident **.
- To carefully inspect treatment chart of patient daily to check whether physicians instructions are being carried out correctly.
- To hand over responsibility of the patients to the resident on duty, verbally and in written before returning for the day.
- To plan out the work and the next day in advance to facilitate functioning and avoid delays.

*Relatives of the patient should be frequently and appropriately apprised of the clinical progress.

**Treatment chart in the file and staff's treatment book should be frequently tallied, and corrected if necessary.

Admission day: Admission day for a unit starts from 8.00 am of the OPD day and ends at 8.00 a.m. of the next day. Following guidelines should be observed by the resident during the admission day.

- ❖ Routine ward work and discharge of patients should be completed by 9.00 am of the admission day.
- ❖ Resident should Inform the doctor on duty about the sick patients, giving detailed verbal and written over, including proposed plan of management. Staff on duty should be fully detailed about drugs and I.V. fluid orders of the sick patient(s).
- ❖ After attending to OPD duty, resident should check up with the senior resident on duty about the cases allotted to him/her for the work up.
- ❖ Before proceeding for lunch resident should make a brief evaluation of the patient should be done.

Vital signs should be immediately recorded in the case sheet as soon as a resident examines a patient. Immediate medical care should be provided if patient is sick. Urgent investigations should be sent, if considered necessary.

- ❖ Resident should work up the patient in detail and be ready with the preliminary necessary investigations reports for the evening discussion with the consultant on call. It would be in order to discuss the clinical details and plan of management of the case, with the SR before the consultants round starts.
- ❖ After clinical round, resident should plan out the investigation for the next day in advance, fill up the forms of the investigations and put them in the staff's record book, after having apprised her.
- ❖ During clinical round, JR and SR should present relatively sicker patient first, to avoid delay in the management.
- ❖ Responsibility of patients should be handed over to the doctor on call personally before returning for the day.
- ❖ In the event of any procedural and logistic problems (e.g. delay in getting a portable X-ray done), SR, consultant or duty officer may be contacted for help.

Doctor on Duty

Duty days for each Junior Resident are allotted according to the duty roster made by the SR and/or consultant every month. No change is permissible unless it is by a mutual consent and in such event senior resident/consultant should be duly informed.

- Resident on duty has to report for duty at 8.00 am and take detailed over from the previous doctor on duty with especial reference to sick patients.
- He should carry the pageboy during his duty hours. The custody and maintenance of the working condition of page boy is the responsibility of the junior resident on duty for the day. 'Page Boy' should be tested repeatedly during the day with a test call especially during taking over and leaving the ward for any purpose. Response to a page call should be immediate by telephone or preferably in person. A resident should never ignore a page call.
(*Not responding to "page" may invite disciplinary action*).
- The resident on duty for the admission day should know in detail about all sick patients in the wards, and relevant problems of all other patients, so that he could face an emergent situation effectively. 7.2.2.d. Admission during night should be worked up and managed according to the suggested guidelines, with intensive monitoring of sick patients.
- In morning, detailed over (written and verbal) should be given to the next resident on duty. This practice should be irridigly observed.
- If a patient is critically sick, discussion about management may be done with SR or consultant at any time, e.g. before or after usual time or evening round.
- The doctor on duty should be available in the ward throughout the duty hours, except during meal times when he is preferably covered by a colleague or intern especially if any patient is critical. He should inform the sister before leaving the ward.

In case of New Admission/Transfer

This is done usually with the knowledge of senior resident on call. If patient is sick the doctor on call should accompany the patient from the casualty or another ward. Initial evaluation and stabilization of

the patient should be carried out pending detailed evaluation.

Care of Sick Patients

Case of sick patients in the ward takes precedence over all other routine work for the doctor on duty. Patients in critical condition should be meticulously monitored round the clock and records maintained. Treatment alterations should be done by doctor on duty in consultation with the Senior Resident, and Consultant, if necessary.

If Patient Merits ICU Care

If patient merits ICU care then it must be discussed with the Senior Resident and Consultant. Consultation should be sent to SR/Consultant Anesthesia or they are contact on phone for evaluating the patient, and transfer to ICU.

Discharge of the Patient

Patient should be informed about his/her discharge about 24 hours in advance. It should be planned in such a manner that patient vacates bed by 11 AM-12 Noon in the morning. Certainly, discharge on Sundays and other holidays are to be avoided.

Discharge summary should be precisely, but comprehensively, written. It should be noted that this document is carried by the patient wherever he/she goes for consultation, or following up hence, incomplete or incorrect information should be avoided. Apart from giving salient points in history and examination, resident should record important management decisions, and ensuring hospital course in a proper manner. Investigations should be properly written, giving dates and numbers of various pathological and radiological tests. Complete diagnosis, complications and procedures done during hospital stay should be duly recorded. Most important part of the discharge summary is the final advice given to the patient. Complete details of dietary advice (preferably with a diet chart), mobilization plan, and instructions regarding activity or exercise should be written, names of drugs, and dosage should be legibly written, giving the timing and duration of treatment. Patient should be briefed regarding date, time and location of OPD/Clinic for the follow up visit. Three copies of discharge summary should be made, one for the patient, second to be attached in the case sheet, and third for unit record or for the follow-up OPD. Discharge summary made by Junior Resident should be carefully checked and corrected by the Senior Resident and/or consultant.

In Case of Death

In case it is anticipated that a particular patient may not survive, relatives must be informed about the critical condition of the patient beforehand. In the event of death of a patient inform the nearest available relative and explain the nature of illness. Follow up death summary should be written in the file. Face sheet notes and must be filled up and the sister-in-charge should be requested to send the body to the Mortuary from where the patient's relatives can collect the body. If it was an MLC case, death certificate has to be prepared in triplicate and body handed over to mortuary and the local police authorities should be informed. No death certificate is given to their relatives of the medico-legal from the wards.

In case Autopsy is Required

Autopsy should be attempted for all patients who have died in this hospital especially so if patient died of undiagnosed illness, unexpected deaths and in conditions where the diagnosis may have a bearing in the health of the relatives/hospital staff. Post-mortem is routinely done in the event of medico-legal cases. Resident should explain the procedure to the relatives emphasizing the need for it. They should fill up the consent form for autopsy after doing all the necessary formalities. The Junior Residents of Pathology on

duty should be informed by page or written call, after checking their duty roster. Senior Resident and consultant of the medical unit should be informed about the autopsy. Resident should try to organize and expedite the process to ensure good compliance by the relatives. Autopsy consent form, autopsy request form and case sheet should be sent to the mortuary, with the dead body.

Bedside Procedure

Various bedside procedures like pleural tap, ascetic tap, liver biopsy, and bone marrow examination etc. need to be performed by a medical resident if indicated for diagnosis and management of the patient. The following guidelines should be observed strictly:

- ◆ Verify the indication for the procedure from SR and/or consultant. Record this in the case sheet.
- ◆ Rule out contraindications like low platelet count, prolonged prothrombin time, etc.
- ◆ Plan the procedure during routine working hours, unless it is an emergency special containers for collecting the material should be ensured before starting the procedure.
- ◆ Explain the procedure with its complications to the patient and his/her relative and obtain written consent on a proper form. 7.2.9.e. Perform the procedure under strict aseptic precautions using standard techniques. Emergency tray containing essential drugs, with IV fluid bottles and cardiac defibrillator should be made ready near the bed of the patient.
- ◆ Dispatch sample(s) in appropriately labeled containers with complete investigations forms, check if the payment for the investigation has already been made to the appropriate laboratories during the recommended hours.
- ◆ Make a brief note on case sheet with the date, time, nature or procedure and immediate complications, if any.
- ◆ Monitor the patient and watch for complication(s)
- ◆ Write the reports of the procedure performed with lab Ref.No. in the case sheet.

Academic Activities

During Junior Residency, post Graduates is not only expected to provide proper patient care, he/she is also supposed to acquire academic knowledge and skills in the field of Internal Medicine.

Case Discussions

This is held twice a week with the unit consultants at a predetermined convenient time. The Junior Resident prepares a case and discusses in detail with the consultant. Interview is then taken by the consultants, on the pattern of final PG examination. The candidate is assessed and given marks on the standardized proforma (see 11.2 and 12.1).

Radiology Conference

This is held in the radiology department once a week separately for each unit where all the radiological investigations of the admitted patients are discussed in detail. The discussion should be recorded in the case file of the respective patients.

Mortality Conference

This is held in the doctor's duty rooms/seminar rooms once a week for each unit where the details of the patients who died the previous week are discussed. The objective of this activity is to understand the management of critically ill patients, identify administrative and personal lacunae and lapses if any, and provide future guidelines for similar patients.

Journal Clubs (see *Post Graduates Seminars In Medicine*)

This is important teaching activity is held on every Wednesday morning at 8.00 a.m. in Medicine seminar room, 3rd floor, teaching block. One resident prepares a 40 min discussion on an allotted topic under the guidance of a preceptor. All residents are supposed to attend it regularly.

Clinical Combined Round (CCR)

Every Tuesday at 2.30 p.m. CCR is held in LT III to discuss interesting case/procedure/surgery seen by a department. Two departments (one surgical and one medical) present, for 30 min each an interesting case/procedure with brief review of literature.

Clinical Grand Round (CGR)

This is a centralized teaching activity held at 4.00 p.m. on Tuesday in LT III where the research activity carried out by a department is presented. The total duration is one hour.

Clinics-Pathological Conference (CPC)

In CPC, one senior faculty member from AIIMS, or any other medical college, discusses an unusual clinical case in detail, and gives his clinical diagnosis. Faculty member from department of pathology follows up the discussion with the final diagnosis.

Other Research Activities

A resident is free to involve himself/herself with other ongoing research activities with any consultant of the department.

Specialty clinics

There are 3 officially recognized specialty clinics being run under the aegis of the department of medicine. These are as follows:

<i>Name of the Clinic</i>	<i>Time and Day</i>	<i>Place</i>
Rheumatology Clinic	Wednesdays, 2 PM onwards	M.O.P.D.
Chest Clinic	Friday, 2 PM onwards	- do -
Geriatric Clinic	Friday, 2 PM onwards	- do -

The following is the arrangement for providing the resident staff for running of these clinics:

Rheumatology Clinic : Resident staff of Unit 2

Chest Clinic : Resident staff of Unit 2

Geriatric Clinic : Resident staff of Unit 3

Faculty members with interest/expertise/training in the subspecialty, irrespective of the General medicine unit to which they may be attached, attend and run these clinics.

Referral of Patients to these Clinics

As these clinics provide long-term follow-up, only those patients should be referred to these clinics who are really committed to avail of this facility. For simple consultation for reaching a diagnosis it is advisable that the residents carry out the preliminary work-up in the medical out-patients department itself and take the help of the consultants/Senior Resident to chalk out the management plan rather than to “dump”

the patient to these clinics without even the preliminary diagnostic work up. Over-loading these specialty clinics with patients coming only for getting a diagnosis or “second opinion” will be a waste of resources of these clinics.

Investigational Facilities and their utilization

AIIMS hospital is one of the most well-equipped hospitals in the country. However, it the responsibility of the ward team to requisition only the relevant investigations after a careful analysis of the clinical problem. The approach should be positive (to confirm the clinical diagnosis) rather negative (to exclude some remote possibility). The so-called “routine” investigations must be kept to a minimum. The habit of not planning investigations in “EMERGENCY” must be strongly discouraged. It hampers with the proper functioning of the hospital laboratories and results the reliability of the laboratory results because of load which cannot be handled.

Medico-Legal Responsibilities of the Residents and Interns

As mentioned in the beginning of this document, Residents and Interns are advised to carefully read and learn the medico-legal responsibilities as related to their day-to-day work in the AIMS hospital from the AIIMS Hospital “Residents’ Manual”. They must be very sure of the formalities and steps involved in making the correct death certificates, mortuary slips, medico-legal entries, requisition for autopsy etc. Similarly, they must be fully aware of the ethical angle of their responsibilities and should carefully learn how to take legally valid consent for the different hospital procedures/therapies etc.

TEACHING AND OTHER ACTIVITIES IN DEPARTMENT OF MEDICINE

POST GRADUATES SEMINARS IN MEDICINE

Day and Time : Wednesdays 8 to 9 am.

Participation

By rotation, the JRs in medicine are allotted topics covering recent advances in medicine. The list is prepared and circulated at the beginning of each session. Faculty members from the department of medicine and the various subspecialties act as preceptors for these seminars. The JRs must contact the preceptors at least 3 weeks before the proposed seminar and carefully chalk out the out-line of the presentation. They must search adequately through the literature and work under the close guidance and supervision of their preceptor(s) and rehearse adequately in advance in order to give a satisfactory presentation with in terms of content and delivery.

After the end of the seminar, the JR is required to submit the properly edited write-up, prepared with the help of the preceptor, within 3 weeks to a faculty member deputed for this purpose. The document must have relevant recent references on the topic discussed. The department is making spiral-bound “Medicine Seminar” volumes for the departmental library. (The first such volume is available from July-December 1993 session).

TEACHING AND TRAINING PROGRAMME IN EACH MEDICAL UNIT

Teaching and Training Schedule of Medicine Unit I

Day and Time	Exercise
Friday 12 noon to 1 p.m.	Radiology Conference
Friday 4 p.m. onwards	Formal case presentation by JRs

Saturday 11.30 am	Case sheet audit; Caseoriented problem onwards solving discussion.
Service and teaching morning ward rounds	Tuesday, Wednesday, Friday, Saturday.
Evening emergency and teaching round	Monday and Thursday

Teaching and Training Schedule of Medicine Unit II

Monday	- 2.30 noon - 3.00 pm :	Mortality Conference Case sheet audit
Monday	- 3.00 pm - 4.00 pm :	formal case presentation by JRs
Tuesday	- 12 noon - 1.00 pm :	Radiology Conference
Wednesday	- 2.00 pm onwards :	Rheumatology Clinic
Thursday	- 2.00 pm - 5.00 pm :	Chest Clinic
Friday	- 3.00 pm - 4.00 pm :	formal case presentation by JRs
Service and Teaching morning ward round - Monday, Tuesday, Thursday, and Friday.		
Evening emergency and teaching round - Wednesday and Saturday.		

Teaching and Training Schedule of Medicine Unit III

Monday	- 12 noon - 1 p.m. -	Case presentation
Wednesday	- 12 noon - 1 p.m. -	Radiology conferece
Thursday	- afternoon -	Hematology conference & Clinic (2.00 p.m. onwards)
Friday	- afternoon -	Geriatric clinic (2.00 pm onwards)

Saturday - Case-sheet audit, mortality conference and “topic” - oriented discussions.

Service and teaching morning ward round - Monday, Wednesday, Thursday and Saturday.

Evening emergency and teaching round - Tuesdays and Fridays. In addition to postings in the 3 general internal medicine units, the Junior Residents are posted in different subspecialty departments namely Neurology, Cardiology, Gastroenterology, Nephrology, endocrinology as well as Casualty and Employee's Health Service, for training. (see 4.0). At the end of each specialty posting, a formative assessment of JRs held taken and supervised by consultant of that particular specialty (see 12.1). The details of the training programmed in these departments, are as follows.

TEACHING AND TRAINING PROGRAMME IN CARDIOLOGY

The period of posting in cardiology is 4 months. A junior Resident, while rotating in the subspecialty of cardiology, undergoes the following clinical/other teaching exercises and acquires knowledge of following procedures/investigations:

Clinical

Clinical work of a resident is closely guided and supervised by the Senior Resident and the consultants.

Ward: Duties include diagnostic case work up and day-to-day management of cases (rheumatic heart disease, ischemic heart disease (IHD), hypertension, congestive heart failure, congenital heart disease etc.)

ICU: Duration 10-15 days. A resident acquires the expertise/knowledge to diagnose and manage acute myocardial infection and its complications, common arrhythmias, cardiogenic shock and pericardial tamponade etc. The resident also learn to perform the procedures and investigations (listed below) necessary to manage such patients in appropriate clinical setting.

OPD: Work up and management of common OPD cases (Rheumatic heart disease, ischemic heart disease, congestive heart failure, hypertension etc.)

Teaching

Two formal bedside case presentation by Junior Residents in a month (or more frequent if considered necessary). All formal bedside case presentations in any unit/specialty are supervised strictly by consultant(s).

Total of 3 classes for:

- Interpretation of investigations (ECG, TMT, Holter etc.).
- Principles of haemodynamics
- Procedures (cardioversion, pericardiocentesis etc.)

Procedures

The junior residents are trained to carry out the following common procedures during their cardiology posting:

- ✧ Pericardiocentesis
- ✧ Cardioversion
- ✧ Defibrillation
- ✧ Intensive haemodynamic monitoring (including CVP and arterial line, Swan Ganz catheterisation).
- ✧ Temporary pacemaker insertion

Investigations

During their cardiology posting the Junior Resident is guided and helped in acquiring theoretical and practical knowledge about the following investigations and their interpretation and applications to the various clinical situations:

- ✧ Electrocardiogram
- ✧ TMT
- ✧ Holter monitoring
- ✧ Head-up tilt Test
- ✧ Nuclear cardiology (Technetium, Thallium scans, multigated acquisition * (MUGA) etc).
- ✧ Cardiac catheterisation and Electro-physiological studies.

TEACHING AND TRAINING PROGRAMME IN NEUROLOGY

The period of posting in neurology is 4 months. A Junior Resident, while rotating in the subspecialty of neurology, undergoes the following clinical/other teaching exercises and acquires knowledge and competencies of the following procedures/investigations:

Clinical

Clinical work of a resident is closely guided and supervised by the senior residents and the consultants.

- (a) Ward: At the end of the neurology posting the junior resident should be able to carry out diagnostic case work up and day-to-day management of the following cases:
- Meningitis, encephalitis, comatose patients, seizures, cerebrovascular accidents, systemic disease with CNS and spinal cord, metabolic and degenerative diseases of nervous system, polymyositis and other muscle disorders etc.
- (b) OPD: Twice a week. A Junior Resident is expected to work up patients, discuss them with the consultant(s) and suggest relevant investigations of common neurological problems, some of which are listed above.

Teaching Schedule

- a) Formal bedside case presentations by the Junior Residents
- ✧ at regular intervals. (at least 2 for each JR).
- b) Formal teaching classes on;
- ✧ Managements of neurological emergencies (with special reference to status epilepticus).
 - ✧ Meningitis and cerebral malaria
 - ✧ Neurological Imaging
- c) Seminars and Journal clubs - once a week
- d) Radiology conference - once a week

Procedures and investigations

At the end of the neurology posting the student should be able to perform the following:

- ✧ Muscle biopsy
- ✧ Nerve biopsy

Junior Resident should have practical and working knowledge of the following:

- ✧ Interpretation of plain x-ray-skull, CT scan and MRI scans.
- ✧ Interpretation of EEG record
- ✧ EMG
- ✧ Nerve conduction studies
- ✧ Evoked potential studies
- ✧ Prostigmin test
- ✧ Botulinum toxin injection

TEACHING AND TRAINING PROGRAMME IN GASTROENTROLOGY:

The period of posting in Gastroenterology is 2 months. A Junior Resident, while posted in the subspeciality of Gastroenterology, undergoes the following clinical/other teaching exercises and acquires knowledge of following procedures/investigations:

Clinical

Clinical work of a resident is closely guided and supervised by Senior Residents and consultants.

- (a) Ward: By the end of the Gastroenterology posting a Junior Resident should become competent in diagnostic case work up and day-to-day management of the following cases:

Acute viral hepatitis and its complications, chronic hepatitis, cirrhosis of liver and its complications, upper and lower gastrointestinal bleed, hepatic coma, acute abdomen (peritonitis, intestinal obstruction, and pancreatitis etc), liver abscess, inflammatory bowel disease and malabsorption, intestinal tuberculosis and its complications, malignant lesions of liver, gall bladder, stomach, pancreas and intestines etc.

(b) OPD - Nil

Teaching

- (a) Formal clinical bedside case presentations and discussions by junior residents - once every 15 days (or more frequent, if considered necessary).
- (b) Regular teaching exercise in the department at 12.00 noon, 5 days a week (Monday-Friday)
- (c) Gastroenterology lecture series every monday from 5 to 6 p.m.

Procedures

At the end of the posting in Gastroenterology, the Junior Resident should have acquired practical knowledge of/and should be able to carry out the following:

- ✧ Per rectal examination and sigmoidoscopy
- ✧ Nasogastric intubation
- ✧ Ascetic tap
- ✧ Liver biopsy
- ✧ FNAC of abdominal masses (blind as well as under ultrasound guidance)
- ✧ Needle aspiration from liver abscess (blind as well as under ultrasound guidance).

At the end of the Gastroenterology posting the junior resident should have acquired practical knowledge of the following procedures (approximate minimum duration of time to be spent on each procedure is specified in brackets against each).

- ✧ Upper gastrointestinal endoscopy (3 hours)
- ✧ Colonoscopy (1 hour)
- ✧ Ultrasound examination of abdomen (3 hours)
- ✧ Laparoscopy (1 hour)
- ✧ ERCP (2 weeks)

Investigations

At the end of the Gastroenterology posting the Junior Resident should have acquired the theoretical/practical knowledge about following investigations:

1. Interpretation of plain X-ray of the abdomen, oral cholecystography, barium swallow, barium meal, barium enema, abdominal ultrasound, nuclear scan and CT scan of the abdomen.
2. Interpretation of liver biopsy in common disease (e.g. acute viral hepatitis, cirrhosis of the liver etc.).

TEACHING AND TRAINING PROGRAMME IN ENDOCRINOLOGY:

The period of posting in Endocrinology is 2 months

A Junior Resident, while posted in the subspecialty of endocrinology, undergoes the following clinical/

other teaching exercises and acquires knowledge of following procedures/investigations.

Clinical

Clinical work of a resident is closely guided and supervised by Senior Residents and consultants.

- (a) Ward: At the end of the endocrinology posting the junior Resident should be able to do diagnostic case work up the day-to-day management of the following common endocrine disorders; NIDDM and IDDM and their complications, hyperthyroidism and hypothyroidism, Cushing's syndrome, Addison's disease, pituitary disorders (growth retardation, panhypopituitarism) hirsutism and virilisation, pubertal disorders, disorders of fertility and sexual potency etc.
- (b) OPD: 3 days per week. A junior Resident is expected to spend 6-8 hours/week in the OPD and work-up common endocrine disorders listed above.

Teaching

- (a) Formal bedside case presentations by Junior Residents - once every 2 weeks. (or more frequent if considered necessary)
- (b) A formal teaching class on investigations related to endocrine disease
- (c) Journal clubs and seminars - Tuesdays and Thursdays 8.15 - 9.15 A.M.

Procedures and investigations

At the end of the endocrinology posting the Junior Resident should have practical knowledge and should be able to carry out following:

- (a) Daily glucose monitoring with glucometer
- (b) Photomicrograms
- (c) Stimulation tests (insulin hypoglycemia, RHRH/TRH/ACTH tests)
- (d) Suppression tests (dexamethasone suppression tests, GH suppression test)
- (e) Other - Prolonged fasting test, water deprivation test, phosphate excretion test, ammonium chloride acidification test etc.

TEACHING AND TRAINING PROGRAMME IN NEPHROLOGY

The period of posting in Nephrology is 2 months

A Junior Resident, while posted in the subspecialty of Nephrology, undergoes the following clinical/other teaching exercises and acquires knowledge of following procedures/investigations:

Clinical

Clinical work of a resident is closely guided and supervised by the Senior Residents and consultants.

- (a) Ward: A Junior Resident is trained for carrying out diagnostic case work up and day-to-day management of the following cases:
RPGN (rapidly progressive glomerulonephritis), ARF, CRF, Renal carcinoma, Obstructive uropathy, Congenital renal disorders, Renal calculus disease, Systemic diseases with renal involvement, urinary-tract infection, hypertension, renal transplant management, renal tubular disorders.

Teaching

- (a) Theoretical and practical aspects of peritoneal and haemodialysis.
- (b) Fluid and electrolyte management with special reference to renal status.

- (c) Journal clubs - Once a week
- (d) Nephropathology conference - 2 per month
- (e) Nephroradiology conference - once per week
- (f) Dialysis - Transplantation review discussion - 1 per week

Procedures

At the end of the posting in Nephrology, the Junior Resident should have acquired the knowledge of and should be able to carry out the following procedures:

- ✧ Renal biopsy
- ✧ Peritoneal dialysis

Investigations

By the end of the Nephrology posting the Junior Resident should have practical and theoretical knowledge of following investigations:

- ✧ Urine examination - essential
- ✧ Serum and urine osmolality
- ✧ Glomerular and renal function test studies.
- ✧ Renal dynamic screening and imaging (esp. renal ultrasound).
- ✧ Immunological tests related to renal diseases
- ✧ Cyclosporin immuno-assay
- ✧ Interpretation of renal biopsy of common renal disease (e.g. Chronic)
- ✧ Glomerulonephritis, chronic pyelonephritis etc.)

TEACHING AND TRAINING PROGRAMME IN EMERGENCY SERVICES

The period of posting in casualty is 2 months.

A Junior Resident, while rotating through Casualty, undergoes the following clinical/other teaching exercises and acquires knowledge of following procedures/investigations:

Clinical

Clinical work of a resident is closely guided and supervised by the Senior Residents and the consultants. At the end of the Casualty posting the Junior Resident should be able to diagnose and manage the following medical problems in the casualty.

Acute myocardial infection, arrhythmias including complete heart block and ventricular tachycardia, cardiogenic asthma and COAD, lobar pneumonia, pneumothorax, massive pleural effusion, pulmonary thromboembolism, peritonitis, diabetic ketoacidosis, yxoedema coma, thyroid crisis, acute renal failure, dyselectrolaemia, metabolic acidosis, cerebrovascular accidents, epilepsy, meningitis, cerebral malaria, coma, dehydration, diarrhea, septicemia, hypertensive emergencies, common poisonings, drowning, electrical injury etc.

Teaching

- (a) Formal case presentation - once a week
- (b) Teaching classes on;
 - ✧ cardiopulmonary resuscitation

- ✧ Management of common poisonings
- ✧ Acid - base balance

Procedures

At the end of the Casualty posting, Junior Resident should possess theoretical knowledge of, and should be able to perform the following procedures:

- ✧ External cardiac massage
- ✧ Use of defibrillator
- ✧ Emergency IV canula insertion and cutdown
- ✧ Emergency ryles tube insertion
- ✧ Gastric lavage in case of poisonings
- ✧ Thoracocentesis and thoracic tube insertion (in case of pleural effusion and pneumothorax respectively)
- ✧ Insertion of foley's scatheter (both in males and females)
- ✧ CVP line insertion
- ✧ Assisted ventilation
- ✧ Arterial puncture and canulation of internal jugular, and subclavian.
- ✧ Use of aerosol nebulisers
- ✧ Tracheostomy.

TEACHING AND TRAINING PROGRAMME IN INTENSIVE CARE UNIT (ICU)

During their posting in various medical units, the JR will be posted in the ICU located in C-II ward. This posting for 3 months will be in the second or third of residency training. The unit has modern monitoring facilities as well as volume cycled ventilation with all modes. The blood gas analysis facilities are located in a room in C-II ward (ultrasound room). The residents are required to be physically present in the ICU during their hours of posting, including night duties. This posting is behind to provide an important component in the training of a resident in the Department of Medicine. The residents are required to mention special progress notes and chest used for monitoring patients in the ICU.

During their posting in the ICU, the residents would be expected to acquire the following skills

- ✧ Providing assisted ventilation using correct modes and strategies using modern ventilations.
- ✧ Compute various parameters of lung mechanics and gas exchange.
- ✧ Insert central venous lines using Triple lumen catheters, record haemodynamics invasive methods.
- ✧ Make correct decision regarding weaning.
- ✧ To look after the nutritional requirements of the patients.
- ✧ To prevent various complications including barotrauma.

The residents will be evaluated in their performance in the ICU after completion of posting.

EVALUATION OF RESIDENTS

Evaluation of residents for their knowledge and acquisition of attitudes, skills and competencies is a continuous process throughout their 3-year period of training. Evaluation of certain attributes such as interpersonal relationships, professional responsibility, sensitivity to patient's need for comfort, ethical

behavior etc. is closely observed by the teaching faculty during the day-to-day clinical work of the resident.

At the end of each clinical posting in each of the medicine units and the subspecialties mentioned above, the residents are assessed in a formal format (given below) by the faculty staff of the concerned unit/department. This formative assessment of the candidates is taken into account at the time of the final M.D. examination held at the end of the three year term.

THE PROFORMA FOR THE FORMATIVE ASSESSMENT OF THE JUNIOR RESIDENTS IN THE DEPARTMENT OF MEDICINE

This assessment is held at regular intervals during and the posting and at the end of posting of the Junior Resident in the medicine units as well as the subspecialties mentioned earlier.

THE EXAMINATION FORMAT FOR THE FORMATIVE ASSESSMENT OF THE JUNIOR RESIDENTS DURING THEIR TRAINING PERIOD AND ITS COMPONENTS

Part 'A': (Total marks 50)	Marks Awarded	Marks allotted
1. Formal periodic case presentation:		
Case 1:		12.5
Case 2:		12.5
2. Day-to-day clinical work:		25.0
A. Patient Care: 15.0		
(i) Case work up and discussion:	5.0	
(ii) Day-to-day care, punctuality etc.		
B. Attitude, behavior and interpersonal relationship:		
(i) Behavior with patients and relatives		5.0
(ii) Behavior with seniors/staff/colleagues		5.0
Part 'B': (Total Marks 50)		
1. Final case presentation:		20.0
2. Multiple choice questions		10.0
3. Spots:		10.0
4. Short clinical problems		10.0
Grand Total		100.0

Final M D Examination

It consist of a written examination, a clinical examination to assess the clinical competencies and skills, and a viva voce examination. The examination is conducted by two internal examiners with the help of two external examiners. Candidates are recommended for the award of M.D. only after they have exhibited acceptable level of competence in all the areas of knowledge, attitudes and skills being evaluated by the examiners and the teaching faculty.

The content of knowledge which is evaluated in the theory examination includes basic sciences as applied to medicine, epidemiology, etiopathogenesis, pathology and clinical manifestations of diseases processes, principles of therapeutics, principles of the management of medical diseases with particular emphasis on newer concepts and recent advances.

There are 4 question papers of 3 hours each. Paper 1 includes questions on “Basic Sciences” as applied to medicine; Paper 2 covers topics of general medicine excluding neurology, therapeutics, infectious disease and tropical medicine; Paper 3 includes general medicine not covered in paper 2; and Paper 4 includes preventive medicine, community medicine, other allied specialties as applied to general medicine.

Written examination may be conducted with the help of traditional essay type question papers, or more objective type of questions requiring short or very short answers. The Department of Medicine, in consultation with the Dean and the residents may recommend any of the above mentioned patterns of written examination, and may vary them over the years depending upon the feedback from several sources.

Clinical examination is the most important part of the evaluation and is aimed at assessing the clinical skills of the candidate and diagnostic reasoning. Entirely objective evaluation of these skills is neither feasible nor desirable. However, in order to test the various skills, the examiners may evaluate the candidates on a structured format, namely, history taking, physical examination, diagnostic reasoning, choice of diagnostic investigations, general management strategies, and general attitude and demeanor towards the patient and the examiners. Patient material selected for examination is usually sufficiently representative of the type of patients for whom an internist may be called upon to give an opinion.

Requirement of Thesis

Currently the residents at the All India Institute of Medical Sciences are required to submit a thesis based on a research protocol developed by them with the help of one or more members of the faculty of the Department of Medicine or allied subspecialties. Introduction to research methodology is considered desirable for the residents so that they can understand the concepts of validity and generalizability of the observed findings. All competent internists must keep themselves in touch with current medical literature. Moreover, they should be able to judge whether the observations reported in the literature would be applicable to their setting or not. Junior Residents who join the department are given the name of faculty member by the office of the department who will guide him/her in the research work leading to the thesis. The allotment of the Junior Residents to different faculty members for guiding the thesis work is done by the department on the basis of a well-designed rotation format and the Junior Residents must follow the same.

The these written by the residents are evaluated and graded by two external examiners in terms of research design, methodology employed, analytical methods used, and validity of the conclusions reached. Although these grades are not added to the theory or clinical assessment, acceptance of thesis as being satisfactory is a pre-requisite for a resident to be able to take the M.D. Examination.

ANNEXURE I

A relevant case work up and good record keeping is the key to good patient care. Record keeping may be uninteresting and laborious but is the cornerstone in the effective and efficient management of the patient.

Case work up

All the cases admitted under the charge of Junior Resident in-charge need to be worked up in detail including clinical, social, personal family and occupational aspects of history. Patients should be examined in detail with special reference to the involved system(s). The resident should make his own diagnosis with differential diagnosis giving full justification for each differential diagnosis. The case is first discussed with the senior resident. Formal presentation in the round, Junior Resident should write down consultant's

opinion on the separate page. He should then chalk out a plan for further investigations and management in a manner outlined below. Senior resident should make a brief note of relevant features, pen down his opinion and plan for further management. Junior Resident may take the help of his colleagues, senior resident/or and consultant so as to divide appropriate course of action. (see also 6.0 and 7.2).

File Keeping

For each admitted patient, a case record file with face sheet is to be meticulously maintained. The following sequence, if properly recorded, may lead to uniform and meaningful medical information.

Page 1 : Face sheet

1. The details of the patient's name, age, sex, nationality, religion, date of admission, CR Number, address etc. are to be filled in by the staff of Central Admission and Inquiry Counter.
2. On admission, Provisional Diagnosis needs to be entered after the initial work up.
3. If there are any previous admission, the corresponding CR No. (s) and date (s) of admission should be entered in the column provided.
4. At the time of discharge, the final diagnosis, secondary diagnosis and complications need to be entered e.g. Appropriate ICD code No. for the disease should also be entered.
5. Operative procedures, if any, with brief note on anesthesia given, should be recorded.
6. Result - The appropriate column on the face sheet need to be ticked or rounded.
7. All the face sheets at discharge, or at the time of death need to be properly filled in and must be duly signed by the senior resident.

Page 2: Problem oriented Medical Records (POMR)

Information collected about a patient is structured into four main components.

- (i) Subjective - Record salient points of history
- (ii) Objective - Positive and pertinent clinical findings.
- (iii) Assessment - This may indicate final diagnosis if evident initially. Alternatively, from the data at hand, a master problem list can be made. This is a dynamic list, and can be altered, dictated and formed from new information (derived from history, examination or investigations). Problems can be classified as active or inactive. The list should be appropriately dated. An example of such a problem list is given below.

Master Problem List

<i>No.</i>	<i>Active</i>	<i>Date</i>	<i>Inactive</i>	<i>Date</i>
1.	Hypertension	1970	Duodenal ulcer	1973
2.	Diabetes	1972	Recurrent bronchitis	1974
3.	Old myocardial infarction	1980		
4.	Acute Anterior M.I	1-9-93		
5.	Prostatic enlargement	1993		
6.	Smoking			
7.	Obesity			
8.	Type A personality			

- (iv) Problem Related Plans - For each problem, plans are displayed as a reflection of physician's responsibility to each problem identified.

Plans are recorded under three categories-

1. Diagnostic i.e., laboratory tests, radiological studies consultations, continued observation etc.
2. Therapeutic i.e., medications, diet, surgery etc.
3. Patient education (Pted) i.e., instruction of the patient in various aspects of self care, education regarding the goal of therapy, the prognosis that has been given etc.

Example

1. Diagnostic - EKG, Enzymes, CXR, Blood sugar. Consultation to Dietitian for dietary advice
2. Therapeutic - Nitrogl, analogizes, oxygen, thrombolytic therapy. Soft liquid diet, stool softener. Anxiolytics. Control of diabetes and hypertension.
3. Patient Education - Explanation of nature of illness. Later on encourage to lose weight and stop smoking.

Page 3

Treatment chart; following should be duly recorded. The treatment chart should preferably be written in capitals, so that there is less problem in understanding, by other doctors, and paramedical staff.

- (i) Date and time of prescription
- (ii) Name, strength, dosing pattern of the drug duration of treatment, and changes in above, if any.
- (iii) Instructions regarding fluid, electrolyte and nutrition
- (iv) Nursing care instructions
- (v) Doctor's name with signature and designation

The treatment chart should be rewritten, if major changes are ordered. Resident should supervise and check effective translation of the order by staff nurses on daily basis.

Page 4-5: Investigation Chart

- (i) Investigations chart with date, time (if relevant), nature of investigations, result, normal range (if it is not mentioned in the form or is not a routine investigations).
- (ii) This chart (if not already available in a typed format) should be spaced out over 2-3 pages to avoid crowding of various investigations.
- (iii) reports of radiological investigations should be comprehensively written giving, data and number of X-rays or scans.
- (iv) Similarly, while writing the histopathology/cytopathology reports, the respective laboratory numbers should be clearly mentioned.
- (v) The discussion on these investigations in various conferences should be duly recorded.
- (vi) ECG's should be serially pasted in case of coronary artery disease) and detailed.

Page 6 : Consultant's Opinion with Date and Time

Page 6-10: History and Examination (or more pages, if required)

Page 11: (Onwards)

Progress notes should be entered daily for all patients and round the clock for sick patients with special reference to the following points;

- (i) Vital signs.
- (ii) New symptoms or signs.
- (iii) Effect or side effect of any drug(s).
- (iv) Investigation plan for the day.
- (v) Providers done with reference to nature, time, date, technique used and post intervention monitoring.
- (vi) Any blood product received with mention of blood group, reference number, and adverse reactions, if any.
- (vii) Assessment of the clinical problems and proposed plan of action based on clinical status of the patient over last 24 hours.

Progress notes can also be detailed in a different manner. These can be structured on the basis of those problems which have been identified. All the problems mentioned need not be entered. An example of the same is given below.

Problem No 6: Acute Anterior M.I.

Date - 6.9.93, Day 5

(1) Subjective finding(s)

Grade 2 dyspnea, No further angina

(2) Objective findings(o) (Including recent relevant investigations)

BP-150/90; Pulse rate-74 per minute, regular; JVP-not raised

Lungs - No crepitations

CVS - No SB

EKG - No fresh changes

(3) Assessment (A)

Stable. Early cardiac catheterization and revascularization.

(4) Plan (p)

- (i) Diagnostic - Cardiac catheterisation
- (ii) Treatment - Continue nitrates/Diltiazem
Insulin/Cremaffin/Aspirin
Attempt early mobilization.
- (iii) Patient education - Education regarding rehabilitation, risk factors and revascularization.

ANNEXURE II**PERIODIC PG ASSESSMENT IN THE DEPARTMENT OF MEDICINE**

Name of the P.G. Student :

Period of Posting :

Part 'A' (Total 50 marks)

Marks Awarded

Marks Allotted

(i) Formal Periodic Case Presentation

1st case

: 12.5

2nd case

: 12.5

(ii) Day-to-day working

: 25 (Total)

(A) Patient Care

: 15 (Total)

(a) Case work up & academic discussion

: 5

(b) Day-to-day care/Follow up of patients
Punctuality/Responsibility

: 5

(c) Maintenance of case sheet & progress
record

: 5

(B) Interpersonal cooperation

: 10 (Total)

(a) Behavior with patients/relatives

: 5

(b) Behavior seniors/staff/colleagues

: 5

Part 'B'

(1) Final case presentation (1 case each)

: 20

(2) Multiple Choice Questions

: 10

(3) Spots

: 10

(4) Short Clinical Problems

: 10

Grand Total**:100**

Date:

Head of the

Department of Medicine

Unit

Head of the

Medicine

MICROBIOLOGY — M D

PREAMBLE

The main aim of this course is to train students of Medicine in the field of Medical Microbiology. Theoretical as well as practical training is imparted to the candidates in the subspecialties viz. Bacteriology, Virology, Parasitology, Immunology and Mycology so that they can participate in good patient care and prevention of infectious diseases in the community. They are introduced to basic research methodology so that they can conduct fundamental and applied research. They are also imparted training in teaching methods in the subject which may enable them to take up teaching assignments in Medical Colleges/Institutes.

AIMS & OBJECTIVES

At the end of the course the students should be able to :

1. Establish good clinical microbiological services in a hospital and in the community in the fields of bacteriology, virology, parasitology, immunology and mycology .
2. Plan, execute and evaluate teaching assignments in medical microbiology and
3. Plan, execute, analyse and present the research work in medical microbiology.

Course contents (Syllabus)

Desirable

PAPER-I GENERAL MICROBIOLOGY AND IMMUNOLOGY

PAPER-II BACTERIOLOGY + MYCOLOGY

PAPER-III VIROLOGY AND PARASITOLOGY

PAPER-IV APPLIED MICROBIOLOGY & RECENT ADVANCES

General Microbiology

1. History of microbiology
2. Microscopy
3. Bio-safety including universal precautions
4. Physical and biological containment

5. Sterilization and disinfection
6. Morphology of bacteria and other microorganisms
7. Nomenclature and classification of microorganisms
8. Normal flora of human body
9. Growth & nutrition of bacteria
10. Bacterial metabolism
11. Bacterial toxins
12. Bacteriocins
13. Microbiology of hospital environment
14. Microbiology of air, milk and water
15. Host-parasite relationship
16. Antibacterial substances and drug resistance
17. Bacterial genetics & bacteriophages
18. Molecular genetics relevant for medical microbiology
19. Quality assurance & quality control in microbiology
20. Accreditation of laboratories

Immunology

1. Components of the immune system
2. Innate and acquired immunity
3. Cells involved in immune response
4. Antigens
5. Immunoglobulins
6. Mucosal immunity
7. Complement
8. Antigen & antibody reactions
9. Hypersensitivity
10. Cell mediated immunity
11. Cytokines
12. Immunodeficiency
13. Auto-immunity
14. Immune tolerance
15. MHC complex
16. Transplantation immunity
17. Tumor immunity
18. Vaccines and immunotherapy
19. Measurement of immunological parameters

20. Immunological techniques
21. Immunopotentiality & immunomodulation

Systematic bacteriology

1. Isolation & identification of bacteria
2. Gram positive cocci of medical importance including *Staphylococcus*, *Micrococcus*, *Streptococcus*, anaerobic cocci etc.
3. Gram negative cocci of medical importance including *Neisseria*, *Branhamella*, *Moraxella* etc.
4. Gram positive bacilli of medical importance including *Lactobacillus*, *Coryneform* organisms, *Bacillus* & aerobic bacilli, *Actinomyces*, *Nocardia*, *Actinobacillus* and other actinomycetales, *Erysipelothrix*, *Listeria*, *Clostridium* and other spore bearing anaerobic bacilli etc.
5. Gram negative bacilli of medical importance including *Vibrios*, *Aeromonas*, *Plesiomonas*, *Haemophilus*, *Bordetella*, *Bruce/la*, *Gardnerella*, *Pseudomonas* & other non-fermenters, *Pasture/la*, *Francisella*, *Bacteroides*, *Fusobacterium*, *Leptotrichia* and other anaerobic gram negative bacilli etc.
6. *Helicobacter*, *Campylobacter* & *Spirillum*
7. Enterobacteriaceae
8. Mycobacteria
9. Spirochaetes
10. *Chlamydiae*
11. Mycoplasmatales: *Mycoplasma*, *Ureaplasma*, *Acholeplasma* and other *Mycoplasmas*.
12. Rickettsiae, *Coxiella*, *Bartonella* etc.

Virology

1. General properties of viruses
2. Classification of viruses
3. Morphology: Virus structure
4. Virus replication
5. Isolation & identification of viruses
6. Pathogenesis of viral infections
7. Genetics of viruses
8. DNA viruses of medical importance including Poxviridae, Herpesviridae, Adenoviridae, Hepadna virus, Papova and Parvo viruses etc.
9. RNA viruses of medical importance including Enteroviruses, Togaviridae, Flaviviruses, Orthomyxoviruses, Paramyxoviruses, Reoviridae, Rhabdoviridae, Arenaviridae, Bunyaviridae, Retroviridae, Filoviruses, Human immunodeficiency virus, Arboviruses, Coronaviridae, Calci viruses etc.
10. Slow viruses including prions
11. Unclassified viruses
12. Hepat.

13. Virioids
14. Vaccines & anti-viral drugs

Parasitology

1. General characters & classification of parasites
2. Methods of identification of parasites
3. Protozoan parasites of medical importance including *Entamoeba*, Free living amoebae, *Giardia*, *Trichomonas*, *Leishmania*, *Trypanosoma*, *Plasmodium*, *Toxoplasma*, *Sarcocystis*, *Cryptosporidium*, *Microsporidium*, *Cyclospora*, *Isospora*, *Babesia*, *Balantidium* etc.
4. Helminthology of medical importance including those belonging to Cestoda (*Diphyllobothrium*, *Taenia*, *Echinococcus*, *Hymenolepis*, *Dipylidium*, *Multiceps* etc.), Trematoda (*Schistosomes*, *Fasciola*, *Fasciolopsis*, *Gastrodiscoides*, *Paragonimus*, *Clonorchis*, *Opisthorchis* etc.) and Nematoda (*Trichiuris*, *Trichinella*, *Strongyloides*, *Ancylostoma*, *Necator*, *Ascaris*, *Toxocara*, *Enterobius*, *Filarial worms*, *Dracunculus* etc.)
5. *Entomology*: common arthropods & other vectors viz. mosquito, sandfly, ticks, mite, cyclops, louse, myasis.
6. Antiparasitic agents.

Mycology

1. General characteristics & classification of fungi
2. Morphology & reproduction of fungi
3. Isolation & identification of fungi
4. Tissue reactions to fungi
5. Yeasts and yeast like fungi of medical importance including *Candida*, *Cryptococcus*, *Malassezia*, *Trichosporon*, *Geotrichum*, *Saccharomyces* etc.
6. Mycelial fungi of medical importance including *Aspergillus*, *Zygomycetes*, *Pseudoallescheria*, *Fusarium*, *Piedra*, other dematiaceous hyphomycetes and other hyalohyphomycetes etc.
7. Dimorphic fungi including *Histoplasma*, *Blastomyces*, *Coccidioides*, *Paracoccidioides*, *Sporothrix*, *Penicillium marneffei* etc.
8. Dermatophytes
9. Fungi causing mycetoma, keratomycosis & otomycosis.
10. *Pythium insidiosum*
11. *Prototheca*
12. *Pneumocystis carinii* infection
13. *Rhinosporidium seeberi* & *Loboa loboi*
14. Actinomycetes & *Nocardia*.
15. Common laboratory contaminant fungi
16. Mycetismus & mycotoxicosis
17. Antifungal agents & invitro antifungal susceptibility tests.

Applied Microbiology

1. Epidemiology of infectious diseases
2. Hospital acquired infections
3. Management of hospital waste
4. Investigation of an infectious outbreak
5. Infections of various organs and systems of human body viz. respiratory tract infections, urinary tract infections, central nervous system infections, congenital infections, reproductive tract infections, gastrointestinal infections, hepatitis, pyrexia of unknown origin, infections of eye, ear & nose, septicaemia, endocarditis, haemorrhagic fever etc.
6. Opportunistic infections.
7. Sexually transmitted diseases
8. Vaccinology: principle, methods of preparation, administration of vaccines information technology (Computers) in microbiology
9. Gene cloning
10. Molecular techniques as applicable to microbiology
11. Automation in Microbiology
12. Statistical analysis of microbiological data and research methodology
13. Animal & human ethics involved in microbiological work

Psychomotor Skills for Postgraduates Students in M.D. (Microbiology)***Bacteriology - Must acquire***

1. Collection/transport of specimens for microbiological investigations
2. Preparation, examination & interpretation of direct smears from clinical specimens
3. Plating of clinical specimens on media for isolation, purification, identification and quantitation purposes.
4. Preparation of stains viz. Gram, Albert's, capsules, spores, Ziehl Neelsen (ZN) Silver impregnation stain and special stains for capsule and spore etc.
5. Preparation and pouring of media like Nutrient agar, Blood Agar, Mac-conkey agar, Sugars, Serum sugars, Kligler iron agar, Robertson's cooked meat broth, Lowenstein Jensens medium, Sabouraud's dextrose agar etc.
6. Preparation of reagents -oxidase, Kovac etc.
7. Quality control of media, reagents etc.
8. Operation of autoclave, hot air oven, distillation plant, filters like Sietz and membrane filters
9. Care and operation of microscopes
10. Washing and sterilisation of glassware (plugging and packing)
11. Care and maintenance of common laboratory equipments like water bath, centrifuge, refrigerators, incubators etc.
12. Aseptic practices in laboratory and safety precautions

13. Sterility tests
14. Identification of bacteria of medical importance upto species level (except anaerobes which could be upto generic level).
15. Techniques of anaerobiosis
16. Tests for Motility: hanging drop, Cragie's tube, dark ground microscopy for spirochaetes
17. In-vitro toxigenicity tests- Elek test, Naegler's reaction
18. Special tests- Bile solubility, chick cell agglutination, sheep cell haemolysis, niacin and catalase tests for Mycobacterium, satellitism, CAMP test, catalase, slide & tube agglutination tests.
19. Preparation of antibiotic discs; performance of antimicrobial susceptibility testing, eg. Kirby-Bauer, Stoke's method, Estimation of Minimal Inhibitory/Bactericidal concentrations by tube/plate dilution methods
20. Tests for Beta-lactamase production
21. Inoculation of infective material by different routes in animals
22. Bleeding techniques of animals including sheep
23. Performance of autopsy on animals & disposal of animals
24. Animal pathogenicity/toxigenicity tests for C. diphtheriae, C. tetani, S. pneumoniae, S. typhimurium, K. pneumoniae etc.
25. Care and breeding of laboratory animals viz. mice, rats, guinea pigs, rabbits etc.
26. Testing of disinfectants - Phenol coefficient and "in use" tests
27. Quantitative analysis of urine by pour plate method and semi quantitative analysis by standard loop tests for finding significant bacteriuria
28. Disposal of contaminated materials like cultures
29. Disposal of infectious waste
30. Bacteriological tests for water, air and milk
31. Maintenance & preservation of bacterial cultures

Bacteriology - Desirable to acquire

1. Conjugation experiments for drug resistance
2. Serum antibiotic assays e.g. gentamicin
3. Phage typing for Staphylococci, S. typhi, etc.
4. Bacteriocin typing viz. Proteocin, etc.
5. Enterotoxigenicity tests like rabbit ileal loop, intragastric inoculation of infant mouse, Sereny's test.
6. Serologic grouping of Streptococci
7. Mouse foot pad test for M leprae
8. Antimicrobial susceptibility tests for Mycobacteria
9. Molecular typing methods
10. Special staining techniques for Mycoplasma, Treponemes, Gardnerella.

Immunology - Must acquire

1. Collection of blood by venepuncture, separation of serum and preservation of serum for short and long periods
2. Preparation of antigens from bacteria or tissues like Widal, Weil Felix, VDRL, SLO and group polysaccharide of Streptococcus etc. and their standardisation.
3. Raising of antisera in laboratory animals
4. Performance of serological tests viz. Widal, Brucella tube agglutination, indirect hemagglutination, VDRL, ASO, Rose Waaler test, IFA.
5. Immunodiffusion in gel (Ouchterlony), counter-immunoelectrophoresis.
6. Enzyme linked immunosorbent assay
7. Latex agglutination tests
8. Preparation & preservation of complement & complement titration

Immunology - Desirable to acquire

1. Radial immunodiffusion for estimation of serum Immunoglobulins
2. Immunoelectrophoresis
3. Crossed immunoelectrophoresis
4. Neutrophil phagocytosis
5. Immunoblotting
6. Performance of serological tests viz. Weil Felix, cold agglutination, Paul Bunnel test
7. Leukocyte migration test
8. T - cell rosetting
9. Separation of lymphocytes by centrifugation, gravity sedimentation etc.

Mycology - Must acquire

1. Collection and transport of specimens
2. Processing of samples for microscopy and culture
3. Direct examination of specimens by KOH, Gram's, Acid fast, Giemsa, Lactophenol cotton blue & special fungal stains
4. Examination of histopathology slides for fungal infections
5. Isolation and identification of medically important fungi & common laboratory contaminants
6. Special techniques like Wood's lamp examination, hair baiting, hair perforation, paraffin baiting and slide culture
7. Maintenance of stock cultures
8. Animal pathogenicity tests viz. intravenous, intracerebral and intra peritoneal inoculation of mice for fungal pathogenicity study

Mycology-desirable to acquire

1. Antigen preparation -viz. from Candida, Aspergillus, Histoplasma, Sporothrix
2. Antibody detection in candidiasis, aspergillosis, histoplasmosis, blastomycosis, Cryptococcosis,

zygomycosis, coccidioidomycosis

3. Antigen detection in cryptococcosis, aspergillosis, candidiasis
4. Skin test using aspergillin, candidin, histoplasmin, sporotrichin
5. Isolation and identification of actinomycetes .
6. Calcofluor staining & examination under fluorescent microscope

Parasitology - Must acquire

1. Collection and transport of specimens for diagnosis of parasitic diseases
2. Examination of faeces for parasite ova and cysts etc. by direct and concentration methods (salt floatation and formol-ether methods)
3. Egg counting techniques for helminths micrometry and mounting of slides
4. Examination of blood for protozoa and helminths by wet mount, thick and thin stained smears
5. Examination of blood for microfilariae including concentration techniques
6. Examination of other specimens eg. Urine, CSF, Bone marrow etc. for parasites
7. Histopathology sections -examination and identification of parasites
8. Preparation & performance of stains -Leishman, Giemsa, Lugol's iodine
9. Micrometry
10. Identification of medically important adult worms
11. Preparation of media -NIH, NNN etc.
12. Copro-culture for larvae of hook worms
13. Identification of common arthropods and other vectors viz. mosquito, sandfly, ticks, mites, cyclops
14. Preservation of parasites-mounting, fixing, staining etc.

Parasitology - Desirable to acquire

1. Maintenance of parasites in laboratory either in vivo in animals or by in-vitro cultures
2. Permanent staining techniques like iron hematoxylin
3. QBC for alaria & filaria .
4. In-vitro culture of parasites like Entamoeba, Leishmania, p falciparum, Acanthamoeba etc.
5. Antigen preparation -viz. Entamoeba, filaria, Toxoplasma, hydatid for serological tests for IRA, ELISA and skin tests like Casoni ' s

Virology - Must acquire

1. Preparation of glassware for tissue cultures (washing, sterilisation).
2. Preparation of buffers like PBS, Hank's
3. Preparation of clinical specimens for isolation of viruses
4. Collection & transport of specimens
5. Recognition of CPE producing viruses
6. Serological tests -ELISA for HIV & HBsAg, Haemagglutination Inhibition test for Influenza, Measles

7. Chick Embryo techniques-inoculation and harvesting
8. Handling of mice, rats and guinea pigs for collection of blood, pathogenicity tests, etc.
9. Special staining procedure for viruses

Virology - desirable to acquire

1. Electron microscopy of virus -TEM, SEM
2. Preservation of viruses
3. Preparation of viral antigens.
4. Molecular techniques in virology
5. Preparation of monkey kidney cells (primary) and maintenance of continuous cell lines by subculture. Preservation in -70°C and liquid nitrogen
6. Performance of haemadsorption for Parainfluenza, Haemagglutination of Influenza, Immunofluorescence, Neutralisation for Enteroviruses and Respiratory viruses. Identification tests on tissue cultures and supernatants etc.
7. Serological tests: haemadsorption for Parainfluenza

NUCLEAR MEDICINE — M D

1. Basic Sciences

- (a) Modes of radioactive decay elementary aspect of the structure of matter.
- (b) Emissions accompanying radioactive decay, and their biological implications.
- (c) Interaction of radiation with matter
- (d) Basic physics of Nuclear Medicine imaging, x-ray computed tomography, Nuclear Magnetic Resonance and Ultrasonography, Single Photon Emission Tomography & Positron Emission Tomography.

2. Mathematics, Statistics & Computer Sciences

- (a) Basic Mathematical Concepts, Counting Statistics, Probability distribution and parametric and non-parametric statistics.
- (b) Basic aspects of computer structure, function and programming both hardware & software.
- (c) Computer applications with emphasis on digital image acquisition, analysis, processing and enhancement, tomographic reconstruction display and recordings of findings.
- (d) Compartmental analysis and mathematical models of physiologic systems.
- (e) Fundamental of filters, their applications and uses.

3. Instrumentation

- (a) Principles of Radiation detection and detectors.
- (b) Nuclear Medicine Instrumentation including Gamma Scintillation cameras, scanners, Single Photon Emission Tomography, Positron Emission Tomography & Cyclotron, Dose Calibrators, Tomography imaging devices, “Positron imaging instruments”, whole body counters, gamma well counters, liquid scintillation counters, monitoring devices.
- (c) Quality Control of nuclear instruments, as mentioned in (b).
- (d) Collimation of radiation detectors, the characteristics of parallel hole Fan beam collimators, High resolution & High energy collimators and other types of collimators, their response to point, line, and plane sources.

- (e) Electronic instruments, such as pulse amplifiers, pulse height analyzer, count rate meters and computer interfaces including gating systems.
- (f) Image production and display technology including photographic principles, with special emphasis on sensitivity, resolution, count rate, latitude and film processing.
- (g) Fusion technology, Online transmission, Connectivity, DICOM technology, PACK system.

4. Radiation Biology & Protection

- (a) The biological effects of radiation exposure with emphasis on the effects of low level exposure, system wise.
- (b) Administrative and technical means of procuring radionuclide.
- (c) Method of reducing unnecessary radiation exposure to patients, personnel and environment.
- (d) Calculation of the radiation dose from internally administered radionuclide.
- (e) The diagnosis, evaluation and treatment of radiation over exposure in any form.
- (f) ICRP- recommendation & their amendments from time to time & other International recommendations, environmental regulations regarding limits of radiation exposure, handling of radioactive patients, transport of radioactivity material and disposal of radioactive wastes.
- (g) Management of radiation accidents, including monitoring, decontamination and subsequent control.
- (h) High dose Iodine therapy, its effects & ways to monitoring for patient wastes like urine, stool, room monitoring shielding, concept of delay tanks, construction & monitoring.
- (i) Protection of relatives of the patients.
- (j) Effect on pregnancy and fertility, subsequent to high dose therapy.

5. Radiopharmaceuticals

This syllabus explores the chemical, physical and biological properties of radiopharmaceutical used in Nuclear Medicine. Production, Quality Control and Regulations of a Nuclear Pharmacy will be examined. Emphasis will be:

- (a) Physical and Chemical Characteristics of radionuclide used in Nuclear Medicine.
- (b) Radiopharmacy generator produced radiopharmaceutical.
- (c) Criteria for selection of radionuclide.
- (d) Biological behavior of radiopharmaceuticals.
- (e) Quality control.
- (f) Mechanism of localization.
- (g) Radiopharmaceuticals for therapy.
- (h) Positron Emission radio-nuclide their preparation, various modules nuclear reactions, target reactions and chemistry.
- (i) Specific topics on Bone seeking Radiopharmaceutical, Hepatobiliary, Tumor seeking, Cardiac Imaging, Radiopharmaceuticals for Research etc.
- (j) Good Manufacturing Practice, laws etc. related to In house manufacturing Radiopharmaceutical for Radio-immuno-assays and related techniques including Shilling test, RBC survival tests: General Principles, methods, quality control, labeling of ligands, in vitro and in vivo thyroid function

studies etc. Receptor assays.

- (k) 2 months in each Academic year to be spent in Radiopharmacy lab. & quality control

6. Diagnostic Imaging

- (a) General clinical indications for and limitations in their appropriate usage, normal and altered anatomy, physiology, biochemistry and metabolism of various organs, to be examined, technical performance of the procedure including proper patient preparation and patient management before, during and after the procedure.
- (b) In vivo imaging and/or function studies, including brain SPECT, cerebrospinal fluid, thyroid using both ^{99m}Tc & I-131 , salivary glands, lung, heart and vessels, esophagus, stomach, Hepatobiliary system, spleen, kidney, adrenal, tumors and abscesses, bladder, bone & joints, bone marrow etc. including three phase bone imaging.
- (c) The use of imaging devices, external detectors and computers for body organ imaging and for time-dependent and differential function studies.
- (d) The use of physiologic gating techniques for functional studies.
- (e) Patient monitoring during intervention such as exercise i.e. using Bruce Protocol and pharmacological
- (f) Administrations such as short lived intervention and necessary management of any emergency situation interpretation of ECG both at rest & at peak of exercise, analysis of ECG.
- (g) Cellular kinetics, absorption and excretion analysis, nuclear hematology and metabolic balance studies using radiotracers.
- (h) Body composition tests, including compartmental analysis
- (i) Whole-Body counting and total body scanning for high dose iodine
- (j) Comparative analysis of Nuclear Medicine procedures with X-ray, MRI, ultrasound, CT, Spiral CT, PET etc.
- (k) Nuclear Cardiology, Stress and redistribution studies using Thallium-201 and other myocardial perfusion agents. Myocardial viability, Gated SPECT studies, Bull's Eye Emory Tool box, Coronary overlay.
- (l) Positron Emission Tomography: All indications for use of PET imaging in Oncology, Cardiology, Neuro Sciences and psychiatric disorders.

7. In-vitro Studies

- (a) Principles of radioisotope micro-analytical techniques such as RIA, quality control and data analysis for various hormones, drugs & cyclosporine assays.
- (b) Binding capacity studies such as receptor assays and T-3 Resin uptake etc.
- (c) Principles of activation analysis and auto-radiography.
- (d) GFR estimations, Red Cell Survival & Red Cell Mass using Chromium.

8. Therapeutic uses of Radionuclide

Application of isotope in Therapy in following areas:

- 1) Thyrotoxicosis
- 2) Cancer Thyroid – both low dose & high dose

- 3) Radiosynovectomy using Yttrium, Holmium
- 4) Bone Palliation using P32, Sr 89 & Sm 153.
- 5) I-131 Lipidol for Hepatic cancer
 - (a) Patient selection, including the diagnostic procedures necessary to establish the need for radionuclide therapy, indications and contra- indications for the use of radionuclide therapeutic procedures and their efficiency in relation to other therapeutic approaches.
 - (b) Dose administration in patient management including dose to the target areas, to the surrounding tissues and/or other organ systems and total-body exposure; the range of doses in each specific application; the special problems of patient care caused by radionuclide therapeutic procedure, potential early and late adverse reactions, the timing and parameters of anticipated clinical response, and the follow-up care and evaluation as needed.

9. Organizational Considerations

- (a) Design of laboratories or various sizes & capacity as per the norms of BARC
- (b) Planning & scheduling of the patient work load.
- (c) Economic aspects of nuclear medicine and cost-effectiveness of nuclear medicine procedures.
- (d) Public relations
- (e) Role of National and International Organizations like AERB, MCI, NMC, BRIT, BARC, IAEA, ICRP

Regular participation in weekly journal club, Seminar and other periodical CME programs

Participation in the Seminars and CME programs of allied departments.

LOG BOOK

Each candidate should be required to maintain a log book in which following details will be entered:

- (a) Investigations performed by him
- (b) Presentations in journal clubs alongwith Title & Journal & Issue with title.
- (c) Cases presented in clinical meetings with other departments.
- (d) Presentation in departmental seminars
- (e) Schedule of interdepartmental rotation
- (f) Details of apprenticeship
- (g) Conferences attended – National/International
- (h) Papers presented at conferences with title name of the conference, date of presentation
- (i) Paper published with title, name & issue of the journal
- (j) Cases worked up for radionuclide therapy

Mid term Evaluation

Each candidate shall have mid term evaluation in terms of

1. Presentation of work completed in Thesis
2. Evaluation of the Log book

3. Case presentation session
4. Scan Interpretation session
5. Oral Viva

Pre examination Evaluation

Examination appearing students shall be evaluated by the faculty & observer for following:

1. Case presentation
2. Scan Interpretation
3. Oral Viva
4. Summary of results of thesis experiments

THESIS

Each candidate has to submit a thesis, which should be accepted by the Board of Examiners before appearing in the final examination. With one Chief guide & Co-guide. The Protocol should be submitted 6 months of admission & presented to entire faculty.

THESIS EVALUATION

The thesis should reflect substantial work for the advancement of scientific knowledge, design or development or applied work. It should show competence in critical analysis of scientific data as well as through familiarity with background literatures.

- I. The evaluation of the thesis will consist of:
 - (a) Evaluation by 2 external examiners
 - (b) Oral examination of the candidate on the thesis during the viva for final examination.
- II. In his/her report, each examiner should highlight the salient features of the thesis and make a clear recommendation regarding its acceptance or rejection for M D Degree. If one of the examiners gives a definite recommendation against the award of the degree, reference to a third examiner will be made. If the report from the third examiner is positive, the oral examination will be held. If his/her report is negative, the thesis will be rejected.
- III. If two examiners recommend against the award of the degree, the thesis will be rejected.

REPORT OF EXAMINERS

- I. Each examiner will be requested to send his report within 2 months of the receipt of the thesis to the registrar. The reports must contain a critical evaluation of the thesis and a clear recommendation as to whether it has attained the standard of M D or not.
- II. In case the examiners are unable to make a definite recommendation they should indicate one of the following alternatives:
 - a) Minor revision, which does not involve retyping or binding of the thesis
 - b) Major revision involving rewriting of one or more sections but not involving additional research
 - c) Rewriting the thesis: If the candidate's work justifies another opportunity being given to him to do further research & rewriting the thesis (this will be treated as a new examination).

Oral Examination & Scan Reading Session

- I. Oral examination is designed to test the general scientific background of the candidate and his/her

own particular contribution embodied by the thesis. The oral examination will be conducted after the thesis has been judged to be satisfactory. The two external examiners and the H.O.D. will conduct the examination, in which a pass is obligatory. They will readout the comments & questions and will seek the answers from the candidate.

- II. Members of the Board for oral examination, he/she may be permitted to appear again after 6 months. If he/she fails in the 2nd attempt, he/she will not be permitted to continue with the M D program.

Case Presentation

Short case and long case presentation

Practical Physics; Quality control of instrumentation, Preparation of radiopharmaceutical; contamination; unknown isotope management of a spill.

JOURNALS

1. Indian Journal of Nuclear Medicine
2. European Journal of Nuclear Medicine
3. Annals of Nuclear Medicine
4. Clinical Nuclear Medicine
5. Seminar in Nuclear Medicine
6. International Journal of radiation application instrumentation, part B; Nuclear Medicine and Biology
7. Journal of Nuclear Medicine
8. Nuclear Medicine communication
9. Medical Physics
10. Journal of Nuclear Medicine Technology

TRAINING PROGRAMME

1. Didactic lecture in physics related in Nuclear Medicine, radiopharmacy, radioisotope techniques, instrumentation data processing and quality control.
2. Participation in the daily routine work of the department including work rounds of patients admitted for radionuclide therapy.
3. Presentation of cases in the reporting sessions of the department
4. Active participation in the combined clinical meetings with other departments for case discussions.
5. Apprenticeship in:
 - (a) Radiodiagnosis - 2 month
 - (b) Cardiology - 1 month
 - (c) Neuro-Sciences - 1 month
 - (d) Nephrology & Urology - 1 month
 - (e) Endocrinology - 1 month

SUGGESTED BOOKS AND AUTHORS

<i>Sl. No.</i>	<i>Name of Books</i>	<i>Editor's Name</i>
1.	Principles of Nuclear Medicine	Henry N. Wagner (Jr.)
2.	Cerebral Radionuclide Angiography	Deland F. H

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| 3. | Cardiovascular Nuclear Medicine | Strauss H. William |
| 4. | Fundamentals of Nuclear Pharmacy | Gopal Shah |
| 5. | Quality Control in Nuclear Medicine
Radiopharmaceutical Instrumentation
& In-vitro Assays | Rhodes Buck |
| 6. | Intervention of Nuclear Medicine
Mosby's Manual of Nuclear
Medicine Procedures | Richard P. Spencer |
| 7. | Mosby's Manual of Nuclear
Medicine Procedures | D Brucee Sodes
Paul J early |
| 8. | Radiopharmaceuticals | Subramaniam G. et al |
| 9. | Thyroid & its Diseases | L.J. De Groot |
| 10. | Nuclear Medicine in Vitro | B. Rothfield |
| 11. | Nuclear Medicine in Clinical
Diagnosis and Treatment
(2nd Edition) | I.P.C. Murray
P.J. EII
Churchill Livingstone |
| 12. | Nuclear Medicine-The Requisites
(2nd Edition) | James H Thrall
Harvey A Ziessman |
| 13. | An Atlas of Clinical Nuclear Medicine
(2nd Edition) | I. Fogelman
M.N. Maissey
S.E.M. Clarke |
| 14. | Nuclear Medicine | Robert E. Henkin
Mark A. Boles |
| 15. | Nuclear Oncology-Diagnosis
& Therapy | Iraj Khalkhali |
| 16. | Medical Imaging Physics | William R. Hendee
Russell Ritenour |
| 17. | Clinical SPECT Imaging | Elissa Lipeon Kramer
Joseph J.Sanger |
| 18. | Nuclear Cardiac Imaging
Principles & Applications | A.S. Iskandrian
Mario S. Verani |
| 19. | Nuclear Cardiology –
State of the Art & Future Directions | Barry I. Zaret
George A. Beller |
| 20. | Cardiac Nuclear Medicine | Myron C. Gerson |

OBSTETRICS & GYNAECOLOGY — M D

PROGRAM GOALS

The residency program in Obstetrics and Gynaecology constitutes a structured educational experience, planned in continuity with undergraduate and continuing medical education, in the health care area encompassed by this speciality. While the programme contains a hospital patient care service component, it is designed primarily to provide education as the first priority.

The main goal of the educational curriculum is to provide an opportunity for resident physicians to achieve the knowledge, skills and attitudes essential to the practice of Obstetrics and Gynaecology and provide opportunity for increasing responsibility, appropriate supervision, formal instruction, critical evaluation and counseling for the resident.

SPECIFIC AIMS AND OBJECTIVES & SYLLABUS OF THE JUNIOR RESIDENT TRAINING PROGRAM IN OBST. & GYNAE

At the end of 3 years of post graduate training, a resident must acquire knowledge, skills and competencies as a result of training under the resident education programme syllabus which includes the following :

I. Basic Sciences

- (a) Normal & abnormal development, structure and function of (female & male) urogenital system and female breast.
- (b) Applied anatomy of genito-urinary system, abdomen, pelvis, pelvic floor, anterior abdominal wall, upper thigh (inguinal ligament, inguinal canal, vulva, rectum and anal canal).
- (c) Physiology of Spermatogenesis.
- (d) Endocrinology related to male and female reproduction.
- (e) Anatomy & physiology of urinary & lower GI (Rectum / anal canal), tract.
- (f) Development, structure & function of placenta, umbilical cord & amniotic fluid.
- (g) Anatomical & physiological changes in female genital tract during pregnancy.
- (h) Anatomy of fetus, fetal growth & development, fetal physiology & fetal circulation.
- (i) Physiological & neuro-endocrinal changes during puberty, adolescence, menstruation, ovulation, fertilization, climacteric & menopause.

- (j) Biochemical and endocrine changes during pregnancy, including systemic changes in cardiovascular, hematological, renal, hepatic and other systems.
- (k) Biophysical and biochemical changes in uterus and cervix during pregnancy & labour.
- (l) Pharmacology of identified drugs used during pregnancy, labour, post partum period in reference to their absorption, distribution, excretion, (hepatic) metabolism, transfer of the drugs across the placenta, effect of the drugs (used) on labour, on fetus, their excretion through breast milk.
- (m) Mechanism of action, excretion, metabolism of identified drugs used in Obstetrics & Gynaecology.
- (n) Role of hormones in Obstetrics & Gynaecology.
- (o) Markers in Obstetric & Gynaecology – Non neoplastic and Neoplastic Diseases
- (p) Pathophysiology of ovaries, fallopian tubes, uterus, cervix, vagina and external genitalia in healthy and diseased conditions.
- (q) Normal and abnormal pathology of placenta, umbilical cord, amniotic fluid and fetus.
- (r) Normal and abnormal microbiology of genital tract - bacterial, viral & parasitical infections responsible for maternal, fetal and gynaecological disorders
- (s) Humoral and cellular immunology in Obstetrics & Gynaecology
- (t) Gametogenesis, fertilization, implantation & early development of embryo
- (u) Normal pregnancy, physiological changes during pregnancy, labour & puerperium
- (v) Immunology of pregnancy
- (w) Lactation

II. Obstetrics

- (a) The full range of obstetrics, including high-risk obstetrics and medical and surgical complications of pregnancy
- (b) Genetics, including the performance and assistance of prenatal diagnostic and therapeutic procedures and patient counseling
- (c) Learning and performing operative vaginal deliveries, including obstetric forceps or vacuum extractor
- (d) Performing vaginal breech deliveries
- (e) Performing vaginal births after previous cesarean delivery
- (f) Obstetrical anesthesia : residents must learn the principles of general and conduction anesthesia, together with the management and the complications of these techniques
- (g) Experience in the management of critically ill patients
- (h) Immediate care of the newborn: every resident must have experience in resuscitation of the human newborn, including tracheal intubation; the principles of general neonatal complications must be learned as well
- (i) The full range of commonly employed obstetrical diagnostic procedures, including imaging techniques especially ultrasonography.

III. Gynecology

- (a) The full range of the content of medical and surgical gynecology
- (b) Diagnosis and medical and surgical management of urinary incontinence

- (c) Oncology, including radiation and chemotherapy
- (d) Diagnosis and nonsurgical management of breast disease, including fine needle aspirations
- (e) Reproductive endocrinology and infertility
- (f) Psychosomatic and psychosexual counselling
- (g) The full range of commonly employed gynecologic diagnostic and surgical procedures, including imaging techniques
- (h) Experience in the management of critically ill patients

IV. Contraception, Neonatology and Recent Advances

- (a) Contraception (Male & Female)
- (b) Medical termination of pregnancy – safe abortion – selection of cases, technique & management of complication of medical and surgical procedures, MTP law
- (c) National health programmes
- (d) Social obstetrics and vital statistics
- (e) Care of new born : Normal and high risk new born (including NICU care)
- (f) Asphyxia and neonatal resuscitation
- (g) Neonatal sepsis – prevention, detection & management
- (h) Neonatal hyper-bilirubinemia – investigation & management
- (i) Birth trauma – Detection & management
- (j) Detection and management of fetal/neonatal malformation
- (k) Management of common neonatal problems
- (l) Emergency medicine
- (m) Ethics and medical jurisprudence

TRAINING PROGRAMME : SCHEDULE

The Junior Residents in Obstetrics & Gynae must undergo the following rotation training during their 3 year's course towards M.D. (OB/GYN)

Obstetric Ward : 1 yr
Gynaecology Ward : 1 yr
Unit Rotation : 3 months each in the other 2 unit (6 mths)
Labour Room : 4 months
Family Planning : 1 months
Radio Therapy : 2 wks
Neonatology : 2 wks 1mth
Total = 36months
(Future Plan Rural posting (Ballabhgarh - 1mth)

OBSTETRIC & GYNAECOLOGY UNITS

The Department of Obst. & Gynae has 3 units (I, II, & III), and Post Partum Programme which is under the programme Director (Head of the Dept.). Each unit has the following :

Staff

1. 3-4 faculty members
2. 2 senior residents
3. 5-6 junior residents

One JR and SR are posted in Post Partum Programme

Beds

To streamline the functioning of the Deptt. and to ensure that all faculty members participate equally in P.G teaching and patient care, the 40 beds in Gynae Ward, 45 beds in Obstetric ward have been divided equally among the 3 units.

In addition the Intensive Care Labour Ward has 13 beds (5 – 1st stage beds, 2 second stage beds, 4 postnatal beds, 2 observation beds). The attached Maternity OT has 2 operation theatres and 4 post operative beds. All these beds and O.T are for common use by all units.

Staff also has to look after patients admitted in Pvt. Ward and emergency beds (C6, D6 wards), EHS patients (AB₆)

Function of the Obstetrics & Gynaecology units

Each clinical units in the Deptt. of Obst. & Gynae has the following main functions:

1. OPD

General OPD : Two per week, forenoon

Antenatal clinic : One per week, afternoon

Oncology Clinic : One per week at IRCH

Special Clinics : Fetal Medicine Clinic, Gynae Endocrine Clinic, Menopause Clinic (are run by some units)

Family Planning Clinic : 6 days/week forenoon and afternoon (3d/wk). The Post Partum Program is under the supervision of Head of the Deptt. who is the Program Director. The PPP also runs the following :

1. MTP OT - 6 days/week
2. Ligation (Sterilization) in Maternity OT - 6 days/week
3. Outreach clinics at Urban Health Centres 1 day/week

Patient care in Wards

1. Obstetric
2. Gynaecology
3. Emergency coverage for all patients with Obst/Gynae problems attending AIIMS casualty on days the unit is on call. The same unit also provides emergency consultation for the AIIMS hospital and attached centres who may require O & G Consultation during after office hours.

Patient Care in Labour Room

Labour emergency coverage is done by each unit concerned from 8 AM – 5PM, after which the emergency unit “on call” provides intensive care duty. Labour Room duty on Sundays is on rotation.

Operation Theatre

Each unit routinely has two days Main OT, 2 days Maternity OT and Interventional ultrasound OT, besides emergency OT patient care.

Ultrasound sessions

Each unit has 3 U/S session (2 forenoon & 1 afternoon), besides access to Emergency U/S

RESPONSIBILITIES & LEARNING ACTIVITIES OF JUNIOR RESIDENTS

The daily routine for a O & G Gynae starts early enough (7.30AM – 8AM) to be able to perform his/her ward responsibilities before Senior Resident rounds/Consultant Rounds/going to Operation Theatre.

OPD Services

Each resident posted in the Obst. & Gynae department would have two OPD days/week.

OPD starts at 9.00 am every day except Sundays and holidays. Residents must be in their OPD cubicle by 9.00am sharp. It is advisable not to change the cubicle repeatedly as this practice makes it difficult for patients attending for follow up.

The following guidelines may be helpful for optimal and efficient functioning in the medical OPD

- Residents should see patients one-by-one on first come first service basis to avoid confusion
- They should evaluate each patient and write the observations on the OPD card with date and signature
- OPD card is a legal document, hence one should be careful about what one writes on the card
- Investigations should be ordered as and when necessary using prescribed forms. All investigation forms should be carefully and completely filled. Short history, findings and clinical assessment should be clearly outlined on forms meant for radiology, pathology and other investigations
- Resident should consult the senior resident/consultant in case of any difficulty regarding diagnosis and the management of each case
- Patient requiring admission according to JR’s assessment should be sent to the senior resident on duty for evaluation
- Patient requiring immediate medical attention should be seen on priority. Consultant/senior resident on duty in OPD should be fully apprised of the case in person. Ideally, the resident should also brief casualty medical officer regarding the case. All haemodynamically unstable patients should preferably be escorted by the resident.
- Only if the patient merits a specialist opinion should she be patient be referred to the specialty OPD with the objective of referral and resident’s opinion clearly written on the card.
- Patients with chronic illness may be referred to specialty clinic, if required, for further management and follow up and not for routine diagnostic work up, which should preferably be done in the medical OPD itself.
- Patients should be clearly explained as to the nature of the illness, the treatment advice and the modus operandi for getting the investigation done.

- Routine investigation reports reach the investigation file of each room. Reports of Pap Smear, histopathology, X-ray, scans, and pathology investigations reach the sister-in-charge usually by 4-6 days time.
- Resident should specify the date and day when patient has to come for follow up.
- Medical representative should be entertained only after completing OPD work
- Following are available with the sister-in-charge of OPD, BP instruments, weighing machine, special investigation forms, pap smear bottles, punch biopsy forceps, stitch removal set, dressing set, Emergency first-aid kit, etc.

In-Patient Care (Ward & Labour Room)

The usual doctor-patient ratio for in-patient services is 1:4-6 which may vary depending on the strength of the residents in the unit. Each Junior resident is responsible and accountable for all the patients admitted under his/her care.

The following are the general guidelines for the functioning of the junior residents in the ward.

- Detailed work up of the case as soon as she is admitted.
- Case sheet maintenance with page numbers, index & in order.
- To organize his/her investigations and collect the reports, if necessary
- Bedside procedures for therapeutic or diagnostic purpose
- Presentation of a precise and comprehensive overview of the patients in clinical rounds to facilitate discussion with SRs and consultant.
- To obtain opinion of specialists of other medical disciplines, if considered necessary by the senior resident and/or consultant
- To evaluate the patient twice daily (and more frequently if necessary) and maintain a progress report in case file along the lines mentioned above.
- Immediate Post operative cases have to be seen at least every 2 hourly or more frequently depending on seriousness of case. Notes should be written legibly in case sheet after every examination and signed.
- To establish rapport with the patient for communication regarding the nature of illness and further plan of management
- If surgery is required, the patient and relatives must be explained about the procedure, prognosis and risks in a mature and realistic manner. Informed written consent must be taken and countersigned. This is very important and is a legal document.
- To write instruction about patients treatment pre operative and post operative clearly in the case sheet and in instruction book along with time, date and the bed number with legible signature of the resident.
- To carefully inspect treatment chart of patient daily to check whether physicians instructions are being carried out correctly
- To hand over responsibility of the patients to the resident on duty, verbally and in written before returning for the day
- To plan out the work of the next day in advance to facilitate functioning and avoid delays

Admission day : Admission day for a unit starts from 8.00am of the OPD day and ends at 8.00am of the next day. Following guidelines should be observed by the resident during the admission day.

- Routine ward work and discharge of patients should be completed by 9.00am of the admission day
- Resident should inform the doctor on duty about the sick patients, giving detailed verbal and written over, including proposed plan of management. Staff on duty should be fully detailed about drugs and I.V. fluid orders of the sick patient(s).
- After attending to OPD duty, resident should check up with the senior resident on duty about the cases allotted to him/her for the work up.
- Before proceeding for lunch resident, a brief evaluation of the patients should be done. Vital signs should be immediately recorded in the case sheet as soon as a resident examines a patient. Immediate medical care should be provided if patient is sick. Urgent investigations should be sent, if considered necessary.
- Resident should work up the patient in detail and be ready with the preliminary necessary investigations reports for the evening discussion with the consultant on call. It would be in order to discuss the clinical details and plan of management of the case, with the SR before the Consultants round starts.
- After clinical round, resident should plan out the investigation for the next day in advance, fill up the forms of the investigations.
- Responsibility of patients should be handed over to the doctor on call personally.
- In the event of any procedural and logistic problems (e.g. delay in getting a portable X-ray done), SR, consultant or duty officer may be contacted for help.

Doctor on duty

Duty days for each Junior Resident are allotted according to the duty roster made by the SR and/or consultant every month. No change is permissible unless it is by a mutual consent and in such event senior resident/consultant should be duly informed.

- Resident on duty has to report for duty before 8.00am and take detailed over from the previous doctor on duty with especial reference to sick patients
- Doctor should carry the pageboy during duty hours. The custody and maintenance of the working condition of page boy is the responsibility of the junior resident on duty for the day. 'Page Boy' should be tested repeatedly during the day with a test call especially during taking over and leaving the ward for any purpose. Response to a page call should be immediate by telephone or preferably in person. A resident should never ignore a page call.

(Not responding to "page" may invite disciplinary action)

- The resident on duty for the admission day should know in detail about all sick patients in the wards, and relevant problems of all other patients. Admission during night should be worked up and managed according to the suggested guidelines, with intensive monitoring of sick patients.
- In morning, detailed over (written and verbal) should be given to the next resident on duty. This practice *should be irridigly observed*.
- If a patient is critically sick, discussion about management may be done with SR or consultant at any time, e.g. before or after usually time or evening round.

- The doctor on duty should be available in the ward throughout the duty hours, except during meal times when he/she is covered by a colleague

In case of New Admission/Transfer

This is done usually with the knowledge of senior resident on call. If patient is sick, the doctor on call should accompany the patient from the casualty or another ward. Initial evaluation and stabilization of the patient should be carried out pending detailed evaluation.

Care of Sick Patients

Case of sick patients in the ward takes precedence over all other routine work for the doctor on duty. Patients in critical condition should be meticulously monitored round the clock and records maintained. Treatment alterations should be done by doctor on duty in consultation with the Senior Resident, and Consultant, if necessary.

Care of Patients in Labour Room Intensive Care

Residents will have 1 day duty (8AM –9PM) and 1 night duty (9PM to 8AM) per week and Sundays/holidays by rotation. Residents have to workup the cases as in In-Patient Care instructions.

Patients in first stage must be monitored very carefully (maternal & fetal). Delivery (Normal, forceps, ventouse) should be conducted. Under supervision of Sr. Res. Decision for operative delivery/Cesarean section must be in consultation with Sr. Res. and Consultant on duty. J.R. have to assist in C.S/perform C.S under supervision and discretion of Sr. Res. & consultant.

If patient merits ICU care eg. eclampsia, then it must be discussed with the Senior Resident and Consultant. Consultation should be sent to SR/Consultant Anesthesia or they are contacted on phone for evaluating the patient, and transfer to ICU.

Discharge of the patient

Patient should be informed about her discharge about 24 hours in advance. It should be planned in such a manner that patient vacates bed by 11 AM – 12 Noon in the morning. Preferably, discharge on Sundays and other holidays are to be avoided.

Computerised discharge summary should be precisely, but comprehensively, written. It should be noted that this document is carried by the patient wherever she goes for consultation, or following up. Hence, incomplete or incorrect information should be avoided. Apart from giving salient points in history and examination, resident should record important management decisions, and ensuring hospital course in a proper manner. Investigations should be properly written, giving dates and numbers of various pathological and radiological tests. Complete diagnosis, complications and procedures done during hospital stay should be duly recorded. Operation notes should be precisely written, with diagrams if necessary eg. after diagnostic laparoscopy, hysteroscopy, tuboplasty (before & after surgery etc.) Delivery notes should contain exact time of birth, birth wt., Apgar score and other maternal/fetal/neonatal details. Most important part of the discharge summary is the final advice given to the patient. Complete details of dietary, mobilization plan, and instructions regarding activity or exercise should be written, names of drugs, and dosage should be legibly written, giving the timing and duration of treatment. Contraceptive advise for Obst. cases must be written. Patient should be briefed regarding date, time and location of OPD/Clinic for the follow up visit. Three copies of discharge summary should be made, one for the patient, second to the attached in the case sheet, and third for unit record or for the follow-up OPD.

Discharge summary made by Junior Resident should be carefully checked and corrected by the Senior Resident and/or consultant and counter signed.

In Case of Death

In case it is anticipated that a particular patient may not survive, relatives must be informed about the critical condition of the patient beforehand. In the event of death of a patient, inform the nearest available relative and explain the nature of illness. Follow up death summary should be written in the file. Face sheet notes and must be filled up and the sister-in-charge should be requested to send the body to the Mortuary from where the patient's relatives can collect the body. If it was an MLC case, death certificate has to be prepared in triplicate and body handed over to mortuary and the local police authorities should be informed. No death certificate is given to their relatives of the medico-legal cases from the wards.

In case Autopsy is Required

Autopsy should be attempted for all patients, fetuses/neonates who have died in this hospital especially so if patient died of undiagnosed illness, unexpected deaths and in conditions where the diagnosis may have a bearing in the health of the relative/hospital staff. Post-mortem is routinely done in the event of medico-legal cases.

Resident should explain the procedure to the relatives emphasizing the need for it. They should fill up the consent form for autopsy after doing all the necessary formalities. The Junior Residents of Pathology on duty should be informed by page or written call, after checking their duty roster. Senior Resident and consultant of the unit should be informed about the autopsy. Resident should try to organize and expedite the process to ensure good compliance by the relatives. Autopsy consent form, autopsy request form and case sheet should be sent to the mortuary, with the dead body.

Speciality Clinics

There are 3 officially recognized speciality clinics being run under the aegis of the department of Obstetrics & Gynaecology. These are as follows :

<i>Name of the Clinic</i>	<i>Time and Day</i>	<i>Place</i>
Antenatal & High Risk Pregnancy	Mon/Wed/Fri, 2 PM onwards	G.O.P.D.
Fetal Medicine Clinic	Wed, 2 P.M. onwards	- do -
Oncology Clinic	Mon/Wed, 2 P.M. onwards	IRCH

The department also runs Gynae Endocrinology Clinic, Menopause Clinic, Recurrent Pregnancy Loss, Pre pregnancy Counselling Clinic. Faculty members with interest/expertise/training in the subspecialty, attend and run these clinics.

Referral of patients to these clinics : As these clinics provide long-term follow-up, only those patients should be referred to these clinics who are really committed to avail of this facility. For simple consultation for reaching a diagnosis it is advisable that the residents carry out the preliminary work-up in the out-patients department itself and take the help of the Consultants/Senior Resident to chalk out the management plan.

Investigational facilities and their utilization

AIIMS hospital is one of the most well-equipped hospitals in the country. However, it the responsibility of the ward team to requisition only at the relevant investigations after a careful analysis of the clinical problem. The approach should be positive (to confirm the clinical diagnosis) rather negative (to exclude some remote possibility). The so-called "routine" investigations must be kept to a minimum. The habit of planning investigations in "EMERGENCY" must be strongly discouraged. It hampers with the proper

functioning of the hospital laboratories and affects the reliability of the laboratory results because of load which cannot be handled.

Medico-Legal Responsibilities of the Residents and Interns

As mentioned in the beginning of this document, Residents and Interns are advised to carefully read and learn the medico-legal responsibilities as related to their day-to-day work in the AIIMS hospital from the AIIMS hospital “Residents’ Manual”. The department of Obstetrics & Gynaecology Residents have to attend to a lot of “rape cases “ in Casualty. They must be very sure of the formalities and steps involved in making the correct death certificates, mortuary slips, medico-legal entries, requisition for autopsy etc. Similarly, they must be fully aware of the ethical angle of their responsibilities and should carefully learn how to take legally valid consent for the different hospital procedure/therapies etc.

TEACHING AND ACADEMIC ACTIVITIES IN DEPARTMENT OF OBSTETRICS & GYNAECOLOGY

During Junior Residency, Post Graduate is not only expected to provide proper patient care, she is also supposed to acquire academic knowledge and skills in the field of Obstetrics & Gynaecology.

Case Discussions, Seminars, Journal Club Presentations :

This is held once a week with all the unit consultants and residents at a predetermined convenient time (4.15PM, Monday). The Junior Resident (usually final year) prepares a case and discusses in detail with the consultant. Interview is then taken by the consultants, on the pattern of final PG examination. The candidate is assessed and given marks on the standardized proforma. Seminars/Journal Clubs are held once/wk (Thursday 3.30 PM) and Jr. Res. (1st & 2nd year) will have to present seminars on pre determined topics by turn.

By rotation, the JRs are allotted topics covering recent advances in Obstetrics & Gynaecology. The list is prepared and circulated at the beginning of each session. Faculty members from the department of Obst. & Gynae and the various subspecialties act as Guides for these seminars. The JRs must contact the preceptors at least 4 weeks before the proposed seminar and carefully chalk out the out-line of the presentation. They must search adequately through the literature and work under the close guidance and supervision of their preceptor(s) and rehearse adequately in advance in order to give a satisfactory presentation with in terms of content and delivery.

Before the seminar, the JR is required to submit the properly edited write-up, prepared with the help of the preceptor, to all faculty members. The document must have relevant recent references on the topic discussed.

Perinatal Mortality Conference

This is held in the seminar room once a month with Neonatology Unit where the details of the fetuses/ neonate who died the previous month are discussed. The objective of this activity is to understand the management of critically ill cases, identify administrative and personal lacunae and lapses if any, and provide future guidelines for similar cases.

Clinical Combined Round (CCR)

Every Tuesday at 2.30 P.M. CCR is held in LT I to discuss interesting case/procedure/surgery seen by a department. Two departments (one surgical and one medical) present, for 30 min each an interesting case/procedure with brief review of literature.

Clinical Grand Round (CGR)

This is a centralized teaching activity held at 4.00 P.M. on Tuesday in LT I where the research activity carried out by a department is presented. The total duration is one hour.

Clinico-Pathological Conference (CPC)

In CPC, one senior faculty member from AIIMS, or any other medical college, discusses an unusual clinical case in detail, and gives his clinical diagnosis. Faculty member from department of pathology follows up the discussion with the final diagnosis.

Other Research Activities

A resident is free to involve himself/herself with other ongoing research activities with any consultant of the department.

TRAINING IN RADIO THERAPY DEPTT

Residents must observe techniques of radiotherapy for Cancer Cervix, Endometrium etc at IRCH.

ROTATION IN NEONATOLOGY UNIT

Residents must learn care of newborn, resuscitation of asphyxiated babies, management of common neonatal problems.

POST PARTUM PROGRAMME ROTATION

Residents must give contraceptive advice insert IUCD's observe and perform Medical Termination of Pregnancy (Medical & Surgical) in first and second trimesters of pregnancy, assist and perform laparoscopy and laparoscopic ligations with Senior Residents, manage complications.

EVALUATION OF RESIDENTS

Evaluation of Residents of their knowledge and acquisition of attitudes, skills and competencies is a continuous process throughout their 3-year period of training. Evaluation of certain attributes such as interpersonal relationships, professional responsibility, sensitivity to patient's need for comfort, ethical behavior etc. is closely observed by the teaching faculty during the day-to-day clinical work of the Resident.

ASSESSMENT OF THE JUNIOR RESIDENTS IN THE DEPARTMENT OF OBSTETRICS & GYNAECOLOGY

At the end of each clinical posting in each of the Obst. & Gynae units mentioned above, the Residents are assessed by the faculty staff of the concerned unit/department. Assessments are held at regular intervals, during the posting 6 monthly, and at the end of posting of the Junior Resident in the Obst. & Gynae units. A theory exam. is held every 6 months. During Seminars and Case Presentations residents are assessed by faculty and recorded.

Final M.D. Examination

It consists of a written examination, a clinical examination to assess the clinical competencies and skills, and a viva voce examination. The examination is conducted by two internal examiners with the help of two external examiners. Candidates are recommended for the award of M.D. only after they have exhibited acceptable level of competence in all the areas of knowledge, attitudes and skills being evaluated by the examiners and the teaching faculty.

Written theory examination are conducted with the help of traditional essay type question papers and short notes. There are 4 questions papers of 3 hours each. Paper 1 includes questions of “Basic Sciences” as applied to Obstetrics and Gynaecology Paper 2 covers Obstetrics; Paper 3 includes general Gynaecology; and Paper 4 includes Neonatology & Recent Advances and Contraception.

Clinical examination is the most important part of the evaluation and is aimed at assessing the clinical skills of the candidate and diagnostic reasoning. Entirely objective evaluation of these skills is neither feasible nor desirable. However, in order to test the various skills, the examiners may evaluate the candidates on a structured format, namely, history taking, physical examination, diagnostic reasoning, choice of diagnostic investigations, general management, medical and surgical procedures and strategies, and general attitude and demeanor towards the patient and the examiners. Patients material selected for examination one obstetrics and one gynae case is usually sufficiently representative of the type patients for whom an internist may be called upon to give an opinion.

Requirement of Thesis

Currently the Residents at the All India Institute of Medical Sciences are required to submit a thesis based on a research protocol developed by them with the help of one or more members of the faculty of the Department of Obst. & Gynae or allied subspecialties. Introduction to research methodology is considered desirable for the residents so that they can understand the concepts of validity and generalizability of the observed finding. All Residents must keep themselves in touch with current medical literature. Moreover, they should be able to judge whether the observations reported in the literature would be applicable to their setting or not. Junior Residents who join the department are given the name of faculty member by the office of the department who will guide him/her in the research work leading to the thesis. The allotment of the Junior Residents to different faculty members for guiding the thesis work is done by the department on the basis of a well-designed rotation format and the Junior Residents must follow the same.

The thesis written by the Residents are evaluated and graded by two external examiners in terms of research design, methodology employed, analytical methods used, and validity of the conclusions reached. Although these grades are not added to the theory or clinical assessment, acceptance of thesis as being satisfactory is a pre-requisite for a Resident to be able to take the M.D. Examination.

ANNEXURE

CASE WORK UP

A relevant case work up and good record keeping is the key to good patient care. Record keeping may be uninteresting and laborious but is the cornerstone in the effective and efficient management of the patient. All the cases admitted under the charge of Junior Residents in-charge need to be worked up in detail including clinical, social, personal, family and occupational aspects of history. Patients should be examined in detail with special reference to the involved system(s). The Resident should make his own diagnosis with differential diagnosis giving full justification for each differential diagnosis. The case is first discussed with the Senior Resident. Formal presentation in the round, Junior Resident should write down Consultant's opinion on the separate page. He should then chalk out a plan for further investigations and management. Senior Resident should make a brief note of relevant features, pen down his opinion and plan for further management.

CASE SHEET KEEPING

For each admitted patient, a case record file with face sheet is to be meticulously maintained. The following sequence, if properly recorded, may lead to uniform and meaningful medical information.

Page 1: Face sheet

1. The details of the patient's name, age, nationality, religion, date of admission, CR Number, address etc are to be filled in by the staff of Central Admission and Inquiry Counter.
2. On admission, Provisional Diagnosis needs to be entered after the initial work up.
3. If there are any previous admission, the corresponding CR No. (s) and date (s) of admission should be entered in the column provided.
4. At the time of discharge, the final diagnosis, secondary diagnosis and complications need to be entered.
5. Operative procedures, if any, with brief note on anesthesia given, should be recorded.
6. Result – The appropriate column on the face sheet need to be ticked or rounded.
7. All the face sheets at discharge, or at the time of death need to be properly filled in and must be duly signed by the Senior Resident.

Page 2 : Problem Oriented Medical Records (POMR)

Information collected about a patient is structured into four main components.

- (i) Subjective – Record salient points of history.
- (ii) Objective – Positive and pertinent clinical findings.
- (iii) Assessment – This indicates final diagnosis.
- (iv) Problem Related Plans :

For each problem, plans are displayed as a reflection of physician's responsibility to each problem identified.

Plans are recorded under three categories –

1. Diagnostic i.e., laboratory tests, radiological studies consultations, continued observations etc.
2. Therapeutic i.e., medications, diet, surgery etc.
3. Patient education (Pted) i.e., instruction of the patient in various aspects of self care, education regarding the goal of therapy, the prognosis that has been given etc.

Page 3 : Treatment chart

The treatment chart should preferably be written in capitals, so that there is less problem in understanding, by other doctors, and paramedical staff. Following should be duly recorded

- (i) Date and time of prescription.
- (ii) Name, strength, dosing pattern of the drug duration of treatment, and changes in above, if any.
- (iii) Instruction regarding fluid, electrolyte and nutrition.
- (iv) Nursing care instructions.
- (v) Doctor's name with signature and designation.

The treatment chart should be rewritten, if major changes are ordered. Resident should supervise and check effective translation of the order by staff nurses on daily basis.

Page 4-5: Investigation chart

- (i) Investigations chart with date, time (if relevant), nature of investigations, result, normal range (if it is not mentioned in the form or is not a routine).
- (ii) This chart (if not already available in a typed format) should be spaced out over 2-3 pages to avoid crowding of various investigations.
- (iii) Reports of radiological investigations should be comprehensively written giving data and number of X-rays or scans.
- (iv) Similarly, while writing the histopathology/cytopathology reports, the respective laboratory numbers should be clearly mentioned.
- (v) The discussion on these investigations in various conferences should be duly recorded.

Page 6 : Consultant's opinion with date and time

Page 7-10 : History and examination (or more pages, if required)

Page 11: Operation Notes. Gynaecological surgery/obstetric Caesarian Section /delivery notes. Should contain detailed relevant notes on procedure planned, performed, final diagnosis, prognosis, blood loss, sponge count. Surgeons' names must be recorded besides names of Anaesthetist and scrub nurse.

Page 12 : (onwards) Progress notes should be entered daily for all patients and round the clock for sick patients with special reference to the following points :

- (i) Vital signs.
- (ii) New symptoms or signs
- (iii) Investigation plan for the day
- (iv) Procedures done with reference to nature, time, date, technique used and post intervention monitoring.
- (v) Any blood product received with mention of blood group, reference number, and adverse reactions, if any.
- (vi) Assessment of the clinical problems and proposed plan of action based on clinical status of the patient over last 24 hours.

RESIDENTS FORMAL ASSESSMENT FORM

1. Credibility & Reliability (3)
2. Punctuality & Regularity (3)
3. Ability to get along with peers (3)
4. Inter-personal relationship (3)
5. Humane & compassionate behaviour with patients & their families. Concern for the welfare of the patients & social obligations to the community (3)

Total = 15 marks.

OPHTHALMOLOGY — M D

The following are the aims and objectives as provided in the AIIMS act 1966. Dr. Rajendra Prasad Centre for Ophthalmic Sciences is a constituent unit of the AIIMS as far as Post-graduate medical education is concerned.

- 1.1 To develop patterns of teaching in postgraduate medical education in all its branches so as to demonstrate a high standard of medical education to all medical colleges and other allied institutions in India.
- 1.2 To provide for advanced postgraduate teaching in sciences of modern medicine and other allied sciences; including physical and biological sciences.
- 1.3 Conduct experiments in new methods of medical education for postgraduate, In order to arrive at Satisfactory Standards of such education.
- 1.4 Prescribe course and curricula for Postgraduate students.
- 1.5 Train teachers for the different medical colleges in India.

Course for M.D. Ophthalmology are whole time residential training course of three years duration. The admission are held in June & December every year. The sessions start from first July and first January every year.

PRE-REQUISITES

For admission to these course, the candidates must have passed MBBS Examination of recognized university and should be registered as a medical practitioner.

The student should have successfully completed one-year internship programme after the MBBS course of 4-1/2 years duration or 6 months internship programme if the course is of 5 years duration.

BOARD OBJECTIVE

The Clinical postgraduate training programmes are intended at developing in a student a blend of qualities of a clinical specialist, a teacher and a researcher. They are organised such that a postgraduate should possess the following qualities knowledge and skills.

Basic Sciences

He should possess basic knowledge of the structure, function and development of the human body as

related to ophthalmology, of the factors which may disturb these mechanisms of such disturbances and the disorders of structure and function which may result.

Clinical Knowledge

He should be able to practice and handle most day to day problems independently in ophthalmology. He should recognize the limitations of his own clinical knowledge and know when to seek further help.

Environment And Health

He should understand the effect of environment on health and be familiar with the epidemiology of at least the more common diseases in the field of ophthalmology. He should be able to integrate the preventive and promotive methods with the curative and rehabilitative measures in the treatment of disease.

Community Ophthalmology

He should practice ophthalmology at the door step of community. He should be familiar with common eye problems occurring in rural areas and be able to deal with them effectively. He should also be made aware of mobile ophthalmic Unit and its working & components.

Current Developments

He should be familiar with the current development in Ophthalmic Sciences.

Teaching

He should be able to plan educational programmes in ophthalmology in association with his senior colleagues and be familiar with the modern methods of teaching and evaluation.

Research

He should be able to identify a problem for research of a clinical or experimental nature involving epidemiological studies or a combination thereof, clearly state his objectives, plan a rational approach to its solution and execute it and critically evaluate his data in the light of existing knowledge.

Scientific Method

He should know that conclusions should be reached by logical education and he should be able to assess evidence both as to its reliability and its relevance.

INTERMEDIATE OBJECTIVES

The following over all objectives are expected to be achieved by the end of 3 years of instructions and residential training programme. The details are listed subject and clinical assignment wise. At the end of this training programme the students should be able to:

Basic Medical Sciences

- (a) Attain understanding of the structure and function of the eye and its parts
In health and disease.
- (b) Attain understanding and application of knowledge of the structure and function of the parts of Central Nervous System and other parts of the body which influence or control the structure and function of the eye.
- (c) Attain understanding of and develop competence in executing common general laboratory procedures employed in diagnosis and research in ophthalmology.

Clinical Ophthalmology

Given adequate opportunity to work on the basis of graded responsibilities in out-patients, in patients and operation theatres on a rotational basis in the clinical section of the Centre from the day of entry to the completion of the training programme, the students should be able to:

- (a) Acquire scientific and rational approach to the diagnosis of ophthalmic cases presented.
- (b) Acquire understanding of and develop inquisitiveness to investigate, to establish cause and effect of the disease.
- (c) To perform all routine and special ophthalmic investigations (e.g. Slit lamp examination, Genioscopy, Ophthalmodynamometry, perimetry, scotometry, Tonography, ERG, EOG, EMG, etc., Dark adaptometry, Dark room procedures, Funds photography, Fluorescein angiography, Hess & Less screen Synoptophore and other procedures, of these investigation in the light of clinical presentation.
- (d) To manage and treat all types of ophthalmic cases.

Refraction

- (e) Acquire competence in assessment of refractive errors (Static and dynamic) and prescription of glasses for all types of refraction problem.
- (f) Acquire basic knowledge of manufacture and fittings of glass and competence of judging the accuracy and defects of the dispensed glasses.

Medical & Surgical Management

- (g) To demonstrate the knowledge of the pharmacological (including toxic) aspects of drugs used in ophthalmic practice and drug commonly used in general diseases affecting the eyes.
- (h) To exhibit competence in medical management of ophthalmic cases.
- (i) To competently handle and execute safely all routine surgical procedures on lens, glaucoma, lid, sac, adnexa, retina and muscle anomalies.
- (j) To competently handle all ophthalmic medical and surgical emergencies.
- (k) To be familiar with micro-surgery and special surgical techniques.

Ophthalmic Specialists

Given an opportunity to work on a rotational basis in various especial clinics of Sub-specialties of ophthalmology. The student should be able to:

- (a) Examine, diagnose and demonstrate understanding of management of the problems of Neuro-ophthalmology and refer appropriate cases to Neurology and Neuro-Surgery.
- (b) To examine, diagnose and demonstrate understanding of management of (medical and surgical) complicated problems in the field of (a) lens, (b) Uvea, (c) Cornea including of transplant and implant (d) Retina including retinal detachment (e) Squint (f) Ophthalmoplasty and and tumours of Eye (g) Glaucoma (h) Plastic Surgery of Eye and (i) Genetic Problems in Ophthalmology.
- (c) To demonstrate understanding of the manufacture, and competence in prescription and dispensing of contact lenses and ocular prosthesis.

Ophthalmic Pathological Science

- (a) Given the relevant clinical operative and radiological data the student should be able to identify and describe the major histomorphology alternations in the tissues received in the section of ocular pathology.

- (b) Be able to interpret the diagnosis in correlation with the clinical data of routine materials received in at least 80 % of the cases.
- (c) Be able to demonstrate an understanding of the histogenic and Patho physiologic processes associated with such lesions.

Community Ophthalmology

Given an opportunity to participate in surveys, eye camps and Rehabilitation teams, the students should be able to:

- (a) Organize & conduct surgery's in rural, urban and industrial communities and in specialized groups of population.
- (b) Organize & conduct comprehensive eye camps covering promotive, Rehabilitative and curative aspects of ophthalmic problems.
- (c) Guide rehabilitation workers in the organization and training of the blinds Blinds in art of daily living and in the vocational training of the blind leading to gainful employment.

Research

- (a) Recognise a research problem.
- (b) State the objective in terms of what is expected to be achieved in the end.
- (c) Plan a rational approach with appropriate controls with full awareness of the statistical validity of the size of the material.
- (d) Spell out the methodology and carry out most of the technical procedures required for the study.
- (e) Accurately and objectively record on systematic lines the result and observation made.
- (f) Analyse the data with the aid of an appropriate statistical analysis.
- (g) Interpret the observations in the light of existing knowledge and highlight in what ways the study has advanced existing knowledge on the object and what further remains.
- (h) Write a thesis in accordance with the prescribed instructions (Appendix III).
- (i) Write at least one scientific paper as expected of International Standards from the material of his thesis.

Teaching

- (a) To write symposiums and critically discuss them
- (b) To methodically summarise Internationally published articles according to Prescribed instructions and critically evaluate and discuss each selected article.
- (c) To discuss symposia and journals with his colleague and guide his juniors in groups.
- (d) To present case at clinical conferences discuss them with his colleagues and Guide his juniors in groups in evaluation & discussion of these cases.

Courses

The training programmes in the Centre are divided into theoretical, clinical and practical in all aspects of the delivery of the Ophthalmic medical and health care. They provide training in methodology of research and teaching. The course run for a period of three years on a residency pattern.

At the end of the prescribed period the students may submit a thesis on a research problem that may

have been identified earlier, and at the end of the prescribed period appears for the final examination lasting for 3 days depending upon the numbers of candidates, the actual questioning time per candidate being not less than 3 hours.

THEORETICAL

The theoretical knowledge is imparted to the candidate through distinct courses of lecture demonstration and symposia. The students are exposed to recent advances through discussions in journal clubs Symposia. These are considered necessary in view of the inadequate exposure to ophthalmology in the undergraduate curriculum. A record of association's library and any students is free to consult them whenever he desires.

DIDACTIC TEACHING IN CLINICAL APPLIED BASIS AND PARA-CLINICAL SCIENCES

(a) Knowledge in applied, basic and para clinical and clinical science is imparted by the member of the staff of the Centre in respective disciplines or by clinicians themselves by conducting didactic courses-(Lecture & Demonstration)

(b) Symposia

In each section which has two or more specialties the residents of 3rd and 4th semester are exposed to 14 symposia in each specialty over a 1 year period to cover the entire specialty.

(c) Journal Clubs

Journals are reviewed in a particular specialty covering all articles in that subject over a 6 months period and 10 major articles presented and discussed by the resident. About 2 journal reviews per section are done every 3 months.

1) Aim

2) Methods

3) Observations

4) Discussions and

5) Conclusions

CLINICAL OPHTHALMOLOGY

For the purpose of clinical training the Centre is divided into clinical sections, Proportionate number of residents are attached to each Section. The training is given in wards out-patient department, speciality clinics and operation theatres. Each Resident rotated through all the clinical sections & work in each section for proportionate period of his/her stay in the Centre.

(a) Out-Patients

For the first six months of the training programme Residents are attached to a faculty member to be able to pick up methods of history taking and ocular examination in ophthalmic practice. During this period the resident is also oriented to the common ophthalmic problems that come to the Centre. After 6 months, the clinical resident is allotted a subicle, where he receives new and old cases including refractions and prescribes for them. The residents are attached to a Senior Resident and faculty member whom they can consult in case of difficulty.

(b) Wards

Each residents is allotted 3 to 5 beds in the in-patient sections of the Centre. The beds of each resident are approximately divided into two halves-general ophthalmic cases and specialty cases. The whole concept is to provide the resident increasing opportunity to work increasing responsibility according to seniority. A detailed history and case record is to be maintained by the resident and he is made familiar with coding and punch card system the Centre.

(c) Specialty Clinics

The residents is provided with an opportunity to work in specialty clinics of the section he is working in at the time of his posting. The Centre. The Centre runs thirteen speciality clinics. The resident is provided with an opportunity to learn by actuality doing all investigative procedures, methods of diagnosis and principles of management of cases in the clinics. These clinics also provide him with an opportunity of learning and sifting proper referrals, follow up cases over a long period and evaluate results.

(d) Operations

The resident is provided with an opportunity to perform operations both extra-ocular & Intra-ocular with the assistance of the Senior Residents and/or under the direct supervision of a faculty member. He is provided with an opportunity to learn special and complicated operations by assisting the Senior Resident or the Senior Surgeon in operations of cases of the speciality and be responsible for the post-operative care of these cases besides their earlier work up & pre-operative preparations.

A phased programme is gone through. In the first phase the resident is given training in regional anaesthetic block preparations of cases for operation and premeditation. In the next phase, the resident assists the operating surgeon operate independently assisted by senior resident faculty member. He is required to be proficient in some operation and show familiarity with others.

Some of the operative procedures are learnt by the residents by practicing the same on eye balls of the goats.

Residents are taken to eye camps for providing them with an opportunity to operate specially so in the last semesters.

(e) Case Discussions

Detailed ward rounds are conducted by each section where the work if the residents is scrutinized and cases are discussed. Case discussions are also held in the O.P.D. and the speciality clinics.

Beside the above a special case conference is held once a week. One case from each section is selected for discussion which is worked up discussed in the group and then presented ant the case conference where the faculty of the Centre, resident, discuss the problem of diagnosis and management.

PRACTICALS IN OCULAR HISTOPATHOLOGY

a) General Pathology

The training is given initially in general pathology to give the residents a revision on the basis general pathology and lesions in various other organs. A set of 60 such slides is studied by each resident in the light of the descriptions provided during the first semester.

b) Ocular Pathology

A set of ophthalmic slides fully documented is provided to each resident for study. The residents see the slides, write their descriptions and compare the same with one given in the documentation. This gives them a basic knowledge of known pathological lesions, during the second semester.

The residents are provided with fully stained slides of the tissues received in ocular pathology section from the clinical material. The residents are provided with relevant clinical material. The residents write out a detailed report on the pathological findings of each part of the eye ball and discuss the diagnosis and differential diagnosis on the basis of the information provided and

collected by examining the slides.

CAMPS

Eye camps are conducted where residents are posted for imparting training to the clinical residents according to a set methodology. The community and school surveys are conducted by residents.

RESEARCH

The methodology of research is given in details elsewhere.

TEACHING

The residents are imparted training in teaching in several ways.

a) **Group Discussions**

The residents are divided in six groups. Each group is composed of a resident from each semester. In the group the following exercises are discussed. The senior group leadership and gain experience in teaching. The IV semester act as a deputy leaders.

b) **Symposia**

The residents present the Symposium to the group where it is fully discussed. The first semester residents are required to show that they have read the topic from the literature besides the cyclostyled copy supplied to them on which they are questioned by the group leader. The leader or deputy group leaders help the other resident by offering clarifications, criticism and pointing out the deficiencies in written up material. A free and fair discussion is encouraged. These discussions enable the residents to prepare for a general discussion in the class.

c) **Journal Clubs**

The resident to whom the journal is allotted present the journal summaries (as cyclostyled and distributed) to the group where each article is fully discussed. They are expected to show their understanding of the aspect covered in the article and on which the other residents are questioned by the group leader and the deputy group leader clarify any of the points raised in the article, offer criticisms and evaluate the article in the light of known literature. These discussion enable the residents to prepare for a general discussion in the class.

d) **Case discussion conference**

The residents present the case allotted to the group and discussion the case in the group and in the class. A free & unfettered discussion is encouraged.

EVALUATION (CLINICAL)

The evaluation of the candidates at the end of the course may be under the following headings:

1. The resident shall be required to demonstrate a comprehension of basis knowledge Of the subject by being able to answer essay type or multiple choice type question in four papers of 3 hours each to the satisfaction of the board of examiners.
2. That the resident shall be evaluated in all fields of the instruction areas of work and demonstrate skills to elicit history, examine, diagnose and treat (medically or surgically or both) cases in out-patient department and admitted cases including the relevance of investigative procedures in the case under discussion. The residents will be required to see and interpret X-ray charts and laboratory reports of special investigations pertaining to these case.

3. The resident may be required to demonstrate the use of appliances and specialized Diagnostic techniques including their utility and limitations.
4. The resident will be required to report on specimens and slides of Pathology and give a pathological diagnosis from the clinicians understanding given relevant clinical data and history.
5. The resident will be required to answer oral questions on any aspect of the Specialty.
6. The evaluation shall be done by a board or examiners for adequate time. The number of days on which examinations to be conducted is 3 days.
7. The external examiners may be invited to deliver extension lectures and participate In discussion on t hose delivered by other during their stay as examiners so that the faculty and students of this Centre can derive the advantage of their scientific knowledge and expertise.

DESIGNATION

That the postgraduate have been designated as Junior Residents which is at per with these who held such appointments in other medical colleges while simultaneously pursuing the postgraduate courses.

CERTIFICATE

After successful termination of the course, the candidates be issued a certificate by the Dean stating:

- (a) That the candidate has completed the course prescribed and has been declared successful at M.D./M.S. examination of _____ of this Institute.
- (b) That he has been a clinical resident at the Eye Centre from _____ to _____.

INSTRUCTIONAL OBJECTIVES

Teaching and Training Programme

Both basic and paraclinical course have been combined with the clinical course.

New Teaching Scheme w.e.f. July, 1995

1st and 2nd Semester

Lecture Demonstration-30 in each semester. The topics covered are lab. Techniques in Pathology, Microbiology, Radiology, Biochemistry, Pharmacology and Eye Bank services investigative modalities and Community Ophthalmology.

3rd & 4th Semester

Presentation of cases and symposia.

5th Semester

Thesis presentation.

6th Semester

Journal reviews and discussion of case after presentation by 3rd and 4th Semester Resident.

**TEACHING PROGRAMME FOR IST AND IIND SEMESTER
JUNIOR RESIDENT
JANUARY-JUNE**

<i>S.NO.</i>	<i>SUBJECT</i>
1.	Verification of lens/Contact Lenses.
2.	Calculation of IOL power.
3.	Contact lenses in ophthalmology –types and indications.
4.	Lab. Diagnosis of bacterial infection.
5.	Lab. Diagnosis of fungal & visual infections.
6.	Eye medication including making of eye dorps.
7.	Preservative media.
8.	Histopathology of ocular & orbital tissue with special reference to collection of material.
9.	Lab. Techniques in Pathology.
10.	Collection of blood samples in various tests.
11.	Orbital & para-orbital radiology.
12.	Radiology in reference to Neuro Ophthalmology.
13.	Local anaesthetics & their toxicity & management.
14.	C.P.R.
15.	Immune response in eye.
16.	Ophthalmic microscopes & techniques in micro surgery.
17.	Microsurgical instruments (corneal transplant, R.K., IOL etc.
18.	Viecrectomy, cryosurgical & diathermy instruments.
19.	Argon laser & its application in anterior segment.
20.	Yag Laser & its application in anterior & posterior.
21.	Minor O.T. procedure- F.R. removal, suture removal and management of ocular trauma.
22.	How to tackle ocular emergencies.
23.	Medico legal aspects in Eye Casualry.
24.	O. T. Care, sterilization, no touch technique.
25.	Eye Bank, set up, equipment, work methodology.
26.	Enucleation procedure, grading eyes, preservation.
27.	Photography in Ophthalmology.
28.	Procedures in Experimental operation theatre.
29.	National plan for control of blindness.
30.	Fluorescent Angiography.
31.	U. S. G.
32.	Electrophysiology ERG, VER, EOG.
33.	Community Services – Eye Camps, needs scope & minimum standards.

**LECTURE DEMONSTRATIONS FOR IST AND IIND SEMESTER JR. RESEIDENTS,
JULY – DECEMBER**

<i>S.NO.</i>	<i>SUBJECT</i>
1.	Retinoscopy and Cycloplegice, PMT including selection of spectacles.
2.	Direct & Indirect ophthalmoscopy & Goldmann 3 mirror examination of funds & vitreous.
3.	Slit lamp biomicroscopy-Anterior Segment.
4.	Tonometry.
5.	Gnioscopy.
6.	Field Charging.
7.	Evaluation of lecrimal pathways & tear film evaluation.
8.	Corneal topography, pachymetry, specular microscopy.
9.	Covertest, PBCT, Ocular movements Maddex Red/Wing, Stereopsis.
10.	Synoptopnere examination, diplopia chart, Less Screen, binocular Uniocular, field of fixation.
11.	Pleoptics.
12.	Macular function tests.
13.	Visual assessment in children & infants.
14.	Radiology of orbit & skull Part-I.
15.	Radiology of orbit & skull Part-II.
16.	A holistic concepts of eye disease.
17.	Epidemiological concepts and techniques, investigation of an epidemic.
18.	Epidemiological indicators and methodology for investigation of an epidemic.
19.	Non Communicable ocular diseases and Nutritional disorders.
20.	Industrial Ophthalmology.
21.	Communicable ocular condition.
22.	Survey Designs, Health Information system and role of computer.
23.	Graphical representation of data and its interpretation.
24.	Principles and practice of eye health education.
25.	Existing eye health infrastructure and the national programme for control of blindness.
26.	Eye Camp approach for management of ocular morbidity.
27.	Role of other national programmes for decreasing ocular morbidity and programmes for visual rehabilitation.
28.	Eye Health Planning and Management.
29.	Financial and human resource development for ocular health care.
30.	Formulation, implementation and evaluation of community directed programme.

LIST OF THE SYMPOSIA

Section-I

1. Basics of Vitreo Retina
 - a) Anatomy and Physiology of Retina.
 - b) Anatomy and Physiology of Vitreous.
 - c) Vitreo Retina Precursrs of Retinal detachment.
2. Retinal detachment surgery
 - a) Evaluation of R. D. Surgery.
 - b) Conventional R. D. Surgery.
 - c) Complications of R. D. Surgery.
3. Exudative retinal detachment
 - (a) Aetiology and immunological concepts.
 - (b) Clinical picture and investigations.
 - (c) Management.
4. Advances in Proliferative vitreo-retinopathy
 - (a) Classification and investigations
 - (b) Surgical techniques in PVR
 - (c) Medical Management.
5. Endophthalmitis
 - (a) Classification and clinical picture
 - (b) Advances with special reference to smear culture and media.
 - (c) Intra-vitreous antibiotic & vitrectomy.
6. Vitreous Substitues
 - (a) Air and gases.
 - (b) Silicone oil and fluoro silicone oil.
 - (c) Perfluorocarbene liquide & recent advances.
7. Lasers & posterior segment diseases
 - (a) Pre-laser work up
 - (b) Different type of lasers and delivery systems
 - (c) Indications, complications and follow up.

MEDICAL OPHTHALMOLOGY

1. Fluorescein Angiography.
 - (a) Principles, Equipment & indications
 - (b) Preparation of patient, dyes used and procedure side effect of FA : F-Scopy.
 - (c) Specialized FA procedures including Oral FA, Low dose FA and anterior segment angiography.

2. Hypertensive Retinopathy
 - (a) Aetiopathogenesis & classification
 - (b) Clinical picture, investigations and complications
 - (c) Management.
3. Dysthyroid Ophthalmology
 - (a) Clinical picture & classifications
 - (b) Aetiopathogenesis with special reference to immunological concepts.
 - (c) Investigations & Management.
4. Parasitic Infestations of the eye & Annexa
 - (a) Ocular Cysti-cercosis : Epidemiology, Life Cycle and presentations.
 - (b) Diagnosis & Management of Ocular cysticercosis
 - (c) Hydatid cyst. Ocular Myiasis and other ocular parasitic infestations.
5. Diabetic Retinopathy
 - (a) Classification with clinical picture
 - (b) Medical Management including laser.
 - (c) Hydatid cyst. Ocular Myiasis and other ocular parasitic infestations.
6. Retinal Degeneration
 - (a) Heredomacular degeneration.
 - (b) Retinitis pigmentosa and its variants.
 - (c) Flacked Retine syndrome.
7. Macular lesions
 - (a) CSR.
 - (b) ARMD.
 - (c) Macula hole.

UVEA

1. Anterior Uveitis
 - (a) Aetiology and classification
 - (b) Clinical work up
 - (c) Treatment
2. Posterior Uveitis
 - (a) Clinical picture
 - (b) Treatment & role of Immunosuppressors.
 - (c) New entities.
3. Basic Principles of Relevance
 - (a) Anatomy of the uveal tract
 - (b) Elements of the immune system

- (c) Concepts of disease pathogenesis.
- 4. Endophthalmitis : A Practical approach
 - (a) Clinical features
 - (b) Differential diagnosis & investigations
 - (c) Principles of Management.
- 5. Specific infective Uveitic entities.
 - (a) Fungal diseases.
 - (b) Viral infections including AID
 - (c) Parasitic infections.
- 6. Specific uveitis entities.
 - (a) Tuberculosis.
 - (b) Leprosy.
 - (c) Syphilis.
- 7. Principles of Management of Uveitis and its complications
 - (a) Investigations.
 - (b) Medical Therapy
 - (c) Surgical Therapy

SECTION-II

- 1. Advances in Vitreous Surgery
 - (a) Instrumentation
 - (b) Indications
 - (c) Techniques
- 2. Basic of Vitreous Surgery
 - (a) Instrumentation.
 - (b) Techniques
 - (c) Complications
- 3. Cystoid macula oedema.
 - (a) Aetiology.
 - (b) Management
 - (c) Role of Vitreous Surgery.
- 4. Vit. Haemorrhage
 - (a) Causes
 - (b) Indications of Vitrectomy
 - (c) Techniques, results & complications.
- 5. Vitreous Surgery in ROP
 - (a) Aetiology, classification and clinical picture.

- (b) Indications for medical/surgical intervention
- (c) Management and complications.
- 6. Vitreo-retinal Surgery in RD
 - (a) Indications
 - (b) Techniques
 - (c) Advances in management
- 7. Vitreous surgery in Posterior Segment Ocular Trauma
 - (a) Indications .
 - (b) Techniques.
 - (c) Management of posterior segment IOFB
- 8. Anterior Segment Trauma
 - (a) Cornea.
 - (b) Iris trauma, hyphaema & glaucoma.
 - (c) Lens injuries.
- 9. Chemical injuries
 - (a) Aetiology & Pathology of acid & alkali burns
 - (b) Clinical features of Acid & Alkali Burns.
 - (c) Management of Acid of Alkali Burns.
- 10. Posterior Segment Trauma
 - (a) Pathophysiology.
 - (b) Traumatic retinal Tears & detachment.
 - (c) Traumatic maculopathies.
- 11. Intra ocular foreign bodies.
 - (a) Diagnosis and localization
 - (b) Siderosis and chalocosis.
 - (c) Management.
- 12. Orbital Fractures
 - (a) Classification
 - (b) Examination & evaluation
 - (c) Management.
- 13. Traumatic Endophthalmitis
 - (a) Aetiology and clinical picture.
 - (b) Diagnosis
 - (c) Management
- 14. Important consideration in Trauma
 - (a) Epidemiology.
 - (b) Prevention
 - (c) Medico legal consideration.

SECTION-III

1. Donor Corneal Tissue
 - (a) Legal Aspects Collection and Processing of Donor Tissue.
 - (b) Evaluation of Donor Corneal Tissue.
 - (c) Preservation Techniques.
2. Penetrating Keratoplasty-Surgical Techniques
 - (a) Cutting of Host Cornea.
 - (b) Cutting of Donor Cornea.
 - (c) Suturing Techniques.
3. Corneal Graft Rejection
 - (a) Human Immune System and Immunopathology of Graft Rejection.
 - (b) Risk Factors and Clinical Picture of Graft Rejection.
 - (c) Management of Graft Rejection.
4. Conjunctivitis
 - (a) Bacterial Conjunctivitis and Ophthalmia Neonatorum
 - (b) Viral Conjunctivitis
 - (c) Allergic Conjunctivitis
5. Tear Film-Abnormalities and Management
 - (a) Physiology of Tear Film and Tear Pump
 - (b) Abnormalities in Tear Film and their Diagnosis
 - (c) Management of Tear Film Abnormalities.
6. Dry Eye & Keratomalacia
 - (a) Aetiopathogenesis of xerosis, Keratomalacia and its management.
 - (b) Dry eye syndrome and its medical management
 - (c) Surgical management of Dry eye.
7. Cataract
 - (a) Anatomy & Embryology
 - (b) Physio Pathology.
 - (c) Pathogenesis of age related cataract.
8. Congenital Cataract
 - (a) Aetiology.
 - (b) Types
 - (c) Management.
9. Acquired Cataract
 - (a) Complicated cataract.
 - (b) Traumatic Cataract
 - (c) Other Types.

10. IOLS
 - (a) History, Physical and Chemical Properties & Types
 - (b) Techniques of IOL Implantation.
 - (c) Complications related to IOL
11. Trachoma
 - (a) Immunology, Structure & Pathology & Classification
 - (b) Clinical picture, sequelae and complications.
 - (c) Control & Treatment.
12. Bacterial Keratitis
 - (a) Aetiopathology Lab. Diagnosis.
 - (b) Clinical Picture.
 - (c) Medical and Surgical management.
13. Viral Keratitis
 - (a) Aetiopathology & Lab. Diagnosis.
 - (b) Clinical Picture.
 - (c) Medical & Surgical management.
14. Fungal Keratitis
 - (a) Pathogenesis
 - (b) Clinical Picture
 - (c) Management.
15. Nonieffective corneal ulcers/corneal Degeneration
 - (a) Morren's Unler.
 - (b) Terrain's And Pellucid Degeneration.
 - (c) Other Causes of non-ineffective corneal ulcers.
16. Corneal Dystrophies
 - (a) Epithelial
 - (b) Stromal
 - (c) Endothelial
17. Ectatic Corneal Dystrophies
 - (a) Keratoconus
 - (b) Keratoglobus
 - (c) Management
18. Phacomulsification Surgery
 - (a) Equipment and Instruments and their Principles.
 - (b) Wound Construction and Closure.
 - (c) Nucleus Management and Cortical Clea UP.

19. Secondary IOL Implantation
 - (a) Indications
 - (b) Choice of IOL and Techniques
 - (c) Complications and Problems
20. The Capsule in Cataract Surgery
 - (a) Clinical picture of after cataracts
 - (b) Management of Secondary Pupillary membrane in Aphakia
 - (c) Posterior capsular Dialysis in Catract Surger.
21. Subluxation/Dislocation of Lens
 - (a) Aetiopathogenesis
 - (b) Clinical Picture
 - (c) Management

SECTION-IV

1. Contact Lens and LOW VISION AIDS
 - (a) Physiology
 - (b) Indications/constrains
 - (c) Fitting philosophies (Hard lens)
2. Contact Lens
 - (a) Material and care system
 - (b) C.L. related ocular complications
 - (c) Corneal complications including infective Keratitis
3. Soft contact lenses
 - (a) Characteristics, advantages and disadvantages.
 - (b) Verification of lenses and fitting methods.
 - (c) Care system and complication.
4. RGP lenses
 - (a) Materials and characteristics
 - (b) Fitting problems and their solution.
 - (c) Complications
5. Special fitting situation in
 - (a) Keratoconus and post R.K.
 - (b) Astigmatism, presbyopia
 - (c) Disposable contact lens
6. Contact lens
 - (a) Extended wear contact lens
 - (b) Therapeutic contact lens
 - (c) Disposable contact lens

7. Low Vision Aids (LVA)
 - (a) Definition of low vision and initial examination.
 - (b) Optics of LVA and classification
 - (c) Prescription of PVA & rehabilitation.
Symposium - Refractive Keratoplasty.
8. Surgery for myopia (R. K.)
 - (a) History of R.K.
 - (b) Medicolegal aspect
 - (c) Preoperative evaluation.
9. Radial Keratotomy
 - (a) Predictability in RK and factors
 - (b) Operative technique and instrumentations.
 - (c) Complications and results.
10. Myopia Surgery
 - (a) Scleroplasty and others
 - (b) Epikeratophakia/keratomelusus/intracornea lenses.
 - (c) Clear lens extraction and phakic AC IOLs.
11. Lasers for Myopia Surgery.
 - (a) Laser in corneal surgery and characteristics
 - (b) Wound healing after laser keratotomy.
 - (c) P.R.K.
12. Surgical Management of Astigmatism
 - (a) Terminology & definition, optical & surgical principles
 - (b) Detection and measurement of astigmatism
 - (c) Surgical nomograms
13. Surgeries of Astigmatism.
 - (a) Weakening procedures
 - (b) Strengthening procedures
 - (c) P.R.K.
14. Surgical management of
 - (a) Post R.K. Astigmatism
 - (b) Pathology and management of post R.k.astigmatism
 - (c) Surgical management of post cataract astigmatism.

GLAUCOMA

15. Diagnosis of glaucoma I
 - (a) Tonometry types, standardization, use
 - (b) Gonioscopes
 - (c) Surgical nerve head and nerve fibre layer evaluation.

16. Diagnosis of glaucoma II
 - (a) Basics of Perimetry
 - (b) Comparison of Goldmann's automated
 - (c) Newer Tests for glaucoma
17. Primary Angle closure glaucoma
 - (a) Epidemiology
 - (b) Diagnostic features.
 - (c) Management.
18. Primary open angle glaucoma.
 - (a) Ocular hypertension
 - (b) Low tension glaucoma
 - (c) Management.
19. Congenital glaucoma
 - (a) Types and associations
 - (b) Clinical features
 - (c) Management.
20. Lasers in glaucoma
 - (a) Iridotomy
 - (b) Argon laser trabeculoplasty
 - (c) Other procedures.
21. Medical management of glaucoma
 - (a) Pilocarpine
 - (b) Beta blockers
 - (c) Hyperosmotic agents.

SECTION- V

Pediatric Ophthalmology

1. Basic concepts of genetics, heredity & congenital malformations.
 - (a) Anatomical & Physiological consideration of inheritance
 - (b) Laws of inheritance
 - (c) Natural basis of congenital malformation
2. Eye in infancy
 - (a) Anatomical & physiological considerations
 - (b) Development of vision and its assessment
 - (c) Ophthalmic evaluation of children.
3. Genetically determined metabolic disorders in children.
 - (a) Protein

- (b) Fat
- (c) Carbohydrate & others
- 4. Leucocoria
 - (a) Aetiology & classification
 - (b) Diagnosis and investigations
 - (c) Management
- 5. Management of epiphora
 - (a) Causes
 - (b) Medical management
 - (c) Surgical management
- 6. Management of congenital cataract
 - (a) Aetiology
 - (b) Investigations
 - (c) Plan of management
- 7. Eye in neurological disorders in children
 - (a) Congenital including cranic facial malformations
 - (c) Inflammatry
 - (c) Orchers

OPHTHALMOPLASTY

- 8. Congenital ptosis
 - (a) Anatomy of LPS & principles of ptosis surgery.
 - (b) Surgical procedures
 - (c) Complications of ptosis surgery
- 9. Lid reconstruction
 - (a) Anatomy & basic requirements
 - (b) Small and large defects
 - (c) Defects on medical side
- 10. Contracted socket
 - (a) Etiopathogenesis & principles of management
 - (b) Closed methods of repair conjuctival & skin grafting
 - (c) Dermis fat graft.
- 11. Lacrimal System
 - (a) Anatomy of drainage system & investigative procedures
 - (b) Per 7 days
 - (c) CDCR & other intribation techniques
- 12. Retinoblastoma
 - (a) Clinical examination and diagnosis

- (b) Surgical treatment
- (c) Radiotherapy
- 13. Orbital diseases
 - (a) Proptosis- clinical exam. & common causes
 - (b) Orbital cellulitis
 - (c) Orbit in leukaemia
- 14. Orbital Surgery
 - (a) Anatomy of orbit & S.O.F.
 - (b) Anesthesia & instrumentation with anterior orbitotomy
 - (c) Lateral Orbitotomy.

SECTION – VI

Neuro Ophthalmology

- 1. Papilledema
 - (a) Etiopathogenesis
 - (b) Clinical picture
 - (c) Differential diagnosis
- 2. Optic neuritis
 - (a) Clinical picture
 - (b) Visual prognosis
 - (c) Treatment
- 3. Space occupying lesions of sellar region
 - (a) Intrasellar tumors
 - (b) Supra sellar tumors
 - (c) Parasellar tumors
- 4. Myopathies & disorders of neuromuscular transmission
 - (a) Ocular myopathies
 - (b) Myogthenia-clinical picture & diagnosis
 - (c) Myogthenio- management
- 5. Defects of ocular motility
 - (a) Neural control of ocular movements
 - (b) Examination of ocular motility-Principles & Techniques
 - (c) Topical diagnosis of supra nucleus disorders.
- 6. Nystagmus
 - (a) Definition & classification
 - (b) Physiological & Induced nystagmus

- (c) Pathological nystagmus & topical diagnosis
- 7. Intracranial aneurysms
 - (a) Clinical picture
 - (b) Diagnosis
 - (c) Management

Strabismus

- 8. Binocular vision
 - (a) Fusion, correspondence, diploma
 - (b) Stereopsis & monocular clue
 - (c) Theories of Binocular Vision
- 9. Amblyopia
 - (a) Classification, pathogenesis
 - (b) Clinical features
 - (c) Management
- 10. Paralytic squint
 - (a) Clinical features
 - (b) Investigations
 - (c) Management
- 11. Esodeviation
 - (a) Aetiology & classification
 - (b) Accomodative esotropia
 - (c) Congenital esotropia, microtropia
- 12. Exodeviations
 - (a) Classification, clinical feature
 - (b) Convergence insufficiency & intermittent divergent squint
 - (c) Secondary deviations.
- 13. A-V Patterns
 - (a) Etiology, classification
 - (b) Clinical features, investigations
 - (c) Management
- 14. Special forms of strabismus
 - (a) Duane's retraction syndrome
 - (b) Other restrictive squint
 - (c) Myasthenia and Myopathies.

RESEARCH

Guidelines for the Methodology and Times Schedules for writing thesis at Dr. Rajendra Prasad Centre for Ophthalmic Sciences. All India Institute of Medical Sciences, New Delhi-29.

Time schedule from _____

The start of the Course

STAGES

Stage –I

Allotment of the Subject & Collection of References

The candidate is allotted Thesis Topic within one month of joining as Junior Resident. He should collect reference relevant to the their topic Cross reference from articles should give the candidate enough opportunity to collect these. This can be done from the material available in the library of the Centre, the Institute library, the National Medical Library of the DGHS and any other sources. The candidate shall write each reference as under:

<p>Reference Card</p> <p>TEWARI H.K. AND ZAD R.V. (1981)</p> <p>IND. J.OPHTHAL. 27 :III 24</p> <p>TITLE OF ARTICLE – “Fluorescein Angiography in Central Serous Retinopathy”</p> <p>SUMMARY:</p> <p>READ ARTICLE IN FULL/ABSTRACT ONLY ARTICLE IS IN FOREIGN LANGUAGE/NOT AVAILABLE</p>
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All cards will be arranged in alphabetical order as the words are arranged in a dictionary. Also copy the same reference in the index register. A consolidated typed list in triple spacing shall be given to the guide/guides for scrutiny and for any addition and deletions.

Stage II

4-12 Weeks : Summaries of the Article and Preparation of the Proforma

Summaries of important articles shall be written on the reference card indicated above. Where ever the candidate has not read the article but read only an abstract; indicate it giving reasons i.e. the article is not available or it is in foreign language submit them in batches to guides for correction every week. This process should be completed by 8 weeks.

Writing of Proforma

In consultation with your guides draw out a proforma giving a short review of the subject aims & objects, lacunae in the knowledge and how the work is likely to fill or narrow the gap and contribute towards fresh thoughts and knowledge. The exact to be applied should be spelt out. It may clearly be understood that new parameters have to be included and simple repetitive work shall not be approved.

Stage III

12-14 Weeks

The completed proforma shall be presented to the O.R.A. according to the schedule announced by the

Secretary. The approved proforma has to be transmitted to the Dean of the Institute by the end of 4th Month.

The candidates and the guides should make sure that all facilities for the work to start are available and that the proposed project will be completed in the scheduled item.

Stage IV

4 to 6 months : Review of Relevant Literature Pilot Experiments & Standardization of Techniques

These experiments should be started immediately after the submission of the proforma and techniques standardized. A full write up of the methodology to be employed be now prepared and got approved by the guides before the candidate passes on to the next stage. At this time the candidate should also prepare a proforma for recording observations and get it approved by his guides. Changes if any required in the mandate given by the O.R.A. should also be presented to the O.R.A. for approval giving reasons as to why the original mandate cannot be carried out.

Stage V

6 to 12 months : Actual Experimental Work on the Project

The work should be started immediately and completed in 10 months. Observations should be regularly made and recorded. Each group/subgroup experiments and observations should be got scrutinized and certified by the guides.

Stage VI

12 to 18 months

Follow up observation, data processing etc. should be carried out during the period.

Stage VII

14 to 24 months : Presentation, Writing and Submission of Thesis and Paper for Publication

In the beginning of the 24th month the candidate shall present his observations to O.R.A. and shall critically discuss the conclusion drawn by him. He shall incorporate the suggestions from the house and shall then proceed with the final write of the thesis under the following headings.

1. Introduction
2. Relevant Review of literature
3. Methodology and Material
4. Observations
5. Discussions
6. Summary and conclusions in this a clear out indication should be given as/in what way this work has advanced the knowledge, by the addition of what original thoughts and parameters.
7. References

A certificate in the prescribed form shall be issued by all guides and then the thesis shall be submitted to Chief Organiser for onward transmission.

The candidate in consultation with the Chief guide shall submit the manuscript of the papers that are to be extracted from the thesis. He shall also prepare slides for projection and photographs for the papers for publication.

At the completion of this stage, all microscopic slides, negatives of microphotographs, other

photographs, specimens, tracing, recordings, election microscopic photographs should be submitted to the Chief Organizer for proper filling cum/or/exhibition at the Centre.

FINAL EVALUATIN (CLINICAL) LIST OF PAPERS

Paper I Basic Sciences as applied to Ophthalmology including optics.

Paper II Ophthalmology and Ophthalmic Pathology.

Paper III Ophthalmology and Ophthalmic Surgery.

Paper IV Other clinical sciences as applied to Ophthalmology.

Speciality Clinics

Section-I

- i) Retina - Vitreous
- ii) Medical Ophthalmology
- iii) Uvea

Section-II

- i) Vitreo Retina
- ii) Trauma

Section-III

- i) Lens
- ii) Cornea and Eye Bank Services

Section-IV

- i) Contract Lense
- ii) Cornea & Ocular surface disorder
- iii) Refractive Surgery.

Section-V

- i) Pediatric Ophthalmology
- ii) Ophthalmoplasty

Section-VI

- i) Ocular Motility and Amblyopia
- ii) Neuro – Ophthalmology
- iii) Glaucoma

Mobile Comprehensive Rural Eye Care Unit

Dr. Rajendra Prasad Centre for Ophthalmic Sciences

New Delhi-110029

Dr. Rajendra Prasad Centre for Ophthalmic Sciences periodically sets up camp through Mobile Comprehensive Eye Care Units in remote rural area in Delhi and neighboring States. These are multipurpose camps unlike the mobile eye camp run for relief work by various private charitable hospitals and Institutions.

Aims & Objectives

1. General survey for the prevalence of various eye disease.
2. To educate people in the methods of prevention of eye diseases, proper care of the eyes to ensure better and lasting eye sight.
3. To provide medical and surgical treatment in the control and care of eye disease.
4. To detect early visual defects and to provide suitable glasses and low visual aids at subsidized rates.
5. To help rehabilitation of the incurable blind in their own surroundings by training them in the art of daily living mobility and vocational training.

Set up of the Mobile Comprehensive Rural Eye Care Unit

Mobile Comprehensive Rural Eye Care Unit is supervised by faculty of Dr. Rajendra Prasad Centre for Ophthalmic Sciences and comprises of the following. The team is constituted for each camp depending upon the work load and availability of facilities at each camp.

- | | |
|--------------------------------------|-----------|
| 1. Senior Surgeon (Faculty) | One |
| 2. Community Ophthalmology Faculty | One |
| 3. Senior Resident | One |
| 4. Clinical Residents | Two-Three |
| 5. Health Educator | One |
| 6. Health Assistant/Field Supervisor | One |
| 7. Theatre Sister | One |
| 8. O.T. Assistant | One |
| 9. Technician | One |
| 10. Optometrist | One |
| 11. Cook | One |
| 12. Rehabilitation Assistant | One |
| 13. Driver | Two |

The camp of Mobile Comprehensive Rural Eye Care Unit is organised several times in a year. Each camp lasts for about 10 days depending upon the need and resources of the place.

EYE CAMPS FOR IMPARTING

Training to Clinical Residents

For the training of the postgraduate in community ophthalmology the Centre organizes minimum of 18 (three by each unit) comprehensive eye care camps every year. Senior postgraduate students and House surgeons are stationed at the camp site and study the organizational aspects for conducting a camp in scientific lines. They study the village organization meet the local authorities and leaders to learn regarding the health problems of that community with particular reference to ocular diseases.

The first 6-7 days of the camp are devoted to publicity for prevention of blindness, registration, examination and operations. During the next 3-4 days they conduct school clinics & general survey for eye diseases of small group of population and visits to small village industry is conducted. During this period, they assess the local problem and offer advice to the people. Patients who are incurably blind and those partially blind are advised for rehabilitation in their own surroundings.

OPERATIONS FOR POSTGRADUATES

Should be able to do

Familiar with (Assisting in)

Lids

- Entropion different methods
- Ectropion (uncomplicated)
- Electrolysis
- Tarsorrhaphy
- Chalazion

- Ptosis
- Lid repair

Sac

- Dacryocystectomy
- Dacryocystorhinostomy

- Fistula repair
- Complicated sac Surgery

Muscle

- a) Horizontal Muscle Surgery
 - i) Recession
 - ii) Resection
 - iii) Other Shortening & Lengthening process

- Vertical Recti and oblique muscle surgery
- Faden
- Adjustable
- Transplantation of muscles

Cornea and Conjunctive

- Cyst removal
- Carbolisation
- Tattooing
- Conjunctival flap
- Pterygium
- Paracentesis

- Keratoplasty
 - a) Lamellar
 - b) Penetrating
 - c) Therapeutic
 - d) Cystoid Degeneration
 - e) Radial Keratotomy
 - f) LASIK

Lens

- Cataract surgery by various methods
- Intracapsular extraction
- Extracapsular extraction
- Phaco (small incision Cataract surgery)
- Combined operation for Glaucoma & Catarect
- Surgery on subluxated lens
- I.O.L.

Iris and cliliarybody & glaucoma

- Yag laser Iridotomies
- Trabeculectomy
- Cyclodestructive procedures
- Optical iridectomy
- Microsurgery for glaucoma like goniotomy
- Laser trabeculotomy ect.
- Glaucoma Seton Operation

Retina & Vitreous

- Peuitomy
- Vitreous biopsy
- Intravitreal Injection
- Detachment
- Photocoagulation/Laser
- Removal of retinal cyst
- Vitreous surgery
- Vitreoretinal surgery

Orbit and globe

- Enucleation with and without implants
- Evisceration
- Orbitotomies
- Exenteration

Injuries

- Repair of wounds
- Removal of extra ocular Ocular foreign bodies
- Handling of operating
- Removal of Intra ocular foreign bodies.
- Microscopy

PATHOLOGY — M D

1. BROAD GOALS

The goals of MD Pathology course is to produce a specialist who is competent to provide laboratory-based diagnosis of illness, is able to teach undergraduates and to a certain extent postgraduates, and should have an idea regarding the rudiments of research. He or she should on successfully completing the training and examination be:

- 1.1. capable of offering a high quality diagnostic opinion in a given clinical situation with an appropriate and relevant sample of tissue, blood, body fluid, etc. for the purpose of diagnosis and overall wellbeing of the ill.

1.1.A. It must be emphasised that with the development of newer specialised areas such as Molecular Biology and Laboratory Medicine, the MD (Pathology) may not be sufficient to train and equip candidates to be equally versatile in these specialties which may have been partly under the realm of Pathology. Therefore appropriate expectations need to be drawn from time to time. For example, it is likely that in future, Hematology as is practiced by Pathologists in this country today, maybe the subject of the super-specialist Hematologist. It is however to be expected that the MD (Pathology) course of Indian Universities should provide sufficient training, competence and confidence in practice and diagnosis related to Histopathology (Surgical Pathology), Cytopathology, Hematology & Blood-Banking and Laboratory Medicine. Wherever possible the course should provide an opportunity to give some knowledge of the newer diagnostic specialties so that the candidate on qualifying in MD (Pathology) should be able to pursue further specialisation and training in these fields.

- 1.2 able to teach and share his knowledge and competence with others

1.2.A. Pathology forms the basis of understanding, diagnosis and hence the treatment of diseases. It is therefore an essential subject in the training and curriculum of various undergraduate and postgraduate courses of medicine and allied disciplines such as nursing etc. The MD (Pathology) course should therefore provide an opportunity to candidates to teach colleagues and students. There is a dearth of inspiring teachers and hence the course should attempt to bring out the best of such talents in these candidates so that, when given

an opportunity, the successful candidate is equipped to take this responsibility in an academic institution. It is also expected that this aspect of the training of the candidate will enhance the capacity of expression and ability to explain scientific data in simple and unambiguous terms.

1.3 capable of pursuing clinical and laboratory based research.

1.3.A. The training should include means by which the student can pursue research either independently or as a part of a team. This would inculcate a spirit of enquiry and also make it possible to accurately record observations, analyse rationally and arrive at an unbiased conclusion of problems. This entire facet is essential to the overall practice of Pathology. It is recommended that a Thesis or Dissertation be included as a part of partial fulfillment to the award of the degree of MD (Pathology).

2. BROAD OBJECTIVES (AT THE END OF THE COURSE)

2.1. Cognitive Domain

- 2.1.1. Diagnose routine and complex clinical problems on the basis of Histopathology (Surgical Pathology) and Cytopathology specimens, Blood and Bone Marrow examination and various tests under the domain of Laboratory Medicine (Clinical Pathology, Clinical Biochemistry/Chemical Pathology) as well as Blood Banking (Transfusion Medicine).
- 2.1.2. Interpret clinical and laboratory data with reasonable accuracy.
- 2.1.3. Able to correlate clinical and pathology data so that various clinical signs, symptoms and manifestations of disease can be correlated and explained.
- 2.1.4. Advice on the nature of appropriate specimens and the tests necessary to arrive at a diagnosis in a difficult or problematic case.
- 2.1.5. To be able to correlate clinical and laboratory findings with pathology findings at autopsy, identify discrepancies and the causes of death due to diseases (apart from purely metabolic causes).
- 2.1.6. Should be able to teach Pathology to undergraduates, postgraduates, nurses and paramedical staff including laboratory personnel.
- 2.1.7. Carry out research.
- 2.1.8. Maintain accurate records of tests and their results for reasonable periods of time so that these may be retrieved as and when necessary.
- 2.1.9. Make and record observations systematically that is of use for archival purposes and for furthering the knowledge of Pathology.
- 2.1.10. Able to systematically write a paper and publish in a journal.
- 2.1.11. Able to present a paper in a conference through an oral presentation and poster presentation.
- 2.1.12. Should be able to identify problems in the laboratory and offer solutions thereof so that a high order of quality control is maintained.
- 2.1.13. Should be capable of effectively disposing laboratory waste to ensure minimisation of risk to infection and accidents to laboratory personnel.

- 2.1.14. Able to supervise and work with subordinates and colleagues in a laboratory.
- 2.1.15. Subject himself/herself to continuing education and constantly update his/her knowledge of recent advances in Pathology and allied subjects.

2.2. Psychomotor Domain

- 2.2.1. Able to perform most of the routine tests in a Pathology Laboratory including grossing of specimens, processing, cutting of paraffin sections making smears, making frozen-sections and staining.
- 2.2.2. Able to collect specimens by routinely performed non-invasive out-patient procedures such as venepuncture, finger-prick, fine needle aspiration biopsy of superficial lumps and bone-marrow aspirates. It is implied that the complications of these procedures and handling of complications are apparent. Further, whenever necessary must be able to provide appropriate help to colleagues performing an invasive procedure such as a biopsy or an imaging guided biopsy.
- 2.2.3. Perform an autopsy, dissect various organ complexes and display the gross findings.
- 2.2.4. Should be familiar with the function, handling and routine care of equipment in the laboratory.

2.3. Affective Domain

- 2.3.1. Should be able to function as a part of a team that is essential for the diagnosis and management of a patient. He/she should therefore develop an attitude of cooperation with his/her colleagues so necessary for this purpose. It is implied that he/she will whenever necessary interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
- 2.3.2. Always adopt ethical principles and maintain proper etiquette in his/her dealings with patients, relatives and other health personnel.
- 2.3.3. Respect the rights of the patient including the right to information and second opinion.
- 2.3.4. Should seek and give second opinion only where necessary.
- 2.3.5. Provide leadership and inspire members of the team with whom he/she is involved with in the fields of diagnostic pathology, teaching and research.
- 2.3.6. Develop communication skills not only to word reports and professional opinions but also to interact with patients, relatives, peers and paramedical staff.

3. COURSE DESCRIPTION

3.1. Duration of Course

It is recommended that the course of Doctor of Medicine (Pathology) or M.D. (Pathology) be of THREE YEARS duration in the form of a Residency Programme that is FULL TIME.

Eligibility

- 3.2.1. The essential qualification shall be MBBS Degree of any Indian University/ Deemed University/Autonomous Institutions etc., as recognised by the Medical Council of India (MCI).
- 3.2.2. Postgraduate Diploma in Clinical Pathology (DCP) may be taken as an added qualification for the eligibility of a candidate only if such a clause is recognised by the rules and

regulations of any particular university/ deemed university/autonomous institution etc.

- 3.2.3. Any other qualification of a foreign university that is recognised by the MCI and the concerned university as equivalent to the MBBS Degree.

3.2.3.A. *The guidelines in such situations are obviously beyond the scope of this curriculum and can be provided by the competent authorities only.*

3.3. Selection

It is recommended that the selection be made on the basis of an entrance examination with Multiple Choice Questions of the level of MBBS, including all subjects of the MCI recognised MBBS course and preferably with atleast 10% of questions testing cognition in Pathology. A separate additional paper in Pathology (predominantly MBBS level with 10% questions testing higher levels) would be ideal.

3.3.A. *It is appreciated that individual universities or equivalent bodies/institutions will have their own methods of selection.*

4. SCOPE OF TRAINING

While professional training in all branches is equally important, since they are inter-dependent and competitive, a balance of emphasis is desirable, as a guideline to the student. It must be appreciated that within the time period of the Training Programme which covers a wide range of subjects and subspecialties, it is difficult, if not impossible, to achieve full proficiency in all the technological methods and available theoretical knowledge. The following categorization is recommended.

4.1. High Degree of Professional Competence

In the following fields in which a high degree of professional competence and theoretical knowledge is expected. The candidate is expected to know both the theoretical as well as practical aspects especially related to diagnosis of appropriate diseases.

4.1.1. Pathologic Anatomy (Surgical Pathology and Cytopathology)

The study of Pathologic Anatomy includes all aspects of Pathology as encompassed in the branches of General Pathology and Systemic Pathology. Therefore only the broad outlines are provided and a compendium of chapters as available in standard books is avoided.

4.1.1.1. General Pathology:

Normal cell and tissue structure and function. The changes in cellular structure and function in disease. Causes of disease and its pathogenesis. Reaction of cells, tissues, organ systems and the body as a whole to various sublethal and lethal injury.

4.1.1.1.A. *The scope of General Pathology is vast and the above is a guideline that in essence covers all aspects.*

4.1.1.2. Systemic Pathology:

The study of normal structure and function of various organ systems and the aetiopathogenesis, gross and microscopic alterations of structure and function of these organ systems in disease.

4.1.1.2.A. All organ systems are to be studied. This forms the basis of Histopathology (Surgical Pathology), Cytopathology, Autopsy Pathology and clinico-pathological correlation.

4.1.2. Haematology

The study of Haematology includes all aspects of the diseases of the blood and bone marrow. This would involve the study of the normal and the causes of diseases and the changes thereof.

4.2. Reasonable working knowledge

In the following fields the student is expected to achieve reasonable working knowledge and diagnostic skill, and be able to run independently a routine service in a teaching hospital, and if necessary, at some future date, with some additional effort acquire the level of competence as in **4.1**. Some centers have separate degrees/diplomas/postgraduate courses for some of these subjects. However, current practice of pathology, both institutional or otherwise demands a reasonable working knowledge of these subjects and therefore until such time as the situation demands, these subjects should be an integral part of post-graduate training in pathology.

4.2.1. Laboratory Medicine (Clinical Chemistry/Clinical Biochemistry/Chemical Pathology and Microscopy/Clinical Pathology including Parasitology).

4.2.2. Transfusion Medicine (Blood–Banking).

4.3. General Acquaintance

Following are the fields in which the student is expected to acquire a general acquaintance of techniques and principles and competence to understand and interpret data without being called upon to achieve technologic proficiency.

4.3.1. Immunopathology

4.3.2. Electron microscopy

4.3.3. Histochemistry

4.3.4. Immunohistochemistry

4.3.5. Use of radioisotopes

4.3.6. Cytogenetics

4.3.7. Tissue culture

4.3.8. Medical statistics

4.3.9. Molecular Biology

4.3.10. Maintenance of records

4.3.11. Information retrieval, Computer, Internet in medicine.

4.3.A. It is expected that the level of proficiency that is to be expected may vary. Therefore the level of competence in Immunopathology assumes importance in the interpretation of Renal Diseases. Similarly the findings on Immunohistochemistry may be as important as the findings on light microscopy in a particular case.

5. COURSE CONTENT

Unlike the undergraduate syllabus, it is difficult to give a precise outline of the Course Content for postgraduate training. A postgraduate appearing for the MD degree is supposed to have acquired not only professional competence expected of a well-trained specialist but also academic maturity, a capacity to reason and critically analyse a set of scientific data. He is supposed to keep himself *au courant* with the latest developments in the field of the pathology and related sciences. A brief outline of what is expected to have learnt during each of the postings in the different sections/laboratories during the MD Course will be given under each head.

5.1. Surgical Pathology

5.1.1. Knowledge

- 5.1.1.1. The student should be able to demonstrate understanding of the histogenetic and patho-physiologic processes associated with various lesions during discussions with colleagues, clinicians, students and patients.
- 5.1.1.2. Should be able to identify problems in the laboratory and offer viable solutions.

5.1.2. Skills

- 5.1.2.1. Given the clinical and operative data, the student should be able to identify, and systematically and accurately describe the chief gross anatomic alterations in the surgically removed specimens and be able to correctly diagnose at least 80 percent of the lesions received on an average day from the surgical service of an average teaching hospital.
- 5.1.2.2. A student will be able to demonstrate ability to perform a systematic gross examination of the tissues including the taking of appropriate tissue sections and in special cases as in intestinal mucosal biopsies, muscle biopsies and nerve biopsies, demonstrate the orientation of tissues in paraffin blocks.
- 5.1.2.3. Given the relevant clinical, operative and radiological data, the student should be able to identify and systematically and accurately describe the chief histomorphological alterations in the tissue received in the surgical pathology service. He/she should also correctly interpret and as far as possible, correlate with the clinical data to diagnose at least 90% of the routine surgical material received on an average day. He/she should be able to diagnose at least 75% of the classical lesions being commonly encountered in the surgical pathology service without the aid of the clinical data.
- 5.1.2.4. Start the automatic tissue-processing machine and verbally demonstrate his understanding of the principles of its running.
- 5.1.2.5. Process a tissue, make a paraffin block and cut sections of good quality on a rotary microtome.
- 5.1.2.6. Stain paraffin sections with at least the following:
 - (i) Haematoxylin and eosin
 - (ii) Stains for collagen, elastic fibers and reticulin
 - (iii) Iron stain
 - (iv) PAS stain

- 5.1.2.7. Demonstrate understanding of the principles of:
 - (i) Fixation of tissues
 - (ii) Processing of tissues for section cutting
 - (iii) Section cutting and maintenance of related equipment
 - (iv) Differential (Special) stains and their utility
- 5.1.2.8. Cut a frozen section of tissues received from the operating room for quick diagnosis, stain and interpret the slide in correlation with the clinical data provided, and correctly diagnose at least 75 per cent of the lesions within 15 minutes.
- 5.1.2.9. Demonstrate the understanding of the utility of various immunohistochemical stains especially in the diagnosis of tumour subtypes.

5.2. Autopsy Pathology

5.2.1. Knowledge

- 5.2.1.1. Should be aware of the technique of autopsy.
- 5.2.1.2. Should have sufficient understanding of various disease processes so that a meaningful clinico-pathological correlation can be made.

5.2.2. Skills

- 5.2.2.1. Demonstrate ability to perform a complete autopsy independently with some physical assistance, correctly following the prescribed instructions. Correctly identify all major lesions which have caused, or contributed to, the patient's death on macroscopic examination alone in at least 90% of the autopsies in an average teaching hospital. In exceptional circumstances, help of a frozen section may be obtained.

<p>5.2.2.1.A. <i>In places where non-medicolegal autopsies are not available each student/candidate should be made to dissect organs from atleast five medico-legal autopsies.</i></p>
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- 5.2.2.2. Identify and correctly diagnose at least 90% of the microscopic lesions found in most autopsies, and be able to correlate the pathologic changes with the patient's clinical history and events of a few days preceding death.
- 5.2.2.3. Write correctly and systematically Provisional and Final Anatomic Diagnosis reports (on gross and microscopy respectively), the major findings at autopsy, and the Autopsy Protocol as per prescribed instructions, of a standard fit for an international journal.

5.3. Cytopathology

5.3.1. Knowledge

- 5.3.1.1. Should possess the background necessary for the evaluation and reporting of Cytopathology specimens.
- 5.3.1.2. Demonstrate verbal familiarity with, and guide the clinical residents in the following, keeping in view the special requirements of each case (Cyto-hormonal status, malignancy, infection, etc.)

- (i) Choice of site from which smears may be taken (as in the case of vaginal smears)
- (ii) Type of smear (morning specimen, after specimen, pre-menstrual specimen, etc.)
- (iii) Method of obtaining various specimens (urine sample, gastric smear, colonic lavage etc.)

5.3.2. Skills

- 5.3.2.1. Independently prepare and stain good quality smears for cytopathologic examination and be conversant with the principles and preparation of solutions of stains.
- 5.3.2.2. Demonstrate conversance with the techniques for concentration of specimens: i.e. various filters and cytocentrifuge.
- 5.3.2.3. Independently be able to perform fine needle aspiration of palpable superficial lumps in patients; make good quality smears, and be able to decide on the type of staining in a given case.
- 5.3.2.4. Given the relevant clinical data, he/she should be able to independently and correctly :
 - (i) Evaluate hormonal status in all cases as may be required.
 - (ii) Diagnose the status of malignancy or otherwise in at least 75% of the cases received in a routine laboratory and categorize them into negative, inconclusive and positive.
 - (iii) Demonstrate ability in the technique of screening and dotting the slides for suspicious cells.
 - (iv) Indicate correctly the type of tumour, if present, in at least 75% cases.
 - (v) Identify with reasonable accuracy the presence of organisms, fungi and parasites in atleast 75% of cases.

5.4. Haematology

5.4.1. Knowledge

- 5.4.1.1. Should demonstrate the capability of utilising the principles of the practice of Haematology for the planning of tests, interpretation and diagnosis of diseases of the blood and bone marrow.
- 5.4.1.2. Should be conversant with various equipments used in the Haematology laboratory.
- 5.4.1.3. Should have knowledge of automation and quality assurance in Haematology.

5.4.2. Skills

- 5.4.2.1. Correctly plan a strategy of investigating at least of the cases referred for special investigations in the Hematology Clinic and give ample justification for each step in consideration of the relevant clinical data provided.
- 5.4.2.2. Correctly and independently perform the following special tests, in addition to doing the routine blood counts:

- (i) Haemogram including Reticulocyte and Platelet counts.
- (ii) Bone marrow staining including stain for iron
- (iii) Blood smear staining
- (iv) Cytochemical characterization of leukemia with special stains like Peroxidase, Leukocyte Alkaline Phosphatase (LAP), PAS, Sudan Black, Oil Red O, Acid Phosphatase (including Tartarate resistant) and Non-specific esterase
- (v) Osmotic fragility
- (vi) Fetal Haemoglobin
- (vii) Sickling phenomenon
- (viii) Bleeding time
- (ix) Clotting time
- (x) Prothrombin time (PT)
- (xi) Activated partial thromboplastin time (APTT)
- (xii) Haemoglobin electrophoresis, paper electrophoresis
- (xiii) Coombs Test
- (xiv) Clot Solubility Test

5.4.2.3. Demonstrate familiarity with the principle and utility in diagnosis of the following:

- (i) Red cell indices
- (ii) Plasma haemoglobin
- (iii) Haemosiderin in urine
- (iv) Presumptive tests for complete antibodies
- (v) Ham's Acid test
- (vi) Sugar water test
- (vii) Serum electrophoresis
- (viii) Platelet function tests including platelet aggregation and adhesion and PF3 release
- (ix) Russell's viper venom time (RVVT)
- (x) Coagulation Factor assays
- (xi) Screening for coagulation factor inhibitors
- (xii) Fibrin Degradation Products (FDP), D-Dimers
- (xiii) Monitoring of anticoagulant therapy
- (xiv) Tests for thrombosis: Lupus anticoagulant (LAC), Anticardiolipin Antibody (ACA), Activated Protein C Resistance (APCR), Protein C (Pr C), Protein s (Pr S), Antithrombin III (AT III)
- (xv) Serum ferritin

(xvi) Serum iron and total iron binding capacity

(xvii) Immunophoretic typing

(xviii) Cytogenetics

5.4.2.2. Demonstrate verbally and in writing, his/her understanding of the principles of the above tests their utility in diagnosis and interpretation of results.

5.4.2.3. Perform a successful bone marrow aspiration/iliac crest biopsy and stain the peripheral and bone marrow smears with Romanowsky stains.

5.4.2.4 Describe accurately the morphologic findings in the peripheral and bone marrow smears, identifying and quantitating the morphologic abnormalities in disease states and arriving at a correct diagnosis in at least 90% of the cases referred to the Haematology clinic, given the relevant clinical data.

5.4.2.5. Possess working knowledge of the following:

(i) Bone marrow transplantation

(ii) Prenatal diagnosis of genetic haematological diseases

(iii) Molecular biology of haematological diseases

5.5. Laboratory Medicine

5.5.1. Knowledge

5.5.1.1. Demonstrate familiarity with the normal range of values of the chemical content of body fluids, significance of the altered values and interpretation thereof.

5.5.1.2. Possess knowledge of the principles of following specialized organ function tests and the relative utility and limitations of each and significance of the altered values.

(i) Renal function test

(ii) Liver function test

(iii) Gastric and Pancreatic function

(iv) Endocrine function test

(v) Tests for malabsorption

5.5.1.3. Explain the biochemical principles involved in the above estimations.

5.5.1.4. Know the principles, advantages and disadvantages scope and limitation of Automation in laboratory.

5.5.1.5. Learn the principles and methodology of quality control in laboratory.

5.5.2. Skills

5.5.2.1. Plan a strategy of laboratory investigation of a given case, given the relevant clinical history and physical findings in a logical sequence, with a rational explanation of each step. He should be able to correctly interpret the laboratory data of such studies, and discuss their significance with a view to arrive at a diagnosis.

5.5.2.2 Demonstrate familiarity with and successfully perform a routine Urinalysis including Physical, Chemical and Microscopic, examination of the sediment.

- 5.5.2.3 Demonstrate familiarity with and successfully perform the macroscopic and microscopic examination of Faeces and identify the ova and cysts of common parasites.
- 5.5.2.4. Independently and successfully perform a complete examination; physical, chemical and cell content of Cerebrospinal Fluid (C.S.F). , Pleural and Peritoneal fluid.
- 5.5.2.5. Successfully perform an examination of Peripheral Blood for the commonly occurring parasites.
- 5.5.2.6. Independently perform a Semen analysis.
- 5.5.2.7. Independently and correctly perform at least the following Quantitative Estimations by Manual Techniques and/or Automated Techniques.
 - (i) Blood urea
 - (ii) Blood sugar
 - (iii) Serum Proteins total & fractional
 - (iv) Serum Bilirubin total & fractional
 - (v) Serum amylase
- 5.5.2.8. Demonstrate familiarity with the following Quantitative Estimations by Automated Techniques.
 - (i) Serum cholesterol*
 - (ii) Uric acid
 - (iii) Serum Transaminases (ALT and AST/SGOT and SGPT)
 - (iv) Serum Alkaline Phosphatase
 - (v) Creatinine*
 - (vi) Serum calcium and phosphorous
 - (vii) Serum Electrolyte (Na⁺ and K⁺)

5.5.2.8.A. **Must also be familiar with the manual method*
- 5.5.2.9. Demonstrate familiarity with:
 - (i) Determination of bicarbonates
 - (ii) Blood gas analysis.
- 5.5.2.10. Prepare standard solutions and reagents relevant to the above tests, including the preparation of normal solution, molar solution and Buffers.
- 5.5.2.11. Explain the principle of Instrumentation, use and application of the following instruments.
 - (i) Photoelectric colorimeter
 - (ii) Spectrophotometer
 - (iii) pH meter
 - (iv) Flame photometer
 - (v) Centrifuge

- (vi) Analytical balance
- (vii) Electrophoresis apparatus
- (viii) Light Microscope
- (ix) Blood gas analyser

5.6. Transfusion Medicine (Blood Banking)

5.6.1. Knowledge

It is expected that students should possess knowledge of the following aspects of Transfusion Medicine.

- 5.6.1.1. Basic immunology
- 5.6.1.2. ABO and Rh groups
- 5.6.1.3. Clinical significance of other blood groups
- 5.6.1.4. Transfusion therapy including the use of whole blood and RBC concentrates.
- 5.6.1.5. Blood component therapy.
- 5.6.1.6. Rationale of pre-transfusion testing.
- 5.6.1.7. Infections transmitted in blood.
- 5.6.1.8. Adverse reactions to transfusion of blood and components
- 5.6.1.9. Quality control in blood bank

5.6.2. Skills

It is expected that the student shall correctly and independently perform the following.

- 5.6.2.1. Selection and bleeding of donors
- 5.6.2.2. Preparation of blood components i.e. Cryoprecipitates, Platelet concentrate, Fresh Frozen Plasma, Single Donor Plasma, Red Blood Cell concentrates.
- 5.6.2.3. ABO and Rh grouping.
- 5.6.2.4. Resolving ABO grouping problems by secretor status in saliva and expanded panel.
- 5.6.2.5. Demonstrate familiarity with Antibody screening by
 - (i) LISS (Low-ionic salt solution)
 - (ii) Enzymes
 - (iii) AHG (Anti-Human Globulin)
- 5.6.2.6. Steps to be taken if the above are positive.
- 5.6.2.7. Demonstrate familiarity with Crossmatching by
 - (i) LISS (Low-ionic salt solution)
 - (ii) Enzymes
 - (iii) AHG (Anti-Human Globulin)
- 5.6.2.6. Steps to be taken if there is incompatibility.
- 5.6.2.7. Demonstrate familiarity with Antenatal and Neonatal work
 - (i) Direct antiglobulin test

- (ii) Antibody screening and titre
- (iii) Selection of blood for exchange transfusion
- 5.6.2.8. Demonstrate familiarity with principle and procedures involved in
 - (i) Resolving ABO grouping problems.
 - (ii) Identification of RBC antibody.
 - (iii) Investigation of transfusion reaction.
 - (iv) Testing of blood for presence of
 - (a) HBV (Hepatitis B Virus Markers).
 - (b) HCV (Hepatitis C Virus Markers)
 - (c) HIV (Human Immunodeficiency Virus Testing)
 - (d) VDRL

5.7. Basic Sciences (in relation to Pathology)

5.7.1. Immunopathology

5.7.1.1. Knowledge

- (i) Demonstrate familiarity with the current concepts of structure and function of the immune system, its aberrations and mechanisms thereof.
- (ii) Demonstrate familiarity with the scope, principles, limitations and interpretations of the results of the following procedures employed in clinical and experimental studies relating to immunology.
 - (a) ELISA techniques
 - (b) Radioimmuno assay
 - (c) HLA typing

5.7.1.2. Skills

- (i) Perform and interpret simple immunological tests used in diagnosis of diseases and in research procedures.
 - (a) Immunoelectrophoresis
 - (b) Immunofluorescence techniques especially on kidney and skin biopsies
 - (c) Countercurrent electrophoresis for demonstration of antigen
 - (d) Latex agglutination
- (ii) Perform and interpret:
 - (a) Anti-nuclear Factor (ANF)
 - (b) Anti-neutrophil cytoplasmic antibody (ANCA)

5.7.2. Electron Microscopy

5.7.2.1. Knowledge

- (i) Demonstrate familiarity with Principles and techniques of electron microscopy and the working of an electron microscope (including Transmission and Scanning Electron microscope: TEM and SEM)

5.7.2.2. Skills

- (i) Perform proper fixation, processing and staining of tissues for electron microscopy.
- (ii) Recognise the appearance of the normal subcellular organelles and their common abnormalities (when provided with appropriate photographs).

5.7.3. Enzyme Histochemistry**5.7.3.1. Knowledge**

Should be familiar with the principles, use and interpretation of common enzyme histochemical procedures (Alkaline Phosphatase, Acid Phosphatase, Glucose-6-Phosphate Dehydrogenase, Succinyl Dehydrogenase, Chloroacetate Esterase, Gamma-glutamyl Transpeptidase and Acetyl Cholinesterase).

5.7.3.2. Skills

- (i) Operate the cryostat, and demonstrate familiarity with the principles of its working and be able to stain tissue sections for some cell constituents.
- (ii) Demonstrate familiarity with the commonly used enzyme histochemical procedures.

5.7.4. Immunohistochemistry**5.7.4.1. Knowledge**

Demonstrate familiarity with the principles and exact procedures of various immunohistochemical stains using both PAP (Peroxidase-Antiperoxidase) and ABC (Avidin-Biotin Conjugate) Systems; employing monoclonal and polyclonal antibodies.

5.7.4.2. Skills

Be able to perform immunohistochemical staining using paraffin section with at least one of the commonly used antibodies (*Cytokeratin or LCA*) using PAP method.

5.7.5. Molecular Biology**5.7.5.1. Knowledge**

Should understand the principles of Molecular biology especially related to the understanding of disease processes and its use in various diagnostic tests.

5.7.5.2. Skills

Should be conversant with the steps of a Polymerase Chain Reaction (PCR) and should demonstrate understanding of the steps and principles of interpretation of Western Blot, Southern Blot, Northern Blot and Hybridisation procedures.

5.7.6. Principles Of Medical Statistics**5.7.6.1. Knowledge**

Demonstrate familiarity with importance of statistical methods in assessing data from patient material and experimental studies e.g., correlation coefficients, expected versus observed, etc. and their interpretation.

5.7.6.2. Skills

Calculate means, standard deviation and standard error from the given experimental data

5.7.7. Radio Isotope and Autoradiography**5.7.7.1. Knowledge**

Demonstrate familiarity with the principles of the commonly used radioisotopes in medicine and autoradiography, and the instruments used to measure radioactivity.

5.7.8. Tissue Culture**5.7.8.1. Knowledge**

Demonstrate familiarity with methods of tissue culture.

5.7.9. Cytogenetics**5.7.9.1. Knowledge**

Demonstrate familiarity with methods of Karyotyping and Fluorescent in-situ Hybridisation (FISH).

5.A. Important Note

- (i) It is appreciated that the facilities in Institutions vary and this is more likely in the case of Basic Sciences Training. All efforts must be made so that the student gets an opportunity to be familiar with all the aspects of expected training that have been mentioned. If necessary extra-mural postings may be considered to take care of any likely shortcomings in the training. It must be emphasised that the training for the degree of MD (Pathology) is not merely to produce a diagnostic pathologist well versed with routine diagnosis but also to ensure all-round development of the student who will be an asset to the society as a responsible teacher and scientist.
- (ii) Development of knowledge and skills in fields not mentioned explicitly should be encouraged. Thus knowledge in imaging techniques and their interpretation would be an asset while interpreting diseases of bones and joints. Knowledge regarding the nature of therapy for various diseases would be helpful not only in identifying iatrogenic diseases but also in actively participating in the diagnosis and management of patients. The relevance of every report of a patient thus becomes more easily understood. No branch of medicine is today restricted or isolated to it. The overall well being of the sick is a team-effort. The student must learn that working, as a team is essential today.
- (iii) It should be the endeavor of every training programme to emphasise on quality control and also on the limitations of each and every test.

6. RESEARCH

All effort must be made so that research methodology is apparent at the end of the course. It is recommended that students submit a Thesis or Dissertation six months prior to examinations as a partial fulfillment to the award of the degree of MD (Pathology). Students should be encouraged to present papers in conferences and publish papers in peer reviewed journals. Due emphasis must be laid on the

importance of obtaining ethical clearance from appropriate committees for both animal and human studies.

A separate course for training in research methodology may not be necessary. Skills will be acquired largely depending on the topic of research. The following points are guidelines to what may be expected of the student at the end of the course.

- 6.1. Recognise a research problem – basic or applied
- 6.2. Clearly state the objectives in terms of what is expected to be achieved in the end.
- 6.3. Plan rational approaches with appropriate controls with full awareness of the statistical validity of the size of experimental material.
- 6.4. Carry out most of the technical procedures required for the study.
- 6.5. Accurately and objectively record on systematic lines the results and observations made.
- 6.6. Analyse the data with the aid of an appropriate statistical analysis, if necessary.
- 6.7. Interpret the observations in the light of existing knowledge and highlight in what ways the study has advanced existing knowledge on the subject and what further remains to be done.
- 6.8. Take photomicrographs, of a quality fit for publication in an international journal
- 6.9. Write the thesis or a scientific paper in accordance with the prescribed instructions, as expected of international standards.

6.A. *It should be appreciated that a clear definition of the goals and precise objectives before starting a research project is as essential as stating one's destination before starting for the journey. These must be stated in clear, unambiguous terms as ultimate results of the study and not as the methods of approach to the problem.*

7. TRAINING METHODS

Human pathology consists of two fundamentally inter-related disciplines: the function of the cell, an integration and correlation of the structural and functional alterations undergone by it and the organ and body as a whole in disease. The superstructure is constituted by diagnostic pathology concerned with the application of the above knowledge, and that of the investigative procedures in the recognition and quantitation of disease. In the training of a pathologist, acquisition of both these disciplines is essential. Eventually, the primary role of the pathologist is to apply the basic understanding of the disease processes to patient care, with the intellectual rigor and careful delineation of problems, characteristic of the research investigator. The training programme should be designed to enable the student to acquire a capacity to learn and investigate for himself, to synthesize and integrate a set of facts and develop a faculty to reason. The curricular programmes and scheduling of postings must provide the student with opportunities to embrace the above broad objectives. *Much of the learning is to be accomplished by the student himself. Interactive discussions are to be preferred over didactic sessions.* The student must blend as an integral part of the activities of an academic department that usually revolves around three equally important basic functions of teaching, research and service. As mentioned earlier the emphasis is recommended under a residency programme or learning while serving/working. The following is a rough guideline to various teaching/learning activities that may be employed.

- 7.1. Collection of specimens including Fine needle aspiration of superficial lumps.
- 7.2. Grossing of specimens.

- 7.3. Performing autopsies.
- 7.4. Discussions during routine activities such as during signing out of cases.
- 7.5. Presentation and work-up of cases including the identification of special stains and ancillary procedures needed.
- 7.6. Clinico-pathological conferences.
- 7.7. Intradepartmental and interdepartmental conferences related to case discussions.
- 7.8. Conferences, Seminars, Continuing Medical Education (CME) Programmes.
- 7.9. Journal Club.
- 7.10. Research Presentation and review of research work.
- 7.11. Guest and in-house lectures.
- 7.12. Participation in workshops, conferences and presentation of papers etc.
- 7.13. Laboratory-work.
- 7.14. Use and maintenance of equipment.
- 7.15. Maintenance of records.
- 7.16. Teaching undergraduates and paramedical staff.

7.A. For the purpose of thesis/dissertation, as far as possible, each individual must be given the freedom of choice of his/her own subjects he would like to study. He/she should be given an opportunity to apprise himself/herself with topics of current research interests of each member of the faculty. In case the student does not have a preference of his/her own, topics are to be suggested by the faculty who ensure that there is generally an equitable distribution of the postgraduates among the faculty. It is obvious that the thesis or dissertation will be on a topic on which there is general interest, expertise and facilities with the faculty. Interdepartmental collaboration should be encouraged to widen the scope and outlook of the research proposal and training.

8. STRUCTURED TRAINING PROGRAMME

A structured scheme of training is recommended so that every student is exposed to different aspects of the subject and acquires sufficient knowledge and skill as expected from the course. The method by which this is done may vary from institution to institution. However, it is suggested that one senior member of the faculty be given the chief responsibility for organising and coordinating this programme and any enquiries may be made or assistance taken, if necessary, from him/her. The three-year training programme for the M.D. degree may be arranged in the form of postings to different assignments/laboratories for specified periods as outlined below. The period of such assignments/postings is recommended for 35 months. Posting schedules may be modified depending on needs, feasibility and exigencies. It is appreciated that individual institutions may find it convenient to follow a different pattern of posting.

Section/Subject	Duration in months
(i) Surgical Pathology and Autopsy	12
(ii) Surgical Pathology Techniques	1
(iii) Haematology	5

(iv) Cytopathology	4
(vi) Thesis/Dissertation Work	4
(vii) Laboratory Medicine	4
(viii) Transfusion Medicine/Blood Bank	2
(ix) Basic Sciences including Immunopathology, Electronmicroscopy, Molecular Biology, Research Techniques etc.	2
(x) Elective/reorientation	1
Total	35

8.A. *Extramural postings to reputed institutions or to other institutions to learn techniques not available in the parent institution and also to acquire knowledge and skill in some aspects of the course may be encouraged.*

9. EVALUATION

A standardised scheme of evaluation is necessary to train candidates in any teaching programme. Both formative and summative evaluations are therefore mandatory.

9.1. Internal (Formative) Assessment

Internal Assessment should in reality be done everyday to assess the training and to identify the weakness as well as the strength of the candidate. Thus appropriate corrective methods can be adopted at the right time so that a well-trained and competent pathologist worthy of a postgraduate degree is available for the society. However a formal assessment can be recorded at the end of every posting and reviewed every six months.

- 9.1.1. A logbook should be maintained recording the duration of posting, the period of absence, if any, skills performed, and remarks if any by the teacher/faculty member. The logbook should also record journal clubs, seminars attended and partaken as well as undergraduate teaching activities the candidate has participated.
- 9.1.2. Research work should be assessed or reviewed every six months. The protocol and the final results should be presented to the entire department.
- 9.1.3. Evaluation sheets may be incorporated for the purpose of assessment. The following points may be considered in the scheme for evaluation of presentations such as seminars and journal clubs:
 - (i) Choice of article/topic (unless specifically allotted)
 - (ii) Completeness of presentation
 - (iii) Clarity and cogency of presentation
 - (iv) Understanding of the subject and ability to convey the same
 - (v) Whether relevant references have been consulted
 - (vi) Ability to convey points in favour and against the subject under discussion
 - (vii) Use of audio-visual aids
 - (viii) Ability to answer questions

(ix) Time scheduling

(x) Overall performance

In the case of specific postings similar points may be assessed with regard to knowledge and skills. It is also recommended that the candidate be assessed with regard to the following:

- Ability to get along with colleagues
- Conduct with patients and staff

9.1.4. Grading may be done in one of the following ways:

(i) Awarding actual marks

(ii) Awarding scores:

0 = Poor
1 = Below average
2 = Average
3 = Above average
4 = Good

(iii) Awarding grades

A+ = 90% - 100%
A = 80% - 89%
A- = 75% - 79%
B+ = 70% - 74%
B = 60% - 69%
B- = 50% - 59%
C = < 50%

9.1.4.1. The grades must be endorsed by more than one faculty member or an average obtained by pooling the grades of different faculty members. This must be conveyed to the candidate periodically (atleast once in every six months) so that the candidate knows where he or she stands.

9.1.A. *It must be understood that different institutions may have different schemes of internal assessment (including periodical tests). The above scheme is a suggestion that can be modified according to convenience and improved upon. Please see Appendices on page 31 for a sample of some of the Scoring/ Grading schemes.*

9.2. University (Summative) Assessment

The university or summative examination shall be held at the end of three years of the training programme. This would include assessment of the thesis or dissertation and a formal examination on the theoretical and practical aspects of the speciality of Pathology.

9.2.1. The thesis/dissertation should be evaluated by atleast two external examiners well-versed in the topic studied. It is therefore recommended that thesis/dissertation be submitted for evaluation six months prior to the theory and practical examinations. The results of the evaluation should be available prior to the practical examinations. If necessary grades may be awarded as given under 9.1.4.

- 9.2.2. For the formal examinations there should be two external and two internal examiners.
- 9.2.3. The Theory Papers shall be set preferably by the external examiner suitably moderated by the internal examiners.
- 9.2.4. There shall be four theory papers:
 Paper I: Haematology , Transfusion Medicine (Blood Banking) and Laboratory Medicine
 Paper II: Systemic Pathology
 Paper III: General Pathology, Pathophysiology, Immunopathology & Cytopathology
 Paper IV: Recent advances & applied aspects
- 9.2.5. Each paper should have ten short answer questions (SAQ) or one long answer question (LAQ) and six short answer questions (SAQ).
- 9.2.6. Practical Examination should be conducted over a minimum period of two days.
 The following is a guideline of the aspects to be covered:
- (i) Clinical Pathology: Discussion of a clinical case history
 Plan relevant investigations of the above case
 Two investigations should be performed
 Complete urinalysis
 - (ii) Haematology: Discuss haematology cases given the relevant history
 Plan relevant investigations
 Perform atleast two tests preferably including coagulation exercise
 Identify electrophoresis strips, osmotic fragility charts etc.
 Examine, report and discuss ten cases given the history and relevant blood smears and/ or bone marrow aspirate smears
 - (iii) Transfusion: Perform blood grouping
 Medicine Perform the necessary exercise given a relevant history
 - (iv) Histopathology: Examine, report and discuss ten to twelve histopathology
 Cytopathology and three to five cytopathology cases given the relevant history and slides
 Perform a Haematoxylin and Eosin stain and any special stain on a paraffin section
 Report on a frozen section
 - (v) Autopsy: Given a case history and relevant organs (with or without slides) give a list of anatomical diagnosis in a autopsy case.
 - (vi) Gross Pathology: Describe findings of gross specimens, give diagnosis and identify the sections to be processed
 - (vii) Basic Sciences: Identify electronmicrographs
 Identify gels, results of PCR, immunological tests including staining for direct/indirect immunofluorescence
 Identify histochemical and immunohistochemistry stains

- 9.2.7. *Viva-voce* is expected to be conducted at every stage of the practical examination. Additionally a formal “grand” viva-voce may be held at the end of the practical examination. Questions on the thesis/dissertation may be asked at this time.
- 9.2.8. Marking may be done by any of the methods suggested in 9.1.4. Grading rather than actual marking is to be preferred because in a post-graduate examination, which is currently subjective to a large extent, it may be extremely difficult to differentiate performance differences within ranges of 1% to 5%.

9.2.A. The above are guidelines only. It is appreciated that individual universities/institutions may have well-laid out and time-tested methods of examinations. It is recommended that attempts be made to ensure that examinations be as objective as possible. The introduction of structured short answers, multiple choice questions and objective-structured practical examinations (OSPE) may be considered. Nevertheless the value of long answer questions in evaluating a candidate's ability to comprehend and systematically explain scientific literature cannot be undermined. Similarly viva-voce, though subjective allows an in-depth examination of the candidate's strengths and weaknesses in the subject.

10. CRITERIA FOR DEPARTMENTS TRAINING STUDENTS

It is recommended that any department that wishes to train a candidate leading to the award of the post-graduate degree in MD (Pathology) should fulfil the following criteria.

- 10.1. The department should be part of a teaching hospital attached or affiliated to a Medical College and/or University or should be a deemed university or autonomous institution recognised by appropriate authorities including the Medical Council of India.
- 10.2. The institution should have various departments encompassing different medical (includes all aspects of medical sciences and not merely the subject of medicine) specialties and super-specialties so that there is no dearth of clinical material, there is adequate scope of interaction with different departments and overall training of the candidate as given earlier.
- 10.3. The department should be of minimum three years standing performing all routine activities as is necessary to fulfil the training requirements of MD (Pathology).
- 10.4. For the first candidate, there should be a minimum of three faculty members of which one has a minimum of five years and the other two a minimum of three years teaching experience after MD (Pathology) or any such degree recognised by the Medical Council of India.
- 10.5. It is recommended that a maximum of two candidates be admitted for every Professor, three for every two Additional Professors/ Readers/Associate Professors and one for every Assistant Professor/ Lecturer (with three years experience after the requisite qualification). In case there is only one Additional Professor/ Reader/Associate Professor then two candidates may be selected. It must be emphasised that this is a guideline for the calculation of total MD (Pathology) students at any given time in a department.
- 10.6. It is expected that all the Faculty members are full-time employees of the institution concerned.
- 10.7. Every thesis/dissertation shall have one Guide/Supervisor and atleast one Co-guide/Co-supervisor from the department. Co-guides/Co-supervisors from other departments may be opted as necessary. In the event of the Guide/Supervisor leaving or retiring, the senior-most Co-guide/Co-Supervisor from the department shall take over as the Guide/Supervisor. Institutional/

University guidelines are to be followed regarding the appointment of Guides/Supervisors. It is recommended that at any given time one Faculty member should not be the Guide/Supervisor for more than five candidates. No such limit can be applied to Co-guides/Co-supervisors.

10.A. *It must be emphasised that the above are only guidelines and it is necessary to apply the rules and regulations as approved by the Medical Council of India, concerned Universities and the institution.*

11. READING MATERIAL

A complete list of reading material is extremely difficult to provide for the postgraduate student in Pathology. In any postgraduate course reading should not be limited only to the subject of specialisation. One is expected to acquire as much theoretical and practical knowledge as possible. There can be no set guidelines in this regard. Students must be encouraged to utilise the Internet and similar information technologies to further their knowledge and to supplement conventional reading.

The following is an incomplete list of reading material that may be helpful to a postgraduate student of Pathology. The habit of referring to current literature and the method of searching for literature must be made a mandatory component of the training.

11.1 Journals and Periodicals

- Acta Cytologica
- The American Journal of Pathology
- The American Journal of Surgical Pathology
- The American Journal of Hematology
- The American Journal of Clinical Pathology
- Archives of Pathology and Laboratory Medicine
- British Journal of Haematology
- Blood
- Diagnostic Cytopathology
- Histopathology
- Human Pathology
- Indian Journal of Cytology
- Indian Journal of Pathology and Microbiology
- Journal of Pathology
- Journal of Clinical Pathology
- Laboratory Investigation
- Modern Pathology
- Pathology
- Seminars in Hematology
- Seminars in Diagnostic Pathology

- Virchows Archives
- Year Book Series
- Recent Advances Series

The list of journals is incomplete. It is also expected that the students make it a habit to read other journals because pathology is not confined to pathology journals alone. Specialty journals such as those related to oncology (Cancer, British Journal of Cancer, International Journal of Cancer, Cancer Research, Journal of National Cancer Institute, Journal of Surgical Oncology etc.) are excellent sources of information regarding the pathology of tumours. Similarly journals related to Cardiology, Chest Diseases, Dermatology, Endocrinology, Gynecology, Gastroenterology, Hepatology, Nephrology, Neurology, Neurosurgery, etc. are invaluable sources of material on the appropriate pathology. Further Journals such as Lancet, New England Journal of Medicine, Nature and Science are a must for every postgraduate student who wishes to keep abreast with what is new in medical science and therefore in pathology.

11.2. Books

- Histology for Pathologists. *Stephen S. Sternberg (Ed)*, Raven Press, New York.
- General Pathology *JB Walter, MS Israel*. Churchill Livingstone, Edinburgh
- Robbin's Pathologic Basis of Disease *Ramzi S. Cotran, Vinay Kumar, Stanley L Robbins* WB Saunders Co., Philadelphia.
- Pathology *Emanuel Rubin, John L Farber*. JB Lippincott Co., Philadelphia
- Anderson's Pathology. *John M Kissane (Ed)*. The CV Mosby Co., St. Louis
- Ackerman's Surgical Pathology. *Juan Rosai* Mosby. St. Louis
- Diagnostic Surgical Pathology. *Stephen S Sternberg*. Lippincott, William Wilkins. Philadelphia
- Systemic Pathology. *W St. C Symmers (Series Ed)* Churchill Livingstone, Edinburgh
- Diagnostic Histopathology of Tumours. *Christopher DM Fletcher (Ed)*. Churchill Livingstone. Edinburgh.
- Soft Tissue Tumors. *Franz M Enzinger, Sharon W Weiss*. Mosby, St. Louis
- Cardiovascular Pathology *Malcolm D Silver* Churchill Livingstone New York.
- Pathology of Pulmonary Diseases *Mario J Saldhana*. JB Lippincott Co., Philadelphia
- Spencer's Pathology of the Lung. *PS Hasleton*. Mc Graw-Hill, New York.
- Dahlin's Bone Tumors. *K Krishnan Unni*. Lippincott-Raven Publishers, Philadelphia, New York
- Bone Tumours *Andrew G Huvos* WB Saunders Co. Philadelphia
- Greenfield's Neuropathology. *J Hume Adams (Ed)* Edward Arnold, London.
- Russell & Rubenstein's Pathology of the Tumours of the Nervous System. *Darrell D Bigna. Roger E Mc Lendon, Janet M Bruner (Eds.)*, Arnold, London
- Rosen's Breast Pathology. *Paul Peter Rosen*. Lippincott-Raven Publishers, Philadelphia, New York.
- Pathology of the Gastrointestinal Tract. *S-I Chun Ming. Harvey Goldman (Eds.)* Williams & Wilkins, Baltimore.

- Haynes and Taylor Obstetrical & Gynaecological Pathology. *H Fox, M Wells*. Churchill Livingstone New York.
- Heptinstall's Pathology of the Kidney. *J Charles Jenette, Jean L Olson, Melvin M Schwartz, Fred G Silva (Eds.)*. Lippincott-Raven Publishers, Philadelphia, New York.
- Potter's Pathology of the Fetus & Infant. *Enid Gilbert-Barnes (Ed)*. Mosby, St. Louis
- Lever's Histopathology of the Skin, *David Elder (Ed)*, Lippincott-Raven Publishers, Philadelphia, New York
- Theory and Practice of Histological Techniques, *Bancroft JD, Stevens A, Turner DR*, Churchill Livingstone, Edinburgh
- Histotechnology – A Self Instructional Text, *Carson FL*, American Society of Clinical Pathologists, Chicago
- Histochemistry Theoretical and Applied. *AG Everson Pearse*. Churchill Livingstone, Edinburgh
- Manual & Atlas of Fine Needle Aspiration Cytology. *Svante R Orell, Gregory F Sterrett, Max N-I. Walters, Darrel Whitaker*. Churchill Livingstone, London
- Cytopathology. *Zuher M Naib*. Little Brown and Company, Boston.
- Diagnostic Cytology and its Histopathologic Basis, *Koss LG, J.B.* Lippincott, Philadelphia
- Comprehensive Cytopathology, *Bibbo M, W.B.* Saunders Co., Philadelphia
- William's Hematology *Beutler E, Lichtmann MA, Collier BS, Kipps TJ*, McGraw Hill, New York
- Postgraduate Hematology *Hoffbrand AV, Lewis SM, Tuddenham EGD*, Butterworth Heinemann, Oxford
- Wintrobe's Clinical Hematology, *Lee GR, Foerster J, Lupeus J, Paraskevas F, Gveer JP, Rodgers GN*, Williams & Wilkins, Baltimore
- Practical Haematology, *Dacie JV, Lewis SM*, Churchill Livingstone, Edinburgh
- Bone Marrow Pathology, *Bain BJ, Clark DM, Lampert IA*, Blackwell Science, Oxford
- Leukemia Diagnosis- A guide to the FAB Classification, *Bain BJ, J.B.* Lippincott, Philadelphia
- Clinical Diagnosis and Management by Laboratory Methods, *Henry JB*, WB Saunders.(Indian Edition, Eastern Press, Bangalore).

12. APPENDICES

SAMPLE OF SCORING/GRADING SCHEMES

Awarding actual marks	:	Maximum marks	= 100%
		Distinction marks	= Optional
		Class	= First / Second / Pass Class (Optional)
		Pass marks	= 50%

Awarding scores	: 0 = Poor 1 = Below average 2 = Average 3 = Above average 4 = Good
Awarding grades	: A+ = 90% - 100% A = 80% - 89% A- = 75% - 79% B+ = 70% - 74% B = 60% - 69% B- = 50% - 59% C = < 50% : A+ = Excellent A = Very Good B+ = Good B = Average B- = Below Average C = Poor

SAMPLE SHEET FROM LOG BOOK

Posting: Surgical Pathology	Dates From: 01.01.2000 To: 31.01.2000
Dates on Leave: Nil	Total Days Absent: Nil

Record of Tests/Procedures Performed							
<i>Sl No</i>	<i>Test/Procedure</i>	<i>No</i>	<i>Remarks</i>	<i>Sl No</i>	<i>Test/Procedure</i>	<i>No</i>	<i>Remarks</i>
01	Frozen Section	10		06			
02	Oil Red O Stain	01		07			
03	PAS Stain	01		08			
04	VVG	01		09			
05				10			

Record of Academic Activities Attended							
<i>Sl No</i>	<i>Activity</i>	<i>Date</i>	<i>Remarks</i>	<i>Sl No</i>	<i>Activity</i>	<i>Date</i>	<i>Remarks</i>
01	Journal Club			06	Dermatopath Conf		
02	Slide Seminar			07	Case Study		
03	Cytopath Conf			08	Lab Med Conf		
04	Hemat Conf			09			
05	Combined Rounds			10			

Remarks by Faculty: Has worked satisfactorily. Needs more practice to improve the speed of preparing frozen sections. Grossing and observation of microscopy are good.

Date: _____

Signature of Faculty Member

Record of Undergraduate Teaching Attended						
<i>Sl No</i>	<i>System</i>	<i>Date</i>	<i>Theory</i>	<i>Practical</i>	<i>Tutorial</i>	<i>Faculty Signature</i>
01	Inflammation	1-10 Jan 00	02	01	Nil	
02	Respiratory System	11-28 Jan 00	06	03	01	
03	Renal System	29/01/00- 14/02/ 00	04	03	02	

Similar records may be obtained for other postings, academic activities, leave etc.

MODEL EVALUATION SHET FOR ACADEMIC ACTIVITIES/ PRESENTATIONS

Journal Club/Seminar

Name:

Topic:

Date:

Sl No	Points to be considered	Score of Faculty Members				
		01	02	04	04	05
01	Choice of article (Journal Club) or topic of seminar (if not allotted)					
02	Understanding of the subject					
03	Whether relevant cross-references and articles have been consulted					
04	Overall preparation					
05	Whether strengths, weaknesses & controversies have been presented					
06	Cogency of presentation					
07	Use of audio-visual aids					
08	Response to questions					
09	Time scheduling					
10	Overall Performance					
MEAN SCORE						
Guidance to the scoring scheme that is to be adopted may be incorporated and separate sheets may be circulated to individual Faculty Members that can be compiled subsequently. Signatures of the Faculty Members should be obtained in the appropriate sheets.						

MODEL ASSESSMENT RECORD

Name:		Date of Admission: 01 Jan 2000 Assessment Period: Jan-Jun 2000			
Posting/Characteristic		Score	Posting/Characteristic		Score
Posting	Surgical Pathology		Academic	Journal Club/Seminar	
	Cytopathology		Research	Aptitude	
	Haematology			Competence	
	Transfusion Medicine			Overall Performance	
	Laboratory Medicine		Service	Aptitude	
	Autopsy			Performance	
	Others (Please Specify)		Attitude towards patients/colleagues		
Attendance	Regularity & Punctuality		Responsibilities towards duties		
Special Remarks if any: <div style="display: flex; justify-content: space-between; align-items: center;"> <div>OVERALL GRADING*:</div> <div style="border: 1px solid black; width: 40px; height: 20px;"></div> </div>					
Date:		Signature of Head/ Faculty-in-charge			

- *Grading may be done from A+(Excellent) to C (Poor) as in Page 31 or in another predetermined scheme.
- One form is to be filled for each candidate by each Faculty Member and the results consolidated.
- If a student is not posted in a particular branch during the period under review then this must be noted.
- All Grades especially those indicative of "Below average" or "Poor" performance must be communicated to the student/candidate.

PEDIATRICS — M D

1. GOAL

The goal of M D course in Pediatrics is to produce a competent pediatrician who:

- (i) recognizes the health needs of infants, children and adolescents and carries out professional obligations in keeping with principles of National Health Policy and professional ethics;
- (ii) has acquired the competencies pertaining to pediatrics that are required to be practiced in the community and at all levels of health care system;
- (iii) has acquired skills in effectively communicating with the child, family and the community;
- (iv) is aware of the contemporary advances and developments in medical sciences as related to child health;
- (v) is oriented to principles of research methodology; and
- (vi) has acquired skills in educating medical and paramedical professionals.

2. OBJECTIVES

At the end of the MD course in Pediatrics, the student should be able to:

- (i) recognize the key importance of child health in the context of the health priority of the country;
- (ii) practice the specialty of Pediatrics in keeping with the principles of professional ethics;
- (iii) identify social, economic, environmental, biological and emotional determinants of child and adolescent health, rehabilitative, preventive and promotive measures to provide holistic care to children;
- (iv) recognize the importance of growth and development as the foundation of Pediatrics; and help each child realize her/his optimal potential in this regard;
- (v) take detailed history, perform full physical examination including neuro-development and behavioral assessment and anthropometric measurements of the child and make clinical diagnosis;
- (vi) perform relevant investigative and therapeutic procedures for the pediatric patient;
- (vii) interpret important imaging and laboratory results;

- (viii) diagnose illness in children based on the analysis of history, physical examination and investigative work up;
- (ix) plan and deliver comprehensive treatment for illness in children using principles of rational drug therapy;
- (x) plan and advise measures for the prevention of childhood disease and disability;
- (xi) plan rehabilitation of children suffering from chronic illness and handicap, and those with special needs;
- (xii) manage childhood emergencies efficiently;
- (xiii) provide comprehensive care to normal, 'at risk' and sick neonates;
- (xiv) recognize the emotional and behavioral characteristics of children, and keep these fundamental attributes in focus while dealing with them;
- (xv) demonstrate empathy and humane approach towards patients and their families and respect their sensibilities;
- (xvi) demonstrate communication skills of a high order in explaining management and prognosis, providing counseling and giving health education messages to patients, families and communities;
- (xvii) develop skills as a self-directed learner, recognize continuing educational needs; use appropriate learning resources, and critically analyze relevant published literature in order to practice evidence based pediatrics;
- (xviii) demonstrate competence in basic concepts of research methodology and epidemiology;
- (xix) facilitate learning of medical/nursing students, practicing physicians, para-medical health workers and other providers as a teacher-trainer;
- (xx) play the assigned role in the implementation of national health programs, effectively and responsibly;
- (xxi) organize and supervise the desired managerial and leadership skills;
- (xxii) function as a productive member of a team engaged in health care, research and education.

3. SYLLABUS

General Guidelines – during the training period effort must always be made that adequate time is spent in discussing child health problems of public health importance in the country or a particular region.

3.1 Topics

3.1.1 Growth and development:

- ♦ principles of growth and development
- ♦ normal growth and development in childhood and adolescence
- ♦ normal newborn
- ♦ normal growth and development,
- ♦ sexual maturation and its disturbances
- ♦ failure to thrive and short stature.

3.1.2 Neonatology :

- ♦ perinatal care
- ♦ care in the labor room and resuscitation
- ♦ prematurity
- ♦ common transient phenomena
- ♦ low birth weight
- ♦ newborn feeding
- ♦ respiratory distress
- ♦ apnea

- ♦ infections
- ♦ jaundice
- ♦ neurologic disorders
- ♦ renal disorders
- ♦ thermoregulation and its disorders
- ♦ anemia and bleeding disorders
- ♦ gastrointestinal disorders
- ♦ malformations
- ♦ understanding of perinatal medicine

3.1.3 Nutrition :

- ♦ maternal nutritional disorders; impact on fetal outcome
- ♦ infant feeding including complementary feeding
- ♦ protein energy malnutrition
- ♦ adolescent nutrition
- ♦ nutritional management of systemic illness (celiac disease, hepatobiliary disorders, nephrotic syndrome)
- ♦ nutrition for the low birth weight
- ♦ breast feeding
- ♦ vitamin and mineral deficiencies
- ♦ obesity
- ♦ parenteral and enteral nutrition in neonates and children

3.1.4 Cardiovascular :

- ♦ congenital heart diseases (cyanotic and acyanotic)
- ♦ infective endocarditis
- ♦ disease of myocardium (cardiomyopathy, myocarditis)
- ♦ hyperlipidemia in children
- ♦ rheumatic fever and rheumatic heart disease
- ♦ arrhythmia
- ♦ diseases of pericardium
- ♦ systemic hypertension

3.1.5 Respiratory :

- ♦ congenital and acquired disorders of nose
- ♦ tonsils and adenoids
- ♦ congenital anomalies of lower respiratory tract
- ♦ foreign body in larynx trachea & bronchus
- ♦ trauma to larynx
- ♦ neoplasm of larynx and trachea
- ♦ bronchitis
- ♦ aspiration pneumonia
- ♦ acute pneumonia
- ♦ suppurative lung disease
- ♦ atelectasis
- ♦ emphysema and hyper-inflation
- ♦ pulmonary edema
- ♦ infections of upper respiratory tract
- ♦ obstructive sleep apnea
- ♦ acute inflammatory upper airway obstruction
- ♦ subglottic stenosis (acute and chronic)
- ♦ bronchiolitis
- ♦ GER
- ♦ recurrent and interstitial pneumonia
- ♦ lung cysts
- ♦ bronchial asthma
- ♦ bronchiectasis

- ♦ pleural effusion
- ♦ mediastinal mass

3.1.6 Gastrointestinal and liver disease :

- ♦ disease of mouth
- ♦ disorders of deglutition and esophagus
- ♦ H. pylori infection
- ♦ congenital pyloric stenosis
- ♦ malabsorption syndrome
- ♦ irritable bowel syndrome
- ♦ hirschsprung's disease
- ♦ hepatitis
- ♦ chronic liver disease
- ♦ Budd-Chiari syndrome
- ♦ cirrhosis and portal hypertension
- ♦ oral cavity and tongue
- ♦ peptic ulcer disease
- ♦ foreign body
- ♦ intestinal obstruction
- ♦ acute and chronic diarrhea
- ♦ ulcerative colitis
- ♦ anorectal malformations
- ♦ hepatic failure
- ♦ Wilson's disease
- ♦ metabolic diseases of liver

3.1.7 Nephrologic & Urologic disorders :

- ♦ acute and chronic glomerulonephritis
- ♦ hemolytic uremic syndrome
- ♦ VUR and renal scarring
- ♦ renal tubular disorders
- ♦ congenital and hereditary renal disorders
- ♦ posterior urethral valves
- ♦ undescended testis
- ♦ nephrotic syndrome
- ♦ urinary tract infection
- ♦ renal involvement in systemic diseases
- ♦ renal and bladder stones
- ♦ hydronephrosis, voiding dysfunction
- ♦ Wilm's tumor

3.1.8 Neurologic disorders :

- ♦ seizure and non-seizure paroxysmal events
- ♦ meningitis
- ♦ brain abscess
- ♦ acute encephalitis and febrile encephalopathies
- ♦ neurocysticercosis and other neuroinfestations
- ♦ SSPE
- ♦ neurometabolic disorders
- ♦ neuromuscular disorders
- ♦ learning disabilities
- ♦ acute flaccid paralysis and AFP surveillance
- ♦ movement disorders of childhood
- ♦ malformations
- ♦ epilepsy and epileptic syndromes of childhood
- ♦ coma
- ♦ Guillain-Barre syndrome
- ♦ HIV encephalopathy
- ♦ cerebral palsy
- ♦ neurodegenerative disorders
- ♦ mental retardation
- ♦ muscular dystrophies
- ♦ ataxia
- ♦ CNS tumors

3.1.9 Hematology & Oncology :

- ♦ deficiency anemias
- ♦ aplastic anemia
- ♦ thrombocytopenia
- ♦ blood component therapy
- ♦ bone marrow transplant/stem cell transplant
- ♦ myelodysplastic syndrome
- ♦ non-Hodgkin's lymphoma
- ♦ hypercoagulable states
- ♦ hemolytic anemias
- ♦ pancytopenia, disorders of hemostasis
- ♦ transfusion related infections
- ♦ acute and chronic leukemia
- ♦ Hodgkin disease
- ♦ neuroblastoma

3.1.10 Endocrinology :

- ♦ hypopituitarism/hyperpituitarism
- ♦ pubertal disorders
- ♦ adrenal insufficiency
- ♦ adrenogenital syndromes
- ♦ hypoglycemia
- ♦ gonadal dysfunction and intersexuality
- ♦ diabetes insipidus
- ♦ hypo- and hyper-thyroidism
- ♦ Cushing's syndrome
- ♦ diabetes mellitus
- ♦ short stature
- ♦ obesity

3.1.11 Infections :

- ♦ bacterial
- ♦ fungal
- ♦ rickettsial
- ♦ protozoal infection
- ♦ protozoal and parasitic
- ♦ HIV
- ♦ control of epidemics and infection prevention
- ♦ viral
- ♦ parasitic
- ♦ mycoplasma
- ♦ tuberculosis
- ♦ nosocomial infections
- ♦ monitoring for nosocomial infections
- ♦ safe disposal of infective material

3.1.12 Emergency & Critical care :

- ♦ emergency care of shock
- ♦ respiratory failure
- ♦ status epilepticus
- ♦ fluid and electrolyte disturbances and its therapy
- ♦ poisoning
- ♦ scorpion and snake bites
- ♦ cardio-respiratory arrest
- ♦ acute renal failure
- ♦ acute severe asthma
- ♦ acid-base disturbances
- ♦ accidents

3.1.13 Immunology & Rheumatology :

- ♦ arthritis (acute and chronic)
- ♦ T and B cell disorders
- ♦ connective tissue disorders
- ♦ immuno-deficiency syndromes

3.1.14 ENT :

- ♦ acute and chronic otitis media
- ♦ post-diphtheritic palatal palsy
- ♦ conductive/sensorineural hearing loss

- ◆ acute/chronic tonsillitis/adenoids
- ◆ foreign body

3.1.15 Skin Diseases :

- ◆ exanthematous illnesses
- ◆ pigment disorders
- ◆ infections: pyogenic
- ◆ Steven-Johnson syndrome
- ◆ seborrheic dermatitis
- ◆ urticaria
- ◆ ichthyosis

3.1.16 Eye problems :

- ◆ refraction and accommodation
- ◆ night blindness
- ◆ strabismus
- ◆ retinopathy of prematurity
- ◆ optic atrophy

3.1.17 Behavioral & Developmental disorders :

- ◆ rumination
- ◆ enuresis
- ◆ sleep disorders
- ◆ breath holding spells
- ◆ mood disorders
- ◆ attention deficit hyperactivity disorders

3.1.18 Social pediatrics :

- ◆ national health programs related to child health
- ◆ child labor
- ◆ disability and rehabilitation
- ◆ national policy of child health and population

3.1.19 Genetics :

- ◆ principles of inheritance
- ◆ chromosomal disorders
- ◆ multifactorial/polygenic disorders
- ◆ prenatal diagnosis

3.1.20 Orthopedics :

- ◆ major congenital orthopedic deformities
- ◆ tubercular

- ◆ allergic rhinitis/sinusitis

- ◆ vascular lesions
- ◆ vesicobullous disorders
- ◆ fungal and parasitic
- ◆ eczema
- ◆ drug rash
- ◆ alopecia

- ◆ partial/total loss of vision cataract
- ◆ chorioretinitis
- ◆ conjunctival and corneal disorders
- ◆ retinoblastoma
- ◆ pailledema

- ◆ pica
- ◆ encopresis
- ◆ habit disorders
- ◆ anxiety disorders
- ◆ temper tantrums
- ◆ autism

- ◆ child abuse and neglect
- ◆ adoption
- ◆ rights of the child
- ◆ juvenile delinquency

- ◆ pedigree drawing
- ◆ single gene disorders
- ◆ genetic diagnosis

- ◆ bone and joint infections: pyogenic
- ◆ common bone tumors

3.2 Approach to Important Clinical Problems

3.2.1 Growth and development :

- ◆ precocious and delayed puberty
- ◆ impaired learning
- ◆ developmental delay

3.2.2 Neonatology :

- ◆ normal newborn
- ◆ sick newborn
- ◆ low birth weight newborn

3.2.3 Nutrition :

- ◆ lactation management and complementary feeding
- ◆ failure to thrive
- ◆ protein energy malnutrition (underweight, wasting, stunting) and micronutrient deficiencies

3.2.4 Cardiovascular :

- ◆ murmur
- ◆ congestive heart failure
- ◆ arrhythmia
- ◆ cyanosis
- ◆ systemic hypertension
- ◆ shock

3.2.5 GIT and liver :

- ◆ Acute diarrhea
- ◆ abdominal pain and distension
- ◆ vomiting
- ◆ gastrointestinal bleeding
- ◆ hepatosplenomegaly
- ◆ persistent and chronic diarrhea
- ◆ ascites
- ◆ constipation
- ◆ jaundice
- ◆ hepatic failure and encephalopathy

3.2.6 Respiratory :

- ◆ Cough/chronic cough
- ◆ wheezy child
- ◆ hemoptysis
- ◆ noisy breathing
- ◆ respiratory distress

3.2.7 Infections :

- ◆ acute onset pyrexia
- ◆ recurrent infections
- ◆ nosocomial infections
- ◆ prolonged pyrexia with and without localizing signs

3.2.8 Renal :

- ◆ Hematuria/dysuria
- ◆ voiding dysfunctions
- ◆ bladder/bowel incontinence
- ◆ renal failure (acute and chronic)

3.2.9 Hematoncology :

- ◆ lymphadenopathy
- ◆ bleeding
- ◆ anemia

3.2.10 Neurology :

- ♦ limping child
- ♦ abnormality of gait
- ♦ macrocephaly & microcephaly
- ♦ acute flaccid paralysis
- ♦ headache
- ♦ convulsions
- ♦ paraplegia, quadriplegia
- ♦ floppy infant
- ♦ cerebral palsy and other neuromotor disability

3.2.11 Endocrine :

- ♦ thyroid swelling
- ♦ obesity
- ♦ precocious & delayed puberty
- ♦ ambiguous genitalia
- ♦ short stature

3.2.12 Skin/Eye/ENT :

- ♦ skin rash
- ♦ pain/discharge from ear
- ♦ epistaxis
- ♦ blindness
- ♦ eye discharge
- ♦ squint
- ♦ pigmentary lesions
- ♦ hearing loss
- ♦ refractory errors
- ♦ cataract
- ♦ redness
- ♦ proptosis

3.2.13 Miscellaneous :

- ♦ habit disorders
- ♦ arthralgia
- ♦ arthritis
- ♦ hyperactivity and attention deficit syndrome
- ♦ multiple congenital anomalies

3.3 Skills**3.3.1 History and examination :**

- ♦ history taking including psychosocial history
- ♦ newborn examination, including gestation assessment
- ♦ nutritional anthropometry and its assessment
- ♦ SMR rating
- ♦ full systemic examination
- ♦ communication with children parents
- ♦ genetic counseling
- ♦ physical examination including fundus examination
- ♦ assessment of growth
- ♦ use of growth chart
- ♦ developmental evaluation
- ♦ health functionaries and social support groups

3.3.2 Bedside procedures :***Therapeutic skills :***

- ♦ hydrotherapy
- ♦ endotracheal intubation
- ♦ administration of oxygen
- ♦ nasogastric feeding
- ♦ cardiopulmonary resuscitation (pediatric and neonatal)

- ♦ venepuncture and establishment of vascular access
- ♦ parenteral nutrition
- ♦ intrathecal administration of drugs
- ♦ administration of fluids, blood blood components
- ♦ intraosseous fluid administration
- ♦ common dressings abscess drainage

Investigative skills :

- ♦ blood sampling – venous and arterial
- ♦ ventricular tap
- ♦ peritoneal, pericardial and subdural tap
- ♦ liver biopsy
- ♦ collection of urine for culture, urethral catheterization suprapubic aspiration
- ♦ lumbar puncture
- ♦ bone marrow aspiration and biopsy
- ♦ kidney biopsy
- ♦ muscle and nerve biopsy

Bedside investigations :

- ♦ hemoglobin, TLC, ESR,
- ♦ urine: routine and microscopic examination
- ♦ stool microscopy including hanging drop preparation
- ♦ Gram stain
- ♦ shake test on gastric aspirate
- ♦ peripheral smear staining and examination
- ♦ examination of CSF and other body fluids
- ♦ ZN stain

3.3.3 Interpretation :

- ♦ interpretation of X-rays of chest, abdomen, bone and skull
- ♦ ECG;
- ♦ common EEG patterns
- ♦ audiograms
- ♦ ABG findings; ultrasound and CT scan
- ♦ ultrasonographic abnormalities and isotope studies

3.4 Understanding of Basic Sciences :

- ♦ embryogenesis of different organ systems especially heart, genitourinary system, gastrointestinal tract
- ♦ applied anatomy of different organs
- ♦ Physiology of micturition and defecation
- ♦ placental physiology, fetal and neonatal circulation
- ♦ regulation of temperature (especially newborn)
- ♦ acid base balance
- ♦ calcium metabolism
- ♦ hematopoiesis, hemostasis
- ♦ growth and development at
- ♦ nutrition
- ♦ functions of kidney, liver, lungs, heart and endocrine glands
- ♦ blood pressure
- ♦ fluid electrolyte balance
- ♦ vitamins and their functions
- ♦ bilirubin metabolism
- ♦ puberty and its regulation
- ♦ different ages

- ♦ normal requirements of various nutrients
- ♦ principles of basic immunology, bio-statistics managerial skills
- ♦ pharmacokinetics of commonly used drugs
- ♦ basics of genetics and molecular biology
- ♦ teaching methodology and and clinical epidemiology
- ♦ microbial agents and their epidemiology

3.5 Community and Social Pediatrics

- ♦ national health nutrition programs
- ♦ prevention of blindness
- ♦ prevention of sexually transmitted diseases
- ♦ health legislation
- ♦ adoption
- ♦ juvenile delinquency
- ♦ investigation of adverse events following immunization in the community
- ♦ general principles of prevention and control of infections including food borne
- ♦ soil born and vector born diseases
- ♦ nutrition screening of community
- ♦ school health programs
- ♦ contraception
- ♦ national policy on children
- ♦ child labor
- ♦ government and non-government support services for children
- ♦ waterborne
- ♦ investigation of an outbreak in a community

4. TEACHING PROGRAM

4.1 General Principles

- Acquisition of practical competencies being the keystone of postgraduate medical education, postgraduate training should be skills oriented.
- Learning in postgraduate program should be essentially self-directed and primarily emanating from clinical and academic work. The formal sessions are merely meant to supplement this core effort.

4.2 Formal Teaching Sessions

<i>Activity</i>	<i>Frequency</i>	<i>Preceptor</i>	<i>Evaluator</i>
Journal Club	Once a week	SR & Faculty	2 faculty members other than the Preceptor

Case Discussion

Pediatrics

all JR	Once in 15 days	Faculty	Faculty
Bedside	Morning – 4 times a week	Faculty (Unit)	Faculty (Unit)
	Evening – twice a week	SR	SR

Other Specialties

Hematology	Once in 3 weeks	Hematology Faculty	
Pediatric Cardiology	Once in 2 weeks	Cardiology Faculty	Cardiology Faculty
Mortality audit	Thrice a month	Senior Resident & Faculty	
Statistics PICU	Once in three month	PICU Faculty	
Statistics NICU	Once a year	SR NICU Faculty	
Interesting/difficult cases	Once a month	Faculty	
Pediatrics Radiology	Once a week	SR & Faculty	
Conference			
Seminar	Once a week	SR & Faculty	2 Faculty members other than the preceptor

Faculty Lectures

Pediatrics	Once a month	Faculty	
Other specialties			
Pediatric Surgery	2 in each semester	Peds. Surgery Faculty	
Dermatology	2 in each semester	Dermatology Faculty	
Psychiatry/			
Psychology	2 in each year	Psychiatry Faculty	
Biostatistics	2 in each year	Biostatistics Faculty	
Communication			
Skills	1 in each semester		
Ethical & Legal Issues	1 in each year		
Departmental Symposium	1 in each semester	Resident & Faculty	Faculty other than preceptor

4.3 Rotations

Postgraduate student must rotate through all clinical units of the department. This is especially important for him to get Pediatric subspeciality training.

- Neonatology (NICU) - 6 months
- Intensive Care (PICU) - 5 months
- Each Unit
- Unit I - 6-8 months
Subspeciality – Nephrology gastro-enterology, hepatology
- Unit II - 6-8 months
Neurology, endocrinology, genetics

- Unit III - 6-8 months
Oncology, pulmonology,
rheumatology & tuberculosis
- Pediatric Cardiology - 2 months

(All Units also provide general pediatric care in addition to subspeciality).

PGS should also attend subspeciality clinics during their respective Unit postings.

5. THESIS

5.1 Objectives

By carrying out a research project and presenting his work in the form of thesis, the student will be able to:

- (i) identify a relevant research question;
- (ii) conduct a critical review of literature;
- (iii) formulate a hypothesis;
- (iv) determine the most suitable study design;
- (v) state the objectives of the study;
- (vi) prepare a study protocol;
- (vii) undertake a study according to the protocol;
- (viii) analyze and interpret research data, and draw conclusions,
- (ix) write a research paper.

5.2 Guidelines

While selecting thesis topics, following should be kept in mind :

- (i) the scope of study should be limited so that it is possible to conduct it within the resources and time available to the student;
- (ii) the emphasis should be on the process of research rather than the results;
- (iii) the protocol, interim progress as well as final presentation must be made formally to the entire department;
- (iv) only one student per teacher/thesis guide;
- (v) periodic department review of the thesis work as per following schedule :
 - End of 4 months - Submission of protocol
 - 6 months prior to examination - Final presentation and submission

6. ASSESSMENT – INTERNAL AND FINAL

6.1 General Principles

- The assessment should be valid, objective, and reliable.
- It must cover cognitive, psychomotor and affective domains.
- Formative, continuing and summative (final) assessment should be conducted in theory as well as practicals/clinicals. In addition, thesis should be assessed separately.

6.2 Overall Weightage

Internal assessment - 30%

Final summative examination - 70%

6.2.1 Formative assessment

The formative assessment should be continuous as well as end-of-term. The former should be based on the feedback from the senior residents and the unit faculty concerned. End-of-term assessment should be held at the end of each semester (upto the 5th semester). Formative assessment will not count towards pass/fail at the end of the program, but will provide feedback to the candidate.

6.2.2 Internal assessment

Proposed Internal Assessment

<i>Items</i>	<i>Weightage</i>	<i>Timing of Assessment</i>	<i>Evaluators</i>
1. Personal attributes* (details)	30%	At end of each posting	Faculty in-charge and Senior Resident
2. Clinical skills and performance	40%	At end of each posting	Faculty in-charge and Senior Resident
3. Academic activities			
i. Journal Club, Seminars, Case discussion	10%	Ongoing	Faculty preceptor, Faculty (Other than preceptor)
ii. End of each semester** Theory exam.	10%	End semester	Faculty
iii. End of each semester*** Practical exam.	10%	End semester	Faculty

*Personal attributes :

- Availability : Punctual, available continuously on duty, responds promptly to calls, takes proper permission for leave.
- Sincerity and motivation : Dependable, honest, admits mistakes, does not falsify information, exhibits good moral values, loyal to institution, has initiative, takes on responsibilities, goes beyond routine work, exhibits keen desire to learn.
- Diligence and performance : Dedicated, hardworking, does not shirk duties, leaves no work pending, competent in clinical case work up and management, skilled in procedures, proficient in record keeping and file work.
- Academic ability : Intelligent, shows sound knowledge and skills, participates adequately in academic activities, and performs well in oral presentation and departmental tests.
- Interpersonal skills : Has compassionate attitude towards patients, gets on well with colleagues and paramedical staff.

****Syllabus for end semester theory exams :**

Semester I. Growth and development, behavioral disorder, nutrition, immunization, infectious disease, biostatistics.

Semester II. Respiratory system, gastroenterology, hepatology and neurology.

Semester III. Neonatology, emergencies, nephrology and endocrinology.

Semester IV. Hematology, hemat oncology immunology, genetics, behavioral and psychological adolescent health disorders, social and preventive pediatrics and other specialities.

Semester V. Whole syllabus

Theory assessment at the end of each semester will consist of 5 short answer questions.

*** End semester practical exam – one case, Viva, OSCE (Neonatology)

6.2.3 Summative Assessment

- Ratio of marks in theory and practicals will be equal.
- The pass percentage will be 50%.
- Candidate will have to pass theory and practical examinations separately.

Theory :

Paper 1 : Basic sciences as applied to pediatrics	25%
Paper 2 : Neonatology and community pediatrics	25%
Paper 3 : General pediatrics including advances in pediatrics relating to Cluster I specialities*	25%
Paper 4 : General pediatrics including advances in pediatrics relating to Cluster II specialities**	25%

*Cluster I – Nutrition, growth and development, immunization, infectious disease, genetics, immunology, rheumatology, psychiatry and behavioral sciences, skin, eye, ENT, adolescent health, critical care, accidents and poisoning.

**Cluster II – Neurology and disabilities, nephrology, hematology, oncology, endocrinology, gastroenterology, hepatology, respiratory and cardiovascular disorders.

In each paper there should be 10 short essay questions (SEQ).

Practicals :

Two external and two internal examiners should conduct the examinations :

- 3 cases semi long 20% each (total 60%)
- OSCE (Neonatology) 20%
- Viva 20%

Recommended Reference Books

- Behrman RE, Kliegman RM, Jenson HB. Nelson Textbook of Pediatrics. Harcourt Asia Pte Ltd, 16th edition, 2000.
- Rudolph AM, Hoffman JIE, Rudolph CD. Rudolph's Pediatrics. Appleton and Lange, 20th edition, 1996. Campbell AGM, McIntosh N. Forfar and Arneil's Textbook of Pediatrics. ELBS. 4th edition, 1992.

- Ghai OP, Gupta P, Paul VK. Essential Pediatrics. Interprint, New Delhi, 5th edition, 2001.
- Singh M. Pediatrics Clinical Methods. Sagar Publications, 1st edition, 1992.
- Siberry GK, Iannone R. The Harriet Lane Handbook. Mosby & Harcourt India. 15th Edition, 2000.
- Singh M, Deorari AK. Drug Doses in Children. Sagar Publications, 2001.

Growth and Development

- Illingworth RS. The development of the infant and young child. Normal and abnormal. Churchill Livingstone, 9th edition, 1987.

Nutrition

- Alleyne GAO, Hay RW, Picou DI, Stanford JP, Whitehead RG. Protein energy malnutrition. Jaypee Brothers, 1989.
- Management of severe malnutrition: a manual for physicians and other senior health workers. WHO, Geneva, 1999.
- Suskind RM, Lewinter-Suskind C. The malnourished child. Nestle Nutrition Workshop Series. Volume 19, 1990.

Infectious diseases

- Feigin RD, Cherry ID. Textbook of Pediatric Infectious Diseases. W. B. Saunders, 5th edition, 2000.
- Remington JS, Klein JO. Infectious Diseases of the Fetus and Newborn Infant. W. B. Saunders, 5th edition, 2000.
- Weatherall DJ, Ledingham JGG, Warrell DA. Oxford Textbook of Medicine; Volume I. Oxford University Press, 3rd edition, 1996.
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- Seth V, Kabra SK. Essentials of tuberculosis in children. Jaypee Brothers, 2nd edition, 2001.
- Pizzo PA, Wilfert CM. Pediatric AIDS. Lippincott Williams & Wilkins. 3rd Edition, 1998.

Intensive care

- Singh M. Medical emergencies in children. Sagar Publications, 3rd edition, 2000. .
- Rogers MC, Nichols DG. Textbook of Pediatric intensive care. Williams & Wilkins, 3rd Edition, 1996.

Neonatology

- Singh M. Care of the Newborn, Sagar Publication, 2000.
- Avery GB, Fletcher MA, MacDonald MG. Neonatology- Pathophysiology and Management of the Newborn. Lippincott William and Wilkins, 5th edition, 2000.
- Cloherty JP, Stark AR. Manual of Neonatal Care. Lippincott- Raven Publishers, 4th edition, 1998.
- Kattwinkel I. Textbook of neonatal resuscitation. American Heart Association and American Academy of Pediatrics, 4th edition, 2000.

Neurology

- Swaiman B, Kenneth F, Ashwal S. Pediatric Neurology: Principles and Practice. St. Louis Mosby, 3rd edition, 1999.

- Brett EM. Pediatric Neurology . Churchill Livingstone, 3rd edition, 1997.
- Menkes JH. Textbook of Childhood Neurology. Lea and Febiger, 5th edition, 2000.

Cardiology

- Allen HO, Clark FB, Gutgesell HP, Driscoll DJ. Moss and Adam's Heart Disease in Infants, Children and Adolescents. Lippincott Williams and Wilkins, 6th edition, 2001.
- Park MK. Pediatric cardiology for practitioners. Mosby- YearBook, Inc., 3rd edition, 1996.

Gastroenterology

- Suchy FI, Sokol RJ, Balistreri WF. Liver disease in children. Lippincott Williams and Wilkins, 2nd edition, 2001.
- Bhan MK, Bhatnagar S. Guidelines for management of diarrhea in children. Ministry of Health, GOI and WHO/SEARO, 2000.

Endocrinology

- Lifshitz F. Pediatric Endocrinology. Marcel Dekker, Inc., 3rd edition, 1995.
- Sharma S, Singhal T, Bajpai A. Management protocols in pediatric endocrinology. April 2000.
- Desai MP, Bhatia B, Menon PSN. Pediatric Endocrine Disorders. Orient Longman, 2001.

Nephrology

- Barratt TM, Avner ED, Harmon WE. Pediatric nephrology. Baltimore Williams and Wilkins, 4th edition, 1998.
- Srivastava RN, Bagga A Pediatric Nephrology, 3rd edition, Jaypee, New Delhi, 2001.

Hematology & Oncology

- Nathan DG, Orkin SH. Nathan and Oski's Hematology of Infancy and Childhood. W. B. Saunders, 5th edition, 1998.

Rheumatology

- Cassidy JT, Petty RE. Textbook of Pediatric Rheumatology. W. B. Saunders, 4th edn. 2001.

Respiratory Medicine

- Chernick V, Boat TF. Kendig's Disorders of the Respiratory Tract in Children. WB Saunders. 6th Edition 1998.

PHARMACOLOGY — M D

OBJECTIVES

At the end of the 3 years training in pharmacology, the PG Student should be able to

1. Acquire sound knowledge of general pharmacological principles, systemic pharmacology and rational use of drugs.
2. Plan and conduct lecture, practical demonstration, and tutorial classes for students of medical and allied disciplines.
3. Carry out screening of drugs for pharmacological and toxicological profile.
4. Critically review and comment on research papers.
5. Monitor adverse drug reactions, therapeutic drug monitoring, and able to provide drug information service to needy places.
6. Preparation of protocols to conduct experimental studies in animals and human drug trials independently.

The following self learning sessions for PG students will be held

- Post graduate lectures in systemic pharmacology to update various aspects basic pharmacology and applied therapeutics.
- Therapeutic club: To critically analyze the day to day development in therapeutics and new drugs
- Journal club: To familiarize with research methodologies and analysis of results.
- Seminars: To update newer developments in pharmacology/emerging trends/ novel mechanisms of drug action etc.
- Practical exercises: Once in a week, under the supervision of a faculty, with/without the help of animals, various principles/ mode of drug action/ screening of drugs/ drug analysis using various techniques should be performed to develop practical skills to conduct similar experiments in future.
- Thesis: Each PG student will carry out research work under the supervision of a faculty member of the Pharmacology Department. The thesis will be submitted to AIIMS and will be analyzed by suitable experts in that field. The acceptance of the thesis by the institute will be a prerequisite for the candidate to be allowed to appear in the final examination.

M D EXAMINATION

Theory Examination

Paper- I

General pharmacological principles and allied sciences (section -1)

Paper-II

Systemic pharmacology, chemotherapy and therapeutics (section-2)

Paper-III

Experimental pharmacology, screening of drugs and statistics (section-3)

Paper-IV

Clinical pharmacology and recent advances in pharmacology (section-4)

Practical examination (2 days)

1. One experimental pharmacology exercise on intact animal**
2. One experimental pharmacology exercise on isolated organ**
3. One chemical pharmacology exercise
4. One clinical pharmacology exercise

Oral Examination

1. Microteaching session
2. Thesis presentation and discussion
3. General viva voce

SECTION 1

1.a. General Pharmacological Principles and Applied Sciences

1.b. Toxicology

Basics of principles of diagnosis and treatment of human poisoning. Clinical features of common poisoning. Antidotes in the management of poisoning. Principles of clinical toxicology. Applied analytical toxicology and toxicovigilance.

Practical skills: Training at poison information centre. Determination of plasma cholinesterase levels in organophosphorus poisoned patients. Spot test for aluminium phosphide poisoning. Estimation of lead in drinking water and patient's urine.

1.c. Molecular Biology in Pharmacology

Gene expression, Pharmacogenomics, Proteomics, techniques involved in studying receptor dynamics. PCR, Northern blot, Southern blot and Western blot. Protein purification. Mono, poly clonal antibodies. Molecular biology in receptor identification. Antisense oligonucleotides, molecular targets of drug action.

1.d. Isolation of Compounds from Herbal Sources

Basic constituents of plants (chemical classification). Isolation of active constituent from plant materials. Percolation and maceration. Qualitative constituent characterisation techniques. Utilisation of HPTLC for the constituent analysis. Estimation of marker compound in biological fluid after crude plant material

administration.

Practical skills: Isolation of active principles from medicinal plants

1.e. Wonder Discoveries in Pharmacology

Nobel laureates in Pharmacology and their revolutionary discoveries

1.f. Teaching and Communication Skills

Delivering lectures, conducting practical/demonstrations for undergraduate and postgraduate students. Maintenance of records of practical exercise. Techniques to retrieve relevant information from various sources. Methodology of preparing research manuscripts. Research presentation in scientific deliberations.

Practical skills: Post graduate teaching of recent developments in pharmacology and therapeutics.

SECTION 2

2.a. Systemic Pharmacology, Chemotherapy and Therapeutics

- Autonomic nervous system
- Central nervous system
- Autacoids
- Drugs affecting kidney function and Cardiovascular system
- Drugs affecting gastrointestinal and respiratory system
- Drugs affecting uterine motility
- Chemotherapy of parasite infections
- Chemotherapy of microbial diseases
- Antineoplastic agents
- Immunomodulators
- Drugs acting on blood and blood forming organs
- Hormones
- Miscellaneous

SECTION 3

3.a. Experimental Pharmacology, Bioassay And Statistics

Experimental methodologies involved in the discovery of drugs (in vivo, in vitro, ex vivo). Animal handling and animal care. Methods of anaesthetising animals and methods of euthanasia. Restraining and blood collecting methods. Drug screening methods involved in the evaluation of anti-ulcer, antidepressant, antianginal, antihypertensive, antiarrhythmic, antidiabetic, anticataract, anti-platelet, anticancer, anti-inflammatory, antidiarrhoeal, antiepileptic, analgesic, antithyroid, antipyretic, antiglaucoma, antihyperlipidemic antiasthmatics drugs and cough suppressants. Drug screening methods used in screening antifungal, antihelminthic, antibacterial, antiviral agents, drugs for heart failure, posterior pituitary, adrenal steroid (gluco & mineralo corticoids), testicular, parathyroid, ovarian, thyroid hormones, Methods involved in testing teratogenicity, carcinogenicity and organ toxicities in animals.

*Practical Skills**:* Effect of antiinflammatory agents on caraagennan induced rat paw edema. Evaluation of analgesic activity of morphine using tail flick latency test. Evaluation of cardiotonic drugs on isolated rabbit heart (Langendroff isolated heart preparation). Demonstration of Dale's vasomotor reversal and nicotinic effect of acetylcholine on dog blood pressure. Effect of autonomic drugs on rabbit intestine.

Demonstration of bronchodilation on guinea pig tracheal chain. Effect of sedatives on rodents (rotarod test).

Four point assay of histamine and acetylcholine on guinea pig ileum. Four point assay of 5HT on rat uterus. Estimation of PA_2 value of atropine. Identification of unknown by evaluating its action on dog haemodynamic parameters. Assay of acetylcholine using rat fundus. Estimation of pressor agents on rat blood pressure.

3.b. Instrumentation in Drug analysis

Qualitative testing, titrimetric analysis. Beer and Lambert's law. Basis and working principle of colorimeter, ultraviolet, atomic absorption spectrometers, Fluorescence spectroscopy, NMR and Mass Spectroscopy. Basics of Chromatography. Partition, adsorption and ionexchange chromatography. column chromatography, thin layer chromatography, paper chromatography, immunoabsorbant chromatography, high performance thin layer chromatography, high performance liquid chromatography and gas Chromatography. Radio immunoassay. Processing of biological materials for drug analysis. Calculations in drug analysis. Good laboratory practice. Validation of analytical procedure.

Practical skills: Spectrophoto & flurimetric estimations of drugs in biological fluids.

3.c. Biostatistics

Calculation of basic statistical parameters (mean, median, mode, standard deviation, standard error etc.). Null hypothesis, parametric and non parametric tests (Student 't test, Wilcoxon, ANOVA etc.). Metaanalysis.

Practical skills: Calculation for statistical significance in the given data for Student paired and unpaired t test. Applying ANOVA to the given set of concentration vs time data of two drug formulations to comment about their bio-equivalence.

SECTION 4

4.a. Clinical Pharmacology and Recent Advances

Pharmacokinetics

Basics of pharmacokinetics, calculation of pharmacokinetic estimates (C_{max} , T_{max} , $T_{1/2}$, $AUC_{(0-n)}$, $AUC_{(0-\infty)}$, V_d , K_e , K_a etc.) Compartment models used in pharmacokinetics (oral and intravenous). Compartment fitting (one comp & two comp). Pharmacodynamic /pharmacokinetic (PK/PD) correlation.

Practical skills: Calculation of Pharmacokinetic estimates from given concentration vs time data

Drug Regulations

Drugs and Cosmetics Act, Drug Price Control order, Application for Investigational New Drug (IND), Application for New Drug Discovery (NDD) according to Indian Control Authority & USFDA guidelines. Conducting bio-equivalence studies. Ethical considerations in utilizing human subjects for drug discovery process. Helsinki's declaration. ICH-GCP Guidelines. Ethical guidelines in utilising animals for experimental purposes.

Practical skills: Draft an IND and NDD application for the approval of a numbered compound.

Drug development process

Methods involved in the development of new drugs. Preclinical toxicological studies. Calculation of LD_{50} & ED_{50} . Acute, subacute and chronic toxicity studies. Irwin profile test, Pre-clinical pharmacokinetic

and dynamic studies. Lipinski's rule for drug like molecule, High throughput screening (invitro and invivo) for pre-clinical pharmacokinetic and pharmacodynamic studies.

4.b. Clinical Trials

Types of clinical trials, clinical trial for a new investigational drug in India. Methods involved in the assessment of drugs in human volunteers and bio-equivalence studies. Key points in drafting protocol for a large scale multicentric drug trial in India.

Practical skills: Draft a protocol to conduct phase II clinical trial for a newly discovered non-steroidal anti-inflammatory drug.

4.c. Therapeutic Drug Monitoring (TDM)

Basic principles of TDM. Therapeutic index. Trough level monitoring and dosage adjustments.

Practical skills: Calculation of the next dosage of drug to the patient whose plasma drug level has been estimated

Therapeutic audit: Drug utilisation studies, essential drug concept, rational prescribing

Drug delivery systems: sustained release, enteric coated formulations and liposome etc.

Pharmacovigilance, Pharmacoeconomics, Pharmacogenetics and Drug Information

Practical skills: 50 hours/annum in ADR monitoring. 62 duties/annum in National Poisons Information centre.

Books Recommended

1. Goodman Gillman's The Pharmacological basis of therapeutics. (2001) Ed. Hardman JG, Limbird LE (Tenth Edition) McGraw Hill press New York.
2. Applied biopharmaceutics and pharmacokinetics (1999) Ed. Sargel L. (IV Edition) Prentice-Hall International, London.
3. Fundamentals of experimental pharmacology. (1984) Ed. Ghosh MN. Scientific book agency, Calcutta.
4. Text book of receptor pharmacology. Eds. Forman JC, Johansen TJ CRC Press, New York 1996.
5. Drug Discovery and Evaluation – Pharmacological assays. (1997) Ed. Vogel HG & Vogel WH. Springer-New York.

Journals to be Referred

Trends in Pharmacological Sciences, Annual Review of Pharmacology, Pharmacological Reviews, Indian Journal of pharmacology, Indian Journal of Physiology and Pharmacology, Annals of Pharmacotherapy, Pharmacology and Experimental Therapeutics, Journal of Ethnopharmacology, Nature, Science, European Journal of Clinical Pharmacology, BJCP and other pharmacology related journals.

****Practical Exercise using Animal Experiments is Subject to Ethical Approval**

Physical Medicine & Rehabilitation (PMR) — M D

A. The overall “GAINS OF THE COURSE” can be classified as below:

1. Patient Care: Keeping the above in view, it is evident that the patient care services in Physical Medicine and Rehabilitation (PMR) are not adequate at present due to lack of trained specialists in Physical Medicine and Rehabilitation. Therefore, the products of this course would fill this gap in Patient Care.
2. Training and Teaching: Since the Post graduate training in PMR is being given only at a few places in India, MD (PMR) would meet the demand, as advocated by Medical Council of India and other international agencies. The MD (PMR) at AIIMS would also set an example of excellence in teaching as well as provide teachers to other medical colleges running these courses.
3. Research: Once we have the trained specialists well versed with the problems of the handicapped, research avenues would automatically be broadened in the specialty.

B. BROAD OBJECTIVES

1. To develop patterns of teaching in Rehabilitation Medicine in postgraduate medical education in all its branches so as to demonstrate a high standard of medical education to all medical colleges and other allied Institutions in India.
2. To train teachers and specialists in Rehabilitation medicine.

C. SPECIFIC LEARNING OBJECTIVES

The clinical postgraduate training programme is intended at developing in a student a blend of qualities of a clinical specialist, a teacher and a researcher. They are organised in such a manner that a postgraduate should possess the following qualities and knowledge on qualification.

1. Patient Care

The candidates need to be trained in the following:

- (i) Basic Sciences: He should possess basic knowledge of (1) the structure, function and development of the human body as related to Rehabilitation Medicine. (2) Knowledge of the factors which may disturb these mechanisms and the resulting disorders of structure, function and psycho social aspects related to Rehabilitation Medicine.

- (ii) **Clinical Knowledge:** He should attain understanding of and develop competence in executing common general laboratory procedures employed in diagnosis and research in rehabilitation medicine. He should be able to practice and handle independently most day to day problems as encountered in Rehabilitation Medicine. He should also be able to recognise the need to seek further help, when required.
- (iii) **Clinical Rehabilitation Medicine:** Given adequate opportunity to work on the basis of graded responsibilities in out-patients, in-patient and operation theatre on a rotational basis in the Department from the day of entry to the completion of the training programme the students should be able to:-
 - (a) acquire scientific and rational approach to the diagnosis of cases presented.
 - (b) acquire understanding of and develop inquisitiveness to investigate to establish the cause and effect of the disease.
 - (c) perform all routine and special investigations and interpret the results of these investigations in the light of clinical presentation.
 - (d) manage and treat all types of cases in rehabilitation medicine that occur commonly.
 - (e) demonstrate the knowledge of the pharmacological aspects of drugs used in rehabilitation medicine.
 - (f) competently handle and execute safely all the routine rehabilitative surgical procedures.
 - (g) demonstrate understanding of the fabrication and competence in prescription and check out of orthoses and prostheses.
 - (h) understand the principles, prescription and supervision of physiotherapy, occupational therapy, psycho-socio-vocational counselling.
- (iv) **Environment and Health:** He should understand the effect of environment on health and be familiar with the epidemiology of common diseases in the field of rehabilitation medicine. He should be able to integrate the preventive and promotive methods with the curative and rehabilitative measures in the treatment of diseases.
- (v) **Community Rehabilitation Medicine:** He should be able to practice rehabilitation medicine at the door step of community. He should be familiar with the common problems occurring in rural areas and deal with them effectively.

Given an opportunity to participate in surveys and camps, the students should be able to:-

 - (a) organise and conduct surveys in rural, urban and industrial communities and in specified groups of population;
 - (b) organise and conduct camps for disability prevention and rehabilitation of disabled persons.
 - (c) guide rehabilitation workers at the peripheral level for rehabilitation of disabled.
- (vi) **Current Developments:** He should be familiar with the current developments in Rehabilitation Medicine.

2. Research

The candidate should be able to

- (a) recognise a research problem.
- (b) state the objectives in terms of what is expected to be achieved in the end.
- (c) plan a rational approach with full awareness of the statistical validity.

- (d) spell out the methodology and carry out most of the technical procedures required for the study.
- (e) accurately and objectively record on systematic lines the results and observations made.
- (f) analyse the data using appropriate statistical approach.
- (g) interpret the observations in the light of existing knowledge and highlight in what ways the study has advanced existing knowledge on the subject and what remains to be done.
- (h) draw conclusions which should be reached by logical deduction and he should be able to assess evidence both as to its reliability and its relevance.
- (i) write a thesis in accordance with the prescribed instructions.
- (j) be familiar with the ethical aspects of research.

3. Teaching

He should be able to plan educational programs in Rehabilitation Medicine in association with his senior colleagues and be familiar with the modern methods of teaching and evaluation.

The candidate should be able to :-

- (a) To deliver lectures to undergraduates and hold clinical demonstrations for them.
- (b) To write and discuss a seminar or a symposium and critically discuss it with his colleagues and juniors.
- (c) To methodically summarise internationally published articles according to prescribed instructions and critically evaluate and discuss each selected article.
- (d) To present cases at clinical conference, discuss them with his colleagues and guide his juniors in groups in evaluation and discussion of these cases.

D. CANDIDATE SELECTION

This would be made on the basis of the following criteria, modified by AIIMS, from time to time:-

- (i) Essential Qualifications: For admission to this course, the candidates must have passed M.B.B.S. examination of a recognised University and should have completed compulsory rotatory internship.
- (ii) Competitive Entrance Examination as for MD/MS entrance examination of AIIMS.

E. THE DESIGN AND THE COURSE CONTENT

1. Duration of the course and rationale: Duration would be three years, as is the requisite period for award of MD/MS degree at the AIIMS.
2. Structure of the course: There would be no division of the course into sections/ semesters.
3. Course content: The course content would include the following:-
 - (1) Philosophy, history, scope and need of Rehabilitation Medicine.
 - (2) Disability process and epidemiology of Disability.
 - (3) Evaluation Process:
 - History taking,
 - Clinical evaluation, Muscle Charting, Joint Range of Motion,
 - Goniometry, outcome measures
 - Investigations, Electrodiagnosis

- (4) Rehabilitation of patients with spinal cord injury:-
 - Anatomy and physiology of the spine and spinal cord
 - Mechanism of injury and fractures of spine
 - Clinical presentation and acute management
 - Rehabilitation of a paraplegic.
 - Rehabilitation of a quadriplegic
 - Management of bladder and bowel
 - Management of complications of spinal cord injury
- (5) Rehabilitation of patients with amputations:-
 - Indications, levels and surgical techniques
 - Immediate fitting of prosthesis
 - Rehabilitation of upper and lower limb amputees
- (6) Rehabilitation of patients with neurologic disorders, e.g. neuropathies, Bell's Palsy, LGB syndrome.
- (7) Rehabilitation of patients with diseases of muscles: e.g. Muscular dystrophy
 - Introduction, types, inheritance
 - Presentation, diagnosis
 - Management and Rehabilitation
- (8) Rehabilitation of patients with neurogenic bladder, incontinence, and principles of urodynamic studies.
- (9) Rehabilitation of patients with diseases of metabolic disorders:
 - Osteoporosis, Osteomalacia, rickets
 - Diabetes Mellitus
 - Gout, Inborn errors of Metabolism
- (10) Rehabilitation of patients with diseases of back pain
 - Introduction, causes, presentation
 - Rehabilitation and conservative management.
- (11) Rehabilitation of patients with diseases of neck pain.
- (12) Rehabilitation of patients with Cerebral Palsy
- (13) Rehabilitation with patients with diseases of pulmonary diseases:-
 - Introduction, diagnosis, investigations
 - Rehabilitation of C.O.P.D. and other pulmonary conditions
- (14) Rehabilitation of patients with cardiovascular diseases
 - Anatomy and physiology of heart, coronary artery disease, Myocardial infarction, Hypertension, Arrhythmia.
 - Principles of cardiac rehabilitation
 - Rehabilitation of post M.I. patient and post coronary artery bypass surgery patient
- (15) Rehabilitation of patients with Stroke

- Introduction causes, presentation, investigation
- Initial management and prevention of complications
- Rehabilitation of a hemiplegic patient
- (16) Rehabilitation of patients with head injury.
 - Introduction, causes, mechanism presentation
 - Rehabilitation of a head injured patient
- (17) Rehabilitation of patients with poliomyelitis
 - Introduction, pathogenesis
 - Clinical presentation, acute management
 - Rehabilitation of polio patient
 - Prevention of polio
- (18) Rehabilitation of patients with Orthopaedic problems
 - Plaster applications
 - Management of Volkmann's Ischaemic Contracture
 - Hand Rehabilitation
 - Fractures and complications.
 - Spinal deformities
 - Congenital deformities
 - C.T.E.V.
 - Common foot disorders
 - Osteoarthritis
 - Post-surgical patient
 - Hip and knee contractures
 - Correction of Equinus deformity
 - Principles of tendon transfers of foot and ankle
 - of knee and hip.
 - Foot stabilization operations -
 - basic principles
 - various techniques
- (19) Rehabilitation of patients with Haemophilia
- (20) Rehabilitation of patients with Arthritis
- (21) Rehabilitation of patients with Leprosy
- (22) Rehabilitation of patients with burns
- (23) Rehabilitation of patients with Ankylosing Spondylitis
- (24) Rehabilitation of patients with Spina bifida and Meningocele
- (25) Rehabilitation of patients with peripheral Nerve Inj.
- (26) Rehabilitation of patients with chronic pain

- (27) Rehabilitation of patients with sports injuries
- (28) Geriatric Rehabilitation :
 - Introduction, Senescence, problems of ageing
 - Rehabilitation of a geriatric patient
- (29) Rehabilitation of patients with cancer related disability
 - Introduction, relative incidence, cancer pain
 - Colostomy, mastectomy, Laryngectomy management
- (30) Principles of rehabilitation medicines as applied to Obstetrics and Gynecology.
- (31) Rehabilitation of patients with Vestibular system problems
- (32) Principles of disability evaluation
 - Basic Principles
 - Various methods
- (33) Computers in Rehabilitation Medicine
- (34) Organisation and administration of Rehabilitation Medicine Services.
- (35) Principles of Physical Modalities
- (36) Rationale of Physical Therapy
- (37) Rationale of Occupational Therapy
- (38) Rationale of A.D.L. (Activities of Daily Living)
- (39) Rationale in the use of Wheel Chair
- (40) Human Walking. Gait analysis and training
- (41) Orthotics:-
 - Introduction, definitions, indications
 - Biomechanics, Prescription Writing, Check out
 - Different types of orthoses for lower, upper limbs and spine
 - Recent advances in Orthotics
- (42) Prosthetics:-
 - Introduction, definitions, indications
 - Biomechanics, prescription writing
 - Assessment of patient, check out of prosthesis
 - Upper and lower limb prostheses
 - Recent advances in prosthetics
- (43) Principles of rehabilitation of visually handicapped.
- (44) Principles of rehabilitation of mentally retarded.
- (45) Principles of management of hearing and speech impaired.
- (46) Principles of management of psychological problems.
- (47) Principles of management of social problems.
- (48) Principles of management of vocational problems.
- (49) Recent Advances
- (50) Law in relations to disability.

- (51) Joint and Soft tissue injection techniques.
- (52) Medical Emergencies in Rehabilitation Medicine.
- (53) Sexuality in Disabled.

F. MODES OF STUDENT LEARNING

The training programmes would be divided into theoretical, clinical and practical in all aspects of the delivery of the rehabilitative care, including methodology of research and teaching.

- (i) **Theoretical:** The theoretical knowledge would be imparted to the candidates through discussions, symposia and seminars. The students are exposed to recent advances through discussions in journal clubs. These are considered necessary in view of an inadequate exposure to rehabilitation medicine in the undergraduate curriculum. Knowledge in applied basic and para- clinical and clinical subjects would be imparted during clinical case discussion in the OPD, speciality clinics and bedside.
- (ii) **Symposia:** Residents would be required to present topics to the combined class of teachers and students. A free discussion would be encouraged in these symposia. The topics of the symposia would be given to the residents with the dates for presentation. The topics would be as follows:-
 - 1. Human walking
 - 2. Spinal Orthoses
 - 3. P.T.B. Prosthesis
 - 4. Pressure Sores
 - 5. Spasticity
 - 6. Squatting A.K. Prosthesis
 - 7. Bell's Palsy
 - 8. Disc Prolapse
 - 9. Cervical Spondylosis
 - 10. Muscular Dystrophy
 - 11. Neuro developmental Techniques
 - 12. Cardiac Rehabilitation
 - 13. Upper extremity in stroke
 - 14. Post head injury Rehabilitation
 - 15. Post polio paralysis and syndrome
 - 16. Scoliosis
 - 17. Osteo Arthritis of Knee joint
 - 18. Arthroplasty rehabilitation
 - 19. Extent of Disability problem in India
 - 20. Leprosy Rehabilitation
- (iii) **Clinical:** The Residents would be attached to a faculty member to be able to pick up methods of history taking and examination in rehabilitation practice. During this period the resident would also be oriented to the common problems that come to the Department after 6 months, the resident would be allotted new and old cases, he would work up these cases including prescription writing. The residents would be supervised by Senior Residents and faculty members.

- (iv) **Bedside:** The residents would work up cases, learn management of cases by discussion with the senior residents and faculty of the department.
- (v) **Surgery:** The resident would be provided with an opportunity to learn, assist and perform operations including post-operative care with the assistance of the Senior Residents and/or under the direct supervision of a faculty member.
- (vi) **Journal Clubs:** This would be a weekly exercise. Following journals have been chosen for discussions:-
 - (a) Indian Journal of Physical Medicine and Rehabilitation.
 - (b) Archives of Rehabilitation Medicine
 - (c) Scandinavian Journal of Rehabilitation Medicine.
 - (d) Spinal Cord
 - (e) Prosthetics Orthotics International
 - (f) Indian Journal of Orthopaedics
 - (g) Stroke
 - (h) Arthritis and Rheumatism
 - (i) Indian Pediatrics
 - (j) Neurology India
 - (k) Indian Journal of Disability and Rehabilitation
 - (l) Sports training, Medicine and Rehabilitation
 - (n) Journal of Rehabilitation Research and Development
 - (o) National Medical journal of India.

The candidate would summarise and discuss the article critically. The contributions made by the article in furtherance of the scientific knowledge are highlighted.
- (vii) **Research:** The student would carry out the research project and write a thesis following the prevailing rules of the Institute. He would also be given exposure to partake in the research projects going on to learn their planning, methodology and execution to learn various aspects of research.

G. ASSESSMENT SYSTEMS

The components of assessment would be:-

1. Evaluation of thesis.
2. Written papers, which would consist of 4 Theory Papers
 - List of Papers**
 - Paper I: Basic Sciences as applied to Rehabilitation Medicine.
 - Paper II: Rehabilitation Medicine II.
 - Paper III: Rehabilitation Medicine III.
 - Paper IV: Applied aspects of Rehabilitation Medicine.
3. Clinical Practical Examination.
4. Viva voce.

These would be done as per the standard criteria, modified from time to time for MD/MS evaluation/examination at the AIIMS.

PHYSIOLOGY — M D

OBJECTIVES

The M.D. (Physiology) program has the following broad and intermediate objectives:

Broad Objectives

The candidate qualifying for the award of M.D. (Physiology) should be able to:

1. demonstrate comprehensive understanding of physiology as well as that of the applied disciplines;
2. demonstrate adequate knowledge of the current developments in medical sciences as related to physiology;
3. teach undergraduates and postgraduates in physiology;
4. plan and conduct research;
5. plan educational programs in physiology utilizing modern methods of teaching and evaluation; and
6. organize and equip physiology laboratories.

Intermediate Objectives

The candidate qualifying for the award of M.D. (Physiology) should be able to:

1. demonstrate comprehensive understanding of the structure, function and development of the human body as related to physiology, all the factors which might disturb these, mechanisms of such disturbances and the disorders of structure and function, which may result from the disturbances;
2. critically evaluate the impact of the recent information on the genesis of current concepts related to various topics of physiology;
3. recapitulate the information imparted to the undergraduate students in physiology;
4. perform and critically evaluate the practical exercises done by undergraduate students;
5. identify a research problem which could be basic, fundamental or applied in nature; define the objectives of the problem and give a fair assessment as to what is expected to be achieved at the completion of the project; design and carry out technical procedures required for the study; record accurately and systematically the observations and analyze them objectively; effectively

use statistical methods for analyzing the data; interpret the observations in the light of existing knowledge and highlight in what way his observations have advanced scientific knowledge; write a scientific paper on the lines accepted by standard scientific journals;

6. design, fabricate and use indigenous gadgets for experimental purposes;
7. demonstrate familiarity with the principles of medical education including definitions of objectives, curriculum construction, merits and demerits of various tools used in the teaching-learning process; use of learning aids and learning settings, and methods of evaluation;
8. share learning experiences with the undergraduate and postgraduate students using appropriate pedagogical skills and methods;
9. draw out meaningful curricula for teaching medical and paramedical courses; give lucid, interactive lectures, presenting the information in a logical, simple and comprehensive manner; generate interest and curiosity amongst the students during lectures; give practical demonstrations;
10. organize the laboratories for various practical exercises, substitute and fabricate some of the simpler equipment for teaching purposes; and
11. handle and order for stores, draw up lists of equipment required to equip physiology laboratories

TEACHING PROGRAMME

To achieve the above objectives in three years, we have the following structured programme.

Semester 1

1. Orientation to the department
2. Choosing the subject of thesis and guide
3. Writing the protocol
4. Recapitulation of undergraduate physiology through attending UG lectures

Semester 2

1. Physiology: theory & practical
2. Thesis work
3. Recapitulation of undergraduate physiology through attending UG lectures

Semester 3

1. Physiology: theory & practical
2. Thesis work

Semester 4

1. Physiology: theory & practical
2. Thesis work

Semester 5

1. Physiology: theory & practical
2. Submission of thesis

Semester 6

1. Clinical posting

Physiology: Theory & Practical

The theory and practical syllabus is completed in four semesters. The department conducts the semester-wise programme in a cyclic fashion so that no matter at what point a student joins the programme, he completes the course in two years. The semester-wise programme is as follows:

- I. a. General & Cellular Physiology
 - b. Hematology
 - c. Renal Physiology & Fluid Balance
- II. a. Cardio-vascular Physiology
 - b. Respiration
 - c. Environmental Physiology
- III. a. Nerve & Muscle Physiology
 - b. General, Sensory & Motor Physiology
 - c. Special Senses
 - d. Limbic System and Higher Nervous System
- IV. a. Nutrition & Metabolism
 - b. Gastro-intestinal System
 - c. Endocrines & Reproduction

Themes and Topics

Semester I

- a. *General & Cellular Physiology*
 - Cell as the living unit of the body
 - The internal environment
 - Homeostasis
 - Control systems
 - Organization of a cell
 - Physical structure of a cell
 - Transport across cell membranes
 - Functional systems in the cells
 - Genetic code, its expression, and regulation of gene expression
 - Cell cycle and its regulation
- b. *Hematology*
 - Erythrocytes
 - erythropoiesis
 - structure & function of RBCs
 - formation of hemoglobin
 - destruction & fate of RBCs
 - anemias
 - polycythemias

- Leucocytes
 - general characteristics
 - genesis & life span of WBCs
 - classification & functions of each type of WBC
 - leukopenia
 - leukemias
- Blood groups
 - classification
 - antigenicity
 - agglutination
 - blood typing
 - principles of transfusion medicine
- Hemostasis
 - components of hemostasis
 - mechanisms of coagulation
 - coagulation tests
 - anticoagulants
- Immunity
 - Innate immunity
 - Acquired immunity
 - Allergy, hypersensitivity and immunodeficiency
 - Psychoneuroimmunology
- c. *Renal Physiology & Fluid Balance*
 - Body fluid compartments
 - Water balance; regulation of fluid balance
 - Urine formation
 - Regulation of extracellular sodium & osmolarity
 - Renal mechanisms for the control of blood volume, blood pressure & ionic composition
 - Regulation of acid-base balance
 - Micturition
 - Diuretics
 - Renal failure

Semester II

- a. *Cardio-vascular Physiology*
 - Properties of cardiac muscle
 - Cardiac cycle
 - Heart as a pump
 - Cardiac output
 - Nutrition & metabolism of heart

- Specialized tissues of the heart
- Generation & conduction of cardiac impulse
- Control of excitation & conduction
- Electrocardiogram
- Arrhythmias
- Principles of Hemodynamics
- Neurohumoral regulation of cardiovascular function
- Microcirculation & lymphatic system
- Regional circulations
- Cardiac failure
- Circulatory shock

b. Respiration

- Functional anatomy of respiratory system
- Pulmonary ventilation
- Alveolar ventilation
- Mechanics of respiration
- Pulmonary circulation
- Pleural fluid
- Lung edema
- Principles of gas exchange
- Oxygen & carbon-dioxide transport
- Regulation of respiration
- Hypoxia
- Oxygen therapy & toxicity
- Artificial respiration
- Environmental Physiology

c. Physiology of hot environment

- Physiology of cold environment
- High altitude
- Aviation physiology
- Space physiology
- Deep sea diving & hyperbaric conditions

Semester III

a. Nerve & Muscle Physiology

- Resting membrane potential
- Action potential
- Classification of nerve fibres
- Nerve conduction
- Degeneration and regeneration in nerves

- Functional anatomy of skeletal muscle
- Neuro-muscular transmission and blockers
- Excitation-contraction coupling
- Mechanisms of muscle contraction
- Smooth muscle
- b. *General, Sensory & Motor Physiology*
 - General design of nervous system
 - Interneuronal communication
 - Classification of somatic senses
 - Sensory receptors
 - Sensory transduction
 - Information processing
 - Dorsal column & medial lemniscal system
 - Thalamus
 - Somatosensory cortex
 - Somatosensory association areas
 - Pain
 - Organization of spinal cord for motor function
 - Reflexes & reflex arc
 - Brain stem & cortical control of motor function
 - Cerebellum
 - Basal ganglia
 - Maintenance of posture and equilibrium
 - Motor cortex
- c. *Special Senses*
 - Optics of vision
 - Receptors & neural functions of retina
 - Colour vision
 - Perimetry
 - Visual pathways
 - Cortical visual function
 - Functions of external and middle ear
 - Cochlea
 - Semicircular canals
 - Auditory pathways
 - Cortical auditory function
 - Deafness & hearing aids
 - Primary taste sensations
 - Taste buds

- Transduction & transmission of taste signals
- Perception of taste
- Peripheral olfactory mechanisms
- Olfactory pathways
- Olfactory perception

d. *Limbic System and Higher Nervous System*

- Autonomic nervous system
- Limbic system and hypothalamus
- EEG
- Sleep
- Emotions & Behaviour
- Learning & Memory
- Yoga

Semester IV

a. *Nutrition & Metabolism*

- Carbohydrates
- Fats
- Proteins
- Minerals
- Vitamins
- Dietary fibre
- Recommended Dietary Allowances
- Balanced diet
- Diet for infants, children, pregnant & lactating mothers, and the elderly
- Energy metabolism
- Obesity & Starvation

b. *Gastro-intestinal System*

- General principles of G-I function
- Mastication & swallowing
- Esophageal motility
- Salivary secretion
- Gastric mucosal barrier
- Pancreatic & biliary secretion
- Gastrointestinal motility
- Digestion & absorption
- Functions of Colon
- Pathophysiology of peptic ulcer and diarrheal disease

- Liver functions
- c. *Endocrines & Reproduction*
 - Classification of Hormones
 - Mechanism of Hormone action
 - Measurement of hormones in Blood
 - Endocrine functions of the hypothalamus
 - Pituitary
 - Thyroid
 - Adrenals
 - The endocrine pancreas
 - Pathophysiology of diabetes
 - Parathyroid, calcitonin, Vit D & calcium metabolism
 - Pineal gland
 - Testosterone & male sex hormones
 - Spermatogenesis
 - Hyper & hypogonadism
 - Menstrual cycle
 - Female sex hormones
 - Pregnancy & Lactation
 - Functions of Placenta
 - Parturition
 - Lactation

Apart from the above topics in general and systemic physiology, the students are introduced to:

1. Biophysics
2. Biochemistry
3. Biostatistics
4. Molecular Biology
5. Medical Education
6. History of Medicine

The above topics are covered through a mix of self-learning and structured program. The structured program consists of:

1. Seminars every Saturday

The seminars are on a topic belonging to a system scheduled for the semester. The topic is presented in depth appropriate for postgraduates by one of the M.D. or M.Sc. students and moderated by a faculty member.

The seminars represent only a small and somewhat arbitrary selection of topics. They are not intended to cover an entire system. Their aims are to:

- a. introduce the system

- b. tune the students to the system
- c. cover recent advances
- d. give students practice in the art of oral presentation

2. Journal clubs and Faculty presentations, every Tuesday

The journal clubs are on an article belonging to a system scheduled for the semester. The article is presented by an M.D./M.Sc./Ph.D. student or senior demonstrator, and moderated by a faculty member. The aims of journal clubs are to:

- a. highlight recent advances
- b. discuss classical papers
- c. inculcate the faculty of critical appreciation of a research article
- d. give students and senior demonstrators practice in the art of oral presentation

Faculty presentations are usually on:

- a. medical education
- b. research methodology
- c. an area of research in which the faculty member is involved

3. Practicals

About 8-10 practical exercises are conducted every semester exclusively for M.D. (and M.Sc.) students on systems scheduled for the semester. The results obtained in these exercises are presented in teaching meetings (see below).

Besides specially designed P.G. practicals, M.D. students perform all undergraduate practicals, and also teach some of these practicals to the undergraduates.

4. Teaching meetings, every Saturday

Since M.D. students are also junior demonstrators, they are actively involved in teaching undergraduates. In the teaching meetings, the forthcoming practical exercises are discussed, and feedback on recently held exercises is obtained. These discussions are designed to improve the performance of M.D. students in teaching and related administrative responsibilities. In addition, teaching meetings are also utilized for discussion of P.G. practicals, research protocols of new P.G. students, presentation of thesis work by P.G. students prior to submission of the thesis, and any other items of interest to the teaching and research staff of the department.

5. Clinical postings

During their last semester, M.D. students are posted for two weeks each in the Departments of Medicine, Cardiology, Gastroenterology, Neurology, Endocrinology and Nephrology, and in Dr. R.P. Centre for Ophthalmic Sciences. In these postings, the students attend ward rounds and also observe the work going on in clinical physiology laboratories associated with these departments, e.g. the pulmonary function test lab, cardiac catheterization lab, and radioimmunoassay lab. The aim of these postings is to:

- a. provide the students concrete living examples of the application of physiology in diagnosis and management of disease, and to
- b. illustrate through some living examples how knowledge of physiology may grow through observations made on patients.

ASSESSMENT

In the first five semesters, an end-semester theory, practical and oral examination is conducted by the department on the systems scheduled for the semester, and a record of the internal assessment maintained. In the last (6th) semester, the students take the final M.D. examination conducted by the examination section.

SUMMARY

A summary of the M.D. (Physiology) program has been given in Fig. 1.

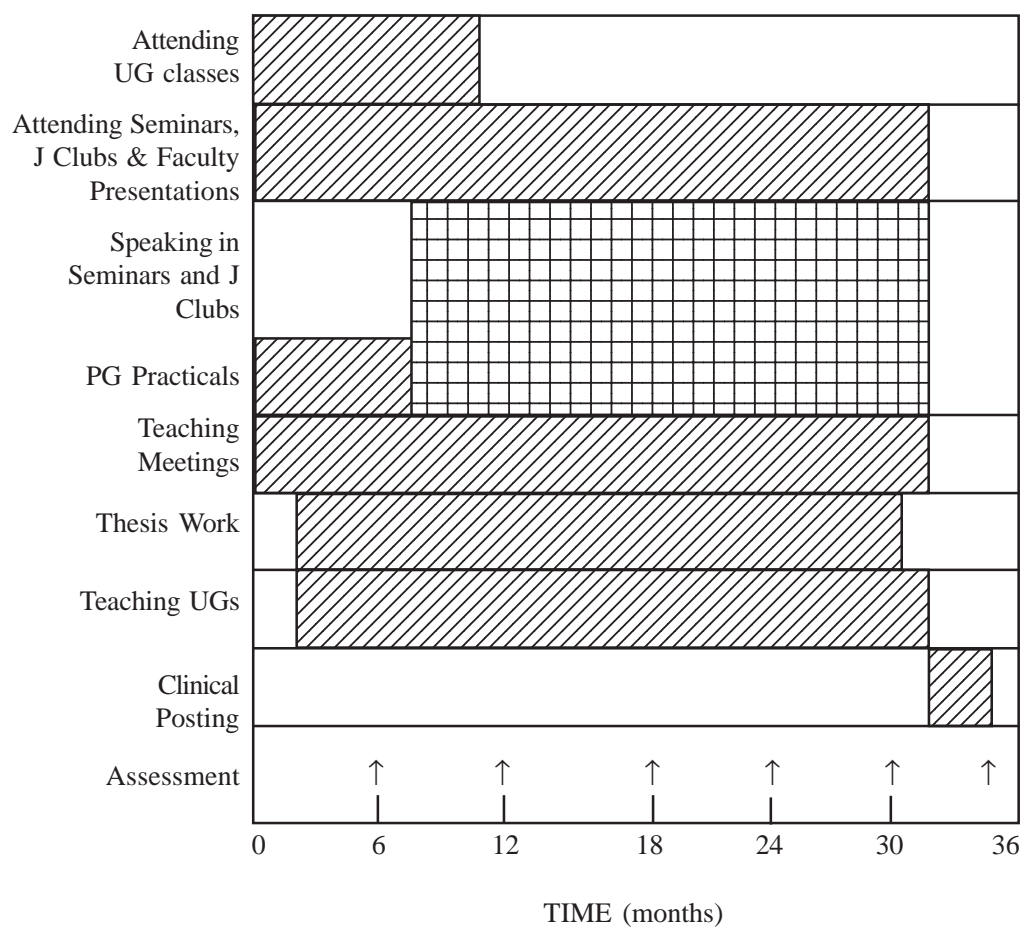


Fig.1. The M D (Physiology) program of AIIMS. The cross-hatched area is the 4-semester period during which one cycle of general and systemic physiology is completed. Light arrows, internal (formative) assessment; heavy arrow, final (summative) assessment.

PSYCHIATRY — M D

I. PREAMBLE

The training programme endeavors to give a general and comprehensive exposure to psychiatry. General objective of the training programme is to enable the candidate to acquire knowledge, skills and desirable attitudes in the principles and practice of psychiatry and gain a particular proficiency in the widely accepted theories and technique.

II. OBJECTIVES

At the end of the course, the candidate should be able to:

1. Function as a competent psychiatrist – a physician specialized in the diagnosis, treatment and rehabilitation of psychiatric disorders (mental, emotional and addictive disorders).
2. Having an understanding of the biological, psychological, social, economic and emotional aspects of psychiatric illnesses including possible preventive measures, primitive measures for mental well being and contemporary advances and developments.
3. Carry out detailed assessments including appropriate investigations.
4. Prescribe psychotropic medication, physical treatments such as ECT and monitor side-effects.
5. Evaluate and treat psychological and interpersonal problems, including providing psychotherapy and counselling in selected cases.
6. Acquire a spirit of scientific enquiry and be oriented to principles of research methodology and epidemiology.
7. Act as a consultant to primary care physicians and be an effective leader of a multidisciplinary mental health team comprising of other mental health professionals such as psychologists, social workers, psychiatric nursing professionals.
8. Deal with the legal aspects of psychiatric illness.
9. Assume the role of a postgraduate or undergraduate psychiatry teacher.
10. Be informed of the mental health programmes, policies, mental health care infrastructure and issues in community care of mentally ill in the country.
11. Psychiatric Emergencies.

III. COMPETENCIES

The candidate, at the end of the postgraduate training course is expected to have competencies in the following areas:

1. Theoretical knowledge

- (a) Etiology, assessment, classification, management and prognosis of various psychiatric disorders.
- (b) Adequate knowledge of adult psychiatry,
- (c) so as to be able to independently assess and manage any patient.
- (d) Working knowledge of various psychiatric specialties.
- (e) Basic medical knowledge to identify and manage co-existing physical and psychiatric problems.

2. Clinical Skills

- (a) Competence in history taking, mental state examination, physical examination, formulating diagnosis, identifying etiology, ordering further investigations, planning comprehensive management including pharmacological treatment.
- (b) Effective communication skills.

3. Ethical Considerations

- (a) An understanding of the general and ethical considerations as pertaining to medical and psychiatric practice.

4. Research and Training

- (a) Basic knowledge of research methods.
- (b) Acquisition of teaching experience.
- (c) Acquisition of skills to lead a multidisciplinary team of general physicians, nurses, psychologists, social workers and other mental health professionals.

IV. COURSE CONTENT

The three-year period is divided into six semesters. These semesters covered theoretical teaching imparted by the following activities as well as clinical duties.

Semester I - Basic Sciences as applied to psychiatry

- Monoamine Neurotransmitters and their implications for Psychiatric Disorders
- Excitatory Amino Acids in Psychiatric Disorders
- Neuropeptides and their relevance to Psychiatry
- Second Messenger Systems and Beyond
- Basic and applied Electrophysiology
- Magnetic Resonance and Implications for Psychiatry
- Consciousness
- Sleep and Dreaming
- Chronobiology
- Transcultural Psychiatry

- Aggression: Psychology and Biology
- Intelligence
- Learning Theories
- Information Processing: Brain Models of Mind
- Experimental Animal Research and Implications for Mental Disorders

Semester II - Clinical Psychiatry

- Approaching to Psychiatric Diagnosis and Classification
- Etiology and Clinical Profile of Dementias
- Organic Delusional, Mood and Personality Disorders
- Concept and Typology of Schizophrenia
- Biological Basis of Schizophrenia
- Course, Outcome and Prognosis of Schizophrenia
- Brief and Reactive Psychosis
- Etiological Theories of Mood Disorders
- Subtypes of Depressive Disorders and their Clinical Relevance
- Course and Outcome of Mood Disorders
- Paranoid Disorders
- Concept and Typology of Personality Disorders
- Antisocial Personality Disorders

Semester III

- Anxiety disorders : Nosological status and natural history
- Reactions to severe stress
- Current concept of dissociative disorders
- Somatization disorders : Diagnosis and clinical features
- Nosological status and clinical features of Neurasthenia
- Non organic sleep disorders
- Recent advances in eating disorders
- Management of premature ejaculation
- Psychiatric aspects of homosexuality
- Biological basis of anxiety
- Habit and impulse disorders

Semester IV

- Models of psychotherapy: an overview
- Scientific evaluation of efficacy of psychotherapy: methodological problems
- Brief dynamic psychotherapies
- Behavioral therapies

- Cognitive therapies
- Supportive psychotherapies
- Psychological management of sexual dysfunctions
- Comparative pharmacology of antipsychotic drugs
- Short-term side effects of antipsychotic drugs and their management
- Tardive dyskinesia: pathophysiology and management
- Recent advances in antidepressant drug therapy
- Management of a suicidal patient
- Role of Lithium in Psychiatric disorders
- Adjuncts and alternatives to Lithium in the management of mood disorders
- Drug treatment of generalized anxiety and panic disorders
- Recent advances in drug treatment of obsessive compulsive disorders
- Electro-convulsive Therapy: current trends

Semester V

- Human Rights of psychiatric patients
- Ethics in Psychiatry
- Indian Mental Health Act
- Epidemiology of psychiatric Illness in Old Age with Special Reference to India.
- Current Issues in Management of Elderly Psychiatric Patients.
- Integration of Mental Health into Primary Care - Its Role and Future in India.
- Classification of Child and Adolescent Psychiatric Disorders.
- Learning Disorders of Childhood
- Child Abuse and Neglect
- School Refusal
- Pervasive Development Disorders of Childhood
- Preventive Aspects of Child and Adolescent Psychiatric Disorders
- Neuro Psychological Assessment of Children

Semester VI

- Dementia: Differential Diagnosis and Management
- Delirium: Differential Diagnosis and Management
- Psychiatric Syndromes with Epilepsy
- Neuro-psychiatric Sequel of HIV Infection
- Consultation-Liaison Psychiatry
- Psychological Aspects of Cardio-vascular Disorders
- Psychological Aspects of Gastro-intestinal Disorders
- The Terminally Ill Patient and Family

- Psychological Aspects of Breast Cancer
- Obesity
- Concept and Assessment of Disability
- Concept and Measurement of Quality of Life
- Neuro-psychologic Assessment and its Relevance to Psychiatric Diagnosis and Management
- Stress and Psychological Disorders
- Psychological Aspects of Organ Transplantation

V. Teaching Methods

The following techniques/methods are followed in the department for various teaching activities:

(a) Didactic Lectures

Didactic lectures are usually taken during the first six months for the new postgraduate resident to familiarize them with clinical methods like history taking, mental state examination, psychopathology, diagnosis and classification and some of the commonly seen clinical problems.

(b) Seminars

Seminars are held once a week for the entire department and are attended by the residents as well as the faculty. The seminars are prepared by the residents under the supervision of a faculty member. During the seminar, the presenting resident distributes a brief summary of his presentation as well as a complete bibliography on the subject.

Journal Club

Journal club is held every week. Important journal articles from the peer reviewed journals are selected before the semester begins and a resident in consultation with the consultant presents a detailed critique of the article.

(c) Case Conference

Case conference is held once a week and is attended by the entire department, i.e., junior residents, senior residents, faculty, psychologists and social workers, etc. Interesting/unusual/difficult case from the inpatient or outpatient services who has been under the care of the presenting resident is discussed in detail regarding psycho-pathology, diagnosis, differential diagnosis and management.

(d) Outpatient Teaching Activities

Residents are required to work up new cases in detail and then discuss with the consultant for the purpose of a psycho-pathology, diagnosis and differential diagnosis and management. During the follow-up clinics also residents are encouraged to bring their follow-up patients to the consultant for presentation and discussion.

(e) Ward Teaching

Ward rounds are taken by the consultants as well as senior residents besides service and management activities the emphasis of the ward round is teaching of postgraduate residents in the art of history taking, eliciting psychopathology arriving at diagnosis, discussing differential diagnosis, management and estimating the premises and outcome of a particular case.

(f) Tutorials

Tutorials are specially held in the De-Addiction Centre on assigned topics.

(g) Practical Demonstrations

Practical demonstrations are done specially for the teaching of EEG, neuro-imaging and psychodiagnostic tools. Residents also learnt by demonstrating various psychological tests like tests of intelligence, memory, personality, etc. to the patients.

(h) Thesis

Each postgraduate resident is required to complete a thesis work under the guidance of guide/co-guide. The objective of thesis is to provide training to the postgraduate in research methodology and technique including identification of a problem, formulation of a hypothesis, literature review, research design, data collection, data analysis, formulating results and finally writing of the dissertation. The dissertation is mandatory as a part fulfillment of the M.D. Course.

(i) Clinical Postings**1. Psychiatry OPD and Ward**

Each resident is posted to Psychiatry OPD and ward for a duration of 27 months out of a total of three years. The aim of the clinical postings in the OPD and ward is acquisition of clinical skills. These clinical skills are:

- Comprehensive history taking and physical examination.
- Working knowledge of major psychiatric diagnoses as per the ICD and the ability to present a reasoned differential diagnosis.
- Psychiatric formulation
- Ability to develop a comprehensive treatment plan.
- Knowledge of psychopharmacological agents, including indications and significant adverse effects.
- ECT administration
- Understanding of and basic competence in identifying psychiatric emergencies and their management.
- Ability to write clear and thorough histories, consultation notes and follow-up notes.
- Demonstrate appropriate professional demeanor and ethics including respect for patient's confidentiality.

2. De-Addiction Centre

De-Addiction Centre is dedicated to the drug dependence and its treatment. The aims of posting of a postgraduate resident is to impart him clinical skills in various kinds of drug dependence. The specific skills expected are comprehensive history taking and physical examination, knowledge of major drug alcohol and drug dependence, follow up to develop a comprehensive treatment plant and knowledge of various techniques of detoxification, long term management and rehabilitation. The duration of this posting is for six months and it usually follows once a resident has put in a minimum of one year in the main psychiatry OPD and ward.

3. Neurology

The resident is posted in the neurology for a period of three months during the second or third year course residency programme. The aim of the posting is to make the resident

competent in:

- Clinical history taking, neurological examination, diagnosis, localization.
- Common neurological disorders encountered in general practice.
- Neurobehavioural disorders
- Special methods of investigation in neurology (including reporting and interpreting EEGs, reading CT scans/MRI).
- Treatment approaches including recent advances.

4. Child Guidance Clinic

During the posting in Psychiatry OPD and Psychiatry Ward the resident attends the weekly child guidance clinic with the objectives of:

- Normative child development
- Interview in children
- Classification, epidemiology, etiology and presentation of child and adolescent psychiatric disorders.
- Conduct, emotional and behavioural problems in children.
- Mental retardation etiology, manifestation, assessment, management and prevention.
- Specific learning disabilities
- Psychopharmacology in children
- Psychosocial management issues with children.
- Adult outcome of child psychiatric disorders.
- Liaison with teachers, schools, child care institutions.

VI. CONSULTATION LIAISON AND EMERGENCY MANAGEMENT

Residents are regularly assigned to primary medical disorder in various medical/surgery disciplines in the hospital under the supervision of a consultation. They also are required to work up and discuss emergency psychiatric cases presenting to the casualty of the hospital.

VII. EXAMINATIONS

1. Thesis

As already mentioned successful completion of thesis and its evaluation by an external examiner is a pre-requisite for a resident to appear in the final MD examination which is conducted towards the completion of three years of residency.

2. Theory Examination

The residents are examined in four written theory papers of 3-hours each as follows:

Paper I - Basic sciences as related to psychiatry

Paper II - Clinical Psychiatry

Paper III - Psychiatry sub-specialties

Paper IV - Neurology and medicine as related to psychiatry

The detailed course contents of these four papers are annexed.

3. Practical/Clinical Examination

The clinical examination consists of following activities

- (a) Long case in psychiatry
- (b) Long case in Neurology
- (c) Spots consisting of EEG, neuro-imaging and psychological testing instruments.
- (d) Grand viva

RADIO-DIAGNOSIS — M D

GOAL

Goal of the course is to orient and train the students on different aspects of diagnostic and interventional radiology in the diseases of various organ systems of the human body. They should be able to apply this training at secondary and tertiary level of medical care.

OBJECTIVES

In order to achieve the goal of this course, following objectives are to be accomplished by the time the candidate completes the 3 years course.

Three broad domains of the objectives are:

1. Cognitive domain (Knowledge)
2. Psychomotor domain (Skills)
3. Attitudinal domain (Human values, ethical practice etc.)

Cognitive Domain (Knowledge)

1. Describe aetiology, pathophysiology, and principles of diagnosis and management of common problems including emergencies, in adults and children.
2. Demonstrate understanding of basic sciences relevant to this specialty.
3. Identify important determinants in a case (e.g. social, economic, environmental) and take them into account for planning therapeutic measures.
4. Recognize conditions that may be outside the area of specialty/competence and to refer them to proper specialist or ask for help.
5. Advise regarding the management (including interventional radiology) of the case and to carry out the management effectively.
6. Update oneself by self-study and by attending courses, seminars, conferences and workshop which are relevant to the field of radio-Diagnosis.
7. Carry out guided research with the aim of publishing his/her work and presenting work at various scientific fora.

Psychomotor Domain (Skills)

1. Take a proper clinical history, examine the patient, perform essential diagnostic/interventional procedures and interpret the results to come to a reasonable diagnosis or differential diagnosis in the condition.
2. Provide basic life saving support service in emergency situations.
3. Undertake complete patient monitoring including the care of the patient.

Attitudinal Domain

1. Adopt ethical principles in all aspects of his/her practice. Professional honesty and integrity to be fostered.
2. Develop communication skills in order to explain the various options available in management and to obtain a true informed consent from the patient.
3. Be humble and accept the limitations of his knowledge and skills and to ask for help from colleagues/seniors when needed.
4. Respect patient rights and privileges including patient's right to information and right to seek a second opinion.

COURSE CONTENT**1. BASIC SCIENCES RELATED TO RADIO-DIAGNOSIS**

- (a) Radiation physics and Radio-Biology,
- (b) Radiological anatomy and pathology of various organ systems
- (c) Imaging Techniques,
- (d) Radiography.

Includes all aspects of: Fundamentals of electromagnetic radiation, X-Ray production, characteristic properties of X-Rays, units of radiation, radiation measurement, X-ray equipments, X-Ray films, intensifying screens, other X-Ray appliances, dark room equipments and procedures, II TV, cine fluorography, tomography.

- Quality assurance.
- Radiation hazards and principle and methods of radiation protection.
- Contrast media : types, chemistry, mechanisms of action, dose schedule, routes of administration, their potential adverse reactions and management.
- Clinical applications of important isotopes and instrumentation in Nuclear medicine with advances in both.
- Physics and applications of advanced imaging i.e., Ultrasound, CT, MRI, Angiography (DSA), PET etc.
- Practical experiments in physics : A list of experiments, which a resident should be able to do and interpret the results, is available in the department.

2. RESPIRATORY SYSTEM

Goal

At the completion of the course the resident should be able to interpret conventional and advanced (CT, MRI) chest examinations, differentiating normal from abnormal cases and be able to recognize specific imaging pattern of different diseases.

Content Coverage

Diseases of the chest wall, diaphragm, pleura and airways; pulmonary infections; pulmonary vasculature; pulmonary neoplasms; diffuse lung disease; mediastinal disease; chest trauma; post-operative lung and X-Rays in intensive care.

Essential Objectives

1. Should be able to localize the chest pathology into one of the following compartments: pulmonary, pleural, mediastinal, extra-pleural, extra-thoracic, diaphragmatic, infradiaphragmatic.
2. Recognize chest pathology that requires urgent or emergency treatment and describe this in an adequate manner: Pneumothorax, traumatic aortic rupture, esophageal rupture, acute pulmonary embolism, CHF and tracheo-bronchial foreign bodies.
3. Recognize acute and chronic patterns of bacterial and viral pneumonia's, occupational diseases, allergic states.
4. Recognize acute and chronic cardiac failure patterns and non-cardiogenic edemas.
5. Understand the radiographic features and precipitating causes of adult and infant respiratory distress syndrome.
6. Recognize and describe appropriately the various manifestations of benign and malignant neoplasm's of the lung.

Evaluation

- Resident's progress through daily observation of work
- At the end of the rotation an assessment by a small group of faculty.
- Maintain a log book showing techniques learnt during the rotation – to be supervised.

3. GASTROINTESTINAL (GIT) AND HEPATO-BILIARY-PANCREATIC SYSTEM

Goal

At the completion of this course the resident should be able to interpret both the conventional and other newer (ultrasound, CT, MRI, angiography) examinations. This includes examination of GIT i.e., esophagus, upper gastrointestinal study, follow through for small bowel (including small bowel enterolysis) and enema (both conventional and double contrast) for colon. It also includes examination of liver, biliary system and pancreas using all the imaging modalities available to a radiologist including specialized investigations like ERCP, PTC and interventional procedures like abscess drainage, Percutaneous Transhepatic biliary drainage (PTBD, internal and external), tumor embolization, Radiofrequency (RF) ablation etc.

During this posting resident also performs other investigations done using fluoroscopic guidance e.g; hysterosalpingography (HSG); fistulogram, sinogram, T-Tube cholangiography, sialography etc. and he/she should be able to perform and interpret studies using these modalities.

Content Coverage

Diseases and disorders of mouth, pharynx, salivary glands, esophagus, stomach, small intestine, large intestine, diseases of omentum, peritoneum and mesentery, acute abdomen, abdominal trauma using conventional and newer imaging methods like CT, MRI, DSA, isotope studies.

Diseases and disorders of hepato-biliary-pancreatic system using conventional & newer imaging methods.

Essential Objectives

1. Learn to evaluate the clinical condition & needs of a patient and to decide the appropriate studies and approach for examining the GIT or hepato-biliary-pancreatic system of a patient.
2. Learn a proper approach to fluoroscopy: this includes developing proficiency in GIT fluoroscopy, mastering the equipment and using proper radiation protection measures (both for the patient and the operator).
3. Learn the basic pathology and patho-physiology of GIT/hepato-biliary-pancreatic diseases.
4. Learn to communicate the findings both at fluoroscopy and in films, in an accurate, succinct and meaningful way.

Evaluation:

- Day to day observation of residents work including documentation and interpretation
- Assessment by a group of faculty at the end of the rotation.
- Log book will be maintained of the procedures learnt.

4. GENITO-URINARY SYSTEM

Goal

At the completion of this course resident should be able to perform, direct the radiography and interpret the conventional radiological examinations of the urinary tract. These includes: excretory urography (intravenous pyelography); cystograms, micturating cystourethrography (MCU) and retrograde urethrography (RGU).

[HSG is included under GIT rotation].

In addition the resident should be able to perform and interpret other diagnostic imaging modalities and procedures which are used to evaluate urinary tract pathology i.e., ultrasound, CT, MRI, angiography, as well as various interventional procedures like percutaneous nephrostomy, kidney biopsy, stent placement, antegrade pyelography, tumor embolization etc.

Obstetrics and gynaecology ultrasound : separate posting in III year.

Hysterosalpingography : already included with GIT posting.

Content Coverage

Imaging : conventional, ultrasound, CT, MRI, angiography; of various diseases and disorders of genito-urinary system. These includes : congenital, inflammatory, traumatic, neoplastic, calculus and miscellaneous conditions.

Essential Objectives

1. Recognize and evaluate emergency conditions involving the urinary tract including trauma, infection, vascular compromise and obstruction.

2. Recognize and understand the patho-physiology of stone disease.
3. Recognize patterns of infectious diseases and the modalities necessary for diagnostic evaluation.
4. Understand the complete evaluation of renal mass lesions and the evaluation of other urinary tract neoplasms, including the detection and staging of the tumor.
5. Recognize the difference between the pattern of diseases affecting the genito-urinary tract of adults and that of children and understand and identify the common conditions affecting the paediatric genito-urinary system on imaging.

Evaluation:

- day to day, based on daily work assessment
- by a group of faculty at the end of the posting.
- Maintain a log book

5. MUSCULOSKELETAL SYSTEM***Goal***

At the end of the course the resident should be able to correctly interpret all the common abnormalities of the bones and joints. He/She should have a good understanding of the common congenital abnormalities, arthritis, bone and joint trauma, neoplastic conditions, metabolic bone disease and inflammatory diseases. He/She should also have an understanding of the role of CT/MRI in all these conditions and should be able to perform and interpret CT/MRI in diseases of musculo-skeletal system.

Content Coverage

Imaging (Conventional, ultrasound, CT, MRI, angiography, Radio-isotope studies) and interpretation of diseases of muscles, soft tissue, bones and joints including congenital, inflammatory, traumatic, neoplastic and miscellaneous conditions.

Essential Objectives

1. Communicate precisely and cogently radiographic descriptions of bone and joint trauma.
2. Differentiate various forms of arthritis and know correlative laboratory and clinical findings.
3. Enumerate the radiographic features that differentiate benign and malignant bone tumors with a basic familiarity of more common tumors.
4. Know radiographic features of acute and chronic osteomyelitis and discitis (including tuberculosis).
5. Recognize differential features of osteoporosis (including Bone Mineral Density or BMD assessment techniques e.g; US,CT,Dexa) including various endocrine and metabolic diseases e.g; osteomalacia, hyperparathyroidism etc.
6. Know the application and interpretation of ultrasound/CT/MRI/angiography in one or more of the above situations.

Evaluation

- through daily sessions assessment
- by a small group of faculty at the end of the posting
- Will maintain a log book

6. CARDIOVASCULAR RADIOLOGY/ECHO CARDIOGRAPHY

Goal

Goal is to provide experience in the role of imaging in cardiovascular diseases by different techniques including cardiac catheterization and cardiac angiography, Digital subtraction angiography (DSA) and interventional procedures in non cardiac arterial and venous diseases.

Content Coverage

Diseases and disorders of cardiovascular system including congenital conditions and the role of imaging by conventional, ultrasound, Echo, color-Doppler, CT, MRI, angiography (including DSA) and radionuclide studies. It also includes interventional procedures e.g; balloon angioplasty, embolization etc.

Essential Objectives

1. Understand the anatomy and common pathology of congenital and acquired cardiac conditions.
2. Correlate plain film findings of common congenital abnormalities with those shown by angiography and explain the pathophysiology including abnormal pressure measurements.
3. Correlate plain film findings and the echocardiographic studies of patients with acquired valvular diseases and other common pathologic conditions including pericardial pathology.
4. Understand the role of newer modalities like CT/MRI, in aortic diseases e.g., aorto- arteritis, aortic dissection and aortic aneurysm.
5. Should be able to perform fluoroscopy on patients before and after valve replacement and identify those with complications after valve replacement.
6. Understand the principle and logic behind various interventional procedures carried out in the cardiovascular labs e.g; PTCA, balloon dilatation of valvular lesions, septostomy etc.

Evaluation

- day to day assessment
- by a small group of faculty
- Maintain a log book to be checked by faculty in charge

7. NEURORADIOLOGY

Goal

At the end of the course the resident should be able to demonstrate reasonable proficiency in the assistance during performance as well as in the interpretation of all neuro-radiological studies. This includes angiograms, both cerebral and non-cerebral studies, transluminal angioplasties, embolization procedures and myelography. They should also be able to perform and interpret CT and MRI of head and spine.

Content Coverage

Includes imaging (using conventional and newer methods) and interpretation of various diseases and disorders of the head, neck and spine covering congenital lesions, infective lesions, vascular lesions, traumatic conditions and neoplasia. It also includes a number of interventional procedures carried out in the department of neuroradiology.

Essential Objectives

1. Know detailed normal neuro-imaging anatomy on different imaging modalities.

2. Identify pathologic conditions (listed under the content) on images acquired using different techniques and communicate the report in a concise manner.
3. Participate in daily neuroradiology conferences held with the neurosurgery or neurology units.

Evaluation

- day to day based on reporting and procedures performed.
- by a small group of faculty.
- Will maintain a log book to be checked by faculty in neuroradiology.

8. GENERAL RADIOLOGY

Goal

In this rotation the resident learns to evaluate conventional radiographs. This includes radiographs of : chest, abdomen, pelvis, skull, spine, musculo-skeleton and soft tissues. Resident is posted in OPD and indoor radiography rooms for this purpose.

During indoor posting, he/she will also have the additional responsibility of directing, evaluating and reporting mammographic procedures including related interventional procedures.

Essential objectives

1. Learns to direct and perform radiography on patients.
2. He/she should be able to decide on further imaging views based on the clinical suspicion and the initial imaging.
3. Write reports on the radiographs obtained in a methodical, concise and precise way and communicate it to the referring unit.
4. Present interesting cases in the departmental meets.

9. ULTRASOUND (INCLUDING GYNAE/OBSTETRICS)

Goal

At the completion of this rotation the resident should be able to perform and interpret all ultrasound studies. These studies include : abdomen, pelvis, small parts, neonatal head, color-duplex imaging (including peripheral i.e; extremity arterial and venous studies), obstetrics/gynaecology (in the deptt of Gyn/Obstet) and interventional procedures using ultrasound guidance. The resident should have a thorough knowledge of the common abnormalities of the abdominal/pelvic organs, retroperitoneal structures, neck, chest, extremities and small parts (thyroid/parathyroid, scrotum, orbit, breast).

Essential Objectives

1. Determine or select the appropriate diagnostic procedure for the clinical problem.
2. Demonstrate proficiency in patient scanning using appropriate techniques and instrumentation.
3. Modify the procedure, if required, based upon the observed abnormalities (pathology).
4. Analyze the results of the diagnostic procedure, make diagnosis and record the findings.
5. Communicate findings, diagnosis and other relevant information to the referring physician.
6. Present interesting ultrasound cases in the departmental conferences/meetings.

Evaluation

- ongoing basis using day to day work

- presentations in departmental meets
- maintain a log book
- by a group of faculty at end of the rotation

10. CT

Goal/Objectives

The goals/objectives to be achieved by the end of this rotation are:

1. Select CT protocol according to the clinical diagnosis. He/she should be able to direct and modify (if required) the performance of the CT examination
2. Demonstrate knowledge of the CT findings of the common pathologic conditions occurring in the head, neck, chest, abdomen, pelvis, and in the soft tissues and musculo-skeletal system.
3. Resident should be familiar with both the conventional and different modified CT techniques (High resolution, Dual phase, CT angio, BMD, multislice CT etc.)
4. Interpret conventional and modified body CT examinations (including HRCT, dual/triple phase CT, CT portography, virtual CT etc.) with a reasonable degree of accuracy.
5. Demonstrate proficiency in verbal and written reporting of CT findings and differential diagnosis.
6. Demonstrate knowledge of the limitations (and potential fallacies) of CT imaging of various pathologic conditions and be able to perform correlations with other imaging modalities including formulations of recommendations for additional appropriate imaging procedures.
7. Perform CT guided biopsy procedures under guidance of seniors.
8. Present interesting cases of CT in the departmental meetings.

Essential Objectives

1. The resident will review the daily body CT schedule and based upon the known clinical information and review of other radiologic studies of the same patient done earlier, select the most appropriate CT imaging protocol for the each patient. This may include altering an existing CT protocol to provide the most appropriate examination for an individual patient.
2. Develop a working knowledge of the actual performance of the CT examinations. This includes starting intravenous lines, amount and timing of injecting i.v. contrast, and actual operation of CT machine.
3. Review and report all the completed body CT examinations. Initially this will be under the supervision of the seniors but later independently – but all reports will be signed by the faculty incharge.
4. Participate and present CT cases in departmental and inter departmental meets.

Evaluation

- on daily basis after observing reporting and working in the CT room
- by a group of faculty
- Maintain a log book under the supervision of faculty incharge.

11. ANGIOGRAPHY AND INTERVENTIONAL RADIOLOGY

Goal

At the completion, the resident should be able to perform the most common non-cerebral angiographic studies. He/she should have a good basic understanding of both; the vascular interventional radiologic

procedures such as angioplasty, embolization using various embolizing agents; as well as the various non-vascular interventional procedures such as percutaneous nephrostomy, stenting, abscess drainage, PTC/PTBD, percutaneous biopsy, balloon dilatation of the esophagus etc. He/she should have a good understanding of the various equipment and available catheters and guidewires and other technical aspects of special procedures. In addition he/she should know all the potential risks and complications of these procedures and their management.

Essential Objectives

1. Evaluate the requisition for appropriate clinical information to determine if additional information is needed.
2. Determine or select appropriate diagnostic procedure for the clinical problem.
3. Assist and perform appropriate procedures under supervision and modify procedures based on observed abnormalities (pathology).
4. Know the potential risks and complications of procedures performed.
5. Know normal vascular anatomy applicable to angiographic procedures performed and know normal anatomy and landmarks to perform other non-vascular procedures.
6. Present interesting cases in the departmental meets.

Evaluation

- day to day evaluation
- by a group of faculty
- Will maintain a log book

12. PAEDIATRIC RADIOLOGY

Goal

Intention is to train residents to perform common radiologic procedures and to be able to interpret paediatric studies in order that they can appropriately deal with examinations of children in a non paediatric hospital environment.

At the completion the resident should be able to interpret most of the conventional and newer paediatric examinations which includes: upper airways, chest, genito-urinary, gastro-intestinal and musculo-skeletal systems. Resident should be familiar with many of the neurologic conditions encountered in neonates and children. Resident should also be able to perform transfontanelle cranial ultrasound.

Content Coverage:

Common diseases and disorders of different organ systems covering congenital, inflammatory, traumatic, neoplastic and other miscellaneous conditions, using both conventional and newer imaging methods.

Essential Objectives

1. Understand the appropriate indications for various imaging procedures and determine that the patient has been properly prepared for the procedure.
2. Know the standard radiographic views for paediatric examinations.
3. Learn to recognize and evaluate imaging manifestations (on conventional and newer methods) of common paediatric conditions occurring in the head/neck, chest, abdomen/pelvis and in the musculo-skeleton.

4. Perform paediatric fluoroscopic examinations with skill and accuracy.
5. Understand and apply the knowledge and principle of radiation protection, both for the child and the operator.

13. RADIOLOGY IN EMERGENCY MEDICINE

Goal

At the end of the course, resident should be able to give an evaluation of the emergency radiographic examinations. He/she should also be familiar with medicolegal cases (MLC) procedures.

Essential Objectives

1. Determine and direct radiography in emergency patients and review and interpret the radiographs.
2. If study is incomplete then determine additional views or repeat views.
3. Know indications for and limitations of the common emergency imaging procedures.
4. Communicate findings, diagnosis and other relevant information to the emergency room physician.
5. He/she should be able to perform (some under supervision) and interpret special imaging procedures needed in emergency room e.g; barium studies, excretory urography, CT, ultrasound, Doppler and angiography.

14. ONCOLOGIC RADIOLOGY

Goal

At the end of the rotation the resident should be able to interpret radiological investigations in patients with neoplastic diseases (both benign and malignant). He/she should be able to perform, interpret and diagnose these patients.

Essential objectives

1. Understand pathology and patho-physiology of common neoplasms.
2. Learn the algorithmic approach to image these patients based on the suspected disease, its biological behaviour and potential and limitations of various imaging modalities.
3. Perform appropriate investigation(both conventional and newer methods), interpret the results and reach at a reasonable diagnosis/ differential diagnosis based on the clinical and biochemical results.
4. Learn to communicate the results in a precise way in a written report to the concerned unit.
5. Present interesting cases in the departmental meets.

15. NUCLEAR MEDICINE

Goal

At the completion of this rotation the resident should be able to interpret common nuclear medicine examinations (including cardiac cases). He /she should be able to evaluate the examinations for completion and determine what further images (including non nuclear medicine) need to be done. He/she should have a good understanding of the physical and biological properties of the commonly used radiopharmaceuticals and become familiar with safe handling of isotopes and basic radiation safety measures while dealing with isotopes.

Essential objectives

1. Review all cases performed each day.
2. Interpret the results of the procedures and give an appropriate diagnosis.
3. Observe and help in some common procedures performed in the department (e.g; thyroid, kidney, bone, cardiac scans), understand the principle underlying the procedure and the basis for using a particular isotope in an investigation.

Evaluation

- Day to day by the nuclear medicine staff.

DISSERTATION**Thesis**

1. Every candidate pursuing MD degree course is required to carry out work on a selected research project under the guidance of a recognised post graduate teacher. The results of such a work shall be submitted in the form of a dissertation.
2. The dissertation is aimed to train a post graduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing of a research study, collection of data, critical analysis, comparison of results and drawing conclusions.
3. Chief guide will be from the department of Radio-diagnosis while co-guides will be from either the department of Radio-diagnosis or other disciplines related to the dissertation topic.
4. Every candidate shall submit a thesis protocol to the Dean of the Institute in the prescribed proforma containing particulars of proposed dissertation work four months from the date of commencement of the course. The thesis protocol shall be sent through the proper channel.

Protocol in essence should consist of:-

- (a) Introduction and objectives of the research project.
 - (b) Brief review of literature
 - (c) Suggested material and methods
 - (d) Bibliography
5. Such thesis protocol will be reviewed and the dissertation topic will be registered by the Institute. No change in the dissertation topic or guide shall be made without prior approval of the Dean of the Institute.
 6. Submission of thesis.

Thesis will be submitted at the end of two and a half (2.5) years.

Thesis should consist of

- (e) Introduction
- (f) Review of literature
- (g) Aims and objectives
- (h) Material and methods

- (i) Results
 - (j) Discussion
 - (k) Summary and Conclusions
 - (l) Tables
 - (m) Annexures
 - (n) Bibliography
7. Two copies of dissertation thus prepared shall be submitted to the Dean AIIMS, six months before the final examination.
8. The dissertation shall be valued by two external examiners appointed by the Institute. Approval of dissertation work is an essential precondition for a candidate to appear in the final MD examination.
- Dissertation is graded as follows :
- Highly commendable
 - Commendable
 - Satisfactory
 - Rejected

MD (Radodiagnosis), Posting Schedule

Total Duration : 3 years

Applied Physics and Basic Sciences

First Year	Second Year	Third Year
Conventional Radiology (OPD) — 3 months	Ultrasound (with interventions) — 2 months	Emergency Radiology (Casualty) — 2 months
Genitourinary-3 months	CT (with interventions) — 2 months	Oncologic Radiology (IRCH) — 2 months
Conventional Radiology, including Paediatric Radiology (Indoor) — 3 months	Angiography (with interventions) — 2 months	Nuclear Medicine — 1 month
Observer Postings:		
1. GIT - 1 month	MRI – 2 months	Obstet/Gyn (US)- 15 days
2. Ultrasound-1 month		
3. CT –1 month	Cardiac Radiology- 2 months	Echocardiography – 15 days
	Neuroradiology – 2 months	Ultrasound – 1 Month
		CT — 1 month
		MRI — 1 month
		Angiography — 1 month
		Elective – 2 months

Dissertation submission at the end of 2 ½ years

Classes on Statistics : A series of lectures held for every one

STRUCTURE

1. Basic Sciences

- (a) Anatomy
- (b) Pathology
 - General Pathology
 - Systemic Pathology
- (c) Radiotherapeutic physics
- (d) Clinical Radiobiology
- (e) Statistical basis for planning & interpretation of clinical trials.

2. Clinical Radiotherapy

3. Clinical Chemotherapy

4. Other disciplines allied to Radiotherapy and Oncology

5. Palliative care

6. Research, Training & Administration

1. BASIC SCIENCES

1.1. Anatomy

- 1.1.1. Knowledge of surface anatomy pertaining to Oncology
- 1.1.2. Detailed knowledge of the anatomy of all organs.
- 1.1.3. Detailed knowledge of the lymphatic system of all regions
- 1.1.4. Practical familiarity with the radiographic appearance of important regions
- 1.1.5. Cross sectional anatomy

1.2. Pathology

- 1.2.1 General Pathology
 - 1.2.1.1. Definitions of & distinction between different types of growth disorders (i.e. distinction between hyperplasia, hypertrophy, regeneration, malformation & neoplasia)
 - 1.2.1.2. Malignant transformation -
 - Initiation & promotion stages of carcinogenesis
 - Mode of origin - monoclonal, polyclonal, unifocal, multifocal
 - Structural & functional changes in the cellular components.
 - Etiology, mechanisms of carcinogenesis, known types of carcinogens & their effects upon the cell. The relative importance of different factors in the causation of human cancer.
 - 1.2.1.3. Rate of growth, methods of measurement
 - Factors affecting growth rate
 - Mechanisms of spread
 - Local effects of tumors

Local & systemic reactions to tumors

Effects of therapy on tumors & normal tissues.

1.2.1.4. Criteria for tumor diagnosis - macroscopic, histological & cytological uses & value of biopsy material

1.2.1.5. Classification of tumors - histogenic, histological, behavioral & immunological

1.2.1.6. Nomenclature - solid tumors, lymphomas, leukemias

1.2.1.7. Structure & organization of tumors - vascular supply, stroma etc

1.2.1.8. Systems of grading

1.2.1.9. Endocrine aspects of malignancy:- production of hormones by tumors, effect of hormones on tumours, paracrine effects of tumors

1.2.1.10. Paraneoplastic syndromes

1.2.1.11. Etiology of cancer

Genetic predisposition, congenital syndromes

Chromosomal abnormalities, hereditary tumours

Protooncogenes, oncogenes, tumor suppressor genes, viruses & malignancy

Multifactorial causation

Nutritional aspects in cancer causation and prevention.

Environmental causes of cancer

Biological - protozoal, bacterial, viral

Chemical - Classes of carcinogenic chemicals, smoking

Physical - trauma, irradiation (UV rays, other electromagnetic radiation including X rays and Gamma rays and particulate radiations)

Common occupational cancers.

Experimental tumours in animals - relationship to human mutagenicity.

1.2.1.12. Tumor immunology

Organisation & development of the immune system & the role of immune response in disease

Cellular basis of immunity & measurement of immune function. Graft versus host reaction

Tumor immunity, tolerance, enhancement

Immune surveillance hypothesis

Immunological markers in diagnosis & monitoring

Experimental & clinical immunotherapy

The HLA systems.

1.3. Radiation Oncology Physics

The aim of this subject is to provide the future Clinical Oncologist with the knowledge of physics required in clinical practice.

An understanding of the principles of planning & carrying out treatment is a necessary prerequisite & will be enhanced by the study of this subject.

*A familiarity with the **physics of electricity, atomic structure & electromagnetic radiation** will also be required in order to understand parts of the syllabus.*

As they are studied they should be analyzed critically with respect to their implications for accurate dose delivery in clinical radiation therapy. Applicability limitations, advantages, & disadvantages of the various devices & techniques should receive particular attention.

Candidates should be encouraged to observe & gain practical experience with the equipment & techniques used in radiotherapy in clinical oncology departments.

- 1.3.1 *Structure of Matter:* Constituents of atoms, Atomic and mass numbers, Atomic and mass energy units, Electron shells, Atomic energy levels, Nuclear forces, Nuclear energy levels
Electromagnetic radiation, Electromagnetic spectrum, Energy quantisation, Relationship between Wavelength, Frequency, Energy
- 1.3.2 *Nuclear Transformations:* Natural and artificial radioactivity, Decay constant, Activity, Physical, Biological and Effective half-lives, Mean life, Decay processes, Radioactive series, Radioactive equilibrium
- 1.3.3 *Production of X-rays:* The X-ray tube, Physics of X-ray production, Continuous spectrum, Characteristic spectrum, Efficiency of X-ray production, Distribution of X-rays in space, Specifications of beam quality, Measurement of beam quality, Filters and filtration
- 1.3.4 *Interaction of radiation with matter:* Attenuation, Scattering, Absorption, Transmission, Attenuation coefficient, Half Value Layer (HVL), Energy transfer, Absorption and their coefficients. Photoelectric effect, Compton Effect, Pair-production, Relative importance of different attenuation processes at various photon energies
Electron interactions with matter: Energy loss mechanisms- Collisional losses, Radiative losses, Ionization, Excitation, Heat production, Delta rays, Polarization effects, Scattering, Stopping power, Absorbed dose, secondary electrons
Interactions of charged particles: Ionization vs. Energy, Stopping power, Linear Energy Transfer (LET), Bragg curve, Definition of particle range
- 1.3.5 *Measurement of radiation:* Radiation Detectors: Gas, Solid-state, Scintillation, Thermoluminescence, Visual Imaging (Film, Fluorescent screens), and their examples
Exposure, Dose, Kerma: Definitions, Units (Old, New), Inter-relationships between units, Variation with energy and material. Measurement of exposure (Free air chamber, Thimble chamber), Calibration of therapy beams: Concepts, Phantoms, Protocols (TG 21, IAEA TRS-277, TG 51) Dose determination in practice (*brief outline only, details not required*)
- 1.3.6 *Radiotherapy Equipment:* Grenz ray, Contact, Superficial, Orthovoltage or Deep therapy, Supervoltage, Megavoltage therapy. Therapy and diagnostic X-ray units – comparison. Filters, factors affecting output, principles of cooling. Betatrons.
Co-60 units: Comprehensive description of the unit, Safety mechanisms, Source capsule

- Linear accelerators:* History, Development, Detailed description of a modern, dual mode linear accelerator, Linac head and its constituents, Safety mechanisms, Computer controlled linacs, Record and Verify systems
- Relative merits and demerits of Co-60 and linac units
- Simulators:* Need for them, Detailed description of a typical unit, Simulator CT
- 1.3.7 *Basic ratios, Factors, Dose distributions, Beam modifications and Shaping in Teletherapy beams*
- Characteristics of photon beams: Quality of beams, Difference between MV and MeV, Primary and scattered radiation
- Percentage depth dose, Tissue-Air Ratio, Scatter Air Ratio, Tissue-Phantom Ratio, Tissue Maximum Ratio, Scatter Maximum Ratio, Back Scatter Factor, Peak Scatter Factor, Off-Axis Ratio, Variation of these parameters with depth, field size, source-skin distance, beam quality or energy, beam flattening filter, target material. Central axis depth dose profiles for various energies.
- Equivalent square concept, Surface dose (entrance and exit), Skin sparing effect, Output factors
- Practical applications:* Co-60 calculations (SSD, and SAD technique), Accelerator calculations (SSD, and SAD technique)
- Beam profiles, Isodose curves, Charts, Flatness, Symmetry, Penumbra (Geometric, Transmission, and Physical), Field size definition
- Body inhomogeneities: Effects of patient contour, Bone, Lung cavities, Prosthesis on dose distribution. Dose within bone / lung cavities, Interface effects, Electronic disequilibrium
- Wedge filters and their use, Wedge angle, Wedge Factors, Wedge systems (External, In-built Universal, Dynamic / Virtual), Wedge isodose curves
- Other beam modifying and shaping devices: Methods of compensation for patient contour variation and / or tissue inhomogeneity - Bolus, Buildup material, Compensators, Merits and Demerits. Shielding of dose limiting tissue: Non-divergent and Divergent beam blocks, Independent jaws, Multileaf collimators, Merits and Demerits
- 1.3.8 *Principles of Treatment Planning - I*
- Treatment planning for photon beams: ICRU 50 and NACP terminologies. Determination of body contour and localization: Plain film, Fluoroscopy, CT, MRI, Ultrasonography, Simulator based
- Methods of correction for beam's oblique incidence, and body inhomogeneities
- SSD technique and isocentric (SAD) technique: Descriptions and advantages of SAD technique
- Combination of fields: Methods of field addition, Parallel opposed fields, Patient thickness vs. Dose uniformity for different energies in a parallel opposed setup, Multiple fields (3 fields, 4 field box and other techniques). Examples of above arrangements of fields in SSD and SAD techniques, Integral Dose
- Wedge field technique, Rotation Therapy (Arc, and Skip), Tangential fields. Beam balancing by weighting. Total and hemi-body irradiation. Field junctions

1.3.9 *Principles of treatment planning – II*

Limitations of manual planning. Description of a treatment planning system (TPS): 2D and 3D TPS. Beam data input, Patient data input (simple contour, CT, MR data, Advantages of transfer through media), Input devices (Digitizer, floppies, DAT devices, Magneto-optical disks, direct link with CT, MR). Beam selection and placement, Beam's Eye View (BEV), Dose calculation and display (Point dose, Isodose curves, Isodose surfaces, Color wash). Plan optimization, Plan evaluation tools: Dose-Volume Histograms (Cumulative and Differential), Hard copy output, Storage and retrieval of plans.

Alignment and Immobilization: External and internal reference marks, Importance of immobilization in radiotherapy, Immobilization methods (Plaster of Paris casts, Perspex casts, bite block, shells, head rests, neck rolls, Alpha-Cradles, Thermoplastic materials, polyurethane foams), Methods of beam alignment (isocentric marks, laser marks, and front/back pointers).

Treatment execution: Light field, Cross hair, ODIs, Scales in treatment machines

Treatment verification: Port films, Electronic portal imaging devices, In-vivo patient dosimetry (TLD, diode detectors, MOSFET, Film, etc) Changes in patient position, target volume, and critical volume during course of treatment

1.3.10 *Electron Beam Therapy*

Production of electron beams: Production using accelerators, Characteristics of electrons. Surface dose, percentage depth dose, beam profiles, Isodose curves and charts, Flatness and Symmetry. Beam collimation, variation of percentage depth dose and output with field size, and SSD, photon contamination. Energy spectrum, Energy specification, variation of mean energy with depth. Suitability of measuring instruments for electron beam dosimetry

Treatment planning: Energy and field size choice, air gaps, and obliquity, Tissue inhomogeneity – lung, bone, air filled cavities. Field junctions (with either electron or photon beam). External and internal shielding. Arc therapy, Use of bolus in electron beam

Total Skin Electron Irradiation, Intraoperative Radiation Therapy

1.3.11 *Physical Principles of Brachytherapy:* Properties of an ideal brachytherapy source, Sources used in brachytherapy: Ra-226, Cs-137, Ir-192, Au-198, Co-60, I-125, Sr-90, Yt-90, Ru-106, Ta-182 and other new radionuclides, Their complete physical properties, Radium hazards. Source construction including filtration, comparative advantages of these radionuclides

Historical background. Radiation and Dose units: Activity used, Exposure, Absorbed Dose, mg-hr, curie, milli-curie, milligram Radium equivalent, roentgen, rad, gray. Source strength specification, Brachytherapy Dose calibrator

Techniques: Pre-loaded, Afterloading (manual and remote), Merits and Demerits. Surface, Interstitial, Intracavitary, Intraluminal, Intravascular brachytherapy. Low, Medium, High and Pulsed dose rates. Remote afterloading machines, Detailed description of any one unit

Dosage systems: Manchester System (outline only), Paris System (working knowledge)

Treatment Planning: Patient selection, Volume specification, Geometry of implant, Number, Strength and Distribution of radioactive sources, Source localization, Dose calculation, Dose rate specification, Record keeping. ICRU 38

Radiation Safety: Planning of brachytherapy facility, Rooms and equipment, Storage and Movement control, Source inventory, Disposal, Regulatory requirements

Beta-ray brachytherapy including methods of use, inspection, storage and transport of sources, dose distribution

Unsealed radionuclides: Concepts of uptake, distribution and elimination, Activities used in clinical practice, Estimation of dose to target tissues, and critical organs, Procedures for administering radionuclides to patients

1.3.12 *Quality Assurance in radiotherapy (QART)*

Overview of ESTRO QART: Need for a quality system in Radiotherapy, Quality System: Definition and practical advantages, Construction, Development and Implementation of a Quality System

Quality Assurance of Simulator, TPS, Co-60, linear accelerator

Acceptance testing of Simulator, TPS, Co-60, linear accelerator

1.3.13 *Radiation Protection and Regulatory Aspects:*

Statutory Framework – Principles underlying International Commission on Radiation Protection (ICRP) recommendations. ICRP and National radiation protection i.e. Atomic Energy Regulatory Board (AERB) standards. Effective dose limits (ICRP and AERB).

Protection mechanisms: Time, Distance and Shielding. Concept of “As Low As Reasonably Achievable” (ALARA)

Personnel and Area Monitoring: Need for personnel monitoring, Principles of film badge, TLD badge used for personnel monitoring. Pocket dosimeter. Need for area monitoring, Gamma Zone monitors, Survey meters

Regulatory aspects: Procedural steps for installation and commissioning of a new radiotherapy facility (Teletherapy and Brachytherapy). Approval of Standing Committee on Radiotherapy Development Programme. Type approval of unit. Site plan, Layout of installation / Associated facility: Primary, Secondary barriers, leakage and scattered radiation. Regulatory requirement in procurement of teletherapy / brachytherapy source(s). Construction of building, Qualified staff, Procurement of instruments, and accessories, Installation of unit and performance tests, Calibration of unit, RP&AD approval for clinical commissioning of the unit.

Other regulatory requirements: Regulatory consent, NOCs, Periodical reports to AERB and Radiological Physics and Advisory Division (RP&AD), Bhaba Atomic Research Centre (BARC).

1.3.14 *Advancements in Radiation Oncology:*

Virtual Simulation: Principle, CT-Simulation, TPS based virtual simulation, Differences, Merits and Demerits, Practical considerations

Conformal radiotherapy (CRT): Principles, Advantages over conventional methods, Essential requirements for conformal radiotherapy.

Various methods of CRT:

1. With customized field shaping using conventional coplanar beams
2. Multiple non-coplanar MLC beams conforming to target shape
3. Stereotactic radiotherapy
4. Principle of Inverse planning and Intensity Modulated Radiation Therapy (IMRT)
 - Using 3D compensators
 - Static IMRT (Step and shoot technique)
 - Dynamic IMRT (sliding window technique)
 - Dynamic arc IMRT
 - Micro-MLC
 - Tomotherapy methods
5. Time gated (4D) radiotherapy

Merits and demerits of IMRT

Stereotactic irradiation methods: Physics principles, Techniques, Description of Units (Gamma Knife and Linac based), Merits and demerits, Stereotactic Radiosurgery (SRS) and Stereotactic Radiotherapy (SRT), Whole body stereotactic frame

Networking in radiotherapy: Networking of planning and treatment units in a radiotherapy department including Picture Archival Communication System (PACS), Advantages, Patient Data Management

1.4. Radiobiology

1.4.1. Introduction to Radiation Biology

1.4.1.1. Radiation interaction with matter

Types of radiation, excitation and ionization. Radiation chemistry: direct and indirect effects, free radicals, oxygen effect and free radical scavengers, LET and RBE theory, dual action theory, intracellular repair, general knowledge of repair models.

1.4.1.2. Introduction to factors influencing radiation response

Physical factors: dose, dose quality, dose rate, temperature *Chemical factors:* Oxygen, radiosensitizers, radioprotectors

Biological factors: type of organism, cell type and stage, cell density and configuration, age, sex.

Host factors: partial or whole body exposure.

1.4.1.3. Relevance of radiation biology to radiotherapy

1.4.1.4. Interaction of ionizing radiation on mammalian cells.

The cell: structure and function; relative radiosensitivity of nucleus and cytoplasm, mitosis, cell cycle, principles of DNA, RNA and protein synthesis, radiation effects on DNA, strand breakage and repair, common molecular biology techniques.

Cell injury by radiation: damage to cell organelle like chromatids, chromosomes; interphase death, apoptosis, mitotic death, micronucleus induction, SLD, PLD. Oxygen

- effect: mechanism, hypoxia, OER, reoxygenation in tumors, significance in radiotherapy.
Dose rate. Brachytherapy sources including ^{252}Cf . Radiobiology of low, high dose rate & pulsed brachytherapy, hyperfractionation, significance in radiotherapy.
Effects of low LET and high LET radiation on cell. Cell survival curves.
Effect of sensitizing and protective agents. Dose modifying factors and their determination. Variation of response with growth and the progression of cell through the phases of cell cycle.
Physical factors influencing cell survival; relative biological effectiveness (RBE); its definition and determination, dependence upon linear energy transfer, dose, dose rate and fractionation. Hyperthermic and photodynamic injury.
Biological hazards of irradiation; dose protection and LET, effects on the embryo and the fetus, life shortening, leukaemogenesis and carcinogenesis, genetic and somatic hazards for exposed individuals and population. Biological basis of radiological protection.
- 1.4.1.5. Organ radiosensitivity and radioresponsiveness, concept of therapeutic index.
- 1.4.1.6. Acute effects on Radiation
- Concept of mean lethal dose
 - Radiation Syndromes: BM, GI, CNS, cutaneous
 - Suppression of immune System: mechanism, consequences
 - Total Body irradiation
 - Biological dosimetry: Blood counts, BM mitotic index. Chromosome aberrations in peripheral blood lymphocytes
 - Radiation accidents: typical examples
- 1.4.2. Radiation Effects on Major Organs/tissues
- Acute & late effects on all normal organs & tissues including connective tissue, bone marrow, bones, gonads, eye, skin, lung, heart, central nervous system tissues, peripheral nerves, esophagus, intestine, kidney, liver & thyroid with special reference to treatment-induced sequelae after doses employed in radiotherapy
 - Normal tissue tolerances
- 1.4.2.1. Late effects of radiation (somatic)
- Sterility, cataracts and cancer
 - Carcinogenesis: mechanisms in vitro and in vivo, oncogenes and anti oncogenes
 - Radiation induced cancer of occupational, medical or military origin
 - Recent controversial results for low level exposure, risk estimates
- 1.4.2.2. Late Effects of Radiation (Genetic)
- Mutations: definition, types, potential hazards.
 - Low level radiation: sources, potential hazards, stochastic and deterministic (non-stochastic) effects, high background areas and cancer.
- 1.4.2.3. Effects of Radiation on Human Embryo & Fetus
- Lethality, congenital abnormalities and late effects (Leukemia and childhood cancer),

severe mental retardation. Doses involved.

1.4.2.4. Biology and Radiation Response of Tumors

Tumor growth; kinetics of tumor response. Growth fraction, cell loss factor.

Volume doubling times, potential volume doubling times, repopulation, and accelerated repopulation.

Radiocurability: definition, factors involved, tumor control probability curves.

Factors determining tumor regression rates. Causes of failure to control tumors by radiation: tumor related, host related technical/mechanical errors.

Relationship between clonogen numbers and tumor control probability. Local tumor control and impact on survival.

1.4.3. Applied Radiobiology

Fractionation: rationale, factors involved (4 R's).

Time, dose, and fractionation relationship: isoeffect curves, isoeffect relationships, e.g. NSD, CRE formalisms and their limitations, partial tolerance, means of summing partial tolerance, steepness of dose response curves.

Multi-target, two component and linear quadratic model. α/β ratios for acute and late effects and means of deriving these values. Isoeffective formulae. Clinical applications of the L-Q model, hyperfractionation, accelerated fractionation, hypofractionation, CHART, split dose treatments.

Brachytherapy - low dose rate, high dose rate and pulsed treatments.

Introduction to new techniques to optimize radio-curability; combination therapy (adjuvant surgery or chemotherapy), hyperthermia, hypoxic cell radio-sensitizes, high LET radiation. Photodynamic therapy.

The volume effect, general principles and current hypotheses.

Shrinking Field technique.

Combination Radiation -Surgery

Pre-, post- and intra-operative radiation.

Rationale, radiobiological factors, current clinical results.

Irradiation of sub-clinical disease, debulking surgery, importance of clonogen numbers.

Combination Radiation -Chemotherapy

Definitions of radiosensitiser, synergism, potentiation, antagonism.

Radiosensitisers: types, mechanism.

Hyperthermia

Sources, rationale (historical examples), advantages and disadvantages, thermotolerance.

Cellular damage: comparison and contrast with radiation, thermal and non-thermal effects of ultrasound, microwaves, radiofrequency, etc. General host responses (immunology, metastases).

Use along with radiotherapy and chemotherapy: optimum sequencing of combined modalities. Current limitations to the clinical use of hyperthermia.

1.4.4. High LET Radiation

Comparison and contrast with low LET radiation.

Neutrons: source (including ^{252}Cf) and boron neutron capture (outline only). Advantages and disadvantages of neutrons, RBE values, hazards of low dose and low energy neutron, use in radiotherapy, combination with low LET, current clinical results.

Other high LET particles: protons, mesons, high-energy heavy nuclei, application to radiotherapy, current clinical results.

1.5. Clinical trials - Statistical basis for planning & interpretation

Clinical Trials.

- Advantages & disadvantages
- Retrospective & prospective studies
- Controlled & uncontrolled trials
- Single-blind & double-blind studies
- Phase I, II & III trials
- Ethics (Helsinki declaration).

Planning a trial

- Establishing objectives- short term and long term
- Determining the appropriate criteria.
- Establishing grounds for inclusion and exclusion of patients
- Determining how many treatment schedules are to be completed
- Determining the treatment schedules and any appropriate modifications
- Determining the method of allocation of treatments ; the allocation ratio and the method and timing of randomization
- Determining what measures are to be taken, how they will be taken, who will take them, at what time(s) and where they will be recorded
- Designing the appropriate forms of documentation
- Determining the proposed duration of the trial, either in terms of a fixed closing date, or the entry of a pre-determined number of patients.
- Establishing conditions under which the trial may be terminated earlier than planned & procedures for detecting these conditions.
- Re-assessing the proposed trial in terms of ethics, appropriateness to the short & long term objectives, feasibility & the availability of resources.
- Writing the protocol
- Running a pilot study

2. CLINICAL RADIOTHERAPY

2.1. Cancer Epidemiology & Etiology

2.1.1. Cancer Statistics - world wide & India

2.1.2. Cancer Registries & National Cancer Control Programme.

- 2.1.3. Analysis of data in cancer registries.
- 2.1.4. Regional Cancer Centers
- 2.1.5. Cancer Screening & Prevention.
- 2.2. Patient Care
 - 2.2.1. Assessment & referral systems for radiotherapy
 - 2.2.2. Diagnosis & workup.
 - 2.2.3. Staging
 - 2.2.4. Care & evaluation during & after treatment
 - 2.2.5. Emergencies in Oncology
 - 2.2.6. Management of different malignancies
- 2.3. Treatment Response & Result
 - 2.3.1. Guidelines for treatment response assessment - Complete Response, Partial Response, No Response, Stable disease.
 - 2.3.2. End points of treatment results: Loco-regional control, recurrence, metastasis, survival, quality of life.
 - 2.3.3. Treatment related morbidity assessment
 - (i) Radiation morbidity (early & late)
 - (ii) Morbidities of combined treatment
 - (iii) Grading Systems.

3. CLINICAL CHEMOTHERAPY

- 3.1. Basic principles of chemotherapy
 - 3.1.1. Chemotherapy drugs .
 - 3.1.2. Newer chemotherapeutic agents.
 - 3.1.3. Basis for designing different chemotherapy schedules. Standard chemotherapy schedules.
 - 3.1.4. Chemotherapy practice in various malignancies
 - 3.1.5. Chemotherapy practice & results/ toxicities in sequential & concomitant chemoradiotherapy.
 - 3.1.6. Supportive care for chemotherapy.
 - 3.1.7. The basic principles underlying the use of chemotherapeutic agents.
 - (i) Classification and mode of action of cytotoxic drugs. The principles of cell kill by chemotherapeutic agents, drug resistance, phase specific and cycle specific action.
 - (ii) Drug administration. The general principles of pharmacokinetics; factors affecting drug concentration 'in vivo' including route and timing of administration, drug activation, plasma concentration, metabolism and clearance.
 - (iii) Principles of combinations of therapy, dose response curves, adjuvant and neo-

adjuvant chemotherapy, sanctuary sites, high dose chemotherapy, and regional chemotherapy.

- (iv) Toxicity of drugs. Early, intermediate and late genetic and somatic effects of common classes of anticancer drugs. Precautions in the safe handling of cytotoxic drugs.
- (v) Endocrine manipulation and biological response modifiers. An understanding of the mode of action and side effects of common hormonal preparations used in cancer therapy (including corticosteroids). Use of the major biological response modifiers such as interferons, interleukins and growth factors and knowledge of their side effects.
- (vi) Assessment of New Agents. Principles of phase I, II, and III studies.
- (vii) Gene Therapy

3.2. Other Disciplines Allied to Radiotherapy and Oncology

3.2.1. Surgical Oncology.

3.2.1.1. Basic principles of surgical oncology, biopsy, conservation surgery, radical surgery, palliative surgery.

3.2.1.2. Basics of surgical techniques - head & neck, breast, thorax, abdomen, gynecological, genitourinary, musculoskeletal, CNS.

3.2.1.3. Combined treatments: with radiotherapy, chemotherapy, and hormone therapy.

3.2.2. Preventive oncology

4. PALLIATIVE CARE

- 4.1. Guidelines for palliative care
- 4.2. Symptoms of advanced cancer
- 4.3. Management of terminally ill patients.
- 4.4. Different pharmacologic & non-pharmacologic methods
- 4.5. Pain control, WHO guidelines for adults & children.
- 4.6. Palliative radiotherapy
- 4.7. Palliative chemotherapy
- 4.8. Home care
- 4.9. Hospice care
- 4.10. Physical, social, spiritual & other aspects.

5. RESEARCH, TRAINING & ADMINISTRATION

5.1. Research in Oncology

- 5.1.1. How to conduct a research
- 5.1.2. Guidelines for biomedical research: Animal studies, drug studies, human trial.
- 5.1.3. Cancer clinical trials. Phase I/II, III
- 5.1.4. Ethics of clinical research
- 5.1.5. Evidence based medicine.

5.2. Training in Oncology

- 5.2.1 Residency in Radiotherapy and Oncology
- 5.2.2. Theory, clinical & practical modes of training
- 5.2.3. Structured training: lectures, seminar, Journal club, Ward-round, Physics demonstration, Practical, Case Presentations (e.g. Long Case; Short Case)
- 5.2.4. Participation in various procedures, techniques (e.g. Brachytherapy, Radiotherapy Planning, Mould Room Procedures etc.)
- 5.2.5. CME-conference, symposium, workshop, seminar
- 5.2.6 Visiting other cancer centers & radiotherapy departments

5.3. Administration in Radiotherapy and Oncology.

- 5.3.1 Clinical Oncologists' role as an administrator.
- 5.3.2. How to set up a Radiotherapy and Oncology department, planning of infrastructure, & equipments
- 5.3.3. Role in cancer control programme.
- 5.3.4. Responsibilities towards safety & quality assurance.

Administration aspects of training, academic, patient care & research.

PAPERWISE DISTRIBUTION OF SYLLABUS FOR PURPOSE OF MD (RADIOTHERAPY AND ONCOLOGY) EXAMINATION

Paper I- Radiation physics and radiobiology, basic sciences related to oncology

Paper II- Management of human neoplasms according to site

Paper III- Chemotherapy

Paper IV- Recent Advances in Radiotherapy and Oncology

ORTHOPAEDICS — M S

COURSE GOAL & OBJECTIVES

Major Goal:

Patient care Ability: A postgraduate in orthopaedics surgery at the end of its 3 year course should develop proper clinical acumen to interpret diagnostic results and correlate them with symptoms from history taking and become capable to diagnose the common clinical conditions/ disease in the specialty and to manage them effectively with success without making any serious complications and sincerely to take such accurate decision, for the patient's best interest including making a referral to consultation with a more experienced colleague/professional friend while dealing with any patient with a difficult condition.

Teaching ability: He/she also should be able to teach an MBBS student about the commonly encountered conditions in orthopaedics pertaining to their diagnostic features, basic pathophysiological aspect and the general and basic management strategies.

Research Ability: He/she should also acquire elementary knowledge about research methodology, including record-keeping methods, and be able to conduct a research inquiry including making a proper analysis and writing a report on its findings.

Team work: He/she should be capable to work as a team member. He/she should develop general humane approach to patient care with communicating ability with the patient's relatives especially in emergency situation such as in casualty department while dealing with cancer patients and victims of accident. He/she should also maintain human values with ethical consideration.

OBJECTIVES OF THE POST-GRADUATE COURSE

A postgraduate at the end of a 3-year P.G. degree course should acquire the following:

1. *Cognitive knowledge:* Describe embryology, applied anatomy, physiology, pathology, clinical features, diagnostic procedures and the therapeutics including preventive methods, (medical/surgical) pertaining to musculo-skeletal system.
2. *Clinical decision making ability & management expertise:* Diagnose conditions from history taking, clinical evaluation and investigations and develop expertise to manage medically as well as surgically the commonly encountered, disorders and disease in different areas as follows:

- (a) *Pediatric orthopaedics*- The student should be exposed to all aspects of congenital and developmental disorders such as CTEV (club-Foot), developmental dysplasia of hip, congenital deficiency of limbs, Perthe's disease and infections, and also to acquire adequate knowledge about the principles of management of these disorders.
 - (b) *Orthopaedic oncology*- The resident is expected to be familiar with the tumours encountered in orthopaedic practice. The recent trends towards limb salvage procedures and the advances in chemotherapy need to be familiar to him.
 - (c) *Management of Trauma*- Trauma in this country is one of the main causes of morbidity and mortality in our demographic statistics. The student is expected to be fully conversant with trauma in its entirety. In any type of posting after qualification the orthopaedic surgeon would be exposed to all varieties of acute trauma. Hence, it is his responsibility to be able to recognize, assess and manage it including the medico legal aspects.
 - (d) *Sports Medicine*- A lot of importance is being given to sports medicine especially in view of the susceptibility of the athlete to injury and his failure to tide over them. Sports medicine not only encompasses diagnostic and therapeutic aspects of athletic injuries but also their prevention, training schedules of personnel & their selection.
 - (e) *Physical Medicine and Rehabilitation*- The student is expected to be familiar with this in all its aspects. Adequate exposure in the workshop manufacturing orthotics and prosthetics is mandatory, as is the assessment of the orthopedically handicapped.
 - (f) *Orthopedic Neurology*- The student should be exposed to all kinds of nerve injuries as regards their recognition & management cerebral palsy and acquired neurologic conditions such as post polio residual paralysis also need to be emphasized in their entirety.
 - (g) *Spine Surgery*- The student is expected to be familiar with various kinds of spinal disorders such as scoliosis, kypho-scoliosis, spinal trauma, PIVD, infections (tuberculosis and pyogenic), & tumours as regards their clinical presentations and management.
 - (h) *Basic sciences in Orthopaedics*- This deals with some of the fundamentals in orthopaedics such as the structure and function of bone cartilage etc, and their metabolic process. In addition the student learns about implants in orthopaedics and their metallurgy.
 - (i) *Radiology*- Acquire knowledge about radiology/imaging and to interpret different radiological procedures and imaging in musculo-skeletal disorders. There should be collaboration with Radiology department for such activities.
 - (j) *Psychologic and social aspect*- Some elementary knowledge in clinical Psychology and social, work management is to be acquired for management of patients, especially those terminally ill and disabled-persons and interacting with their relatives.
3. *Teaching*: Acquire ability to teach an MBBS student in simple and straightforward language about the common orthopaedic ailment/disorders especially about their signs/symptoms for diagnosis with their general principles of therapy.
 4. *Research*: Develop ability to conduct a research enquiry on clinical materials available in Hospital and in the community.
 5. *Patient doctor relation*: Develop ability to communicate with the patient and his/her relatives pertaining to the disease condition, its severity and options available for the treatment/therapy.
 6. *Preventive Aspect*: Acquire knowledge about prevention of some conditions especially in children

such as poliomyelitis, congenital deformities, cerebral palsy and common orthopaedic malignancies.

7. *Identification of a special areas within the subject:* To further develop higher skills within the specialty in a specialized area such as Arthroplasty, Neurology, Arthroscopy oncology, spine surgery, hand surgery and Rheumatology, identify some area of interest during the residency and do fellowship/senior residency programme in one of such areas.
8. *Presentation of Seminar/paper:* Should develop public speaking ability and should be able to make presentation on disease-conditions/research topics to fellow colleagues in a Seminar/meeting/conference using audiovisual aids.
9. *Research writing:* Should be capable to write case-reports and research papers for publication in scientific journals.
10. *Team work:* Team spirit in patient management, working together in OPD, OT, ward and sharing responsibility with colleagues such as doctor, nurses and other staff are essential. Resident has to develop these attributes through different mechanism of infection

PRACTICAL TRAINING:

A Junior Resident doctor, pursuing a P.G. Degree course is expected to perform major and minor surgical procedures independently as well as under supervision of a faculty member/senior resident. She/he should be able to do many major procedures independently such as: (Few examples only given):

- Closed reduction of fractures
- External fixation of compound fractures
- Debridement of crush injuries
- Amputations
- Internal fixation of common simple fractures
- Polio surgery such as TA lengthening, steindler's procedure etc
- Intra-articular injections
- Steroid injections for various painful conditions
- Sequestrectomy in chronic osteomyelitis
- Corrective POP casts for club foot & other congenital deformities
- Biopsy from a mass

He/she should be able to do the following operations under supervision/guidance of senior colleagues/faculty member (Few examples only given):

- Internal fixation of simple fractures such as fracture of both bones of forearm, supracondylar fracture humerus, malleolar fractures, femur shaft fractures, per trochanteric fractures etc.
- Polio surgery such as Jone's procedure Campbell's procedure, triple arthrodesis, lambrinndi procedure etc.
- Club foot surgery such as postero-medial soft tissue release, dilwyn-ewan's procedure, triple arthrodesis, JESS fixator, ilizoror fixator application.

DURATION OF TRAINING AND ROTATION PROGRAMMES (WARD/OT/OPD) FIRST YEAR

- Spends 6 (six) months in orientation programme including exposure to casualty

- Learns bedside history taking in ward, OT exposures, casualty, ICU requirement and their visit to related disciplines such as physical medicine and rehabilitation/Anesthesia.
- Care of indoor (medical; preoperative and postoperative) patients for a minimum period of 6 months and learn techniques of traction wound care and splintage.
- Attends operation theatre and emergency operations for acclimatization.
- Assists ward rounds and visits other wards with senior colleagues to attend call/consultations from other department.
- Participates in the teaching sessions in ward for bedside clinical in the weekly afternoon seminar/journal club.

After 6 months of orientation during 2 ½ yrs:

- Attends orthopaedics OPD 3 day a week
- Discuss problematic cases with the consultant (s) in OPD/ward
- Attends operation room/theatre 3 days a week
- Attend 2 morning rounds/ week
- Care of the indoor patients on beds allotted to him/her.
- Attends the weekly Journal Club and seminar and presents the same by rotation
- Attends scoliosis, polio, hand, CTEV, arthritis clinics and presents cases participates in discussions including therapy-planning etc.
- During the 2 ½ years, the resident must attend the combined teaching
- Programme of the department of surgery, Neurosurgery and Medicine i.e. clinical meetings, CPC's of students and staff of the whole hospital
- Surgicopathological conference in Pathology Department, with surgeons.
- All kinds of specially prepared lectures by department. Faculty or from R.T./plastic or Neurosurgery Departments.
- Visits by rotation the Rural Clinic for community exposures/work experience.
- Does 24 hours-emergency duty once a week/ as per roster of the department.
- Attends lectures by visiting faculty to the department/college from India/abroad.
- Attends/participate/present papers in state/zonal national conferences.
- Actively participate/help in organization of departmental workshop, courses in specialized areas like Arthroplasty, Arthroscopy, Spine, Hand surgery from time to time.

Research methodology / reporting on research: Learns the basics in research methodology and make the thesis protocol with the 4 months of admission.

- Problem oriented record keeping including use of computer
- Use of medical literature search including through Internet use, in the library.
- Attends bio statistics classes by arrangement.
- Research Report – writing including preparation of Protocol for Research/Thesis.
- Writing an abstract/short paper/presentation style (slide-making & audiovisual aids).
- Preparation of a report on a research project/Thesis.

- Humanity/Ethics:
- Lectures on humanity including personality development, team spirit and ethical issues in patient care and human relationship including, public relations, by Psychologist and public relation officers are to be arranged by the department/college.

Presentation for the Thesis work:

- (a) Selection of thesis topic: Subject of thesis will be selected by the candidate under guidance of faculty, which will be approved by the departmental guide and other faculty. The candidate will be asked to submit the protocol within 4 (Four) month of admission after it is scrutinized by departmental faculty. It is to be approved by the central thesis committee of the institute/college if such committee does exist, and the ethical considerations are also discussed in such Research Programme Committee.
- (b) Once the thesis protocol is approved the candidate starts his research work under direct supervision of guide and co-guides.
- (c) Three/six monthly progress of the thesis will be checked to know the outcomes/or difficulties faced by the candidate. Candidate will be asked to submit the thesis 6 months before the final exams. At the discretion of director/thesis committee one month extension may be given to a candidate for submission of the protocol and the final thesis for any valid reason for the delay.

Teaching Methods:

The following learning methods are to be used for the teaching of the postgraduate students:

1. *Journal club*: 1 hrs duration –Paper presentation/discussion – once per week (Afternoon).
2. *Seminar*: One seminar every week of one hour duration (Afternoon)
3. *Lecture/discussion*: Lectures on newer topics by faculty, in place of seminar/as per need.
4. Case presentation in the ward and the afternoon special clinics (such as scoliosis/Hand clinics). Resident will present a clinical case for discussion before a faculty and discussion made pertaining to its management and decision to be recorded in case files.
5. *Case Conference*- Residents one expected to work-up one long case and three short cases and present the same to a faculty member and discuss the management in its entirety on every Monday afternoon.
6. *X-Ray Classes*- Held twice weekly in morning in which the radiologic features of various problems are discussed.
7. *Surgicopathological Conference*: Special emphasis is made on the surgical pathology and the radiological aspect of the case in the pathology department such exercises help the ortopaedics/ Pathology/Radiology Residents.
8. *Combined Round/Grand Round*: These exercises are to be done for the hospital once/wk or twice/ month involving presentation of usual or difficult patients. Presentations of cases in clinical combined Round and a clinical series/research data on clinical materials for benefit of all clinicians/Pathologists/ other related disciplines once in week or fortnightly in the Grand round.
9. *Community camps*: For rural exposure and also for experiences in preventive aspect in rural situation/ hospital/school, patient care camps are to be arranged 2-3/ year, involving residents/junior faculty.
10. *Emergency situation*: Casualty duty to be arranged by rotation among the PGs with a faculty cover daily by rotation.

11. Afternoon clinics: Scoliosis Clinic- Held once a week. Residents work up the cases of spinal deformity and present them to a faculty member and management plan recorded in case file.
 Hand Clinic- Held once a week. All the cases of hand disorders are referred to the clinic and discussed in detail.
 CTEV Clinic- Held once a week corrective casts are given and the technique learnt by the residents. Surgical management is also planned & recorded in case file.
 Polio- Clinic- Held once a week, Various braces & Calipers are prescribed and surgical management planned.
12. Besides clinical training for patient care management and for bed side manners:
 Daily for ½ to one hour's during ward round with faculty and 1-2 hours in the evening by senior resident/faculty on emergency duty, bed side patient care discussions are to be made.
13. Clinical teaching:
 In OPD, ward rounds, emergency, ICU and the operation theatres:
 Residents/Senior Residents and Faculty on duty in respective places – make discussion on clinical diagnosis/surgical procedures/treatment modalities, including postoperative care and preparation of discharge slip.
14. Clinical interaction with physiotherapist:
 Clinical interaction with physiotherapist pertaining to management of the patients in post-op mobilization.
15. Research Methodology:
 Course and Lectures are to be arranged for the residents for language proficiency by humanity teachers besides few lectures on human values and ethical issues in patient care.
16. Writing Thesis:
 Thesis progress is presented once in 3 months and discussion made in the department. Guides/co-guides are to hear the problems of the candidate; can provide assistance to the student. Progress made or any failure of the candidate may be brought to the notice of college Dean/Principal.

Final Examination & Examiners:

The oral, clinical and Practical Examination:

One or 2 centers depending on local university rules. Not more than 4 P.G. students should be subjected to practical exam in a day during the examination.

Results of the examination will be declared as pass/failed/pass with distinction (Grade/marks may also be given if necessary as per University Rules). While doing so, both, formative and summative assessment will be taken into consideration.

The Examination for the degree (MS-Orthopaedics) shall consist of

1. Theory exams: papers
2. Practical Exams:- clinical, Oral, instruments/specimen/specimen/X-rays.
1. Theory: There shall be four papers: Each being of three hours duration. Each paper will have 8-10 short question from the curriculum.
 Paper I Basic Sciences related to Orthopedics.

Paper II Principles and Practices of orthopaedics.

Paper III Recent advances in orthopaedics & trauma surgery.

Paper IV General Surgical Principles & allied specialties.

2. Practical Examination –

(b) Identification of Surgical Pathology, excised specimens & discussion, reading X-rays & CT Scan/MRI, identification of Instruments & discussion, identification of braces & calipers & discussion thereon.

(c) Clinical Patient presentation/discussion:

(i) One long case: The long case will be structured comprising – history taking, clinical examination, investigations, decision making, proposed treatment modalities, ethical justification and personal attributes.

(ii) Three short cases: The short cases will also be structured in which only one particular system may be considered and therapy decision/discussion, made.

EXAMINERS/ Final Examinations:

- (a) There shall be four examiners including two external and two internal. One of the internal examiners will be the Head of Department and he/she shall be chairman/Convener. The second internal examiner shall be next senior most member of faculty of the department provided he/she is eligible for such duty. The necessity of an external examiner is to maintain the standard of the examination at the National level. All examiners must be a full time teacher with requisite experience as per MCI guidelines. Hony teacher with previous full time experience (of 10 years standing) may only be made examiners if there does not exist nay a full time qualified faculty under the same university/ college. No Hony. Faculty shall be made a chairman/convener of the examination.
- (b) The external examiners will be asked to send two sets of question papers for the theory examination. There will be 2 external examiners from a different university so that the number of questions available, will be double the which will be given to the student in the moderate papers. The Chief internal examiner or Chairman/Convener will moderate it and finally make two sets of question paper, containing 8-10 shorts questions. He/she shall send both sets of such papers to the university and university will decide to give one of the sets to the students.
- (c) All examiners shall be jointly responsible for the examination. In presence of the external examiners, the Chairman and the internal examiner shall make the necessary arrangements for conducting the final examination. Not more than 4 students will be evaluated/examined per day in any Center. For different College/Institution, separate examination center/examiners may be arranged/appointed for convenience and proper administration of the final examination. While preparing the final results, formative assessment of the students shall be taken into consideration and the results will be sent to the university under seal cover.

Syllabus for individual papers:

Paper-I:

Basic Sciences:

Development of skeleton, histology of cartilage histology & histopathology of bone, physiology of fracture healing and delayed and non-union of bones, histology of skeletal muscle, collagen, physiology and mineralization of bone, physiology of cartilage, biophysical properties of bone and cartilage, metabolic

bone disease and related dysfunction of parathyroid glands.

Paper-II:

Principles & Practice of orthopaedics:

Bone Infections (Pyogenic, tuberculosis syphilis, mycotic infections, salmonella & brucellar osteomyelitis), congenital deformities (upper & lower extremities, spine and general defects), developmental conditions (osteogenesis imperfecta, dysplasias, hereditary multiple exostosis etc.) diseases of the joints (osteoarthritis, Rheumatoid arthritis, neuropathy joints, ankylosing spondylitis, sero-negative spondyloarthropathy, traumatic arthritis etc.) orthopaedic neurology, tumors of bone.

- Disease of muscle fibrin disease peripheral vascular diseases
- Disorders of hand & their management

Paper-III:

Trauma surgery & Recent advances in orthopaedics

- General principles of fracture management fractures of lower extremity, fractures of pelvis and hip, fractures of upper extremity and shoulder girdle, fractures and dislocations in children, malunited fractures, delayed union and non-union of fractures, acute dislocations, old unreduced dislocations, recurrent dislocations.
- Arthroscopy, LASER, Endoscopic minimally invasive spine surgery, allografts & bone banking Ilizarov & bone transport, chemotherapy of cancers.

Paper-IV:

(General surgical Principles & orthopedic surgery)

General surgery, oncology, and & Medicine as applicable to the musculo-skeletal disorders/disease.

Radiology, Imaging – computed tomography and magnetic resonance imaging, (MRI) and interventional radiology and angiography as related to orthopaedics.

General pathologic aspects such as wound healing and also pathology and pathogenesis of orthopaedic disease, pharmacology, molecular biology, genetics, cytology, haematology, and immunology as applicable to orthopaedics.

General principles of traumatology and also neck injury,

Plastic surgery as applicable to orthopaedics.

<p>I. Orientation program: in ward, OPD, OT, Emergency (6 months)</p> <p>II. DISCIPLINE TRAINING (During – 2 ½ yrs)</p> <p>A. Ward Round daily (Patient care/Teaching)</p> <p>B. OPD – Case base learning & Patient care</p> <p>C. Demonstration of operative procedures in OT & Trauma Management in causality</p> <p>D. Case-presentation/discussion (Afternoon special clinics)</p> <p>E. Journal Club Weekly</p>	<p>Common Foundation Course 6 month.</p>
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F. Seminar weekly including presentation of thesis progress G. Surgicopathological conference - monthly H. Radiology Conference – weekly I. Thesis submission after final presentation III. Attendance of State, Zonal/National level conferences /workshops/symposium during (2 nd – 3 rd yr.)	Final exams.
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ORTHOPAEDIC SURGERY

RECOMMENDED READING ORTHOPAEDIC SURGERY

Title of the book	Author	Publisher
Watonson Jones-Fractures And Joint Injuries	J.N. Wilson	Churchill Livingstone
Fractures, Dislocations and Sprains	Kay & Conwell	C.V. Mosby
Outlines of Fractures	Crawford Adams	Churchill Livingstone
Closed Treatment of Fractures	H. John Charnley	Churchill Livingstone
Outlines of Orthopaedics	Crawford Adams	Churchill Livingstone
Mercer's Orthopaedics Surgery	Duthie	Edward Arnold
Fundamentals of Orthopaedic Surgery	Philip Wiles	Churchill Livingstone
Paediatric Orthopaedic And Fractures	WJ Sherrad	Butterworth
Orthopaedic Diseases	Aegerter and Kirkpatrick	Saunders
Tumours and Tumourous Conditions of Bone and Joints	Jaffe	Lea Febiger
Campbell's Operative Orthopaedics	A H Crenshaw	C V Mosby
Extensive Exposure	A K Henry	Churchill Livingstone
Hand book of Physical Medicine	Krusen	Kottae
Rehabilitation Medicine	Howard & Rusk	Ellwood
Electrodiagnosis	Sidney Licht	
Kinesiology	Rach & Bruke	

JOURNALS

Indian Journal of Orthopaedics.
 Journal of Bone and Joint Surgery (British & American Volumes).
 Orthopaedic Clinics of North America.
 Clinical Orthopedics and Related Research
 Yearbook of Orthopaedics.
 British journal of Rheumatology and Physical Medicine.
 Journal of rehabilitation, Bombay.

OTOLARYNGOLOGY (ENT) — M S

I.	Orientation programme: in ward, OPD, OT, Emergency	Common Foundation Course
	Posting (1 month) ICU posting (2 weeks by rotation).	6 month; Assessment (5%)
	Protocol for thesis submission	
	DISCIPLINE TRAINING (during – 2 ½ yrs)	
	A. Ward Round daily (Patient care/Teaching)	
	B. OPD – Case base Learning & Patient care	1 year Assessment (5%)
	C. Demonstration of operative procedures in OT and Cadaveric dissections in the laboratory (Temporal bone & head and Neck dissection)	
	D. Case-presentation/discussion (Afternoon special clinics)	1½ year Assessment (5%)
	E. Journal Club Weekly	
	F. Seminar weekly including presentation of thesis progress	2 years Assessment (5%)
	G. Surgicopathological conference, weekly	
	H. Radiology Conference – monthly	2.5 years assessment (5%)
II.	Thesis submission after final presentation	
III.	Audiovestibular/experimental Labs (ABR;ENG;Animal). Exposure during 2nd-3rd yr.	Formative = 25% Assessment
IV.	Attendance of State,Zonal/National level Conferences/Workshops/symposium during (2nd-3rd yr)	Final exams. Summarative = 75%
V.	Community service-patient care camp/Awareness camps on ear diseases/Head-neck oncology (especially or preventive otolaryngology during 2nd-3rd year).	

COURSE GOAL & OBJECTIVES

Major Goal

Patient care Ability: A postgraduate in ORL-Head and Neck surgery at the end of its 3 year course should develop proper clinical acumen to interpret diagnostic results and correlate them with symptoms from history taking and become capable to diagnose the common clinical conditions/diseases in the speciality and to manage them effectively with success without making any serious complications;and sincerely to take such accurate decision, for the patient's best interest including making a referral to/consultation with a more experienced colleague /professional friend while dealing with any patient with a difficult condition. He/ she should be able to create awareness about preventive Otolaryngology in the society.

Teaching ability: He/she also should be able to teach an MBBS student about the commonly encountered conditions in ENT pertaining to their diagnostic features basic pathophysiological aspect and the general and basic management strategies.

Research Ability: He/she should also acquire elementary knowledge about research methodology, including record-keeping methods, and be able to conduct a research enquiry including making a proper analysis and writing a report on its findings.

Team work: He/she should be capable to work as a team member. He/she should develop general humane approach to patient care with communicating ability with the patient's relatives especially in emergency situation such as in Casualty department while dealing with cancer patients and victims of accident. He/she should also maintain human values with ethical consideration.

OBJECTIVES OF THE POST-GRADUATE COURSE

A post graduate at the end of a 3 year P.G. degree course should acquire the following:

1. Congenitive knowledge: Describe embryology, applied anatomy, physiology, pathology,clinical features, diagnostic procedures and the therapeutics including preventive methods, (medical/surgical) pertaining to Otorhinolaryngology – Head & Neck Surgery.
2. Clinical decision making ability & management expertise: Diagnose conditions from history taking, clinical evaluation and investigations and develop expertise to manage medically as well as surgically the commonly encountered, disorders and diseases in different areas as follows:

Otology, Neurology & Skull-base Surgery: External, middle and internal ear diseases, deafness including the common complications associated with middle ear inner facial Nerve palsy, tinnitus, vertigo and other conditions such as acoustic neuroma, malignant tumours, glomus tumor and petrous apex cholesteatoma etc. and to be capable of doing early diagnosis of these conditions and also to acquire adequate knowledge about principles of therapy of these diseases.

Rhinology : Able to Diagnose and manage Nose and paranasal sinus conditions such as infection, polyps and allergy. Acquire some surgical skills to do septorhinoplasty, septoplasty, functional endoscopic sinus surgery (FESS). Develop capability to do oncologic diagnosis and therapy planning for proper management of such patients in collaboration with radiotherapists and medical oncologists.

Laryngology : Able to diagnose and manage benign lesions of the larynx including voice-disorders and pharyngeal and nasopharyngeal diseases, viz-adenoids and angiofibroma. Capable to do diagnosis of oncologic conditions such as laryngeal carcinoma and plan its therapy strategies.

Oral cavity/salivary glands : Learn about Oral cavity and salivary gland diseases, their diagnosis

and therapy planning with referral strategies for cancer patients to advanced cancer centres/Hospital.

Head/Neck conditions/diseases : Learn about head and neck diseases including Parotid gland and thyroid diseases, neurogenic tumours and neck space infections/and their management.

Broncho-esophageal region : Learn about broncho-esophageal diseases/disorders such as congenital disorders, diagnosis of Foreign bodies in wind/food pipes with their management policies. Capable to perform Panendoscopies for oncologic evaluation in the head-neck region, including oesophageal malignancy.

Plastic reconstruction following major head neck surgery & trauma : Acquire general principles of reconstructive surgery and its referral needs.

Advanced Surgical methods: Acquire knowledge about phonosurgery like microlaryngoscopic surgery, palatopharyngoplasty for VPI & Cleft palate, and thyroplasty for voice-disorders.

General principles of newer therapy/Surgery : Newer knowledge about ENT diseases in general, including technological (Laser) and pharmacologic advances (medicines) and newer method of therapy for certain conditions such as Obstructive sleep apnoea syndrome and asthma.

Traumatology & Facio-maxillary Injury : Acquire knowledge in the management of Traumatology in general and faciomaxillary injury in particular, including nasal fractures. Be capable of doing screening in the community, of the audiological & speech related disabilities, and also to do early identification of malignancies and create its awareness in the community/society to eventually get better cooperation from people in health management.

Radiology: Acquire knowledge about radiology/imaging and to interpret different radiological procedures and imaging in Otolaryngology – Head and Neck and skull base regions. There should be collaboration with Radiology department for such activities.

Audiology & Rehabilitation : Perform different audiological and neuro-otological tests for diagnosis of audiology/vestibular disorders/diseases and become capable to interpret these findings and to incorporate their implication in diagnosis and their treatment including the rehabilitative methods in audiology and speech pathology including hearing aids and other assistive and implantable devices.

Psychologic and social aspect : Some elementary knowledge in clinical Psychology and social, work management is to be acquired for management of patients, especially those terminally ill and disable-persons and interacting with their relatives.

3. Teaching: Acquire ability to teach an MBBS student in simple and straight forward language about the common ENT ailment/disorders especially about their signs/symptoms for diagnosis with their general principles of therapy.
4. Research: Develop ability to conduct a research enquiry on clinical materials available in Hospital and in the community.
5. Patient doctor relation : Develop ability to communicate with the patient and his/her relatives pertaining to the disease condition, its severity and options available for the treatment/therapy.
6. Preventive Aspect: Acquire knowledge about prevention of some conditions especially in children such as middle ear and sinus infection, hereditary deafness and early diagnosis of head-neck malignancy. Hence he/she should know about the preventive Otorhinolaryngology (ENT).
7. Identification of a special areas within the subject: To further develop higher skills within the specialty

in a specialised area such as Otolaryngology, Neurology, Rhinology, head and neck oncology, skull base surgery and audiological medicine, Resident may identify some area of interest, during the Residency and do fellowship/Senior Residency Programme in one of such areas like Otolaryngology.

8. Presentation of Seminar/paper: Should develop public speaking ability and should be able to make presentation on disease-conditions/research topics to fellow colleagues in a Seminar/meeting/conference using audiovisual aids.
9. Research writing: Should be capable to write case-reports and research papers for publication in scientific journals.
10. Team work: Team spirit in patient management, working together in OPD, OT, ward and sharing responsibility with colleagues such as doctor, nurses and other staff are essential. Resident has to develop these attributes through different mechanism of interaction.

PRACTICAL TRAINING

A Junior Resident doctor, pursuing a P.G. Degree course is expected to perform major and minor surgical procedures independently as well as under supervision of a faculty member/a senior resident. She/he should be able to do many major operations independently such as: (Few examples only given):

- Tracheostomy,
- Tonsillectomy
- Adenoidectomy/grommet insertion,
- Nasal Polypectomy
- Incision/drainage of quinsy/other abscesses,
- S.M.R. & Septoplasty
- Cortical mastoidectomy
- Modified radical Mastoidectomy.

Be able to manage common emergencies like, fracture nasal bone, stridor requiring a tracheostomy, epistaxis, Subperiosteal abscess, and Peritonsillar abscess.

He/she should be capable to do minor operations independently viz, (Few examples only given)

- Myringotomy and myringoplasty
- Antral washout and nasal biopsy
- Sub-mandibular salivary gland removal
- Biopsy from a neck mass, such as a node
- Direct Laryngoscopy
- Nasopharyngoscopy
- Flexible Bronchoscopy and Oesophagoscopy
- Aural polypectomy

He/she should be able to do the following operations under supervision/guidance of senior colleagues/faculty member (Few examples only given):

- Fiberoptic rigid endoscopy of oesophagus
- Interantral ethmoidectomy

- External ethmoidectomy
- External fronto ethmoidectomy
- Maxillectomy (Partial and Total)
- Excision of thyroglossal cyst
- Superficial Parotidectomy
- Radical block dissection of the neck for metastatic nodes.
- Total Laryngectomy for cancer.
- Laryngofissure
- Repair of laryngotracheal trauma.
- Ligation external carotid artery

He/she should be able to do under guidance/supervision the following specialised operative procedures (Few examples only given):

- Facial nerve decompression
- Pinna-Repair (Post-traumatic)
- Surgery of choanal atresia,
- External canal atresia-surgery,
- Functional endoscopic/sinus surgery,
- Stapedectomy
- Tympanoplasty with mastoid surgery
- Rhinoplasty for cosmetic purposes.
- Fibre-optic bronchoscopy and oesophagoscopy including foreign body removal
- Cryo/Laser surgery in ENT
- Microlaryngoscopic voice-surgery for vocal nodules, polyps/ cyst etc
- Phonosurgery for cord palsy including type I thyroplasty.
- Skull base/parapharyngeal space surgery
- Thyroid surgery,
- Laryngo-tracheal stenosis – surgical correction,
- Faciomaxillary injury etc.

Duration of Training and Rotation Programmes (ward/OT/OPD) First Year

- Spends 6 (six) months in orientation programme including exposure to Audiology Section and Vestibular Laboratory;
- Learn bedside history taking in ward, OT exposures, casualty, ICU requirement and their visit to related disciplines such as Neurosurgery/Anaesthesia.
- Care of indoor (Medical; preoperative and postoperative) patients for a minimum period of 6 months.
- Attends operation theatre and emergency operations for acclimatization.
- Assists ward rounds and visit other wards with senior colleagues to attend call/consultations from other deptt.

- Participates in the teaching sessions in ward for bedside clinical aspect in the weekly afternoon Seminar/Journal Club.

After 6 months of orientation during 2 ½ yrs:

- Attends ENT OPD 3 days a week
- Discusses problematic cases with the consultant(s) in OPD/ward
- Attends Operation Room/theatre 3 days a week
- Attends 3 morning rounds/ week
- Looks after minor O.T. once a week by rotation in the OPD area for minor procedures.
- Care of the indoor patients on beds allotted to him/her.
- Attends the weekly Journal Club and seminar and presents the same by rotation.
- Attends Vertigo Clinic, Otology Clinic, Rhinology Clinic and Tumour Clinic and presents cases participates in discussions including therapy planning etc.
- During the 2 ½ years, the resident must attend the combined Teaching Programme of the Department of Surgery, Neurosurgery and Medicine i.e. Clinical meetings, CPC's of students and staff of the whole hospital.
- Surgicopathological conference in Pathology Department, with surgeons.
- All kinds of specially prepared lectures by deptt faculty or from R.T./Plastic or Neurosurgery deptts.
- Visits by rotation the Rural Clinic for community exposures/work experience
- Does 12 hours emergency duty twice a week/ as per Roster of the deptt.
- Attends lectures by Visiting Faculty to the deptt/college from India/abroad,
- Attends/participate/present papers in State/Zonal/National conferences.
- Actively participate/help in organization of Departmental Workshop, Courses in specialised areas like FESS/Otology, Rhinoplasty, Neurotology and Head-Neck Oncology from time to time.

Research methodology/ Reporting on research

Learns the basics in research methodology and make the thesis protocol with the 4 months of admission.

- Problem oriented record keeping including use of computer.
- Use of Medical literature search including through Internet use, in the Library.
- Attends biostatistics classes by arrangement.

Research Report

- writing including preparation of Protocol for Research/Thesis.
- Writing an abstract/short paper/presentation style (Slide- making & audiovisual aids).
- Preparation of a report on a research project/Thesis.

Humanity/ Ethics:

- Lectures on humanity including personality development, team spirit and ethical issues in patient

care and human relationship including, public relations, by Psychologist and public relation officers are to be arranged by the deptt./college.

Presentation for the Thesis work

a. Selection of thesis Topic

Subject of thesis will be selected by the candidate under guidance of Faculty which will be approved by the departmental guide and other faculty. The Candidate will be asked to submit the protocol within 4 (Four) month of admission after it is scrutinized by departmental Faculty. It is to be approved by the Central thesis committee of the Institute/College if such committee does exist, and the ethical considerations are also discussed in such Research Programme committee.

Once the thesis protocol is approved the candidate starts his research work under direct supervision of guide and coguides.

Three/six monthly progress of the thesis will be checked to know the outcomes/or difficulties faced by the Candidate. Candidate will be asked to submit the thesis 6 months before the final exams. At the discretion of director/rector/thesis committee one month extension may be given to a candidate for submission of the protocol and the final thesis for any valid reason for the delay.

TEACHING METHODS

The following learning methods are to be used for the teaching of the postgraduate students:

1. Journal club: 2 hrs duration - Paper presentation/discussion - once per week (Afternoon).
2. Seminar : One seminar every week of one hour duration (morning).
3. Lecture/discussion : Lectures on newer topics by Faculty, in place of seminar/as per need.
4. Case presentation in the ward and the afternoon Special clinics (such as vertigo / otology Tumour clinics).

Resident will present a clinical case for discussion before a faculty and discussion made pertaining to its management and decision to be recorded in case files.

5. Surgicopathological Conference: Special emphasis is made on the surgical pathology and the radiological aspect of the case in the pathology deptt. such exercises help the ENT/Pathology/Radiology Residents.
6. Combined Round/Grand Round: These exercises are to be done for the hospital once/wk or twice/month involving presentation of unusual or difficult patients. Presentations of cases in clinical combined Round and a clinical series/research data on clinical materials for benefit of all clinicians/Pathologists/other related disciplines once in week or fortnightly in the Grand round.
7. Community camps: For rural exposure and also for experiences in preventive aspect in Rural situation/hospital/school, Patient care camps are to be arranged 2-3/year, involving Residents/junior faculty.
8. Emergency situation: Casualty duty to be arranged by rotation among the PGs with a Faculty cover daily by rotation.
9. Afternoon Clinics:
 - (i) Vertigo Clinic :

Once a week. All the patients of vertigo attending ENT OPD/referred cases are worked up in details by the Junior Residents and are discussed with one/two Faculty and treatment, decided upon.

- (ii) Tumour clinic/head-neck Cancer Clinic: Once or twice a week. In collaboration with the Radiotherapy Department, the patients with head and neck cancer in the field of ENT and Head and Neck are worked up by the Junior Residents and discussed about for their management by the ENT as well as Radiotherapy Consultants and treatment decision, made.
 - (iii) Rhinology Clinic: Once/week for patients with sinus diseases and nasal deformity for rhinoplasty-presented and discussed. Decision for FESS/Rhinoplasty or only other treatment taken.
 - (iv) Otology Clinic: Once a week. The ear cases are thoroughly investigated and are discussed by the Junior Residents with the faculty for their management/discussions are made after each case is presented. Audiologist also participated in this clinic.
10. Bedside clinical training for patient care care management and for bedside manners: Daily for ½ to one hour's duration during ward round with faculty and 1-2 hours in the evening by senior resident/Faculty on emergency duty, bedside patient care discussions are to be made.
- Once a week one Faculty should take a one hour Teaching Round by Rotation of Faculty (4/5 such rounds per semester of 6 months).
11. Death Cases: Once a month/ once in 3 months the records of such cases are presented by the Senior Residents. The Junior Residents are encouraged to participate actively in the discussion in the presence of Faculty of ENT and hospital administration. This programme helps to take corrective measures as well as to maintain accountability in patient management.
12. Clinical teaching: In OPD, Ward rounds, Emergency, ICU and the Operation Theatres: Residents/ Senior Residents and Faculty on duty in Respective places – make discussion on clinical diagnosis/ surgical procedures/ treatment modalities, including post operative care and preparation discharge slip.
13. Clinical interaction with audiologists/speech therapist: Clinical interaction with audiologist/ speech therapist pertaining to management of the patients with 1audiological/speech problems are to be made/discussion arranged. Audiologic methods and therapy strategies are to be made known to Resident doctors.
14. Research Methodology : Courses and Lectures are to be arranged for the residents for language proficiency by humanity teachers besides few lectures on human values and ethical issues in patient care.
15. Writing Thesis: Thesis progress is presented once in 3 months and discussion made in the dept. Guides/co-guides are to hear the problems of the candidate; can provide assistance to the student. Progress made or any failure of the candidate may be brought to the notice of college Dean/ Principal.
16. Cadaveric dissection Lab: Cadaveric temporal bone, Nose & Paranasal Sinuses and head & neck dissections must be arranged in the Departmental Lab and/or in the anatomy department for learning surgical anatomy by dissection as well as for learning different operative procedures under faculty supervision and independently (for middle ear operations using operating microscope and for other head and neck surgical procedures including endoscopic (FESS) sinus surgery using endoscopes during 2nd & 3rd year of Residency on a regular basis before/during exposure of particular batch of students to real operative procedures in patients.

Final Examination & Examiners

The Oral, Clinical and Practical Examination: One or 2 centres depending on local university rules. Not

more than 4 P.G. students should be subjected to practical exam in a day during the examination.

Results of the examination will be declared as pass/failed/pass with distinction (Grades/marks may also be given if necessary as per University Rules). While doing so, both, formative and summative assessment will be taken into consideration.

Assessment

Formative: 25% (6 monthly, each with 5% weightage) Based on day to day/semester Tests, jointly or individually assessed by different faculty members & computed and a final aggregate will be considered together and that will considerate a 2.5% weightage:

Summative: Final Examination - will have a 75% weightage: Basis Theory/practical examination. Both Formative assessment and Summative assessment will be added together at the time of final examination, and results prepared accordingly.

The Examination for the degree (MS-ENT) shall consist of

Theory exams : Papers

Practical Exams : clinical, Oral, instruments/specimen/X-rays.

1. Theory : There shall be four papers: Each being of three hours duration. Each paper will have 8-10 short questions from the curriculum.

Paper I Basic Sciences related Otolaryngology

Paper II Principles and Practices of Otolaryngology

Paper III Recent advances in Otolaryngology and Head Neck surgery.

Paper IV General Surgical Principles & Head-Neck Surgery.

2. Practical Examination- (a) Identification of Surgical Pathology, excised specimens & discussion, Reading X-Rays & CT Scan/MRI/Identification of Instruments & discussion, interpretation as audiovestibular investigations such as audiogram, ABR, ENG etc.simulated surgical situation/steps of operative procedures, required instruments/discussion.

Clinical Patient presentation/discussion:

- (i) One long case: The long case will be structured, comprising history taking, clinical examination, investigations, decision making, proposed treatment modalities, ethical justification and personal attributes.
- (ii) Two short cases: The short cases will also be structured in which only one particular system may be considered and therapy decision/discussion, made.

Examiners/ Final Examinations

- a. There shall be four examiners including two external and two internal. One of the internal examiner will be the Head of the Deptt and he /she shall be Chairman/Convener. The second internal examiner shall be next senior most member of Faculty of the deptt provided he/she is eligible for such duty. The necessity of an external examiner is to maintain the standard of the examination at the National level. All examiners must be a full time teacher with requisite experience as per MCI guidelines. Hony teacher with previous full time experience (of 10 years standing) may only be made examiners if there does not exist any a full time qualified faculty under the same university/college. No Hony. Faculty shall be made a chairman/convener of the examination.
- b. The external examiners will be asked to send two sets of question papers for the theory examination.

There will be 2 external examiners from a different University so that the number of questions available, will be double the number which will be given to the student in the moderated papers. The Chief internal examiner or Chairman/Convener will moderate it and finally make two sets of question paper, – continuing 8-10 shorts questions. He/she shall send both sets of such papers to the university and university will decide to give one of the sets to the students.

- c. All examiners shall be jointly responsible for the examination. In presence of the external examiners, the Chairman and the internal examiner shall make the necessary arrangements for conducting the Final examination. Not more than 4 students will be evaluated/examined per day in any Centre. For different College/Institution, separate examination Centre/Examiners may be arranged/ appointed for convenience and proper administration of the Final examination. While preparing the Final Results, Formative assessment of the students shall be taken into consideration and the results will be sent to the university under seal cover.

Syllabus for Individual Papers

Paper –I

Physiology- Mechanism of perception of smell and taste, mechanism of breathing and voice production, lacrimation, deglutition and salivation. Functional tests of the nose and para nasal sinuses, Mechanism of cough and sneezing.

Physics of sound, theories of hearing, mechanism of perception of sound and speech Production, Physiology of equilibrium & Cerebral function . Physiology of brain in connection with hearing, speech, smell and phonation. Audiologic tests like audiometry, impedance, evoked potentials, OAE, Speech audiometry Physiology of larynx, tracheobronchial tree & oesophagus - Histology of mucous membranes, internal ear and other associated organs and structures, nose, PNS NPx, Larynx, TB tree, Lymphoepithelial system. Mechanism of immune system/immunology and genetics.

Anatomy- Embryogenesis of ear, nose and throat including palate and the larynx, Oesophagus, trachea and lungs, tongue, salivary gland Head & Neck & skull base etc.

Parapharyngeal spaces in the neck including connective tissue barriers of larynx.

Applied anatomy of the skull bones, accessory sinuses, external, middle and inner ears, nose, PNS, nasopharynx, meninges, brain, pharynx, larynx, trachea and bronchii, lungs, pleurae oesophagus and the mediastinum.

Anatomy of all cranial nerves with their functions.

Paper-II

1. Clinical methodology as applied to ORL HN disease in adult & children and the accessory sinuses, diagnosis and surgical treatment of diseases of nose, throat and ear in adult and children. Prevention and treatment, infectious diseases of Otolaryngology and Head Neck region. Circulatory and nervous disturbances of the nose, throat and ear and their effects on other organs of the body. Deformities, injuries sinus infections, polyps and the tumours of the nose, and paranasal sinuses. Examination of the ear, deafness and allied diseases, complications of diseases of the ear. Injuries, tumours, nervous and circulatory neurological disturbances of the ear. Diagnosis and treatment of tinnitus and vertigo. Diagnosis and rehabilitation of the Hearing handicapped including, dispensing of hearing aid other vibrotactile aids.
2. Surgical pathology of Otolaryngology and Head Neck region.
3. Basic knowledge of the anaesthesia as related to ENT.

4. Examination of diseases of children (Pediatric ORL) in connection with throat and larynx. Neurological and vascular disturbances. Congenital and neonatal stridor.
5. Pathology of various diseases of the larynx and throat, tracheo bronchial tree and their causative organisms.
6. Indications and various techniques of direct laryngoscopy, nasal endoscopy, bronchoscopy and oesophagoscopy, including microlaryngoscopic procedures.
7. Reading of radiograms, scans, audiograms, nystagmograms and tympanograms in connection with ENT diseases/ disorders.
8. Special apparatus for the diagnosis and treatment of the diseases of ear, nose and throat including audiometer, BERA, ENG, Speech analyser etc.

Paper- III

1. The recent developments in the diagnosis pathogenesis treatments of the ENT diseases.
2. The knowledge of the frontiers of the oto-laryngology and lateral skull base surgery.
3. Rhinoplasties, endoscopic sinus surgery, and anterior cranial fossa surgery.
4. Knowledge of LASERS and fibre optics.
5. Other methods of managing Hearing loss.
6. Implantable hearing aids.cochlear implants.
7. Phonosurgery
8. Etiology and Managements of sleep apnoea/snoring,
9. Hypophysectomies and optic nerve decompressions.
10. Immunotherapy and modalities of the gene therapy
11. Newer techniques for Radiotherapy including, use of gamma knife for treatment of intracranial tumours and other malignancy.
12. Chemotherapy of cancer.

Paper –IV

(General surgical Principles & Head Neck Surgery)

1. General surgery, Head & Neck oncology, and & Medicine as applicable to the ENT disorders/ diseases. Surgery of congenital deformities of nose, ear (Pinna) & trachea/oesophagus etc.
2. Radiology, Imaging – computed tomography and magnetic resonance imaging, (MRI) and interventional radiology and angiography as related to E.N.T.
3. General pathologic aspects such as wound healing and also Pathology and Pathogenesis of ENT diseases, Pharmacology, molecular biology, genetics, cytology, haematology, and immunology as applicable to otolaryngology.
4. General principles of faciomaxillary traumatology and also neck injury, Plastic surgery as applicable to Otolaryngology.
5. Basic computers, computer averaging of the biological signals and its applications in Otolaryngology & Otolaryngologic equipments.
6. Audiologic and speech disorders and their management strategies.
7. Principles of Jurisprudence and ethical issues and applicable to ENT surgeons.

SURGERY — M S

GOALS/OBJECTIVES

1. To practice surgery safely and effectively, backed by scientific knowledge and sound skills
2. To have a keen interest in patient –care and develop caring attitude
3. Maintain high ethical standards
4. To provide a comprehensive and structured training programme in general surgery and to enable trainees to achieve the training and experience necessary for independent practice.

DURATION

The duration of training will be 3 years to be followed by the “exit” or specialty examination in General Surgery

CLINICAL POSTINGS

1. Surgical Posting: Each postgraduate (PG) is posted in one of the four surgical units soon after joining the course
2. Rotations in Specialty Departments is for a period of one year. This is done after the PG has spent six months in learning basic ward work and surgical skills in the surgical unit. This rotation includes a three month posting in Casualty
3. ICU Posting is for a period of one month.

TEACHING AND LEARNING ACTIVITIES

Most of the teaching is conducted within the unit by the consultants and senior residents of the respective unit. Various learning activities are Journal Club presentations, case presentations, ward rounds and teaching rounds. Seminars are held every week which are attended by the whole department. Each postgraduate presents about two to three seminars every year. Interdepartmental meetings are held weekly with the radiology and pathology department. Interesting cases are discussed in these meetings. Clinico-pathological conference (CPC) is held every month and Clinical combined rounds and Clinical Grand rounds (CGR) are held weekly. All postgraduates should attend these. They are also encouraged to attend CME's, conferences.

THESIS

All postgraduates are required to carry out a research project under the guidance of faculty of the department. They are encouraged to select the project of their choice. They must submit the protocol within four months of joining the MS degree course.

CONTENT OF TRAINING

General Objectives of Training

Trainees should develop:-

1. Clinical and operative competence in both emergency and elective general surgery. Additionally they require knowledge and some experience across a wide range of surgery to ensure appropriate referral.
2. The competence to be responsible for both the emergency admissions in general surgery and elective referrals.
3. Appropriate skills in:-
 - (a) Basic Gastro-intestinal endoscopy
 - (b) Endoscopic surgery
4. A knowledge of the basic sciences related to general surgery including relevant specialist applied anatomy.
5. The ability to teach medical students
6. The ability to work as a member of a clinical team, bearing in mind the needs of the service and the hospital.
7. An understanding of the particular requirements of day case surgery.
8. A knowledge of palliative care.
9. A knowledge of subjects such as medical ethics, health economics, medico-legal matters, risk management, medical statistics, information technology and health service management.
10. A knowledge and experience of clinical audit.
11. An understanding of research methods.

Syllabus

The following pages comprise schedules of knowledge and operative skills, which provide a syllabus for training in general surgery and its sub-specialties. The knowledge required includes the basic science relevant to each topic. There is no intention to limit knowledge and operative experience. Trainees, as part of their general surgical training, must acquire competence in the scheduled operations but will also have experience of other procedures from the sub-specialty departments.

Knowledge: The Postgraduates are required to acquire sound knowledge of following topics. The list includes topics found in most standard surgical textbooks. The PG's should also be familiar with recent advances and current controversies.

1. **Applied Basic Sciences** include applied anatomy, physiology, biochemistry, microbiology and pathology.
2. **General Surgical Topics** include the following:

- History of Surgery
- Fluids and Electrolyte balance/ Acid – Base metabolism
- Wound Healing and Wound Management
- Pathophysiology and Management of Shock
- Principles of Operative Surgery: Asepsis, Sterilization and Antiseptics
- Surgical Infections and Antibiotics
- Nutrition and Metabolism
- Principles of Burn Management
- Principles of Oncology
- Principles of Laparoscopy and Endoscopy
- Haemostasis, Blood Transfusion
- Trauma: Assessment of polytrauma, triage, basic and advanced trauma
- Basic Principles of Anaesthesia
- Informed Consent and Medicolegal Issues
- Organ Transplantation
- Molecular Biology and Genetics
- Hernias: Types of hernias, repair techniques
- Breast Diseases: Benign breast disorders, investigations, screening, genetics, Breast Cancer
- Thyroid Disorders: Solitary nodule, investigations, multinodular goitre, Graves disease, malignancies

PERI-OPERATIVE MANAGEMENT 1

Pre-operative Management

- Assessment of fitness for anaesthesia and surgery.
- Tests of respiratory, cardiac and renal function.
- Management of associated medical conditions, eg: diabetes; respiratory disease;
- cardiovascular disease; malnutrition; anaemia; steroid, anticoagulant,
- immunosuppressant and other drug therapy.

Infection

- Pathophysiology of the body's response to infection.
- The sources of surgical infection - prevention and control.
- Surgically important micro-organisms.
- Principles of asepsis and antisepsis.
- Surgical sepsis and its prevention.
- Aseptic techniques.
- Skin preparation.

- Antibiotic prophylaxis.
- Sterilisation.

Investigative and Operative Procedures

- Excision of cysts and benign tumours of skin and subcutaneous tissue.
- Principles of techniques of biopsy.
- Suture and ligature materials.
- Drainage of superficial abscesses.
- Basic principles of anastomosis.

Anaesthesia

- Principles of anaesthesia.
- Pre-medication and sedation.
- Local and regional anaesthesia.
- Care and monitoring of the anaesthetised patient.

Theatre Problems

- Surgical technique and technology.
- Diathermy - principles and precautions.
- Lasers - principles and precautions.
- Explosion hazards relating to general anaesthesia and endoscopic surgery.
- Tourniquets - uses and precautions.
- Prevention of nerve and other injuries in the anaesthetised patient.
- Surgery in hepatitis and HIV carriers (special precautions).
- Disorders of coagulation and haemostasis (prophylaxis of thromboembolic disease).

PERI-OPERATIVE MANAGEMENT 2

Skin and Wounds

- Pathophysiology of wound healing.
- Classification of surgical wounds.
- Principles of wound healing.
- Incisions and their closure.
- Suture and ligature materials.
- Scars and contracture.
- Wound dehiscence.
- Dressings.

Fluid Balance

- Assessment and maintenance of fluid and electrolyte balance.
- Techniques of venous access.

- Nutritional support - indications, techniques, total parenteral nutrition.

Blood

- Disorders of coagulation and haemostasis.
- Blood transfusion - indications, hazards, complications, plasma substitutes.
- Haemolytic disorders of surgical importance.
- Haemorrhagic disorders; disorders of coagulation.

Post-operative Complications

- Post-operative complications - prevention, monitoring, recognition, management.
- Ventilatory support - indications.

Post-operative Sequelae

- Pain control.
- Immune response to trauma, infections and tissue transplantation.
- Pathophysiology of the body's response to trauma.
- Surgery in the immuno-compromised patient.

TRAUMA

Initial Assessment and Resuscitation after Trauma

- Clinical assessment of the injured patient.
- Maintenance of airway and ventilation.
- Haemorrhage and shock.

Chest, Abdomen and Pelvis

- Cardiorespiratory physiology as applied to trauma.
- Penetrating chest injuries and pneumothorax.
- Rib fractures and flail chest.
- Abdominal and pelvic injuries.

Central Nervous System Trauma

- Central nervous system: anatomy and physiology relevant to clinical examination of the central nervous system; understanding of its functional disorders particularly those caused by cranial or spinal trauma; and interpretation of special investigations.
- Intracranial haemorrhage.
- Head injuries, general principles of management.
- Surgical aspects of meningitis.
- Spinal cord injury and compression.
- Paraplegia and quadriplegia - principles of management.

Special Problems

- Pre-hospital care.

- Triage.
- Trauma scoring systems.
- Traumatic wounds - principles of management.
- Gunshot and blast wounds.
- Skin loss - grafts and flaps.
- Burns.
- Facial and orbital injuries.

Principles of Limb Injury

- Peripheral nervous system - anatomy and physiology.
- Fractures - pathophysiology of fracture healing.
- Non-union, delayed union, complications.
- Principles of bone grafting.
- Traumatic oedema, compartment and crush syndromes, fat embolism.
- Brachial plexus injury.

INTENSIVE CARE

Cardiovascular

- The surgical anatomy and applied physiology of the heart relevant to clinical cases.
- Physiology and pharmacological control of cardiac output, blood flow, blood pressure, and coronary circulation.
- Cardiac arrest, resuscitation.
- Monitoring of cardiac function in the critically ill patient, central venous pressure, pulmonary wedge pressure, tamponade, cardiac O/P measurements.
- The interpretation of special investigations.
- The management of haemorrhage and shock.
- Pulmonary oedema.
- Cardiopulmonary bypass - general principles, cardiac support.

Respiratory

- The surgical anatomy of the airways, chest wall, diaphragm and thoracic viscera.
- The mechanics and control of respiration.
- The interpretation of special investigations; lung function tests, arterial blood gases, radiology.
- The understanding of disorders of respiratory function caused by trauma, acute surgical illness and surgical intervention.
- Respiratory failure.
- Complications of thoracic operations.
- Adult respiratory distress syndrome.
- Endotracheal intubation, laryngotomy, tracheostomy.

- Artificial ventilation.

Multisystem Failure

- Multisystem failure.
- Renal failure - diagnosis of renal failure, complications of renal failure.
- GI tract and hepatic failure.
- Nutrition.

Problems in Intensive Care

- Sepsis, predisposing factors, organisms causing septicaemia.
- Complications of thoracic operations.
- Localised sepsis, pneumonia, lung abscess, bronchiectasis, empyema, mediastinitis.

Principles of ICU

- Indications for admission.
- Organisation and staffing.
- Scoring.
- Costs.

NEOPLASIA: TECHNIQUES AND OUTCOME OF SURGERY

Principles of Oncology

- Epidemiology of common neoplasms and tumour-like conditions; role of cancer registries.
- Clinico-pathological staging of cancer.
- Pathology, clinical features, diagnosis and principles of management of common cancers in each of the surgical specialties.
- Principles of cancer treatment by surgery, radiotherapy, chemotherapy, immunotherapy and hormone therapy.
- The principles of carcinogenesis and the pathogenesis of cancer relevant to the clinical features, special investigations, staging and the principles of treatment of the common cancers.
- Principles of molecular biology of cancer, carcinogenesis; genetic factors; mechanisms of metastasis.

Cancer Screening and Treatment

- The surgical anatomy and applied physiology of the breast relevant to clinical examinations, the interpretation of special investigations, the understanding of disordered function and the principles of the surgical treatment of common disorders of the breast.
- The breast: acute infections; benign breast disorders; nipple discharge; mastalgia. Carcinoma of breast; mammography; investigation and treatment.
- Screening programmes.

Techniques of Management

- Terminal care of cancer patients; pain relief.
- Rehabilitation.

- Psychological effects of surgery and bereavement.

Ethics and the Law

- Medical/legal ethics and medico-legal aspects of surgery.
- Communication with patients, relatives and colleagues.

Outcome of Surgery

- The evaluation of surgery and general topics.
- Decision-making in surgery.
- Clinical audit.
- Statistics and computing in surgery.
- Principles of research and design and analysis of clinical trials.
- Critical evaluation of innovations - technical and pharmaceutical.
- Health service management and economic aspects of surgical care.

LOCOMOTOR SYSTEM

Musculo-skeletal anatomy and physiology relevant to clinical examination of the locomotor system and to the understanding of disordered locomotor function, with emphasis on the effects of acute musculo-skeletal trauma.

Effects of Trauma and Lower Limb

- Effects of acute musculo-skeletal trauma.
- Common fractures and joint injuries.
- Degenerative and rheumatoid arthritis (including principles of joint replacement).
- Common disorders of the lower limb.
- Amputations and prosthesis.

Infections and Upper Limb

- Common soft tissue injuries and disorders.
- Infections of bones and joints (including implants and prostheses).
- Pain in the neck, shoulder and arm.
- Common disorders of the hand, including hand injuries and infections.

Bone Disease and Spine

- Common disorders of infancy and childhood.
- Low back pain and sciatica.
- Metabolic bone disease (osteoporosis, osteomalacia).
- Surgical aspects of paralytic disorders and nerve injuries.

VASCULAR

The surgical anatomy and applied physiology of blood vessels relevant to clinical examination, the interpretation of special investigations and the understanding of the role of surgery in the management of cardiovascular disease

Arterial Diseases

- Chronic obliterative arterial disease.
- Amputations.
- Aneurysms.
- Carotid disease.
- Special techniques used in the investigation of vascular disease.
- Limb ischaemia: acute and chronic; clinical features; gangrene; amputations for vascular disease.
- Principles of reconstructive arterial surgery.
- Atherosclerosis
- Principles of Angioplasty/stenting
- Thrombolysis
- Reno-vascular disease
- Raynaud's/vasospastic disorders
- Lymphoedema
- Cerebrovascular disease
- Vasculitis
- Mesenteric ischaemia
- Graft prosthetics
- Graft surveillance
- Autonomic dysfunction
- Reperfusion injury
- Ischaemic limb Arterial trauma
- Hyper/hypo coagulable state
- Arteriography
- Continuous wave doppler
- Duplex ultrasound

Venous Diseases

- Vascular trauma and peripheral veins.
- Varicose veins.
- Venous hypertension, post-phlebitic leg, venous ulceration.
- Disorders of the veins in the lower limb.
- Deep venous thrombosis and its complications.
- Chronic ulceration of the leg.
- Thrombosis and embolism.

Lymphatics and Spleen

- Thromboembolic disease.
- Spleen; role of splenectomy; hypersplenism.

- Lymph nodes; lymphoedema.
- Surgical aspects of auto-immune disease.
- The anatomy and physiology of the haemopoietic and lymphoreticular systems.
- Surgical aspects of disordered haemopoiesis.

HEAD, NECK and ENDOCRINE

The surgical anatomy and applied physiology of the head and neck relevant to clinical examination, the interpretation of special investigations, the understanding of disorders of function, and the treatment of disease and injury involving the head and neck.

The Head

- Laryngeal disease; maintenance of airway; tracheostomy.
- Acute and chronic inflammatory disorders of the ear, nose, sinuses and throat.
- Intracranial complications.
- Foreign bodies in ear, nose and throat.
- Epistaxis.
- Salivary gland disease.
- The eye - trauma, common infections.

Neck and Endocrine Glands

The surgical anatomy and applied physiology of the endocrine glands relevant to clinical examination, the interpretation of special investigations, the understanding of disordered function and the principles of the surgical treatment of common disorders of the endocrine glands.

- Common neck swellings.
- Thyroid: role of surgery in diseases of the thyroid; complications of thyroidectomy; and the solitary thyroid nodule.
- Parathyroid; hyperparathyroidism; hypercalcaemia.
- Secondary hypertension.
- Pituitary
- Adrenal cortex
- Adrenal medulla
- Gut as endocrine organ
- Endocrine pancreas and the management of:-
- Thyrotoxicosis
- Adrenal insufficiency
- Hyper/hypo thyroidism
- Carcinoid syndrome
- Counselling and screening in familial disease
- Anaesthetic and pharma-cological problems
- Radio-immuno assays

- Imaging techniques
- Histo/cyto pathology

Paediatric Surgical Disorders

- Neonatal physiology: the special problems of anaesthesia and surgery in the newborn; and the principles of neonatal fluid and electrolyte balance.
- Correctable congenital abnormalities.
- Common paediatric surgical disorders: cleft lip and palate; pyloric stenosis; intussusception; hernia; maldescent of testis; torsion; and diseases of the foreskin.
- RIF pain
- Testicular pain
- Paediatric trauma
- Burns
- Intussusception
- Pyloric stenosis
- Hirschprung's disease
- Ano-rectal anomalies
- Tracheo-oesophageal fistula
- Spina bifida
- Congenital small bowel obstruction
- Intestinal malrotation
- Associated anomalies
- Paediatric oncology
- Management of less complex abdominal trauma
- Hydrocephalus

ABDOMEN

The surgical anatomy of the abdomen and its viscera and the applied physiology of the alimentary system relevant to clinical examination, the interpretation of common special investigations, the understanding of disorders of function, and the treatment of abdominal disease and injury.

Abdominal Wall

- Anatomy of the groin, groin and other ventral hernias, acute and elective; clinical features of hernias; complications of hernias.
- Anterior abdominal wall, anatomy, incisions, laparoscopic access.

Acute Abdominal Conditions

- Peritonitis; intra-abdominal abscesses.
- Common acute abdominal emergencies.
- Intestinal obstruction; paralytic ileus.

- Intestinal fistulae.
- Investigation of abdominal pain.
- Investigation of abdominal masses.
- Gynaecological causes of acute abdominal pain.
- Pelvic inflammatory disease.
- Assessment of the acute abdomen
- Appendicitis and right iliac fossa pain
- Peritonitis
- Acute intestinal obstruction
- Intestinal pseudo-obstruction
- Biliary tract emergencies
- Acute pancreatitis
- Strangulated hernia
- Intestinal ischaemia
- Swallowed foreign bodies
- Gastrointestinal bleeding
- Toxic megacolon
- Superficial sepsis and abscesses
- Acute ano-rectal sepsis
- Ruptured aortic aneurysm
- Acute presentations of urological disease
- Acute presentations of gynaecological disease

Abdominal injury

- Assessment of the multiply injured patient
- Triage (major accidents)
- Battle triage and Field hospitals
- Initial management of head injuries.
- Closed abdominal injuries, especially splenic, hepatic and pancreatic injuries
- Closed chest injuries
- Stab and gunshot wounds
- Arterial injuries
- Injuries of the urinary tract
- Initial management of head injuries and interpretation of CT scans
- Initial management of severe burns

SMALL BOWEL AND COLORECTAL DISORDERS

- Neoplasms of large bowel

- Inflammatory bowel disease (inc.medical management)
- Diverticular disease
- Irritable bowel syndrome
- Haemorrhoids
- Anal fissure
- Rectal prolapse
- Acute appendicitis/RIF pain
- Intestinal obstruction
- Intestinal pseudo-obstruction
- Intestinal ischaemia
- Peritonitis
- Large bowel and rectal injuries
- Anal tumours
- Pelvic autonomic nerves
- Screening for colorectal cancer
- Genetics of colorectal cancer
- Place of radiotherapy and chemotherapy in treatment
- Anorectal physiology
- Anorectal ultrasound
- Faecal incontinence
- Chronic constipation
- Intestinal fistulae
- Colonic bleeding
- Radiation enterocolitis
- Other small bowel conditions
- Colonic obstruction
- Colonic perforation

The use of staplers

LAPAROSCOPIC SURGERY

- Laparoscopic anatomy of the abdomen
- Diagnostic laparoscopy
- Physiology of pneumo-peritoneum Dangers of pneumoperitoneum
- Principles of diathermy
- Informed consent for laparo-scopic procedures
- Pre and post operative management of laparoscopic cases
- Port complications

- Technology of video imaging, cameras, insufflator etc.
- The methods of manipulation of images
- Laparoscopic instruments, clips, staplers and port types
- Management of equipment failure
- Ultrasound interpretation, internal and external techniques
- Recognition and management of laparoscopic complications
- Use and dangers of diathermy
- Anaesthetic problems in laparoscopic surgery
- Medico-legal implications of video-endoscopic surgery
- Theory and practice of choledochoscopy
- Theory of different forms of diathermy
- Laparoscopic ultrasound
- Advanced instrumentation and equipment
- Endoscopic suturing devices
- Theory, uses and dangers of lasers and other energy sources e.g. harmonic scalpel
- Creation and maintenance of new endoscopic spaces
- Use of assistance robots and robotic instruments

TRANSPLANTATION with special reference to RENAL AND HEPATIC DISEASE

- Pathology of renal and hepatic disease
- Patho-physiology of renal and hepatic failure
- Peritoneal- and haemo-dialysis
- Management of fluid and electrolyte disorders
- Selection of patients for transplantation
- Post-operative management
- Immuno-pathology of rejection
- Management of rejection
- Immunosuppression
- Opportunist infections
- Immunosuppression and cancer
- Transmission of viral and fungal diseases
- Tissue typing
- The HLA system
- Bladder dysfunction

HEPATOPANCREATOBILIARY SURGERY

- Gallstones and complications

- Biliary stricture
- Obstructive Jaundice
- Neoplasms of the Liver, Biliary Tract and Pancreas
- Pancreatitis, acute and chronic, complications
- Liver injuries
- Portal Hypertension
- Hydatid disease
- ESRD and Liver transplantation

UPPER GI TRACT

- Neoplasms of the upper GI tract
- Management of perforations of the upper GI tract
- Management of intestinal obstruction
- Management of GI bleeding
- Oesophageal motility disorders
- Oesophageal Strictures
- Gastro-oesophageal reflux and its complications
- Peptic ulceration and its complications
- Radiation enteritis
- Abdominal trauma
- Principles of screening for cancer
- The use and limitations of multimodality treatment for upper GI cancer
- Oesophageal motility disorders
- Other small bowel conditions
- Principles of Small bowel resection
- Sutured and stapled anastomoses
- Urinary Tract
- Urinary tract infection.
- Urinary Tract Obstruction
- Haematuria.
- Trauma to the urinary tract.
- Urinary calculi.
- Retention of urine.
- Urinary tract Neoplasms
- Disorders of prostate.
- Pain and swelling in the scrotum.
- Other Scrotal Lesions
- Testicular Neoplasms

NEUROSURGERY

- Cranial, spinal and peripheral nerve tumours
- Head Injury
- Spinal and peripheral nerve injuries
- Hydrocephalus
- Cerebrovascular Accidents
- Infections
- Recent advances

Cardiac and Thoracic Surgery

- Myocardial revascularisation
- Valvular Disorders
- Peripheral vascular disease
- Renovascular disease
- Secondary Hypertension
- Inflammatory Lung Disease
- Chest Wall lesions
- Thoracic Neoplastic Disease
- Chest Trauma
- Pleural Diseases

Orthopaedics

- Principles of Orthopaedic Trauma
- Casts and braces
- Nerve injuries
- Hand Infections
- Principles of Traction
- Amputations
- Principles of Rehabilitation
- Congenital Lesions
- Bone and Joint Infections

SKILLS

Objectives

1. To provide a comprehensive and structured training programme in general surgery and to enable trainees to achieve the training and experience necessary for independent practice.
2. The PG should be able to take proper history, conduct physical examination, perform or request for relevant investigations. He should be able to interpret these investigations to arrive at a working diagnosis.

3. Communicate with patient. Discuss operative plan, possible management options, postoperative complications etc and be able to take informed consent
4. Perform minor operative procedures and common major general surgical operations independently
5. Evaluate and manage trauma and acute surgical emergencies.
6. Undertake Critical care
7. Undertake wound management

Basic Ward Procedures

- Insertion of intravenous cannula, Nasogastric tube, urinary catheters
- Removal of Tubes and Drains
- Abdominal Paracentesis, Pleural Tap
- Venous Cutdown
- Wound dressings

ICU Procedures

- Insertion of CVP line, arterial lines, endotracheal intubation
- Intercostal Drainage
- Tracheostomy
- Knowledge of Ventilators and Monitors
- Prescribing TPN

Minor Surgical Procedures

- Hydrocele surgery, Lymph node biopsy, Excision of superficial swellings, Ingrowing toe nail, Circumcision, Banding of Haemorrhoids, Vasectomy

Emergency Room Procedures

- Diagnostic peritoneal lavage (DPL)
- Suturing of lacerations
- Drainage of abscesses
- Wound Debridement
- Reduction and Plaster application of simple fractures and dislocations
- Anal Dilatation and Sphincterotomy
- Preoperative Workup and Postoperative Care

Major Operative Procedures

A) Perform Independently/ Assistance:

The following list is not exhaustive. The Trainee should try to get the maximal operative exposure possible. The range of exposure will also depend upon the type of surgeries a particular unit (where the Trainee is posted) is performing.

Routine: Open and laparoscopic Cholecystectomy, Groin Hernia Repair, Mastectomy, Breast Lump Excision, microdochectomy, Radical Duct Excision, Hemithyroidectomy, Laparotomy, Diagnostic laparoscopy, Thoracotomy, Cystogastrostomy, Suprapubic cystostomy, Hemicolectomy, Cysts and

Sinuses of the Neck, Gastrostomy and feeding jejunostomy, Nephrectomy, Pyelolithotomy, Uterolithotomy, Orchidopexy, Skin grafting, Varicose vein surgery, vein harvesting, Lumbar Sympathectomy, Small bowel resection, Femoral herniorrhaphy, Umbilical and para umbilical hernia repair, Incisional and para-stomal hernia repair

Emergency: Appendectomy, Laparotomy for intestinal Obstruction, Trauma Laparotomy, Splenectomy, Closure of Peptic Ulcer Perforation, Enteric Perforation, Resection-Anastomosis of bowel, Colostomy, Hemicolectomy, Amputations, Embolectomy, Tracheostomy, Obstructed Inguinal Hernia

B) Assist/Observe

Vascular

- Reconstructive arterial surgery.
- Aneurysm Surgery

HEAD, NECK, ENDOCRINE AND PAEDIATRIC

The Head

- Parotidectomy, submandibular gland excision

Neck and Endocrine Glands

- Thyroidectomy, parathyroidectomy, congenital or developmental problems
- Adrenalectomy
- Surgery for endocrine pancreatic tumours

Paediatric Disorders

- Common paediatric surgical disorders: cleft lip and palate; pyloric stenosis; intussusception; hernia; maldescent of testis; torsion; and diseases of the foreskin.

ABDOMEN

- Sub-total colectomy
- Diagnostic laparoscopy
- Gastrectomy for bleeding
- Endoscopy for upper GI obstruction
- Laparotomy for perforated colon
- Suture of bleeding peptic ulcer
- Emergency cholecystectomy
- Exploration of scrotum for torsion
- Emergency hernia repair
- Laparotomy for abdominal
- Reduction of paraphimosis
- Laparotomy for small bowel injury
- Diagnostic peritoneal lavage
- Intestinal obstruction
- Splenic repair

- Hartmann's operation
- Operation for ruptured liver
- Pancreatic debridement
- Median sternotomy

Reconstructive Surgery

- Myocutaneous flaps
- Tissue expanders
- Breast reduction

Colorectal

- Therapeutic Endoscopy, colonoscopy
- Anterior resection of rectum
- AP resection of rectum
- Ileorectal anastomosis
- Panproctocolectomy
- Closure of Hartmann's
- Prolapse surgery
- Incontinence surgery
- Sphincter repair
- Recto-vaginal fistula
- Ileo-anal and colonic pouch
- Colo-anal anastomosis
- Operation for intestinal fistula
- Complex fistula-in-ano
- Posterior approach to rectum
- Block dissection of groin
- Operative cholangiography
- Laparoscopic suturing and knotting
- Nephrectomy
- Pyelo and ureterolithotomy
- Pyeloplasty
- Open prostatectomy

Laparotomy for acute abdomen

- Splenectomy
- Oesophageal dilatation
- Operations for upper GI bleeding
- Exploration of common bile duct

- Biliary bypass
- Formation of Roux-en-Y loop
- Oesophagectomy/total gastrectomy
- Pancreatectomy
- Liver resection
- Oesophagectomy
- Total and subtotal
- gastrectomy
- Heller's myotomy
- Long oesophageal myotomy
- Pharyngeal pouch
- Repair of biliary stricture
- Whipple's procedure
- Pancreatectomy (distal and total)
- Drainage of infected pancreatitis
- Drainage of pancreatic pseudo-cyst
- Liver injuries
- Hydatid disease
- Porto-systemic shunt
- Vascular suture/anastomosis
- Control of venous bleeding
- Balloon thrombo-embolectomy
- Fasciotomy
- Arterial injuries
- Vascular access for dialysis

ORTHODONTICS — M D S

The course shall comprise of a minimum of three years which the student will be deemed to have acquired :

- (a) An update to knowledge of Clinical Orthodontics, reentgeno-cephalometrics, growth and development of teeth, jaws, periodontium, TMJ and occlusion.
- (b) Competance at running independently orthodontic services and cleft palate Orthodontics.
- (c) Working knowledge of some of the important instruments , equipments in the scientific investigation of malocclusion of teeth, jaws and craniofacial anomalies.
- (d) Familiarity with the modern teaching methods and assessment strategies for undergraduate students.
- (e) And have undergone concurrent clinical training in major disciplines.

The student shall be rotated for training in different sections i.e. Radiodiagnosis (roentgeno-cephalometric) and Otolaryngology (oral breathing, nasal obstructions & speech). The student shall write at least two papers and a thesis on a research project under the perceptorship of the guide.

The course shall be given in the following forms

1. Didactic lectures, seminars, demonstrations & laboratory techniques twice a week.
2. The lectures will be so arranged that the student joining either in January or July will rotate without difficulty. A good number of lecturers/demonstrations will be necessary in order to cover the entire field of dentistry and its sub-specialty of Orthodontics.
3. There will be journal club once a week. Each student will be assigned a journal of Orthodontics or of allied sciences for this purpose of Orthodontics or of allied sciences for this purpose to review the more important articles that have appeared in current journals irrespective of topic to give practice to the student in comprehension and presentation of the data and his own views before a group.
4. Clinical case conference twice a week – the student will present all data including cephlometric analysis for discussion in the conference of faculty and students.
5. The students will work on patients in the clinics, both in the mornings and in the afternoons under the supervision of the teachers.
6. Lecturers in the basic sciences – attending at this course given by the basic science disciplines will

be compulsory. This is usually given once every year and attendance at these courses will be essential.

7. Concurrent clinical training – each student will be required to undergo compulsory concurrent clinical training for this purpose in paediatric Surgery, Plastic Surgery, Otolaryngology and Radiodiagnosis.
8. Training in methodology of teaching – the postgraduate will attend the undergraduate classes to learn the methodology of teaching and they will be encouraged to teach the undergraduate students after preparing lectures and getting it corrected by a faculty members under whom he will work.
9. The candidate will get training in various aspects of Orthodontics during the three year course.
10. Internal assessment examination will be conducted after every 6 months.
11. The candidate must submit thesis protocol within 4 months of their joining the course i.e. 30th April and 31st October for the January and July session respectively.
12. The candidate must submit thesis six months prior to final examination for the January and July session i.e. by 30th November and 30th June respectively.

SYLLABUS OF COURSE IN ORTHODONTICS

1. Applied Anatomy : Applied anatomy of oro-dental tissues with special reference to the jaws, teeth, TMJ, muscles of mastication, deglutition, speech, occlusion and dental morphology.
2. Histology : Normal histology of the teeth, peridontium and oral tissues.
3. Development : Growth and development of the jaws, teeth, supporting structures, TMJ and dentofacial anomalies.
4. Physical anthropology : Evolution of jaws and teeth, study of anthropometric and landmarks.
5. Applied physiology : Physiology of investing tissues arch forms and occlusion, physiology of mastication, deglutition and speech.
6. Nutrition : Study of nutritional factors, vitamins, carbohydrates, fats, proteins, minerals and their individual dental implications.
7. Applied pathology : Development anomalies affecting tooth form and number. Disease of teeth and jaws, heredity and anomalies of the jaws. Effects of endocrine and nutritional deficiencies affecting the development of TMJ teeth & jaws.
8. Applied dental materials : Applications of dental cements, stainless steel wires, band material, solders, impression materials, plaster of Paris, stone plaster, acrylic resins and other materials used in Orthodontics.
9. Applied radiology : Dental radiology including cephalometrics and panoramic.
10. Child psychology from birth to adolescence.
11. Genetics – heredity with special reference to dental and other facial anomalies.
12. Study of biostatistics as applied to dentistry and research.

ORTHODONTICS

1. History of Orthodontics, scope & limitations
2. Principles of Orthodontics
3. Normal occlusion

4. Recognition of malocclusion, incidence, etiology and classification.
5. Importance of orthodontic records.
6. Cephalometrics, models and photographic analysis.
7. Growth prediction by computers
8. Diagnostic aids.
9. Treatment planning by computer.
10. Preventive and Interceptive orthodontics.
11. Role of extractions
12. Serial extractions.
13. Corrective Orthodontics by removal appliances.
14. Corrective orthodontics by fixed appliances (techniques).
15. Myofunctional appliances
16. Analysis of forces, applied in orthodontic treatment.
17. Biomechanical principles of Orthodontics tooth movement and tissue changes.
18. Anchorage
19. Retention and relapse.
20. Cleft palate Orthodontics, presurgical, mixed dentition and permanent dentition.
21. Surgical Orthodontics
22. Slow & rapid max. expansion.

II. Clinical and laboratory techniques

1. Model preparation
2. Cast trimming
3. Wire bending techniques
4. Soldering
5. Manipulation of cold & hot cure acrylic resins
6. Spot welding
7. Impression taking
8. Bite registration
9. Radiographic and cephalometric analysis, tracing digitization.
10. Conventional & prefabricated bands, cementation and arch fixation on the patient.
11. Clinical demonstrations of treatment planning by different methods & techniques.
12. Typodont exercises by both techniques
13. Removable and functional appliances.
14. Direct bonding.

EXAMINATION

I. Theory

a) Paper I

Basic & Applied subjects

(Applied Anatomy, Physiology, pathology, Nutrition, Biostatics & Dental Materials)

b) Paper II

(Orthodontics – Basic Principles)

c) Paper III

(Clinical Orthodontics)

d) Paper IV

(Essay on basic, applied advanced Orthodontics)

II. Practical, Clinical and Viva Voce Examination will consists of :-

a) Presentation of laboratory techniques, exercises.

b) Clinical examination – case presentations (20 completed cases , at least 5 debonded).

c) Taking working bite on the patient, preparation and fitting of a functional appliance.

d) Making of a set of U/L arch wires, auxiliaries and fixing them on the patient.

e) Making a cast analysis, cephalometric, photographic diagnosis and treatment planning of a given cases.

f) Viva voce examination will consists of :-

i) Oral examination

ii) Case discussion

iii) Thesis discussion

PROSTHODONTICS — M D S

The course shall comprise of a minimum of three years during which the student will be deemed to have acquired.

- a) An updated knowledge of Prosthodontics including Removable, Fixed, Maxillofacial Prosthodontics and Implantology, growth and development of teeth, jaws, Periodontics, T.M.J. and occlusion.
- b) Competence at running independently Prosthodontics service and Maxillofacial Prosthodontics.
- c) Working knowledge of some of the important instruments, equipment in the scientific investigations of Dental Materials, Prosthodontic rehabilitation including masticatory efficiency, TMJ dysfunction syndromes & craniofacial anomalies.
- d) Familiarity with the modern methods and assessment strategies for teaching of undergraduate students.
- e) Clinical training in major disciplines including Oral Cancer and Plastic Surgery.

The student shall be rotated for training in different sections i.e. Radiodiagnosis (roentgenocephalometric, panoramic), Paediatric Surgery (cleft lip and palate repair) and Head & Neck Cancer. The student shall write at least two papers and a thesis on a research project under the perceptorship of the guide.

The course shall be given in the following forms

- 1. Didactic lectures, seminars, demonstrations & Laboratory techniques thrice a week.
- 2. The lectures will be so arranged that the student joining either in January or July will rotate without difficulty. A good number of lectures / demonstrations will be necessary in order to cover the entire field of dentistry and its subspeciality of Prosthodontics.
- 3. There will be Journal Club once a week. Each student will be assigned a Journal of Prosthetic Dentistry, the International Journal of Prosthodontics, Oral Rehabilitation or of allied sciences to review the most important articles that have appeared in the Journals irrespective of topic to give practice to the student in comprehension and presentation of the data and his own views before a group.
- 4. Clinical case conference once a week - the student will present all data including case records, models, radiographs and photographs.

5. The students will work on patients in the clinics, both in the mornings and in the afternoons under the supervision of teachers.
6. The students will undertake the laboratory work for the patients who are under their treatment.
7. Lectures in basic sciences-attendance at this course given by the basic science disciplines will be compulsory. This is usually given once every year and attendance at these courses will be essential.
8. Concurrent clinical training - each student will be required to undergo compulsory concurrent clinical training for this purpose in Plastic Surgery, Otolaryngology and Radio diagnosis.
9. Training in methodology of teaching - the postgraduate will attend the undergraduate classes to learn the methodology of teaching and they will be encouraged to teach the undergraduate students after preparing lectures and getting it corrected by a faculty member under whom he will work.
10. The candidate will get training in various aspects of Prosthodontics during the three years both in the clinics and laboratory.
11. Internal assessment examination will be conducted every 6 months.
12. The candidate must submit thesis protocol within 4 months of their joining the course i.e. by 30th April and 31st Oct. for the January and July session respectively.
13. The candidate must submit thesis six months prior to final examination for the January and July session i.e. by 30th November and 30th June respectively.

SYLLABUS OF COURSE IN PROSTHODONTICS

A. Applied Anatomy, Physiology, Pathology and Biostatistics

1. Anthropology as applied to craniofacial region.
2. Genetics in Dentistry.
3. Endocrine glands in particular reference to Pituitary, Parathyroid and Thyroid glands.
4. Normal occlusion, development of occlusion in deciduous, mixed and permanent dentitions.
5. Anatomy of T.M.J., its movements and Myofacial pain dysfunction syndrome.
6. Role of Vit A, C and B complex in oral mucosal and periodontal health.
7. Role of Calcium and Vit D in growth and development of teeth and jaws.
8. Growth and development of face, jaws and teeth.
9. Oral pre-cancerous lesions.
10. Malignant lesions of the oral cavity and head and neck region.
11. Histology of enamel, dentin, cement, periodontal ligament and alveolar bone.
12. Pulpal anatomy, histology and biological considerations.
13. Anatomy, physiology and function of the masticator system.
14. Speech Mechanism.
15. Mastication, swallowing and deglutition mechanism.
16. Salivary glands and saliva.
17. Anatomy and histology of oral mucous membrane.
18. Congenital abnormalities of face and oral cavity.

19. Indices in diagnosis of dental caries and periodontal diseases.
20. Sterilization in dentistry.
21. Tooth numbering systems.
22. Introduction to Biostatistics: scope and need for statistical application to biological data.
23. Definition of selected terms-scale of measurements related to statistics.
24. Methods of collecting data.
25. Presentation of data - statistical diagrams and graphs.

Dental Materials

1. Physical, mechanical and biological properties of modern dental materials.
2. Gypsum products used in Prosthodontics.
3. Die and counter die materials.
4. Various resins used in Prosthodontics including Denture base materials.
5. Impression materials used in Dentistry.
6. Duplicating materials.
7. Metals and alloys used in Dentistry.
8. Dental waxes including inlay casting wax.
9. Investments.
10. Casting procedures involved in small castings and cast partial dentures.
11. Soldering and welding.
12. Cements.
13. Porcelain including Porcelain fused to Metal alloys.
14. Porcelain furnace, firing and techniques.
15. Mechanics of tooth cutting (burs and points).
16. Abrasives and polishing agents.
17. Implant materials.

B. Complete Denture Prosthodontics

1. Anatomy and physiology of edentulous mouth.
2. Diagnosis and treatment planning for a completely edentulous mouth.
3. Oral aspects of systemic diseases of Prosthodontic interest.
4. The problem of reduction of residual ridges.
5. Surgical preparation for complete Dentures.
6. Impressions in Complete Denture Prosthodontics.
7. Posterior palatal seal, principles and techniques.
8. Articulators and face bow in complete denture construction.
9. Recording of mandibular movements and maxillo - mandibular relations in edentulous patients.

10. Selection and arrangement of anterior teeth including guidelines for complete denture esthetics.
11. Complete denture occlusion.
12. Selection and arrangement of posterior teeth.
13. Verification of maxillo-mandibular relation records.
14. Try in of complete dentures.
15. Laboratory procedures involved in complete denture construction.
16. Denture Insertion.
17. Patient's education and complete denture maintenance.
18. Complaints associated with dentures.
19. Relining and rebasing of dentures.
20. Denture repair.
21. Immediate dentures.
22. Transitional dentures.
23. Overlay dentures.
24. Obturators on complete dentures.
25. The single complete denture.
26. Implants for the edentulous arches.
27. Geriatrics complete denture patients.
28. Preventive Prosthodontics.
29. Epidemiology of edentulousness.
30. Role of computers in Prosthodontics.

c. Partial Denture Prosthodontics

1. Introduction and terminology used in partial denture Prosthodontics.
2. Examination, diagnosis and treatment planning in partial denture Prosthodontics.
3. Classification of partially edentulous arches.
4. Components of removable partial dentures and their function.
 - a. Major connectors
 - b. Minor connectors
 - c. Rests and rest seats
 - d. Direct retainers
 - e. Indirect retainers
 - f. Denture base considerations and teeth
 - g. Stress breakers
5. Principles of removable partial denture (R.P.D) design and RPI concept.
6. Surveying.
7. Mouth preparation for removable partial denture including preparation of abutment teeth.

8. Impression materials and procedures for partially edentulous mouth.
9. Support for the distal extension denture base.
10. Occlusal relationship and arrangement of teeth.
11. Laboratory procedures involved in cast partial dentures.
12. Trying in and adjustment of cast frame work.
13. Processing, finishing, delivery and instructions about maintenance of removable partial dentures.
14. Repairs and additions to removable partial dentures.
15. Acrylic partial dentures.
16. Immediate partial dentures.

D. Fixed Prosthodontics

1. Diagnosis and treatment planning.
2. Periodontal considerations in fixed Prosthodontics.
3. Fundamentals of occlusion.
4. Biomechanical principles of tooth preparation.
5. Individual tooth preparation.
 - a. Complete metal crown.
 - b. Partial veneer crown for Ant. and Post teeth.
 - c. Porcelain Jacket Crown.
6. Preparations for intra-coronal restorations.
7. Preparations for extensively damaged or endodontically treated teeth.
8. Provisional or temporary restorations.
9. Fluid control and soft tissue management.
10. Impression materials and techniques.
11. Working casts and dies.
12. Articulation of casts.
13. Wax patterns.
14. Investing and casting.
15. Occlusal equilibration.
16. Finishing and cementation.
17. Pontics.
18. Cementing Medium.
19. Porcelain fused to metal restorations.
20. Porcelain laminates.
21. Resin bonded retainers (Maryland bridges).
22. Fixed removable Prosthodontics.
23. Solder joints and other connectors.

E. Maxillofacial Prosthodontics

I. Maxillofacial Prosthodontics in completely and partially edentulous mouth.

1. Obturators
2. Speech prosthesis
3. Palatal lift prosthesis
4. Splints and stents
5. Cleft palate prosthesis
6. Radiation carrier prosthesis

II. Extra Oral prosthesis including ocular, orbital, nasal and auricular.

III. Cranial and facial implants.

IV. Maxillofacial prosthesis materials and adhesives.

PRECLINICAL EXERCISES

The student would be asked to complete the following preclinical exercises in Prosthodontics in first six months.

A. Setting up of teeth in balanced occlusion(Complete Denture)

- (a) Class I Jaw Relation (Dentogenic concept).
- (b) Class II Jaw Relation.
- (c) Class III Jaw Relation.
- (d) Balanced class I complete denture
- (e) Relining of mandibular complete denture.
- (f) Immediate denture using lower dentulous and upper semi- edentulous casts with upper anterior missing.

B. Fixed Partial Denture Work : Typodont & Laboratory:

- (a) Occlusal carving using cone waxing technique on mounted casts for maxillary and mandibular premolars & molars.
- (b) Post and core preparation on upper right Central incisor with casting and PFM crown.
- (c) Three quarter crown for maxillary canine (preparation and casting).
- (d) Anterior PFM 3 units FPD replacing upper right lateral incisor using modified ridge lap pontic.
- (e) PFM crown on maxillary molar(preparation & casting).
- (f) Laminate preparation on upper left lateral incisor with porcelain facing.
- (g) Full metal crown for mandibular molar (preparation and casting).
- (h) Posterior 3 unit PFM FPD replacing right lower first molar using spheroidal pontic with 4/5 crown on premolar and full crown on second molar.
- (i) Maryland bridge preparation to replace lower left lateral incisor.

C. Removable Partial Dentures

- (a) Duplication surveying and designing & wax up of one each of Kennedy's Class I, II, III & IV plaster casts.
- (b) Casting, finishing and polishing etc. of any one of the above.

CLINICAL LOAD DURING TRAINING

1. Complete Dentures	– 25
2. Partial Dentures	– 40
a. Cast partial dentures	– 15
b. Interim partial dentures	– 15
c. Transitional partial dentures	– 05
d. Immediate dentures	– 10
3. Crown	– 30
a. Post full metal crowns	– 10
b. Post full metal ceramic crowns	– 05
c. Ant. jacket metal ceramic crowns	– 05
d. Acrylic jacket crowns	– 05
e. Porcelain jacket crowns	– 05
4. Fixed partial dentures	– 10
5. Maxillofacial Prosthesis	– 05

ASSESSMENT SYSTEM

Examination:

The components of the assessment would be

1. Evaluations of thesis

2. Theory

a) Paper I

Basic Sciences as applied to Prosthodontics.

b) Paper II

Clinical Prosthodontics

Complete Denture Prosthodontics including Maxillofacial Prosthodontics.

c) Paper III

Clinical Prosthodontics

Removable Partial & Fixed Prosthodontics including Implantology.

d) Paper IV

Essay on Basic and Clinical Prosthodontics

3. Practical, Clinical & Viva Voce Examination (2 days) will consist of:

a) Presentation of Pre-clinical exercises

b) Complete Denture Case will be completed up to 'Trial Stage' including Gothic Arch Tracing for Centric Records, Protrusive Records and balanced set up on Hanau Articulator

c) Three Units Fixed Bridge Case will be completed up to 'Wax Patterns' / Castings

d) Designing of a Cast Partial Denture of a given case

e) Viva Voce examination will consist of

i) Thesis discussion

ii) Oral Examination

iii) R.P.D Case discussion

CONSERVATIVE DENTISTRY AND ENDODONTICS

It will be a course of minimum 3 years duration, at the end of which the student would acquire the following knowledge and skills in the specialty of Conservative Dentistry and Endodontics.

Conservative Dentistry

1. History and rationale of conservative procedures.
2. Occlusion
3. Pathologic and non-pathologic lesions of the hard tissue of the teeth, advanced knowledge of etiology, diagnosis, treatment and prevention.
4. Modern development and advanced knowledge of restorative materials, procedures, cutting tools, drugs and chemicals used in conservative dentistry.
5. All type of restorations used in conservative dentistry
6. Modern biological and mechanical dentistry
7. Moisture control and soft tissue management
8. Cariology – Epidemiology, etiology, microbiology, histopathology, prevention and role of Fluorides.
9. Conservative dentistry in relation to other branches of dentistry including Periodontics, Oral Surgery, Pedodontics, Preventive and Community Dentistry and Geriatric Dentistry
10. Infection control in Conservative Dentistry
11. Use of auxillaries
12. Aesthetic Dentistry
13. Ceramic Dentistry
14. Radiology as related to Conservative Dentistry and Endodontics
15. Managing elderly patients, requiring restorative and endodontic services, specially medically, physically and psychologically compromised elderly

Endodontics

1. History and rationale of endodontic procedures
2. Pulp and periapical pathology, advanced knowledge of etiology, diagnosis, treatment and management of pulpally involved teeth.
3. Bacteriological investigations and intra canal medication
4. Advanced knowledge of root canal instruments, their sterilization and use.
5. Advanced knowledge of materials used in endodontics.
6. Basic and advanced procedures for root canal preparation
7. Techniques of root canal obturation
8. Endodontic failures and re-treatment.
9. Endo-perio relationship
10. Pediatric endodontics
11. Geriatric endodontics
12. Diagnosis and management of endodontic pain.
13. Endodontic emergencies and flare-ups.
14. Etiology and treatment of fractured and traumatized teeth
15. Surgical Endodontics and Endosseous Implants
16. Restoration of Endodontically treated teeth
17. Infection control in Endodontics
18. Radiology as related to Endodontics

Syllabus for MDS course in Conservative Dentistry and Endodontics

1. Applied Anatomy and Histology and age related changes

Development of face

Muscles of Mastication

Temporo-Mandibular Joint

Salivary glands

Tongue

Paranasal sinuses

Hard and palate

Trigeminal, facial, glossopharyngeal and hypoglossal nerves

Oral Histology

Development of tooth

Structure of enamel, dentine, pulp and periodontium

Oral mucous membrane

Occlusion

Shedding and eruption

2. Applied General and Oral Physiology and Biochemistry and age related changes

Mastication and deglutition

Saliva

Diet and nutrition

Pain : pathways and mechanism

Blood: Physiology and pathology

Cardio vascular homeostasis

Respiratory system: Normal physiology and variations in health and disease

Endocrinology: Thyroid, parathyroid, adrenals, growth hormone, sex hormone and pregnancy, regulation of blood sugar

General Pharmacology

Chemotherapy of bacterial infections

Local and General Anaesthetics

Analgesics and anti-inflammatory drugs

Hypnotics, Tranquilizers and antipyretics

Important hormones and their actions.

Drug addiction and tolerance

Drugs acting on autonomic nervous systems

Immuno-suppressive drugs

Hypertensive and hypotensive drugs

Emergency drugs in dental practice

Special aspects of Geriatric pharmacology

3. Applied general and oral pathology and microbiology

Applied general pathology

Cellular metabolism and effect of aging

Degeneration and necrosis

Vascular changes

Blood dyscrasias, bleeding diathesis

Neoplasia

Immunology- its fundamental principles

Applied oral pathology

Developmental disturbances of oral and dental structures

Oral tumors and tumor like conditions, red and white lesions, oral manifestations of nutritional and metabolic diseases

Diseases of blood and blood forming organs

Cyst – clinico pathological aspect

Diseases of salivary gland and effect of aging

Microbiology

Oral Flora

Staphylococci, Streptococci, Lactobacilli, Actinomyces

Viruses – Herpes, AIDS, Hepatitis

Fungi-Candida

Defense Mechanisms

Vaccine

Bio-statistics

1. Introduction
2. Collection, classification and presentation
3. Averages (Mean, Median, Mode)
4. Dispersion, skewness and kurtosis
5. Correlation
6. Regression
7. Binomial, poisson and Normal Distribution
8. Tests of significance (large samples)
9. X^2 , t and p test
10. Clinical trials

Principles of research methodology

Types of Research:

- a. Basic or fundamental
- b. Applied
- c. Clinical
- d. Experimental

Qualification in Research Methodolgy

- e. Open trials – Bias and safeguards against it.
- f. Double blind, Triple blind studies
- g. Cross over methods

Objectivity in Research Methodolgy

- h. Instrumental quantification, rationales and fallacies
- i. Reproducibility
- j. Scoring methods – Safeguards against subjective bias.

Records, Protocols and analysis

Special areas of research

- a. Clinical
- b. Experimental
- c. Histological & morphological
- d. Histochemical
- e. Genetic and
- f. Epidemiologic studies

Basic understanding of computer

1. Creation of Database for research purposes
2. To learn making of charts, bar graphs, means, standard deviation, percentiles and p values
3. Preparation of slides
4. Writing of articles and letters
5. Learn about e-mail, world wide web etc.

Dental materials

1. Physical, mechanical and biological properties of modern dental materials
2. Gypsum products
3. Impression materials used in Dentistry
4. Metals and alloys used in Dentistry
5. Silver amalgam
6. Dental Waxes including inlay casting wax
7. Investments
8. Casting procedures
9. Cements
10. Composite resins
11. Porcelain including porcelain fused to metal alloys.
12. Porcelain furnace, firing and techniques
13. Mechanics of tooth cutting (burs and points)
14. Abrasives and polishing agents

Teaching Programme**Theory:**

There will be weekly seminars, journal club and clinical case discussion, in which the entire departmental faculty and residents will participate. The students will be encouraged to use latest AV aids available to make presentation of their seminars and efforts will be made to train them in teaching methods to make them good teachers in future.

Dissertation :

Each candidate will have to work on a dissertation topic of his/ interest, after approval of the guide/co guides and final approval of the Dean. The protocol for the dissertation will have to be submitted to the Dean's office within four months of joining (i.e. by 30th April for January batch students). The research topic can be experimental, clinical or epidemiological. The work can be inter-disciplinary in nature, including multiple departments of the institutions or outside institutions, and in consultation with the department of Biostatistics to select sample size and statistical tests applicable etc. the research work will have to be completed and submitted six months before appearing in the final exams. The research finding has to be compiled in the form of a final report of not less than 50 typed pages (A-4 size with double spacing) excluding acknowledgement, table of contents and reference. Two copies of the dissertation will have to be submitted to the Academic Sections through the Chief of the Centre, after certification from guides and co guides.

Practical : Laboratory Exercises.

Exercise I: Techniques on extracted teeth.

- Ideal class I, II, III and V cavities for amalgam and gold/ porcelain inlays and onlays
- Full crown and jacket crown preparation on anterior and posterior teeth
- Post and core restoration in anterior and posterior teeth
- Preparation of anterior teeth to receive laminate veneers.
- Performing root canal procedures on extracted teeth (anterior and posterior)
- Preparation of post space.

Exercise II : On Typhodont

- Cavity cutting (CI I, II, MOD) for amalgam and inlays/onlays
- Preparation of laminates on upper anterior teeth.
- Preparation of full crowns on anterior and posterior teeth

The teeth should be mounted on study models.

Clinical Work:

The student will undertake clinical work from the first year itself and will be required to complete the following clinical assignments during his/her 3 years' training. The student is required to get the work checked by the department faculty at every step and maintain the record of the work done, with the signature of the faculty certifying the work. All Endodontic cases should be done under rubber dam isolation and using magnification loupes. Strict asepsis should be observed during clinical procedures. The student should maintain proper patient record along with x-rays and clinical photographs (wherever applicable).

Clinical Assignments	No. of Cases
Class II filling with Silver amalgam	25
Class II with Composite resin	25
Class III composite/Glass ionomer fillings	25
Direct Composite restorations	25

Cast gold inlay/onlay	10
Porcelain inlay/onlay	10
Class V restorations with Composite/GIF	25
ART restorations	25
Fissure sealing	10
Porcelain veneers	5
MFP crowns – Anterior teeth	5
Full crowns – Posterior teeth	10

Endodontics

a. RC treatment in Anterior teeth	30
b. RC treatment in Bicuspid	30
c. RC treatment in molars	50
d. Post and core restorations in anterior teeth	
(i) Cast post and core	10
(ii) Prefabricated post and composite core	10
e. Post and core restorations in posterior teeth	10
f. Bleaching	
(i) Non-vital teeth	5
(ii) Vital bleaching	5
(with fabrication of custom trays)	
g. Endodontic Surgeries	20
(Apicoectomy, retrograde fillings, hemisection, etc.)	
Management of traumatized teeth	
(Sub-luxation, avulsion, root fractures)	10
Management of pulpo-periodontally involved teeth	10

Important

The student should be encouraged to attend seminars and present papers in the subject at various local and national association conferences. The student must be encouraged to undertake original studies in the use of various materials, which he handles and then present the findings at the conference or publish them in a national journal. The student should be encouraged to teach undergraduate and their junior post-graduate students under the supervisor of their guide/department faculty members. He/she should also be asked to prepare patient education charts and materials for the Department

Mode of Examination:

Candidate will be admitted to the examination on producing a certificate of having completed six terms in the branch for which registered to the satisfaction of the post graduate teacher of the subject, Head of the Department and Chief of the Centre.

At the time of filling up the Final examination form at the end of 5th term, every candidate will be required to produce a certificate of having completed the dissertation prepared under the direction and guidance of the post graduate teacher along with four typewritten and bound copies of dissertation.

The dissertation will be referred to the examiners and acceptance of it by the examiners will be a pre-condition to the admission of the candidate for the final examination. It may form the basis of the viva-voce examination and due credit may be given for the same.

Final Examination : Theory Exams

There will be four papers of three hours duration each.

Paper I- Basic Dental Sciences, Dental Materials and Cariology

Paper II – Conservative Dentistry

Paper III – Endodontics

Paper IV – An Essay

Practical :

1st day – Morning session: Preparation of post space, jacket crown and taking direct wax pattern for post and core.

- Afternoon session: Direct composite restoration in anterior tooth (restoration of fractured incisor/diastema closure/direct laminate/recontouring peg shaped lateral incisor)

2nd Day-Morning Session: Endodontic treatment in permanent molar – Rubber dam application, access opening, negotiating the canals, working length radiograph, cleaning and shaping till master cone fitting.

Short case presentation and discussion.

- Afternoon Session: Dissertation presentation, Viva-voce.

Important :

The student should keep the case histories with X-rays and photographs of at least 30 cases treated by him/her at the time of examination, which should include porcelain/cast gold inlay/onlay, restoration of fractured incisal angle/edges, porcelain laminate veneers, bleaching of non-vital and vital teeth., root canal treatment in anterior and posterior teeth and cases of endodontic surgeries.

HOSPITAL ADMINISTRATION — M H A

PREAMBLE

Today the success of a hospital manager lies in multidisciplinary conceptual skill development and to protect medical profession and clients from unnecessary litigation; human resource development; quality management, risk management; environment conservation; marketing and product diversification and logistic emergency management etc.

Department of Hosp. Admn. conducts a Master degree program in Hospital Administration (MHA), full time residency since 1966. The MHA training programme aims to prepare a candidate to assume the responsibilities of a hospital administrator/executive in a government or corporate or any other hospital. This training programme emphasizes on developing knowledge component, skill and attitude pertaining to Hospital Managers. This training programme will also help the candidates in developing expertise in planning and managing different types of hospital in our social setting and will equip the student with problem solving devices.

The concept of professionalisation, development of specialized skills and leadership in hospital administration has further emphasized the need to rationalize the resource utilization and maximize output in health sector. Therefore, the hospital administrator of the future needs to be well equipped to meet the challenges arising out of rising health care cost; procurement, utilization, maintenance & cost effective analysis of technology import.

Therefore, the focus of the syllabi of MHA course is as follows:

Instructional objectives

The training programme will consist of didactic lectures, seminars, workshops, project work, journal club, field visits, administrative residency and attachments in all the areas of the hospital for an integrated learning. The following are the instructional objectives:

(a) General Administration and management of Hospital

- The students are to be exposed to the scientific approach to management in general and the hospital administration in particular.
- The candidates are to be made capable to contribute in decision-making on various management issues under the guidance of the faculty.

- Emphasis will be laid on development of conceptual skill for planning, policy formulation, resource utilization, financial management, material management & legal issues.
- The students are to be unveiled to human relations issues, handle work force planning and development of staffing norms to suit the needs of the organization.
- In a social institution like hospital, the students of hospital are to coordinate so as to integrate functioning of the hospital with other health care organizations and professionals to provide integrated care.

(b) Health Administration and Medical Care

- The student will be involved in application of principles of health administration in delivering medical care in hospital and in the community through its outreach programme.
- The significance of socio-economic, cultural conditions and its impact of these on the health will be taught for planning an appropriate medical care for the community.
- The students are expected to learn to apply epidemiological and biostatistical techniques to evaluate the health care programme, & to plan, organize the medical care within available resources.

(c) Hospital Administration and planning of clinical and non-clinical services

- It is to be emphasized upon the students, the importance to guide the architects with regards to essential requirements of hospital planning for effective utilization of resources.
- The student will also be trained to look into the future & plan for different support services i.e. – Nursing care, Public relations, hospital hazards, Disasters, Medico-legal issues, Disciplinary proceedings, health education, social care for the needy patients etc.
- The students will be sensitized to appreciate the modalities for organizing the clinical as well as non-clinical services to assess needs of the patients, physicians and other para-medical personnel in the Health care setting.

Programme Structure

The curriculum has been designed to cover the conceptual and quantitative skills needed by future managers in high performing contemporary hospitals. The programme is practical oriented substituted with teaching that combines classroom lectures, case studies, team discussions, presentations, and field visits to variety of hospitals. The formal coursework includes teaching modules, detailed as under.

Stage-I: Basic Introductory Course

Module - I

- Development of Management concept
- Management function & tools
- Fundamentals of Planning and Decision Making
- Organisation structure & function
- Office procedure & Disciplinary proceedings

Module - II

- Development of Health services in India
- Medical sociology

- Health and diseases
- Research methodology in Health and Hospital Administration

Module - III

- Hospital an Introduction
- Hospital Administration as a specialty
- Nursing Administration
- System Approach to Hospital Management

Module - IV

- Hospital Planning-General consideration

Stage-II: Core Course**Module - I**

- Basics of Computers
- Communication
- Personnel Management & Human Resource Development
- Organisational Behaviour and group dynamics
- Financial Management in Hospital context

Module - II

- National Health Policy
- Epidemiology, its application and use in Hospital Administration
- Biostatistics
- Health Information System

Module - III

- Human relations in hospital
- Employees' welfare

Module - IV

- Planning & organization of clinical services
- Planning & Organisation of support services

Stage - III: Applied course**Module - I**

- Material management
- Risk management
- Industrial Relations & conflict resolution

Module - II

- Health Care Delivery System in various part of world
- Health Economics

- Population dynamics and environment

Module - III

- Legal issues in Hospital Administration
- Hospital Hazard
- Bio Medical Waste Management
- Disaster management in hospitals

Module - IV

- Planning & Organisation of utility services
- Planning of special hospitals

Stage – IV: Specialised course**Module - I**

- Management Information System
- Quantitative Methods of Management and Modern Management techniques
- Marketing Management

Module - II

- National Health Programs
- Community Health Administration

Module - III

- Equipment Management
- Quality in Health services
- Future of Hospital Administration

Module - IV

- : Project Management and related case studies

Note: The detail contents of each Module are enclosed as Annexure:

THESIS, DISSERTATION, SEMINAR, LIBRARY WORK

Each candidate will study the allotted department comprehensively. They will correlate the theoretical and practical knowledge of the hospital administration and be involved in problem identification, decision-making and implementation of concrete solution as related to the allotted departments. They will accompany the Medical Superintendent/ Dy. Medical Superintendent on his weekly rounds of the hospital and attend presentation such in class room teaching and conferences. The students will also be required to carry out detailed study of any emergent hospital problem and attempt to solve the problem under the guidance of the Faculty Incharge. They will learn how to send convening orders for a meeting, prepare agenda items, write down minutes of meeting. The programmes of didactic lectures will be so arranged that they are able to spend around 18 hours per week, except for first 12 weeks, which will be solely devoted towards orientation of the candidate to the hospital & protocol presentation.

THESIS & DISSERTATION

The thesis will be issue-based study carried out in clinical/support service/utility areas of the hospital. At the end of the tenure the student will submit a thesis & four dissertations starting from the 2nd stage of the course and will spread over the 3rd and 4th Stages. During their tenure, the candidates will be individually attached in rotation to the different departments/services areas of the hospital. A report (protocol) will be submitted thereafter in approximately 2500 words on the related issues viz:

The students will carry out a issue based case study and write a report of approximately 2500 words while attached to the following areas:

- Planning & designing of various hospital services
- Patient scheduling & facility streamlining by application of quantitative methods
- Human resource planning
- Organisation & staffing of services
- Quality of patient service
- Behavioural & social aspects
- Employee benefit
- Patient satisfaction
- Administrative issues
- Bio medical waste management
- Financial & Legal issues
- Stores management & Marketing related studies
- Disaster management & occupational hazard studies
- Epidemiological studies so on & so forth....

After completion of the study, each student will be asked to present his case study report to the rest of the group and the subject will be discussed by members of the faculty and officers from the concerned departments will also be invited to such presentations. These reports will be critically evaluated by the faculty members of the Department of Hospital Administration and awarded marks for internal assessment.

Special Administrative Attachments: The aim of such an attachment is to familiarise the students with the special features and functioning of different types of medical institutions, both government and non-government. One, two or three or more days will be allotted for the same depending upon the size and importance of the attachment.

MODULE – I: GENERAL MANAGEMENT

<i>Sl</i>	<i>Entremets</i>	<i>Learning Objectives</i>	<i>Contents</i>
1.	Development of Management concepts	To understand the evolution & management concepts over the years and characteristics of management	<ul style="list-style-type: none"> History and growth of management science Traditional vs. modern management Evolution of management theory Management as a profession Process of management
2.	Management function & tools	To explain principles and functions of management	<ul style="list-style-type: none"> Management levels and skills Functions & Principles of management Challenges to manager System Approach
3.	Fundamentals of planning and decision making -	To understand the importance of planning in management and to explain the mechanics of planning and the process of decision-making.	<ul style="list-style-type: none"> Steps in planning Nature and process of managerial decision making
4.	Organisation structure and function	To explain nature and process of organizing and the underlying factors influencing organizational efforts	<ul style="list-style-type: none"> Organisational design and structure Matching structure and strategy Functional organization Cultural aspects of power Line and staff authority Delegation
5.	Office procedure and Disciplinary proceedings	To understand the organization of an office in a health unit/hospital. Explain the principles & procedures of official communication.	<ul style="list-style-type: none"> Definition of Office Drafting official letters Office procedures Service rules & procedure Conduct rules Disciplinary proceedings
6.	Basics of Computer	To familiarize with computers	<ul style="list-style-type: none"> Components of computer Basic concepts about computer software Working knowledge of commonly used computer programmes and application in hospitals
7.	Communication	To explain the meaning and purpose of communication. To explain the process of organizational communication and ways to make it effective	<ul style="list-style-type: none"> Basic concepts Types of communication Barriers of communication Principles of good communication Communication in the management of Health Care Institutions Communication with the media
8.	Personnel Management & Human Resource	To emphasise the importance of human resource in a hospital and to know in	<ul style="list-style-type: none"> Definition & Importance Difference between personnel

	Development	detail about the functions of personnel management	management and human resource development <ul style="list-style-type: none"> • Work study & Method study • Manpower planning • Recruitment & selection • Job analysis • Job description • Job evaluation • Job enrichment • Training & development • Performance Appraisal
9.	Organisational Behavior and Group Dynamics	To understand the behavior of people in their work environment and its relation in team building for achieving organizational goals	<ul style="list-style-type: none"> • Basics of sociology, anthropology, Psychology • Characteristics of workgroups • OB labs • Dynamics of organizational behavior • Motivation & Leadership • Conflict management • Transactional analysis • Team building
10.	Financial Management	To understand the issues & scope of financial management & it's utility as an indispensable part of administration & quality control.	<ul style="list-style-type: none"> • Basics of Financial Management • Issues and scope of financial management • Basics of Management Accounting • Elements of cost, costing & cost accounting • Methods of costing of health services • Modern methods of costing • Hospital rate setting • Break even analysis • Budgeting • Resource mobilization • Cost containment
11.	Material Management	To help, learn the scientific methods, materials and equipment planning, procuring, storing and dispensing including maintenance	<ul style="list-style-type: none"> • Importance of Material Management • Inventory control - meaning, scope, definition • Purchase cycle • Tender System • Materials Planning • Inventory analysis • Economic order quantity, Safety stock, Lead time • Receipt and Inspection of Stores • Distribution, Standardisation Codification • Condemnation and Disposal • Stores documentation • Role of computers in Stores Management

12.	Risk Management	To emphasise the need for Risk Management & need for occupational safety in an organization to prevent loss of manpower & wages.	<ul style="list-style-type: none"> • Ergonomics and its application in hospitals • Occupational hazards • Workman Compensation Act • Grievance redressal and settlement of disputes • Wage fixation & collective bargaining
13.	Industrial Relations	To get an understanding about the industrial relations and its influence on the staff behavior. To understand the policy covering wage and salary administration, to dispose of the grievance fairly and equitably.	<ul style="list-style-type: none"> • Definition, scope and importance of industrial relations • Industrial Disputes Act • Trade unions • Organs of industrial peace • Industrial relations in health services industries
14.	Management Information System	To study the need of management and information together forming a system. Integration of different aspects of MIS Preparation of Information system Manual	<ul style="list-style-type: none"> • Concepts of management information system analysis and design • MIS a tool to managerial control
15.	Quantitative methods of Management, Modern Management Techniques	To understand the quantitative methods and modern management techniques as applicable in health care settings as a tool to system development and better managerial control.	<ul style="list-style-type: none"> • Concepts • Applications of OR techniques i.e. PERT, CPM, simplex method, queuing theory etc • Management by objective.
16.	Marketing Management	To understand the market forces, which determine the services, rendered by the organisation. To understand the role of marketing in health care industry, its importance in quality management & organisational development.	<ul style="list-style-type: none"> • Concept of Marketing • Marketing strategies, evaluation and control • Marketing information and research • Marketing and medical ethics • Marketing of Hospital and health facilities • Social Aspects of Marketing • Privatization of health and hospital services

MODULE– II: HEALTH ADMINISTRATION AND MEDICAL CARE

<i>Sl</i>	<i>Entremets</i>	<i>Learning Objectives</i>	<i>Contents</i>
1.	Development of health Services in India	To provide a history and development of medical services in India over the years	<ul style="list-style-type: none"> • Medicine in antiquity • Modern medicine • Definition & dimensions of health • Evolution of modern medicine • Review of different reports on Health Care

2.	Medical Sociology	<p>To understand the basics of Health need, analyse the relation of demand & supply.</p> <p>To study the importance of society towards positive health & how it contributes to diseases.</p>	<ul style="list-style-type: none"> • Introduction • Sociological perspectives of Health, illness and healing • The institutional perspective • Organisational perspective
3.	Health & Disease	<p>To emphasise the concept of health & factors responsible for disease causation, its prevention & estimation of disease load in the community.</p>	<ul style="list-style-type: none"> • Concept of health & disease • Concept of well being • Natural history of disease and role of hospitals in various levels of prevention • Cause and effect relationship • Dynamics of disease transmission • Changing pattern of diseases • Concept of health indicators
4.	Research Methodology in health and hospital Administration	<p>To understand the scientific method of conducting research.</p>	<ul style="list-style-type: none"> • Introduction • Types of surveys • Selecting a problem, making hypothesis • Determining objectives • Sample size determination • Data collection techniques and tools • Interview techniques • Observation technique • Analysis of data • Report writing
5.	National Health Policy	<p>To create an awareness about the health policy in India, its targets and achievements.</p> <p>To understand the role of hospitals as a supportive & referral services to the national goal.</p>	<ul style="list-style-type: none"> • Health for all by 2000 AD and Primary Health Care • Role of Health education and communication • Overview of health policy, National population policy and five year plans
6.	Epidemiology, its application and use in hospitals	<p>To study the distribution of diseases in the community & the role of hospital in its prevention.</p>	<ul style="list-style-type: none"> • Methods of Epidemiological studies • Monitoring and surveillance • Screening and surveys • Investigation of an epidemic and role of hospital in its control
7.	Biostatistics	<p>To understand the role of statistics in the estimation of burden of disease & the methods applicable to calculate the same.</p>	<ul style="list-style-type: none"> • Basic concepts – Introduction, Definitions • Presentation of data • Frequency of distribution • Measurements of central tendency • Measurement of dispersion • Sampling & Sampling error • Testing of hypothesis • Test of significance

8.	Health statistics and Health Information System in India	To understand the various indicators of health, importance of health statistics in future planning for health care services & understand health information system in India.	<ul style="list-style-type: none"> • Need • Common rates & ratio • Incidence & prevalence rates • Morbidity Statistics • International Classification of Diseases • Health reports • Notifiable diseases • Health Information System in India
9.	Health care delivery system in India and various parts of world	To understand the background and health care delivery system in India	<ul style="list-style-type: none"> • Health Care Delivery System in India– Primary, Secondary and Tertiary Care • District Health Organisation • Regionalisation • Inter-sectoral coordination • Indigenous system and medical care • IEC and community participation • Health systems in developed and developing countries
10.	Health Economics	To study the economics & its relation to health status of a nation. To familiarize with concept of health insurance, its scope and applicability in our country.	<ul style="list-style-type: none"> • Basics of health economics • Analysis of demand and supply • Health Insurance Schemes and social Security scheme like CGHS, ESI etc. in India • Medical care system & Health Insurance System in different countries (USA, UK, USSR)
11.	Population Dynamics	To study the science of demography and its role in population policy of India	<ul style="list-style-type: none"> • Demography and Family Planning • Demographic cycle
12.	National Health Programmes	To give an idea about the background objectives, action plan, targets, operations, achievements and constraints of various National Health Programmes	<ul style="list-style-type: none"> • All National Health Programmes
13.	Communication & health education	To discuss the importance of effective health information system & health education towards positive health.	<ul style="list-style-type: none"> • Types of communication • Levels of health information • Health care reporting & Role of NIC • Principle & practice of health education
14.	International Health	To conceptualise the role of health agencies and the international health regulation	<ul style="list-style-type: none"> • International Health agencies/NGOs • International Health Regulations

MODULE – III: HOSPITAL ADMINISTRATION AND PLANNING

<i>Sl</i>	<i>Entremets</i>	<i>Learning Objectives</i>	<i>Contents</i>
1.	Hospital- An Introduction	To give an idea about hospital and its role in health care delivery system. To review the history of hospitals; role of political and economic factors in the growth of hospitals & classification of hospitals	<ul style="list-style-type: none"> History and development of hospitals Definition, types, control, role and functions Hospitals in India today- their number, types, size, distribution, ownership, utilization, issues & trends
2.	Hospital Admn. as a specialty	To outline the peculiarities of health care institutions, factors influencing hospital care and role of hospital administration in provisioning of good patient care. Special problems of administration of a teaching hospital, voluntary hospital, district hospital, PHC, nursing home etc.	<ul style="list-style-type: none"> Roles & functions of Hospital Administration Hospital as an Organisation Profile of Hospital Administrator, Role of hospital administration in education and research
3.	Nursing Administration	To study the role of nursing administration in health care delivery.	<ul style="list-style-type: none"> Introduction to Nursing profession- Nursing organisation structure Nurses and doctors relationship Nurses and patient relationship Nurse as a social and professional entity Staffing norms in various types of hospitals and different departments Recent trends in nursing profession and nursing practices
4.	System approach to Hospital Administration	To introduce the system concept and to outline the functional organization of a hospital	<ul style="list-style-type: none"> Hospital as a system System approach to Hospital Admn.
5.	Human relations in hospital	To define human relations, its importance in a hospital organization and methods adopted to resolve conflict through human relation approach To highlight the responsibilities of the hospital to the general public	<ul style="list-style-type: none"> Public relations & Hospital Training of medical & paramedical manpower in hospitals Interpersonal relationship Conflict management
6.	Employees welfare	To understand the various factors which can affect the working of employees in hospital to improve their output.	<ul style="list-style-type: none"> Stress management Counseling Occupational safety
7.	Legal issues in Hospital Administration	To explain the laws and regulations applicable to hospitals and hospital employees. To study the medico-legal aspects of practice of Medicine in hospital setting	<ul style="list-style-type: none"> Broad introduction to medical jurisprudence and its application in hospitals Consumer Protection Act and its application in hospitals Law of Tort

			<ul style="list-style-type: none"> • Different laws & Acts applicable to hospitals e.g. Drug & Cosmetic Act, Organ Transplantation Act etc.
8.	Hospital Hazards	<p>To create an awareness about the hazards of operating a Hospital and the responsibility of the hospital for their management</p> <p>To review major types of hospital hazards.</p>	<ul style="list-style-type: none"> • General safety • Fire safety • Hospital Hygiene • Hospital acquired infection
9.	Biomedical Waste Management	To understand the significance of Biomedical waste & its proper disposal.	<ul style="list-style-type: none"> • BMW management & handling rule • Segregation • Collection • Transportation • Disposal • Modern technology for handling BMW • Radioactive waste handling
10.	Disaster Management in hospitals	Definition of Disaster– To learn to identify and assess disasters in the community. To set forth policies and procedures for disaster preparedness and to prepare a disaster plan for a hospital	<ul style="list-style-type: none"> • Definition, types • Components of Disaster plan- Pre-hospital & hospital • Disaster preparedness • Disaster plan formulation & implementation
11.	Equipment Management	<p>To learn about the equipment management process and its various components and their roles in hospital system</p> <p>To learn to establish equipment management procedure for a hospital</p>	<ul style="list-style-type: none"> • Demand estimation • Strategies of Hospital Equipment Planning and Selection • Purchase procedure • Installation and commissioning • Hospital Equipment Utilisation & Audit • Hospital Equipment Repair and Maintenance • Quality control in equipment planning
12.	Quality in Health Services	To understand the concept of quality & its relation to health care scenario, its importance as regards patient satisfaction & marketing of services provided.	<ul style="list-style-type: none"> • Quality concept • Verifiable standards and parameters in evaluation of quality • Quality Assurance • Total Quality Management • Quality Circle • Performance Review • Hospital statistics & quality control
13.	Future of Hospital Administration	To visualize into the future the needs & expectation of the community from the hospitals.	<ul style="list-style-type: none"> • Recent trends in hospital administration • Challenges to administrators • Reengineering • Telemedicine • Artificial intelligence • Accreditation

MODULE – IV: ADMINISTRATION OF CLINICAL & NON-CLINICAL SERVICES

<i>Sl</i>	<i>Entremets</i>	<i>Learning Objectives</i>	<i>Contents</i>
1.	Hospital Planning– General consideration	To create awareness about the changing requirements of health services vis-à-vis hospital design, which should necessarily follow the functional, needs. To outline general considerations in planning and designing of hospitals– what, where and how to build.	<ul style="list-style-type: none"> • Changing system of Health Services concepts in planning, designing and space • Site surveys for planning a hospital • Hospital buildings an overview • External architectural aspects • Internal arrangements • Hospital hygiene • Lighting & Ventilation • Role of administrator in building a hospital
2.	Clinical Service Areas	To consider various planning & operational aspects like importance, function, local area and space, organization staffing pattern, utilization and work load, records, equipments and supplies requirements and standards and evaluation of each services	<ul style="list-style-type: none"> • Outpatient Department • Operating Department • In patient Deptt • Ward designing- general & specialised • Intensive Care Unit-general & specialised • Nuclear Medicine Department • Physical Medicine Department • Burns, paraplegic and Malignant Diseases Treatment Centres • Nephrology services - Renal dialysis unit • Transplantation unit
3.	Support Services	To consider various planning & operational aspects like importance, function, local area and space, organization staffing pattern, utilization and work load, records, equipments and supplies requirements and standards and evaluation of each services	<ul style="list-style-type: none"> • Radiological and other imaging services • Hospital Laboratory services • Blood Transfusion services • Ambulance services • Pharmacy services • Central Sterile Supply Department (CSSD) • Oxygen Manifold/Concentrator • Dietary services • Hospital Laundry
4.	Utility services	To consider various aspects of planning, operating and evaluation of different utility services in hospitals.	<ul style="list-style-type: none"> • House keeping services • Hospital Engineering Services • Hospital Stores • Medical Records, Admission, enquiry and registration • Hospital establishment and offices • Cafeteria services • Welfare services • Mortuary

5.	Planning of different types of hospitals	To understand all aspects of planning and commissioning of different types of hospital including specialty hospitals.	<ul style="list-style-type: none">• Planning of 30,100, 250 bedded hospital (general/ specialty)• Planning of 500,750 and above bedded hospital (teaching/super specialty/ non-teaching specialty hospitals)
6.	Project Management & related case studies	To understand the process of making a project report & its implementation.	<ul style="list-style-type: none">• Feasibility study• Project conceptualisation• Functional requirements• External and Internal traffic• Space programming Adjacency delineation• Architects brief• Enumeration and description of project as an entity• Human Resource Plan
