



Syllabus D M / M Ch at the AIIMS



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

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All India Institute of Medical Sciences

New Delhi - 110 029

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P R E A M B L E

The Health Survey and Development Committee, popularly known as the Bhole 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.

The AIIMS imparts high quality, state of the art training in 18 major superspecialities viz :

- | | |
|-------------------------------------|--|
| 1. Cardic Anaesthesiology | 10. Nephrology |
| 2. Cardiology | 11. Neuro Anaesthesiology |
| 3. Endocrinology & Metabolism | 12. Neurology |
| 4. Gastroenterology | 13. Neuroradiology |
| 5. Hematology (Clinical Hematology) | 14. Cardiothoracic Vascular Surgery (CTVS) |
| 6. Hematology (Memato-path) | 15. G.I. Surgery |
| 7. Medical Oncology | 16. Neurosurgery |
| 8. Neonatology | 17. Paediatric Surgery and |
| 9. Pediatric Neurology | 18. Urology |

Broad areas covered during the course tenure are highlighted here. 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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CARDIAC-ANAESTHESIOLOGY — D M

- Duration of Course** — 3 academic years
- Research Projects** — Research projects to be completed submitted before the end of one and half years
- Basic Qualification for admission** — M.D. Anaesthesiology from University recognised by MCI
- Number of Candidates** — 2 + sponsored per year

Course would consist of Theory and Practise of cardiothoracic anaesthesia.

BASIC CURRICULUM

A basic sciences include Anatomy, Physiology, Pharmacology, Physics, Biochemistry, coagulation, CPB –Pharmacokinetics during CPB, monitoring, diagnostic techniques involve cardiology diagnostic and therapeutic therapy.

- Special consideration — Cardio pulmonary bypass
— Drugs related to anaesthesia of CPB

Pulmonary life-Support — Advanced cardiac life support

Operative Observations

- Operative DIRECT CARE (Conduct of anaesthesia)]
 - Post-operative care and pain relief
 - Research Projects/Exchange Programme with other Centres:
 - Examinations — Basic Sciences
- (Theory and Practical) Clinical Practise of Anaesthesia Allied Sciences
Recent advances.

GENERAL

- ❑ History of Anaesthesia for thoracic & Cardiovascular surgery
- ❑ Natural History of Cardiac & Pulmonary diseases Demography
- ❑ Diagnosis, Pre-Op. evaluation & Preparation for surgery

Detailed Syllabus

I. BASIC SCIENCES

ANATOMY	Cardiac	: Embryology, development of heart, pulmonary and vascular anatomy, coronary artery anatomy
PHYSIOLOGY	Cardiac	: Cellular Physiology, Haemodynamics, Autonomic nervous system, Cardiac functions, Blood Physiology, Coagulation action potential, Cardiac arrhythmia
	Pulmonary	: Open & Closed chest ventilation. Ventilation/perfusion mismatch. Pulmonary airway mechanics, one lung ventilation. Thoracotomy and pulmonary physiology. Renal, Hepatic, CNS, Endocrinal System, others, metabolic effects of surgery. Endocrines response to anaesthesia and surgery
PATHOPHYSIOLOGY		: Heart Failure, Congenital defects, COAD, Cardiopulmonary reserves, acquired cardiac & pulmonary diseases. Vascular pathology. Immunological response metabolic response during CPB
PHARMACOLOGY		: Total circulatory arrest, Pharmaco Kinetics & Pharmacodynamics of Anaesthetic and Vasoactive drugs Biochemical reactions, applied concepts. Drugs related to anaesthesia practice Cardiovascular drugs. Current antibiotics for ICU use bronchodilator. Antiarrhythmic drugs, nitric oxide
PHYSICS		: Basic concepts, Analysing, measuring & monitoring devices, electronics, computing of patients data. Laser in cardiac surgery, robotic technique
		Equipment: Computer application, Maintenance monitoring techniques, Equipment in OT, Equipment for transport of patients, ICU equipment

II. CLINICAL SCIENCES

Anaesthesia for Cardio-thoracic & Vascular Surgery:- or diagnostic procedures in adults & Paediatric age groups.

Anaesthesia for - Cardiac Surgery : For closed & Open heart surgery.

Vascular Surgery : Aortic surgery, carotid artery surgery.

- PAEDIATRIC : Basic haemodynamics, palliative procedures, Pre-op. preparations & special care in monitoring, Fluid balance & airway management
- Anaesthesia for neonatal complex cardiac surgery
 - Anaesthesia management for re-surgery
 - Paediatric diagnostic procedures in Cath Lab & echocardiography
 - Invasive therapeutic techniques like ASD devices, stent in major vessels, coil embolization
- ADULT : Anaesthesia a for ischemic heart disease, valvular heart disease, vascular disease, adult congenital heart surgery
- Electrophysiological & Arrhythmia surgery. Heart transplant, heart lung transplant, ventilator assets devices
 - Anaesthetic techniques for pulmonary surgery Diagnostic & elective. Emergency procedures for lung surgery. One - Lung anaesthesia, Ventilation, Physiotherapy (gas exchange & airway dynamics)
 - Anaesthesia during emergency, surgery and direct emerging from cath lab after cath lab complication
 - Anaesthesia in patients for diagnostic & palliative procedures in Cardiology, Radiology cath LAB (outside operative rooms). Invasive cardiology procedure
 - Anaesthesia management of re-surgery
 - Management for Post Op. ventilation care, prolonged ventilation, weaning, Control of Pain - its techniques & agents, used. Postoperative pain management
 - Intra op. monitoring, PAC, Cardiac output coagulation monitoring

CARDIOPULMONARY BYPASS

- Perfusion technology, principles, equipment, oxygenators, haemofiltration
 - Hypothermia, techniques & protocols
 - Myocardial Protection
 - Haemodilatation
 - Anticoagulation, Pharmacology, monitoring methods
 - Side-effects, complications & management
 - Subsystem care - cerebral, Renal Hepatic protection
- Cerebral protection, cerebral monitoring

Total circulatory arrest, left heart bypass

Anaesthesia management during CPB

Pharmacokinetics & pharmacodynamics of drugs during CPB

INTENSIVE CARE MANAGEMENT

- Protocols for sub-system care, cerebral, Renal, Hepatic & others
- Ventilatory Care, weaning of Ventilatory support. Parenteral Nutrition, control of infection
- End stage renal failure, bedside dialysis techniques
- Postoperative management of single ventricular repair
- Hepatic failure
- ICU monitoring technique in postoperative pain management
- ICU Management, especially after neonatal surgery – ventilatory support in neonates, ECMO programme for neonates and children
- Intensive coronary care
- Cerebral monitoring

III ALLIED SCIENCES

- Cardiac Surgery : Surgical technique, curative surgery, Palliative procedures Risk evaluation, prognosis, Robotic surgery.
- Cardiology and cardiac Radiology : Pre-op. evaluation, patho-physiology, Electrophysiology, Diagnostic Procedures-ECG, x-ray Angiography, Cardiac Cath, Doppler's. Echo-Cardiography, Nuclear studies & their interpretations & their Treatment of disease Special procedures : Pacing, Cardioversion, PTCA, etc. Automated cardioverters, invasive procedures for arrhythmia i.e. ablation of abnormal pathway.
- Biotechnology : Various mechanical & electronic equip. Animal experiments, materials used for CPB techniques, VAD. IABP, Laser for TMR, Ecmo
- Statistics** : Statistical technique
- Hospital Administration** : Sterilization/Gas supply, equipment maintenance

Monitoring in Anaesthesia

Invasive & Non-Invasive monitoring techniques for Pre-peri & Post-operative periods in cardiothoracic centre :

- Understanding of basic concepts of monitoring
- Indications, cost effectiveness, complications
- Equipment usage & knowledge of accessories

Knowledge of the following monitoring —

Cardiac functions	: ECG, ABP, Vent. Pressures, Calculation of cardiac output, resistance, Flow, Echo, Dopplers & (CAT, PET, NMR)
Pulmonary functions	: PFT, Blood gases, Acid-base Pulm. Airway mechanics.
Coagulation Profile	: Temp. renal, B. Sugar, Enzymes. ACT Heparin & Protomine regulation, thromboelastography.
Neuromuscular blockade	: And other Recent advances in monitoring, BIS cerebral oximetry, evoked potential monitoring, CNS monitoring during CPB.

RECENT ADVANCES

Knowledge of recent developments in field of Cardio thoracic & Vascular surgery

- Cardiology - PTCA, Balloon emobolectomy etc.
- Heart - lung transplant - physiology, pharmacology (Anaesthetic consideration) - Donor - recipient selection
- Immunosuppression etc.
- Cardiac assisting devices - Artificial heart, IABP, LHAD
- Advances Pulm. support - ECMO, H.F. Ventilation
- Blood substitutes
- Current advances and concepts in drugs, equipments, and monitoring methods

CURRICULUM FOR D M CARDIAC-ANAESTHESIOLOGY

1. Permeable

DM (Cardiac Anesthesiology) course is designed to train candidates in the principles and practice of Cardiac Anesthesia to enable them to conduct anaesthesia and intensive care to cardiac patients and to function as faculty/consultant in Cardiac Anesthesia and Cardiac Thoracic, preoperative and postoperative intensive care.

2. Admission Requirement

For admission to DM (Cardiac Anesthesiology) candidate is required to possess MD/in anesthesia of an institute/university recognized by the Medical Council of India.

3. Duration of Course

Three academic years

4. Aims and Objectives of the Course

The aim of the course is to impart thorough and comprehensive training to the candidate in the various aspects of this specialty to enable him/her:

- (a) To function as a faculty/consultant in the specialty
- (b) To carry out and help in conducting applied research in the field of cardiac anesthesia
- (c) To plan and set-up independent cardiac anaesthesia unit catering to cardiothoracic vascular surgery and intensive cardiac care and cath lab.

5. Method of Selection

The selection of candidate for admission of DM in Cardiac Anesthesia is to be made in the form of an entrance examination both in theory and clinical assessment held in the institute. The selection should be based on merit only.

6. Teaching Methods

During the period of training candidates follow in-service residency programme. He/She works as senior resident and is given gradually increasing responsibility – for independently managing the sample cardiac operations and decision making in intensive care management, and its Cath Lab investigative procedure and various intensive monitoring.

The day to day work of the trainees will be supervised by the consultant of the department of cardiac anesthesiology. The posting is so designed that the trainee get posted in various areas of the department like operation theatre, postoperative ICU, Intensive coronary care unit, cath. Lab, echo room. He or she will be leaving invasive cardiology diagnostic procedure and therapeutic procedure done in cath lab and emergency services. Beside this a programme for invasive monitoring demonstration, seminars, workshops, journal club will also be organized.

7. Teaching Programme

The following teaching programme is prescribed for the course:

Operation theatre	4 days/week
Intensive care unit	2 days/week
DM seminar	Once week
Journal Club	Once a week
Surgery/Cardiothoracic	Once a week
Cath Lab	Once a week

Teaching of MD, Anesthesia, by the DM student if available is part of the training.

Intensive Coronary Care Unit

During their posting in CCU for one month ; the candidate is required to be attending the CCU rounds and learn for himself, the coronary intensive care in addition to the ventilatory care.

Pediatric Cardiology Intensive Care

For their one month posting in pediatric intensive care unit, trainees will be participating in the teaching ward rounds and in addition their teaching programme in cardiology cath labs and echo room.

Cardiac Radiology

During their posting in Cardiology, trainees are required to participate in cardiac-cardio, radiology meet and teaching programme and also echo room training.

The trainee is made conversant with the technique of various invasive cardiac therapeutic and diagnostic procedures in adults children and neonates, as well as CT scan and MRI scan also under the guidance of cardiac radiologist for one month. Cardiac radiological investigations are conducted every day and a special posting will be done for getting conversant with these produces.

Cath Lab

A special posting for cath lab for handling the neonates and children undergoing investigative and therapeutic procedure and also four insertion of implants/pacemaker in adult patient. They will learning current advancing in imagine cardiology during their posting in cath lab.

Period of Posting in Various Units

The trainee will be posted in different specialties and during of this posting will be as following :

Cardiac anaesthesia	2 years
CTVS	3 months
Cath Lab	2 months
Echo lab	1 month
ICCU	1 month
Paediatric ICU	1 month
Research experience	1 month (optional)
Elective posting	3 months

ASSESSMENT

Regular three internal assessment both in theory and clinical should be made for every candidate. Internal assessment will be made in day to day work of the trainee, which involve patient care, teaching, anesthesia management in the operation room, emergency service, bed side presentation and research.

RESEARCH

The trainee shall be required to undertake research and write papers under the guidance of consultant. The candidate will have to submit a proposal/topic for the project work within three months of the joining of the course. The work period for the project will be 1½ year to 2 year. Papers from the project

should be accepted for publication in an indexed journal. Another article as first author should also be submitted for publication in an indexed journal before the candidate appear in the final DM. Cardiac Anesthesiology examination.

FINAL EXAMINATION

Eligibility

Candidate will be allowed to appear after three year of training.

Board of Examiners

Cardiac anesthesiologists with minimum 8 years of teaching experience in the specialty.

Theory Papers

There shall be three theory papers with the following titles

- Basic science as related to cardiac anesthesia
- Clinical aspects of cardiac anesthesia
- Recent advances in cardiac anesthesia

Clinical Practical and Viva Voice

One long case and two short cases will be given to the candidates and the discussion there on would last 30-40min in each case. The candidates are also given ECG, X-rays to be interpreted. Various equipment, used in OT, intensive care, drugs, fluids, catheter for invasive monitoring are also required to be interpreted and discussed. Viva is also held. Two examination could be held every year in the months of May and December.

Cardiac Anesthesiology Curriculum

As per recommendation of the committee under the chairmanship of HOD, is as following. They will also coordinate and monitor the implementation of the programme mentioned in this. The training programme shall be updated as and when required.

The trainer shall maintain a log book of the work assigned to them.

CARDIOLOGY — D M

BASIC SUBJECTS

Teaching and attaining proficiency in applied Anatomy (including developmental anatomy), Physiology and Pathology related to the cardiovascular system.

CLINICAL CARDIOLOGY

Etiopathology, hemodynamics, clinical evaluation, noninvasive and invasive evaluation and management strategies for the following disorders:

1. Coronary artery disease
2. Rheumatic heart disease
3. Congenital heart disease and other paediatric cardiac disorders
4. Pericardial diseases
5. Cardiac arrhythmias
6. Heart failure
7. Peripheral vascular disorders
8. Pulmonary thromboembolism and pulmonary hypertension
9. Systemic hypertension
10. Systemic diseases involving heart
11. Heart muscle diseases
12. Traumatic heart disease
13. Tumors of heart
14. Genetics, molecular biology and immunology related to cardiology

15. Geriatric heart disease
16. General anaesthesia and non cardiac surgery in patients with heart disease
17. Pregnancy and heart disease
18. Epidemiology and preventive cardiology

Non-invasive Technique

To perform and interpret various non invasive techniques including:

1. Electrocardiography
2. Radiography – routine and specialized areas like CT and MRI
3. Stress testing – tread mill test, stress related and other nuclear techniques
4. Holter monitoring for arrhythmias and ischemic disorders
5. Echocardiography – M-mode, Two dimensional, Doppler, color flow imaging, transesophageal echocardiography and echo directed hemodynamic studies.

Invasive Cardiology

- Experience in cardiac catheterization to calculate and interpret various hemodynamic parameters
- Right and left heart cath and coronary angiography procedures in adults and children
- To perform temporary pacemaker insertion.
- To assist in various interventions including valvuloplasty, coronary and congenital interventions.
- Electrophysiology: To interpret electrophysiological data and assist in electrophysiology procedures, permanent pacemaker implantation.

Biomedical Aspects

To understanding the functional principles of various bio-medical equipments used for the invasive and non invasive cardiology.

Research Projects

As of now each DM student is completing four research projects during the course.

- I It is recommended that the number of projects be reduced to two, however at least one of these projects must be prospective in nature. In addition, one of the projects must be submitted for publication in an indexed journal before submission. Special credit should be given for additional published case reports, published articles.
- II The candidate should write two reviews as the topics presented by him on seminars.

Academic and Clinical Work Requirements

Journal club readings – minimum of 4 reviews and 6 journal readings

Minimum No. of Procedures

Number of Echo's done	—	200
Number of TMT procedures	—	100
No. of temporary pacemakers done	—	30
Number of Holter analysed	—	50
Number of permanent pacemakers assisted or done	—	5
Number of cardiac cath procedures including Interventions assisted or done	—	100

(The Head of the department should certify this)

Duration of the study program

Ward + CCU	11 months
Cath Lab	8 months
Echo	4 months
TMT/Holter	4 months
Electrophysiology/pacemaker	2 months
Cardiac Surgery	1 month
Nuclear Cardiology	1 month
Pediatric Cardiology	4 months

Duration of the training programme: 3 years i.e. – 36 months.

The D M exam at the end of 36 months of training.

ENDOCRINOLOGY & METABOLISM— D M

Duration : 3 Years

Educational Qualifications and eligibility: A candidate must possess M.D. in Medicine or Pediatrics of the All India Institute of Medical Sciences or any other University or an equivalent qualification recognized by the MCI for this purpose.

Age Limit: 35 years, relaxable in case of SC/ST candidates by a maximum of 5 years. The upper age limit is not applicable to sponsored candidates.

METHOD OF SELECTION

Selections for DM is through a 3 – stage performance evaluation:

Stage I: Candidates will appear for an entrance examination (theory test) for 90 marks, of 90 minutes duration in the subject. The result will be displayed the following day on the notice board of examination section. No individual communication will be sent.

Stage II: Based on the performance in the theory test (stage I), candidates 3 times the number of seats advertised will be called for Department clinical assessment on the third day to assess the suitability of the candidate, keeping in view the practical knowledge of the candidate, ability to attain the high academic level in the discipline and aptitude for research and teaching. A maximum 90 marks have been determined for Departmental Clinical assessment.

Stage III: Those candidates who secure 50% marks (out of 180 marks) or above in theory plus departmental clinical assessment will be finally interviewed on the fourth/fifth day by the selection committee under the chairmanship of Director. A maximum of 20 marks have determined for the interview.

Candidates who fail to attend any of the three stages mentioned above or secure less than 50% aggregate marks in the above three stage performance evaluation, will not be considered for admission.

SYLLABUS

A three years training period is designed to meet the minimum requirements for training in endocrinology prior to certification. Clinical Endocrinology should include:

1. Basic sciences as related to clinical endocrinology:
 - ♦ Hormone receptors/receptor biology
 - ♦ Genetics in Endocrinology
 - ♦ Molecular biology
 - ♦ Hormonal assays
2. Hypothalamic pituitary disorders
3. Thyroid disorders
4. Reproductive disorders
5. Bone and mineral disorders/Vitamin D metabolism
6. Adrenal disorders (Glucocorticoids/Mineralocorticoids, Adrenomedullary disorders)
7. Metabolic disorders (lipids, carbohydrates and protein metabolism related disorders)
8. Diabetes Mellitus
9. Disorder of growth and sexual differentiation

All the candidates will be involved in the direct care of the patients admitted to the endocrine services. This will include taking a complete history and performing a comprehensive examination. Additionally residents will be required to attend outpatient endocrine clinics where consultants will be available for on spot consultations.

Training in nuclear medicine will be coordinated with the department of nuclear medicine. The residents will be given training in principles of scanning of various endocrine organs and interpretation of data. Additionally regular monthly conferences will be scheduled with the nuclear medicine department where faculty and the resident staff will go over interesting scans of the previous month.

TRAINING IN THE PATH LABORATORY

It is primarily aimed at providing trainee experience in the area of endocrine-pathology eg. Estimation/quantitation of auto-antibodies, acquainting with techniques of fluorescent microscopy, principles of electron microscopy and histo-pathological identification of common pathological entities encountered in Endocrinology. Training in aspiration cytology will be arranged.

MOLECULAR BIOLOGY COURSES: (AS APPLIED TO ENDOCRINOLOGY)

It is mandatory to learn basics and acquaint with techniques. The course is devised in collaboration with faculty in the department of biotechnology.

MEDICAL STATISTICS

A 2 week course (15 hrs) in medical statistics is mandatory. This is to acquaint students with principles of statistics and analysis of data in currently accepted scientific way. The course will be organized in collaboration with department of biostatistics.

CLINICAL/LABORATORY RESEARCH

Minimum 6 months experience in the laboratories of endocrine department will be required. Candidates

will be required to complete 2 research projects related to clinical/experimental endocrinology during their stay. Faculty will supervise and help in completion of research protocols.

CASE CONFERENCES

Combined Endocrine/Radiology — once a week

Combined Endocrine/Surg. Pathology — twice a month

Logbook will be maintained by the residents where data on all the patients seen the clinics or on consultation service shall be enclosed. Similar record shall be maintained on procedures such as thyroid aspiration biopsies etc.

SEMINARS/JOURNAL CLUBS/ENDOCRINE GRAND ROUNDS

- ♦ Once a week journal club in the department
- ♦ Once a week seminar in the department
- ♦ Outside speakers (visiting professors) shall be invited regularly to give endocrine grand rounds. It is proposed to bring atleast 6 speakers/year from outside.

Suggested Reading

- | | |
|---|-------------------------------------|
| 1. Williams Textbook of endocrinology | Wilson & Foster |
| 2. Textbook of Endocrinology | Felig, Baxter and Broadus |
| 3. Endocrinology | Cachill & Bradley |
| 4. Josline Diabetes Mellitus | Ellenberg & Rifts |
| 5. Diabetes Mellitus | Ellenberg & Rifts |
| 6. Metabolic basis of Inherited disease | Stanbury, Wtngard et al |
| 7. The Thyroid | Sydeay Singbar and Braverman |
| 8. Reproductive Endocrinology | Jaffe and yen |
| 9. Reproductive Endocrinology | Speroff & Kase |
| 10. Neuroendocrinology | Martine & Besser |
| 11. Handbook of Endocrinology | Dillon |
| 12. Immunoassay a practical Guide | Brian's Law |
| 13. RIA, Principles and Practice | Pillai and Bhandarkar, 1998, BARC |
| 14. Antibodies A laboratory manual | Ed. Harlow and David lane |
| 15. Text book of Clinical Chemistry | eitz. |
| 16. Nutritive value of Indian Foods | C. Gopalan, ICMR |
| 17. Hypothalamic pituitary development | Ed. Rapheel Rappaport serge Amselem |
| 18. Adrenal diseases in childhood | I A Hughes A J L Clark |

19. Genetic disorders of Endocrine Neoplasia Patricia Dahia Charis Eng.

Journals

1. Journal of Clinical Endocrinology & metabolism
2. Endocrinology
3. Journal of Endocrinology
4. Diabetes
5. Diabetologia
6. Fertility and Sterility
7. Neuroendocrinology
8. Proc. Natl. Acad. Sciences (USA)
9. Nature
10. Science
11. New England Journal of Medicine
12. Lance
13. American Journal of Physiology
14. J. Steroid Biochemistry
15. J. Metabolic diseases
16. Metabolism
17. American Journal of Medicine
18. Annals of Internal Medicine
19. Hormone & Metabolic Research
20. J. Clinical Nutrition

TRAINING PROGRAMME

Clinical endocrinology 2.5 years

Clinical/laboratory research and elective 6 months

DISSERTATION

The candidates registered for D. M. would be required to prepare a dissertation after undertaking original investigative (clinical or experimental) work. The progress of this work, which is an important pre-requisite for completion of D. M. course will be reviewed at monthly meeting of the department and results published at appropriate time based on progress of the work. Satisfactory completion of such work is pre-requisite for candidates to appear for D. M. examination.

EXAMINATION

There will be 3 theory papers of 3 hours each.

1. Basic sciences relevant to the discipline of endocrinology and metabolism.
2. Laboratory technology and procedures and interpretation there of related to endocrinology and metabolism.
3. Clinical and therapeutic aspects of endocrinology and metabolism.

Clinical examination, wherein clinical acumen of the candidates is objectively evaluated by testing his ability to arrive at diagnosis and suggest method of management. A carefully selected group of patients from the entire speciality will be given as cases for this examination. Knowledge of evaluating

the laboratory data in clinical situation and the knowledge of laboratory techniques used in clinical endocrinology and metabolism will also be assessed.

GASTROENTEROLOGY — D M

Duration : 3 Years

Admission eligibility : MD (Medicine)

SYLLABUS

At this level of training, insistence of a syllabus may not be appropriate. Trainees should acquire an overall knowledge in Gastroenterology by reading standard textbooks, monographs and peer reviewed journals dealing with Gastroenterology, Hepatology, Pancreatology and related Basic Sciences and Epidemiology. A core syllabus is however, recommended as in **appendix 1**, but it does not purport to be either comprehensive or restrictive. Furthermore, it is likely to change from time to time.

TEACHING

The training program should include close supervision of clinical work and assessment in the initial period followed gradually by greater delegation of responsibility. Trainees must maintain a logbook and staged evaluation must be documented by the department.

a) Clinical Teaching

In service training should be imparted through supervised outpatients and in-patients care by trainees. Trainees must be exposed to clinical features, clinical data analysis, investigative work-up, clinical decision making, emergency care and ethical aspects of all common diseases in the field of gastroenterology and hepatology.

Clinical case presentations by trainees and ward rounds with faculty must serve as important media for training in the art of eliciting history and physical signs, synthesis of information, decision making and treatment of the patients.

b) Procedures on patients

Several diagnostic and therapeutic procedures are done on patients in the speciality of gastroenterology, most prominent of them being endoscopic procedures. They have to be taught to the trainees in a graded

and staged manner under close supervision. Desirable minimum numbers of the endoscopic procedures to be done by the trainees are shown in the table below, but they may vary from center to center depending on the facilities and patient load available.

Table: Proposed list of minimum number of procedures

Procedures	No.
Upper GI Endoscopy	200
Side Viewing duodenoscopy	25
Endoscopic variceal ligation	10
Endoscopic sclerotherapy	50
Proctosigmoidoscopy (rigid)	100
Pile banding	10
Flexible sigmoidoscopy	25
Full length colonoscopy	10
Polypectomy	5
Endoscopic retrograde cholangio-pancreatography	25*
ERCP with papillotomy	5*

* May only assist

c) Imaging and laboratory

Diagnostic techniques like radiological and other imaging and laboratory techniques relevant to patients with gastroenterological diseases must receive attention. Trainees must be exposed to the theory behind these techniques and must be demonstrated all the tests. This may be organized either by arranging periodic workshops or through rotation in different areas performing these techniques. Trainees need to be familiarized with interpretation of these data.

d) Didactic and theoretical teaching

Teaching may be organized in semesters or courses through seminars and journal clubs presented chiefly by the trainees under active supervision by the faculty. Emphasis must be placed on review of recent information by the trainees and improvement of their critical faculties.

Attempts must be made to cover all particularly common gastroenterological diseases and those that gain importance through recent research and information in pathogenesis, diagnosis and therapy. These topics should be organized in such a way that every trainee gets exposed to most of these areas during his training. However it is unnecessary to aim at a comprehensive text-book type coverage of all topics at this level of training.

e) Basic sciences

DM trainees ought to be familiar with basic science aspects of techniques and diseases that they encounter such as molecular biology, biochemistry, physics, etc.

APPENDIX 1

Recommended Core Syllabus

Basic Sciences

1. Immune system of the gastrointestinal tract (GIT) and its importance in various GI disorders
2. Molecular biology in relation to GIT
3. Genetic diseases of the GIT and the liver
4. Gene therapy
5. GI tumors and tumor biology
6. Gastrointestinal hormones in health and diseases
7. Embryology of the gut, liver, pancreas and congenital anomalies

Miscellaneous

1. Upper and lower gastro-intestinal bleeding
2. Gastrointestinal tuberculosis
3. HIV and the GIT, hepatobiliary and pancreatic systems
4. GIT and liver in systemic diseases
5. Cutaneous manifestations of GI diseases
6. Vascular diseases of the GIT
7. Gastrointestinal side effects of drugs especially NSAIDs
8. Gastro-intestinal symptoms physiology and interpretation

Nausea, vomiting

Pain abdomen

Diarrhoea

Constipation

Dysphagia

Jaundice

Esophagus

1. Basic anatomy, histology and physiology
2. Congenital anomalies

3. Motility of the esophagus and motor disorders
4. Mechanism of deglutition and dysphasia
5. Approach to a patient with dysphasia
6. Gastro-esophageal reflux disease
7. Tumors of the esophagus
8. Esophageal webs, membranes and diverticulum
9. Management of benign and malignant esophageal strictures
10. Esophagus and systemic diseases
11. Infectious diseases of the esophagus
12. Foreign bodies in the esophagus and stomach
13. Esophageal perforation
14. Drug induced esophagitis

Stomach

1. Anatomy, histology, functions
2. Physiology of acid and bicarbonate secretion in health and diseases
3. Defence mechanisms against acid and pepsin
4. Gastroduodenal motor function in health and diseases.
5. Gastritis (nonspecific and specific)
6. Helicobacter pylori infection
7. Peptic ulcer
8. Dyspepsia
9. Stress and stomach
10. Gastric hypersecretory states including Zollinger Ellison syndrome
11. Ulcer complications and their management
12. Surgery for peptic ulcer
13. Post gastrectomy complication
14. Bezoars
15. Tumors of the stomach
16. Diverticuli and hernia of the stomach

Small Intestine

1. Anatomy, blood supply, histology
2. Motility of the small intestine
3. Congenital anomalies
4. Normal absorption of the nutrients
5. Intestinal electrolyte absorption and secretion
6. Malabsorption syndromes
 Pathophysiology, manifestations and approach
7. Celiac sprue
8. Infection related diseases
 - a. Intestinal microflora in health and diseases
 - b. Tropical sprue
 - c. Whipple's disease
 - d. Infectious diarrhoea and food poisoning
 - e. Parasitic diseases
9. Small intestinal ulcers
10. Short bowel syndrome and intestinal transplantation.
11. Eosinophilic gastroenteritis
12. Food allergies
13. Intestinal obstruction and pseudo-obstruction
14. Short bowel syndrome
15. Acute appendicitis
16. Malrotation of the gut
17. Bezoars
18. Management of diarrhoea
19. GI lymphomas
20. Small intestinal tumors
21. Small intestinal transplantation

Colon

1. Basic anatomy blood supply, histology and functions
2. Motility of the colon and disorders of motility
3. Congenital anomalies
4. Megacolon

5. Constipation
6. Colonic pseudo-obstruction
7. Fecal incontinence
8. Antibiotic associated diarrhoea
9. Inflammatory bowel disease
 - a. Ulcerative colitis
 - b. Crohn's disease
 - c. Indeterminate colitis
 - d. Ileostomies and its management
10. Diverticular disease of the colon
11. Radiation entero-colitis
12. Colonic polyps and polyposis syndromes
13. Malignant diseases of the colon
14. Other inflammatory diseases of colon including
 - a. Solitary rectal ulcer syndrome
 - b. Diversion colitis
 - c. Collagenous and microscopic colitis
 - d. Non specific ulcerations of the colon
 - e. Malakoplakia
 - f. Pneumatoses cystoids intestinalis
15. Hemorrhoids
16. Diseases of the anorectum

Pancreas

1. Anatomy, physiology, blood supply, developmental anomalies
2. Physiology of the pancreatic secretion
3. Pancreatic function tests
4. Acute pancreatitis
5. Recurrent acute pancreatitis
6. Chronic pancreatitis
7. Malignancies of the pancreas(Exocrine and endocrine)
8. Cystic fibrosis and other childhood disorders of the pancreas
9. Hereditary pancreatitis
10. Pancreatic transplantation

Biliary Tree

1. Anatomy, Physiology
2. Physiology of bile formation and excretion
3. Enterohepatic circulation
4. Bilirubin metabolism.
5. Approach to a patients with jaundice
6. Gallstones, its complications, and management
7. Acute acalculous cholecystitis
8. Miscellaneous disorders of the gallbladder
9. Acute cholangitis
10. Benign biliary structure
11. Benign and malignant neoplasms of the biliary system.
12. Endoscopic management of biliary obstruction.
13. Motility and dysmotility of the biliary system and sphincter of Oddi dysfunction
14. Congenital diseases of the biliary systems

Liver

1. Anatomy, physiology, blood supply
2. Functions of the liver
3. Microcirculation of liver
4. Liver function tests
5. Portal hypertension
 - i. Extrahepatic portosplenic vein obstruction
 - ii. Non cirrhotic portal fibrosis
 - iii. Cirrhosis
6. Acute viral hepatitis
7. Chronic hepatitis
8. Fulminant hepatic failure
9. Subacute hepatic failure
10. Cirrhosis of liver
11. Ascites
12. Hepatorenal syndrome
13. Autoimmune liver disease
14. Metabolic liver disease
15. Sclerosing cholangitis- primary and secondary
16. Primary biliary cirrhosis

17. Hepatic venous outflow tract obstruction
18. Fibrocystic diseases of the liver
19. Wilson's disease
20. Hemochromatosis
21. Liver in porphyria
22. Hepatic tumors
23. Infections of the liver
24. Liver in pregnancy
25. Liver in congestive heart failure
26. Liver biopsy
27. Liver transplantation and artificial liver support

Peritorium and Retroperitoneum

1. Ascites
2. Chronic peritonitis
3. Budd-Chiari syndrome
4. Malignant ascites
5. Diseases of the retroperitoneum

Nutrition

1. Normal nutritional requirements
2. Assessment of nutritional status
3. Protein energy malnutrition
4. Manifestations and management of nutritional deficiency and excess
5. Nutritional support in various GI disorders (malabsorption, acute and chronic pancreatitis, inflammatory bowel disease)

Vascular Diseases of the GI Tract

GI Radiology

Reading and interpreting the common x-ray films including

- X-ray films of the abdomen
- Barium studies, ultrasound examination
- CT scans, MR scans and angiography and ERCP films

GI Pathology

Reading and interpreting histological slides of common gastrointestinal and liver diseases.

Endoscopic Training

Endoscopic training is an integral part of training in superspecialty of gastroenterology. A trainee is supposed to have knowledge of instruments and its application.

- i. Endoscopes
- ii. Accessories
- iii. Sterilization of endoscopes and accessories
- iv. Electrosurgical instrument
- v. Keeping of endoscopes and accessories

HEMATOLOGY — D M

CLINICAL HEMATOLOGY

- Aims and objectives
- Eligibility and admission
- Training program
 - Clinical hematology
- Educational program
 - Course content
 - Teaching activities
- Evaluation pattern
- Dissertation
- Faculty

AIMS AND OBJECTIVES

The department of hematology offers postdoctoral course (DM Course) in both Clinical Hematology (DM Clinical Hematology) and to ensure that doctors from clinical (internal medicine and pediatrics) background have maximum career choices.

The program has been so designed to give the resident comprehensive training in clinical and laboratory hematology, to enable them to follow a subsequent career pathway in either academic or community hematology.

At the end of training in hematology, it is expected that the qualified resident will be able to:

1. Diagnose and manage all patients with non-malignant and malignant hematological disorders.
2. Perform independently different laboratory hematological investigations used to diagnose hematological disorders.

3. Interpret laboratory data and synthesize laboratory and clinical data so as to provide rational solutions for patients with hematological problems.
4. Supervise the activities of a clinical hematology/laboratory services where ever necessary.
5. To provide the state of art therapy to patients with hematological disorders.
6. To have knowledge and expertise to do BMT.
7. To be able to prepare and perform protocol based therapies for various oncological and hematological disorders.

ELIGIBILITY AND ADMISSION

The person applying for the DM course must be a postgraduate and the eligibility criteria is as follows:

DM Clinical hematology: Possession of MD in general medicine or pediatrics from a university recognized by the Medical Council of India.

There are both general and sponsored seats for these courses. Admission is made through an entrance examination conducted by AIIMS twice annually. The number of seats offered varies from time to time and is mentioned in the AIIMS prospectus. Candidates applying for sponsored seats have to forward their application through their sponsoring authorities.

TRAINING PROGRAM

DM CLINICAL HEMATOLOGY

The training program in clinical hematology is of 3 years (36 months) duration. The resident spends 21 months in clinical hematology, 9 months in laboratory hematology and 3 months in allied specialties. The resident is given 3 months for elective posting in a specialty area of his choice.

1st Year: In the first year the resident spends 9 months in the clinical hematology. In the ward residents learns the art of history, examination an approach to investigation and treatment. The remaining 3 months in the laboratory. This posting is primarily aimed to make the resident familiar with different hematological investigations performed in the laboratory.

2nd Year: The resident undergoes 6 months posting in laboratory .He/she is also posted in the allied specialties as a part of the training program. The duration of postings is as follows:

Nuclear medicine	—	2 weeks
Transfusion medicine	—	2 weeks
BMT	—	3weeks
Medical oncology	—	3 weeks
Radiotherapy	—	2 weeks

The remaining 3 months is spent in the clinical hematology. The trainee resident actively participates in the management of the in patients under full supervision of the faculty. Residents gets the broader exposure and leans from the allied department regarding these services available there and their application to hematology.

3rd Year: The resident is allotted 3 months for elective posting in a specific area of his/her choice. The remaining 9 months is spent in the clinical hematology to learn the state of art care for patients with various hematological disorders.

Clinical Training

The clinical training (21 months) is spread over a 3 year period, this has the advantage that the resident gets to follow up the patients over a prolonged period of time, and hence develop a better understanding of the process of hematological disease and response to its treatment. During his clinical training the resident is involved in the following activities:

- a) **Out-patient clinic:** the department runs three out-patient clinics per week in the forenoon session, which is attended by the resident. Each clinic contains both new and follow-up cases. The resident is expected to work up the new cases, arrive at an appropriate provisional diagnosis. They are also expected to see the follow-up patients of interest, especially those with whom they have been previously involved under the supervision of attending consultant. In the afternoon session the resident attends the joint clinic manned by the clinical and hematopathology consultants. In the joint clinic the new cases are discussed and the peripheral blood smears examined to help in arrive at a definitive diagnosis. The bone marrow aspirates and biopsies of the follow-up patients previously performed are also evaluated.
- b) **Hematology in-patient service:** the trainee resident actively participates in the management of the in-patients under the supervision of the faculty. The trainee sees all the hematology in patients. He/she is expected to evaluate the patient, record the clinical history and physical examination findings and arrive at an appropriate diagnosis. Relevant hematological investigations and other tests should be performed and the results reviewed. The resident presents the case to the consultant during the rounds and follows up the patient during their stay. Thus the residents get the exposure and learn the state of care for various hematological disorders.
- c) **Day care service:** the resident is expected to supervise the running of the day care center on rotation basis during their clinical training period. The day care center provides blood transfusion facilities for patients with chronic anemia. The day care center is also used to deliver intravenous chemotherapy to patients with all types of hematological cancer. Intrathecal chemotherapy is also given by the resident in this clinic. Other procedures such as bone marrow aspirates, biopsies and diagnostic lumbar punctures are also carried out.
- d) **Emergency services:** the hematology department provides services on all the seven days of the week. The residents by rotation are assigned to a 24 hour emergency call duty, with supervision from the faculty on the consult call service.
- e) **Inter-departmental consultation:** the resident is also expected to see patients with associated hematological problems admitted in other departments e.g. obstetrics and gynecology, surgery, for whom an opinion has been sought.

The competencies that a resident is expected to develop from the clinical hematology training include.

Competencies

1. Morphology, physiology and biochemistry of blood, marrow, lymphatic tissue and spleen.
2. Related basic fields including immunology, pharmacology, cell biology, and molecular genetics.
3. Basic pathophysiologic mechanisms and therapy of disease of the blood including anemias, diseases of white cells, and disorders of hemostasis and thrombosis.
4. Etiology, epidemiology, natural history, diagnosis, and management of neoplastic disease, of the blood, blood-forming organs, and lymphatic tissue.
5. Effects of other systemic disorders on the blood, blood-forming organs and lymphatic tissue and management of the immunocompromised patients.
6. Genetic aspects of hematology.
7. Relevant drugs, their mechanisms of actions, pharmacokinetics and clinical indications and limitations, including effects, toxicity, and interactions.
8. Tests of hemostasis and thrombosis for both congenital and acquired disorders, and regulation of antithrombotic therapy.
9. Transfusion medicine, including the evaluation of antibodies, blood compatibility, and the use of blood-component therapy and apheresis.

Fellows are also expected to gain competence in the following clinical skills:

1. Bone marrow aspiration and biopsy.
2. Preparation and interpretation of films of blood and marrow.
3. Administration of chemotherapy.
4. Apheresis technique.
5. Phlebotomy exchange transfusion.
6. Management and care of indwelling catheter.
7. Lumbar puncture with chemotherapy.
8. To diagnose and initiate prompt management of seriously sick patients.
9. To learn and apply protocol based therapies in management of various hematological disorders.
10. To have competency to BMT and manage its complications.

Laboratory Training

The training in hematopathology is for 9 months (1st year = 3 months; 2nd year= 6 months). The training is imparted in the following subdivisions:

- a) Morphology and general hematology
- b) Hemostasis and thrombosis laboratory
- c) Hemolytic anemia laboratory
- d) Leukemia laboratory

- a) **Morphology and general hematology:** the resident is responsible for reviewing all the peripheral blood smears and discusses the results of abnormal blood films with the consultant hematopathologist. He/She also reviews the bone marrow aspirates and biopsies performed on that day and discuss the findings during the morphology clinic conducted in the forenoon session of the next day with the reporting consultant. The resident will also acquire the expertise in staining of blood smears and bone marrow smears, special stains and cytochemistry for leukemia diagnosis. They are also required to learn how to use automated cell counters. Resident is also expected to learn how to process bone marrow biopsy and different reviewing techniques used. They will also spend time in the laboratory learning the basics of quality assurance and quality control. The resident is also expected to learn how to process bone marrow biopsy and different staining technique used.
- b) **Hemostasis and thrombosis laboratory:** initially the trainee will familiarize his/herself with basic laboratory practices in hematology including quality control. The resident will then review abnormal and special tests daily with the faculty. During the period of posting the trainee is expected to learn to perform independently the basic coagulation tests. (Bleeding time, PT, APTT and TT factor assay, screening test for factor inhibitors, tests for lupus anticoagulants and platelet function tests. He/she will also spare time in acquiring knowledge about molecular genetics and a prenatal diagnosis of inherited coagulation defects.
- c) **Hemolytic anemia laboratory:** The trainee will spend time in learning tests performed for diagnosis of hemolytic anemia. He/she should be able to perform independently HbF, HbA₂ estimation, Hb electrophoresis, G6PD and PKD screening tests, Ham's tests for PNH, serum iron studies. The trainee will also be taught how to use HPLC and its hematological applications; the gel card centrifuge etc.
- d) **Leukemia Laboratory:** The trainee will develop both academic and practical expertise in the immunphenotyping of leukemia and lymphomas by APAP technique. The trainee will also learn the theoretical aspects of flow cytometry. They will also receive practical training in DNA and RNA extraction, southern blot techniques and use of PCR etc.

ROTATIONS

The resident in his/her 2nd year of training will be posted for a total of 6 months in the following allied specialties for training

i) **Bone Marrow Transplantation (3 weeks)**

During this post the resident is expanded to develop ability to gather, collate and interpret clinical, radiological and laboratory information that is required to assess a patients suitability for transplantation. He /she should acquired the knowledge, procedure and attitudinal skills to perform an autologous and allogenic transplant. The chief goals of this posting are as follows

1. Donor selection
HLA typing and MLR in bone marrow transplantation, screening of Donor.
2. Conditioning regimens
The trainee must be familiar with the different conditioning regimens, principles of their use in different disorders and complications.

3. Harvesting and manipulation of the bone marrow
Bone marrow collection, red cell or plasma reduction, peripheral blood stem cell mobilization and collection, cryopreservation, Transfusion of marrow. Purging of marrow – T cell depletion.
4. Transplantation immunology
Histocompatibility, graft versus host disease – diagnosis and management, Immune reconstitution following transplantation.
5. Management of post transplant patient

ii) Transfusion Medicine (2 weeks)

The training develops the residents expertise in transfusion medicine and blood transfusion practice. The trainee will learn the basis of blood compatibility, the principles and methods of screening and cross matching, procurement and preservation of blood and blood components and clinical use for specific component therapy. He/she will also learn the quality control and quality assurance program with the blood bank. Resident will learn the principles of immunohematology and various other tests being conducted in blood bank.

iii) Medical oncology (3 weeks)

The resident will learn the principles of management of different solid tumors, other hematological malignancies such as NHL, Hodgkins disease, multiple myeloma. The will also learn the basics of high dose chemotherapy and newer modalities of treatment. The are expected to participate in community cancer screening program during their posting.

iv) Radiotherapy (2 weeks)

The resident will learn the principles of radiotherapy, the use of various radioisotopes. Radiotherapy in management of NHL, hodgkins disease, multiple myeloma, CNS prophylaxis in acute leukemias. They will also familiarize themselves with various radiotherapy equipments.

v) Nuclear medicine (2 weeks)

The resident will be expected to acquire the basic knowledge of use of nuclear medicine in diagnosis of both oncologic and non-oncological hematological disorders. The trainee will be expected to be able to perform studies for hypersplenism, red cell mass estimation for polycythemia, nuclear bone scans and bone marrow scans.

EDUCATION PROGRAMME

COURSE CONTENT

Semester 1

Core Topics:

1. Introduction to clinical hematology.
2. Introduction to Laboratory hematology.
3. Allied specialty
 - Nuclear Medicine.
 - Biostatistics.

Subtopics:

1. Basic morphology and basic concepts of hematopoiesis.
2. Bone marrow structure and examination.
3. Red blood cells: Structure and function.
4. Laboratory approach to diagnosis of anemia.
5. Development of Immune system.
6. Overview of normal hemostatic mechanism.
7. Laboratory approach to diagnosis of bleeding disorders.
8. Clinical evaluation and management of inherited bleeding disorders.
9. Laboratory approach to diagnosis of leukemias.
10. Laboratory methods in hematology
 - a. Principles of automated cell counter and interpretation of results.
 - b. Hemoglobin electrophoresis.
 - c. HPLC use in hematology.
 - d. Special stains and cytochemistry.
 - e. Flow cytometry and its applications.
 - f. Diagnostic procedures for analyzing DNA.
11. Principles of Nuclear Medicine: and applications in hematology & oncology.
12. Biostatistics.

Semester II

Core Topic: Disorders of Erythrocytes: (Part I)

Subtopics:

1. Iron metabolism and iron deficiency anemia.
2. Megaloblastic anemia.
3. Red cell membrane defect: hereditary spherocytosis.
4. Red cell enzymopathies.
5. Thalassemia: (a) Clinical aspects and community screening (b) molecular genetics.
6. Sickle cell anemia.
7. Abnormal hemoglobins.
8. Immune hemolytic anemias.

Semester III

Core topics: Disorders of white cells (Part I)

Subtopics:

1. Cell Cycle and Carcinogenesis.
2. Principles of chemotherapy.
3. Quantitative defect of neutrophils.
4. Reactive lymphocytosis.
5. Introduction to acute leukemias.
6. Immunophenotype of acute leukemias.
7. Cytogenetics of acute leukemias.
8. Acute lymphoblastic leukemia in children.
9. Acute lymphoblastic leukemia in adults.
10. Acute myeloid leukemia.
11. Acute promyelocytic leukemia.
12. Minimal residual disease in acute leukemia.
13. MDR genes in Leukemia.
14. Chronic myeloid leukemia.
15. Chronic lymphocytic leukemia.
16. Hairy cell leukemia.
17. T cell lymphoproliferative disorders.
18. Bone marrow transplantation.
19. Disorders of spleen.

Semester IV

Core Topics: Disorders of Hemostasis and Thrombosis

Subtopics:

1. Laboratory diagnosis of platelet function defects.
2. Overview of megakaryopoiesis.
3. Quantitative platelet disorders.
4. Qualitative platelet disorders.
5. ITP.
6. TTP/HUS.
7. Hemophilia
 - a. genetics; prenatal diagnosis.
 - b. Laboratory diagnosis.
 - c. Special management issues.
8. Von Willebrand's disease
 - a. Laboratory diagnosis.
 - b. Management.
9. Dysfibrinogemias.
10. Other rare coagulation disorders.
11. Fibrinolysis and defects of fibrinolytic pathway.
12. Disseminated intravascular coagulation.
13. Lupus anticoagulant
 - a. Lab diagnosis.
 - b. Clinical presentation and management.
14. Acquired disorders of coagulation.
15. Hemostasis in the Newborn.
16. Bleeding disorders in the Newborn.

Semester V

Core Topic:

1. Disorders of hemostasis and thrombosis.
2. Disorders of erythrocytes Part II.

Subtopics:

Part A

1. Pathophysiology of thrombosis.
2. Inherited thrombotic disorders.
3. Laboratory testing of prothrombotic state.
4. Thrombosis in adults: Management issues.
5. Pediatric issues in thrombosis.
6. Thrombosis and pregnancy.

Part B

1. Bone marrow failure syndrome
 - a. aplastic anemia.
 - b. Paroxysmal nocturnal hemoglobinuria.
2. Hematological manifestation syndrome disease.
3. Red cell disorders in pregnancy.
4. Red cell disorders in the newborn.
5. Polycythemia.
6. Infections and hematological problems.

Semester VI

Core Topic:

1. Disorders of white cells Part II.
2. Miscellaneous topics
 - a. Transfusion medicine.
 - b. Immuno hematology.
 - c. Consultative hematology.
 - d. Quality assurance program.

Subtopics:**Part A**

1. Myelodysplastic syndrome.
2. Idiopathic myelofibrosis/essential thrombocythemia.
3. Non Hodgkin's lymphoma.
4. Hodgkin disease.
5. Plasma cell disorders.
6. Histiocytosis.

Part B

1. Infections and blood transfusions.
2. Complications of blood transfusion.
3. Hematological manifestation of HIV.
4. Consultative hematology
 - a. Obstetrics and Gynecology.
 - b. Surgery.
5. Blood and component therapy.
6. Blood safety program.

Teaching Activities: The weekly time table of teaching activities is given below:

DM PROGRAM
Teaching Schedule

<i>Days</i>	<i>Tuesday</i>	<i>Thursday</i>	<i>Saturday</i>
	12-1 PM Lecture/ Clinical case/ Case study	10-12 Noon Clinical Grand Rounds 12.00 — 1.00 P.M. Hematopath conference Radiology conference (Alternate weeks)	12-1 PM Journal club/ DM Seminar/ Mortality meet/ Test
	2-4 PM Institute CGR & CPC	2.30-3.30 PM Postgraduate Seminar	

Weekly Teaching Schedule

<i>Week</i>	<i>Tuesday</i>	<i>Saturday</i>
1st Week	Lecture	Mortality meet
2nd Week	interesting case	Journal Club
3rd Week	Case study	DM Seminar
4th Week	Lecture	Test

DM Program Moderator: Dr. Renu Saxena & Dr. V.P. Choudhry

DM Program Co-ordinator: Dr R Kashyap

Mortality meets Co-ordinator: Dr M Mohapatra

Radiology conference Co-ordinator: Dr. M Mohapatra

Hematopathology conference Co-ordinator: Dr. Akhilesh K Singh

DM Dissertation: 2 dissertation to be presented

Submission of protocols: within 6 months of joining DM course

Submission of final dissertation: At the end of 2 and half years.

Research Experience: Dissertation

The program must ensure meaningful, supervised research experience with appropriate protected time while maintaining the clinical and laboratory experience. These residents must learn the design and interpretation of research studies, responsible use of informed consent and research methodology and interpretation of data and statistical analysis. They will be advised and supervised by qualified staff members in the conduct of research . They must learn to use library, Medline search, internet facilities etc. This training will help them to develop skills in planning, designing and conduct of research studies.

Each DM candidate is expected to have 2 dissertation. For DM hematopathology, Our dissertation may be primarily lab oriented (90% lab component) and the other having some clinical hematology, one dissert may be primarily clinical (90% clinical) and the other having some lab component (60% clinical +40% lab). The protocol is expected to be submitted in this 1st 6 months.

Evaluation and Mode of Examination

Examination will be held at the end of having completed three years of supervised training and having submitted two dissertations. The work could be either clinical, laboratory or combined.

Three papers each of 3 hours duration and 100 marks each. (total 300 marks) would be given . They would include either 10 short essays or 2 long and 6 short essays. In addition, a candidate will have to appear in practical and clinical examination of 350 marks, candidate will have to pass both in theory and practical examination as given below for the two degrees.

Evaluation for DM Clinical Haematology

Theory

- Paper I : Basic & applied Haematology
 Paper II : Paper on clinical Haematology
 Paper III : Advances in clinical Haematology

Practical & clinical examination:

Clinical

- Two long cases (100 Marks)
 Two short cases (50 Marks)
 Case exercises (25 Marks)
 Skills (Radiology/Procedures/ICU) (25 Marks)

Laboratory

- Blood & B/M morphology (50 Marks)
 Spots-Data analysis (25 Marks)
 Basic Lab data (25 Marks)
 Viva Voce (50 Marks)

Patterns of practical examination

Clinical Haematology

<i>Day 1 (Forenoon)</i>	<i>Day 2</i>
Two long case (1)	Blood & B/M morphology (10 cases)
Two short case (2)	Spots data analysis (5 cases)
	Basic lab data (5 cases)
<i>(Afternoon)</i>	
Case exercise (2)	
Skills (5)	Viva Voce

HEMATOLOGY — D M

HEMATO-PATH

- Aims and objectives
- Eligibility and admission
- Training program
 - Hematopathology
- Educational program
 - Course content
 - Teaching activities
- Evaluation pattern
- Dissertation
- Faculty

AIMS AND OBJECTIVES

The department of hematology offers postdoctoral course and laboratory hematology (DM hematopathology), to ensure that doctors from both pathology background have maximum career choices.

The program has been designed to give the resident comprehensive training in laboratory and clinical hematology, to enable them to follow a subsequent career pathway in either academic or community hematology.

At the end of training in hematology, it is expected that the qualified resident will be able to:

1. Diagnose and manage all patients with non-malignant and malignant hematological disorders.
2. Perform independently different laboratory hematological investigations used to diagnose hematological disorders.

3. Interpret laboratory data and synthesize laboratory and clinical data so as to provide rational solutions for patients with hematological problems.
4. Supervise the activities of a laboratory or clinical services where necessary.
5. To have the efficiency of conducting all types of hematological investigations.
6. To have in depth knowledge and ability for molecular diseases including for antinatal diagnosis.

ELIGIBILITY AND ADMISSION

The person applying for the DM course must be a postgraduate and the eligibility criteria is as follows:

DM Hematopathology : Possession of MD in pathology from a university recognized by the Medical Council of India.

These are both general and sponsored seats for these courses. Admission is made through an entrance examination conducted by AIIMS twice annually. The number of seats offered varies from time to time and is mentioned in the AIIMS prospectus. Candidates applying for sponsored seats have to forward their application through their sponsoring authorities.

DM HEMATOPATHOLOGY

The training in hematopathology is of 3 years (36 months) duration. The training periods include 21 months in the laboratory, 9 months in clinical hematology, 3 months rotation in allied specialty and 3 months elective posting

1st year: The resident spends 9 months in laboratory and remaining 3 months is spent in the clinical hematology division. During the 9 months resident learns the basis of all the investigations being conducted in the department. In addition residents does him/her self common tests. This 3 months is used by the resident to familiarize him/herself with the clinical presentation of various hematological disorders and be able to physically evaluate the patients and learn the basics of management.

2nd year: Trainee is posted for 6 months in clinical hematology during the second year, the resident is also posted in allied specialties as part of his/ or her training. The duration of postings is as follows:

Transfusion Medicine	— 3 weeks
Transplantation medicine	— 2 weeks
BMT	— 2 weeks
Biotechnology	— 2 weeks
Genetics	— 3 weeks

The remaining 3 months is spent in the laboratory.

3rd year: The resident is given 3 months for having training in a specific area of his/or her choice. The remaining 9 months is spent in the laboratory hematology. Residents learns the state of art in the laboratory including their application techniques along with their application.

A. Laboratory Training

The training in hematology (21 months) is spread over a 3 year period. The training period is flexibly divided as follows:

i) Morphology and General Hematology

1. Proper use and care of common instruments such as light microscope, centrifuge, water baths, freezers, weighing balance, etc.
2. Weighing of solids, preparation of molar and N-solutions, preparations and use of buffers. Familiarization of practical concepts of pH, molarity, normality, osmolality with normal and reference values.
3. The nature and use of distilled and deionised water.
4. Blood collection samples-venepuncture and finger prick methods of sample collection, types of anticoagulants, containers and the effects of delay in processing and storage.
5. Determination of peripheral blood counts (Hemoglobin, Hematocrit, Total WBC and platelets) manually and calculation of red cell indices.
6. Use of automated blood cell counters including principles and practice. Interpretation of peripheral blood counts and abnormal flags.
7. Preparation of blood films and CSF, staining of peripheral/blood films and CSF cytospin slides with Ramanowsky and other dyes.
8. Review of normal and abnormal blood films with emphasis on morphology of red cells, white cells and platelets.
9. Performance of WBC differential counts; subjective assessment of platelet counts and diagnostic interpretation of abnormal counts.
10. Preparation and staining of thick and thin blood films for malarial parasites.
11. Measurement and significance of ESR and plasma viscosity.
12. Supravital staining of reticulocytes, counting of reticulocytes.
13. Performance of bone marrow aspiration; trephine needle biopsy, splenic aspiration.
14. Preparation of smear of bone marrow aspirates and biopsy (touch) imprints. Staining and diagnostic evaluation of bone marrow aspirates.
15. Performance of sickling and solubility tests and screening for red cell G6 PD activity with interpretation of result.

ii) Hemostasis and Thrombosis Laboratory

Platelets:

1. Performance of Ivy bleeding time and platelet count; study of platelet morphology.
2. Principles, practice and interpretation of platelet aggregometry tests.
3. Platelet associated immunoglobulin (PAIgG) and circulating antiplatelet antibodies.

Screening for coagulation factor abnormalities:

1. Prothrombin time and stypven time.
2. Activated partial thromboplastin time.
3. Thrombin time and reptilase time.
4. Plasma fibrinogen.
5. Correction studies with normal plasma, adsorbed plasma, aged serum and factor deficiency plasmas.
6. FDP and D-Dimers.
7. Assays of clotting factors particularly factors VIII and IX.
8. Urea solubility test for factor XIII.
9. Euglobulin lysis time and other relevant tests of plasma fibrinolytic activity.

iii) Hemolytic Anemia Laboratory

1. HB S solubility test.
2. Screening for unstable hemoglobin, supravital staining of Hb H inclusion.
3. Principles and practice of separation and identification of normal and abnormal hemoglobins by electrophoresis and chromatography.
4. Quantitation of normal and abnormal hemoglobins by densitometry and chromatography.
5. Quantitation of HbF by alkali denaturation and cellular distribution of HbF by Kleihauer acid elution technique.
6. Heinz body preparation.
7. Screening for G6PD deficiency and quantitative estimation of G6PD and other red cell enzymes.
8. Direct and indirect Coomb's test, warm and old autoantibody titers.
9. Miscellaneous biochemical test on red cell, plasma and urine
 - i) Principle and procedures for estimation of plasma bilirubin and haptoglobin; and significance of the results, screening for methaemalbumin, methaemoglobin and sulphaehemoglobin.
 - ii) Screening for cryoglobins, principles of immunoglobulin estimation and immune electrophoresis.
 - iii) Estimation or urine for Hb, red cells hemosiderin, urobilinogen and bilirubin.
 - iv) Principles of estimation of serum ferritin and iron/TIBC.
 - v) Principles and estimation of red cell folate, serum folate and serum cobalamin.

iv) Leukemia Laboratory

Performance of the following staining procedures, Sudan black, Myeloperoxidase, specific and non specific esterase, acid phosphatase. PAS and iron staining. They will also learn to perform

immunophenotyping studies for leukemia diagnosis by APAP technique. The will also learn various laboratory methods used in molecular genetics such as southern blot, PCR etc.

v) Laboratory equipment and organization

A working knowledge of the mechanics of the various laboratories instruments including their operation, calibration and basic maintenance, is desirable.

1. Laboratory space distribution; ordering, siting and installation of laboratory equipment; workflow procedures and handling of samples.
2. Staffing-technical and non-technical.
3. Use of computers and generation of laboratory statistics.
4. Health and Safety measures (Physical/Chemical/Biological/Radiation).
5. Waste disposal.
6. Quality Assurance (Internal and External) measures.
7. Budgeting.

B. Clinical training

The training in clinical hematology is for 9 months (1st year - 3 month 2nd year - 6 months) at the clinical training has the following components.

- i) Out patient clinic.
- ii) Hematology in patients services.
- iii) Day Care Service.

The objectives of this posting are similar to that of the training for DM clinical hematology. However, the resident undergoing clinical hematology posting as part of DM hemato- pathology is not expected to be on emergency call duty and inter departmental refereed services.

The competencies that a resident is expected to develop from the clinical hematology training include.

Competencies

1. Morphology, physiology and biochemistry of blood, marrow, lymphatic tissue and spleen.
2. Related basic fields including immunology, pharmacology, cell biology, and molecular genetics.
3. Basic pathophysiologic mechanisms and therapy of disease of the blood including anemias, diseases of white cells, and disorders of hemostasis and thrombosis.
4. Etiology, epidemiology, natural history, diagnosis, and management of neoplastic disease, of the blood, blood-forming organs, and lymphatic tissue.
5. Effects of other systemic disorders on the blood, blood-forming organs and lymphatic tissue and management of the immunocompromised patients.

6. Genetic aspects of hematology.
7. Relevant drugs, their mechanisms of actions, pharmacokinetics and clinical indications and limitations, including effects, toxicity, and interactions.
8. Tests of hemostasis and thrombosis for both congenital and acquired disorders, and regulation of antithrombotic therapy.
9. Transfusion medicine, including the evaluation of antibodies, blood compatibility, and the use of blood-component therapy and apheresis.
10. They can start molecular studies and initiate Ante-natal diagnosis.

Fellows are also expected to gain competence in the following procedural skills:

1. Bone marrow aspiration and biopsy.
2. Preparation and interpretation of films of blood and marrow.
3. Administration of chemotherapy.
4. Phlebotomy exchange transfusion.
5. Apheresis techniques.
6. Management and care of indwelling access catheters.
7. Lumbar puncture with chemotherapy.

ROTATIONS

The resident in his/her 2nd year of training will be posted for a total of 6 months in the following allied specialties for training.

i) Transfusion Medicine (2 weeks)

The resident will have hands on experience in practical blood banking. The trainee will be trained in the following aspects:

1. Blood donor management
2. Blood component preparation and their clinical use
 - preparation of various components
 - Packed red cells, fresh frozen plasma cryoprecipitates etc.
 - Leukodepletion technique; irradiation of blood components
3. Blood processing and cross matching
 - ABO blood grouping/Rh typing
 - Antibody screening and classification
 - Cross matching

4. Transfusion transmitted infection screening

Screening for various infections

HIV, HbsAg, HCV, Syphilis, Malaria

Various methods, ELISA, Spot, Rapid, automated

5. Quality control and assurance program

ii) Bone Marrow Transplantation (3 weeks)

The resident must be familiar with current indications and results of bone marrow transplantation in various diseases.

1. Donor selection

HLA typing and MLR in bone marrow transplantation, screening of Donor.

2. Conditioning regimens

The trainee must be familiar with the different conditioning regimens, principles of their use in different disorders and complications.

3. Harvesting and manipulation of the bone marrow

Bone marrow collection, red cell or plasma reduction, peripheral blood stem cell mobilization and collection, cryopreservation, Transfusion of marrow. Purging of marrow – T cell depletion.

4. Transplantation immunology

Histocompatibility, graft versus host disease – diagnosis and management, Immune reconstitution following transplantation.

5. Management of post transplant patient.

iii) Transplantation Medicine (2 weeks)

The resident trainee will be hands on experience in tissue typing and will review the tissue typing results on patients and families evaluated for transplantation purposes. The trainee will also learn the practical aspects of flow cytometry.

iv) Genetics (3 weeks)

The training will include familiarization with cytogenetics, understanding the principles of cytogenetics and appreciating the relevance and significance of chromosomes in diagnostic hematology, interpreting the results of chromosome preparation of hemopoietic cells. The training will also include general principles, specimen collection and preparation, karyotyping and fluorescence in situ hybridization (FISH) procedures and laboratory quality assurance measures.

v) Biotechnology

The trainee resident will get exposure to various molecular diagnostic techniques, will also learn the basics on monoclonal antibodies manufacture and its applications, vaccine preparation and its use in oncology.

EDUCATION PROGRAMME

COURSE CONTENT

Semester 1

Core Topics:

1. Introduction to clinical hematology.
2. Introduction to Laboratory hematology.
3. Allied specialty
 - Nuclear Medicine.
 - Biostatistics.

Subtopics:

1. Basic morphology and basic concepts of hematopoiesis.
2. Bone marrow structure and examination.
3. Red blood cells: Structure and function.
4. Laboratory approach to diagnosis of anemia.
5. Development of Immune system.
6. Overview of normal hemostatic mechanism.
7. Laboratory approach to diagnosis of bleeding disorders.
8. Clinical evaluation and management of inherited bleeding disorders.
9. Laboratory approach to diagnosis of leukemias.
10. Laboratory methods in hematology
 - a. Principles of automated cell counter and interpretation of results.
 - b. Hemoglobin electrophoresis.
 - c. HPLC use in hematology.
 - d. Special stains and cytochemistry.
 - e. flow cytometry and its applications.
 - f. Diagnostic procedures for analyzing DNA.
11. Principles of Nuclear Medicine: and applications in hematology & oncology.
12. Biostatistics.

Semester II

Core Topic: Disorders of Erythrocytes: (Part I)

Subtopics:

1. Iron metabolism and iron deficiency anemia.
2. Megaloblastic anemia.
3. Red cell membrane defect: hereditary spherocytosis.
4. Red cell enzymopathies.
5. Thalassemia: (a) clinical aspects and screening (b) molecular genetics.
6. Sickle cell anemia.
7. Abnormal hemoglobins.
8. Immune hemolytic anemias.

Semester III

Core topics: Disorders of white cells (Part I)

Subtopics:

1. Cell Cycle and Carcinogenesis.
2. Principles of chemotherapy.
3. Quantitative defect of neutrophils.
4. Reactive lymphocytosis.
5. Introduction to acute leukemias.
6. Immunophenotype of acute leukemias.
7. Cytogenetics of acute leukemias.
8. Acute lymphoblastic leukemia in children.
9. Acute lymphoblastic leukemia in adults.
10. Acute myeloid leukemia.
11. Acute promyelocytic leukemia.
12. Minimal residual disease in acute leukemia.
13. MDR genes in Leukemia.
14. Chronic myeloid leukemia.
15. Chronic lymphocytic leukemia.

16. Hairy cell leukemia.
17. T cell lymphoproliferative disorders.
18. Bone marrow transplantation.
19. Disorders of spleen.

Semester IV

Core Topics: Disorders of Hemostasis and Thrombosis

Subtopics:

1. Laboratory diagnosis of platelet function defects.
2. Overview of megakaryopoiesis.
3. Quantitative platelet disorders.
4. Qualitative platelet disorders.
5. ITP.
6. TTP/HUS.
7. Hemophilia
 - a. genetics; prenatal diagnosis.
 - b. Laboratory diagnosis.
 - c. Special management issues.
8. Von Willebrand's disease
 - a. Laboratory diagnosis.
 - b. Management.
9. Dysfibrinogenemias.
10. Other rare coagulation disorders.
11. Fibrinolysis and defects of fibrinolytic pathway.
12. Disseminated intravascular coagulation.
13. Lupus anticoagulant
 - a. Lab diagnosis.
 - b. Clinical presentation and management.
14. Acquired disorders of coagulation.
15. Hemostasis in the Newborn.
16. Bleeding disorders in the Newborn.

Semester V

Core Topic:

1. Disorders of hemostasis and thrombosis.
2. Disorders of erythrocytes Part II.

Subtopics:

Part A

1. Pathophysiology of thrombosis.
2. Inherited thrombotic disorders.
3. Laboratory testing of prothrombotic state.
4. Thrombosis in adults: Management issues.
5. Pediatric issues in thrombosis.
6. Thrombosis and pregnancy.

Part B

1. Bone marrow failure syndrome
aplastic anemia.
Paroxysmal nocturnal hemoglobinuria.
2. Hematological manifestation syndrome disease.
3. Red cell disorders in pregnancy.
4. Red cell disorders in the newborn.
5. Polycythemia.
6. Infections and hematological problems.

Semester VI

Core Topic

1. Disorders of white cells Part II.
2. Miscellaneous topics
 - a. Transfusion medicine.
 - b. Immuno hematology.
 - c. Consultative hematology.
 - d. Quality assurance program.

Subtopics

Part A

1. Myelodysplastic syndrome.
2. Idiopathic myelofibrosis/essential thrombocythemia.
3. Non Hodgkin's lymphoma.
4. Hodgkin disease.
5. Plasma cell disorders.
6. Histiocytosis.

Part B

1. Infections and blood transfusions.
2. Complications of blood transfusion.
3. Hematological manifestation of HIV.
4. Consultative hematology
 - a. Obstetrics and Gynecology.
 - b. Surgery.
5. Blood and component therapy.
6. Blood safety programme.

Teaching Activities: The weekly time table of teaching activities is given below:

DM PROGRAM Teaching Schedule

<i>Days</i>	<i>Tuesday</i>	<i>Thursday</i>	<i>Saturday</i>
	12-1 PM Lecture/ Clinical case/ Case study	10-12 Noon Clinical Grand Rounds 12.00 – 1.00 P.M. Hematopath conference Radiology conference (Alternate weeks)	12-1 PM Journal club/ DM Seminar/ Mortality meet/ Test
	2-4 PM Institute CGR & CPC	2.30-3.30 PM Postgraduate Seminar	

Weekly Teaching Schedule

<i>Week</i>	<i>Tuesday</i>	<i>Saturday</i>
1st Week	Lecture	Mortality meet
2nd Week	interesting case	Journal Club
3rd Week	Case study	DM Seminar
4th Week	Lecture	Test

DM Program Moderator: Dr. Renu Saxena & Dr. V.P. Choudhry

DM Program Co-ordinator: Dr R Kashyap

Mortality meets Co-ordinator: Dr M Mohapatra

Radiology conference Co-ordinator: Dr. M Mohapatra

Hematopathology conference Co-ordinator: Dr. Akhilesh K Singh

DM Dissertation: 2 dissertation to be presented

Submission of protocols: within 6 months of joining DM course

Submission of final dissertation: At the end of 2 and half years.

Research Experience: Dissertation

The program must ensure meaningful, supervised research experience with appropriate protected time while maintaining the clinical and laboratory experience. These residents must learn the design and interpretation of research studies, responsible use of informed consent and research methodology and interpretation of data and statistical analysis. They will be advised and supervised by qualified staff members in the conduct of research . They must learn to use library, Medline search, internet facilities etc. This training will help them to develop skills in planning, designing and conduct of research studies.

Each DM candidate is expected to have 2 dissertation. For DM hematopathology, Our dissertation may be primarily lab oriented (90% lab component) and the other having some clinical hematology, one dissert may be primarily clinical (90% clinical) and the other having some lab component (60% clinical +40% lab). The protocol is expected to be submitted in this 1st 6 months.

Evaluation and Mode of Examination

Examination will be held at the end of having completed three years of supervised training and having submitted two dissertations. The work could be either clinical, laboratory or combined.

Three papers each of 3 hours duration and 100 marks each. (total 300 marks) would be given . They would include either 10 short essays or 2 long and 6 short essays. In addition, a candidate will have to appear in practical and clinical examination of 350 marks, candidate will have to pass both in theory and practical examination as given below for the two degrees.

Evaluation for DM Hematopathology

Theory

- Paper I : Basic & applied Haematology
 Paper II : Paper on clinical Haematopathology
 Paper III : Advances in clinical Haematopathology

Practical & laboratory examination:

Clinical

- Two short cases (50 Marks)
 Case exercises (25 Marks)
 Spots- Procedures (25 Marks)

Laboratory

- Morphology (100 Marks)
 Long exercise (50 Marks)
 Short exercise (25 Marks)
 Spots-Data analysis (25 Marks)
 Viva Voce (50 Marks)

Patterns of practical examination

Laboratory Haematology

<i>Day 1 (Forenoon)</i>	<i>Day 2</i>
Long exercise (1)	Two short cases
Short exercise (1)	Case exercise (2)
<i>(Afternoon)</i>	
Morphology (10 cases)	Viva Voce
Spots-Data analysis (5 cases)	
Skills procedures (5)	

MEDICAL ONCOLOGY — D M

*Department of Medical Oncology, Institute Rotary Cancer Hospital,
All India Institute of Medical Sciences, New Delhi*

INTRODUCTION

The practice of oncology is in a period of significant change. There is an expansion of new information regarding the molecular and cellular biology, immunology and biochemistry of cancer and a steady increase in our ability to more effectively diagnose and treat human malignancies. 'Medical Oncology' as a specialty has assumed immense importance. Institute Rotary Cancer Hospital, All India Institute of Medical Science is one of the few centers in India that provides the prestigious postgraduate super specialty course-DM Medical Oncology. It is important that the candidates interested in pursuing their career in medical oncology, besides a good clinical acumen, possess a sound understanding of the related basic sciences. They should be able to comprehend the essentials of molecular biology, genetics, signal transduction and immunology and translate the knowledge into clinical practice.

GOAL OF THE PROGRAM

To ensure adequate supply of medical oncology experts who assume leadership role in their fields.

AIMS OF THE PROGRAM

To produce a medical oncologist who:

1. Is capable of providing an excellent patient care
2. Possesses adequate knowledge base (both basic and applied) to effectively interact with medical colleagues in a wide range of disciplines.
3. Is a good researcher
4. Is a competent teacher

OBJECTIVES AND GUIDELINES TO THE CONDUCT OF PROGRAM

It is a 3-year course that imparts intense training to DM candidates into the field of medical oncology and related subjects with adequate exposure to clinical and laboratory based activities.

CLINICAL TRAINING

The objectives of the clinical training are:

1. To develop clinical judgment and technical skills in diagnosis and the total management of patients with neoplastic diseases, with various modalities of treatment individually or in combination
2. To make the student expert in handling all kinds of medical emergencies arising either due to cancer spread or problems related to therapy. The latter include: a) infections secondary to severe neutropenia, leading to respiratory distress/failure, renal insufficiency, hepatic insufficiency, and neurological disturbance, b) hemorrhagic complications, c) electrolyte disturbance, d) other toxicities.
3. To impart full knowledge concerning cancer chemotherapy, hormone therapy, biologics, gene therapy, immune therapy; their mechanism of action, side effects, mode of administration, interrelation with other drugs and their therapeutic effects.
4. To make the candidate familiar with all the modern diagnosis aids including ultrasound, CT scan, NMR, MRI, PET scans, mammography, endoscopy, and radionuclide scans.
5. To make the candidate conversant with the indications and application of blood component therapy, newer antibiotics, newer antifungal and antiviral agents and other supportive measures.
6. To make the candidate fully conversant with and trained in various aspects of high dose chemotherapy and stem cell transplantation (both allogeneic and autologous) including schedule of treatment, indication for the use of growth factors, GVHD prophylaxis and management of various complications including acute and chronic GVHD.
7. To provide an insight into clinical trials (design, data collection, analysis and interpretation of related statistics), cancer epidemiology, preventive and community oncology.
8. To make the candidate understand the psychology of his patients, which is often disturbed with the knowledge that he or she has a cancer. The candidate will be made to learn to understand and tackle these psychological issues with compassion and gentle behaviour.
9. To teach the candidate about effective communication skills and how to impart bad news to the patients.
10. To make them expert in managing the terminally ill patients. They would be given knowledge regarding pain management and other palliative care measures.

GUIDELINES

The candidate works in the department of medical oncology as following

INDOORS POSTING

This may vary from **8 to 12 months**

The candidate is allotted certain beds and he is required to work up patients admitted on those beds. He plans out a diagnostic work up and treatment plan, discusses it with the concerned consultants, presents it on the grand rounds and assumes complete responsibility of the patients during their hospital

stay. He should work in harmony with the ward nurses.

OUT PATIENT DEPARTMENT (OPD) POSTING

Duration is **16 months**. The candidate is posted to **chemotherapy evaluation clinics** and various **specialty clinics** including *breast cancer, gastrointestinal, urology, lymphoma-leukemia, pain evaluation, bone and soft tissue, pediatric tumors, head and neck, gynecology oncology, pulmonary oncology*.

The candidates posted to these clinics work under the supervision of consultants. They are expected to see new as well as follow-up patients so as to plan out the management and assess the therapeutic responses of a particular patient.

DAY CARE AND OPD PROCEDURES (MINOR OT) POSTING

Duration is 4 months. During this posting a candidate is expected to learn skills

- In introducing per cutaneous subclavian, internal jugular, and femoral vein catheters
- Familiarity with different venous access devices likes Hickman catheter, subcutaneous port etc.
- Institution of chemotherapy and supervision of side effects
- Procedures like bone marrow biopsy, liver biopsy, trucut biopsy, lumbar puncture, intrathecal chemotherapy and aspiration of fluids.

BMT UNIT POSTING

Duration is **2 months**. The candidate works under the supervision of concerned consultants and assumes responsibility of managing the patients undergoing high dose chemotherapy.

ELECTIVE POSTING

It is for **6 weeks**. The candidate selects the area of his or her interest, it may be training within the institute or at other specialized centers within or out side India. The candidate is required to seek acceptance from the concerned departments/centers where he wishes to work and also permission from the Chief IRCH.

ANCILLARY POSTING

It will be for 3 months as follows:

- Surgical oncology (3 weeks)
- Radiation oncology (3 weeks)
- Laboratory (4 weeks)
- Rotation to blood bank and nuclear medicine department (1 week each)
- Radiodiagnosis (2 weeks)

LABORATORY TRAINING

The candidate, apart from understanding the value of laboratory tests in a given malignancy must possess the basic knowledge of interpreting the laboratory data and correlating it with clinical data. For this purpose, candidate is posted in various laboratories through laboratory posting or dissertation topic.

- The candidate are posted to various laboratories, some of which are attached to medical oncology itself, such as cytogenetics laboratory, in-vitro tissue culture laboratory. In addition, candidate is posted in immunology, microbiology, HLA and pathology laboratory.
- These postings enable the candidate to understand histopathology, immunopathology, histochemistry, cytopathology, genetics of tumors, their functional properties and modes of spread etc. He is also made familiar with the various types of stem cell mobilization, harvesting, and cryopreservation techniques.
- The candidate is required to learn the basic techniques of tissue culture, cytogenetics, staining and study of peripheral/bone marrow smears, operation of blood cell counter and cell separator machine.

RESEARCH TRAINING

The candidate is introduced to the field of research in medical oncology; both at clinical and laboratory level.

DISSERTATION

The candidate is required to work on **2 projects clinical and laboratory based**. The research proposals are to be submitted within 6 months of joining the course and completed report 6 months before the final exam. Every 6 months the candidate should present the progress report on the thesis work.

The candidate can either design a prospective study or do retrospective analysis related to his thesis work. The candidate should see to it that the study is published in a national or international journal.

Besides the dissertation work, the candidate is encouraged to work on and publish case series and case reports in peer reviewed journals and send papers for presentation to national and international conferences. He is also be encouraged to design new clinical as well as laboratory based protocols, to write research proposals for granting of funds and to establish new laboratory techniques.

TRAINING ORIENTED TOWARDS MAKING THE CANDIDATE AN EXPERT TEACHER

Academic schedule

Integrated teaching program to expose the candidate to various fields of oncology are provided by regular clinico-pathologic conferences, seminars, case discussion sessions, and radiology conferences. Following academic activities are planned through out the year except during summer and winter vacations. The candidate will be encouraged to actively participate in these meetings, carefully listen to the topics, ask questions, critically analyze and give his/her comments and suggestions.

Monday: Teaching program, 8-30 to 9-30AM. Faculty from IRCH and from other departments at AIIMS discusses topics related to basic and clinical oncology, biostatistics, making an effective presentation etc.

Tumor Board, 4-30 to 5-30 PM. By rotation senior resident working with each of the faculty members brings some interesting/difficult case/es for discussion. After taking into consideration view points of various members, a consensus is reached as to the best treatment plan for the patient.

Tuesday: Radioconference, 8-30 to 9-30 AM. The radiographs, CT/MRI/bone scans and GI series of patients seen in the OPD and wards are discussed with the radiologist. If present, serial films are discussed. This helps in diagnosis, staging, prognosis and response evaluation. It is preferable that the senior resident reads the films and then asks for the expert opinion.

Oncopath Conference, 12 noon to 1 PM. The senior residents provide the clinical history of the cases and the histopathology slides are discussed with the expert pathologists.

Wednesday: Journal club/mortality meeting, 8-30 to 9-30 AM. Alternatively journal club and mortality meeting are planned. In the journal club, the senior resident reviews relevant studies published in the latest journals, presents them and critically analyze the design of the study, the results, drawbacks and feasibility of carrying out the study in our set up. In the morality meeting, the treatment course and probable cause of death of the patients expired recently in the IRCH ward is discussed. The senior resident also discusses a related topic in detail.

Thursday: Seminar, 8-30 to 9-30 AM. Candidate presents a given topic and discusses it. He should be able to review the topic critically and make independent observations.

Friday: 8-30 to 9-30 AM. During this session, the candidates present their research proposals and update on their projects. Also case discussions are held, whereby the candidate presents the case history, examination and management plan of the patient.

CONDITIONS FOR CERTIFICATION

The candidate will be guided and judged as regards his/her abilities to provide competent care to his patients through various means like ward rounds, discussions held in OPD/clinics and weekly academic activities. Internal assessment through internal examination held in March and September every year will be done and this record will be made available at the time of final examination.

EXAMINATION

The examination will be conducted in three parts.

1. *Theory paper*

Paper I

Basic science in oncology: Radiation physics, Tumor biology, Biochemistry, Biometry, Immunology and Pharmacology.

Paper II

General oncology, Tumor pathology, Staging, Diagnosis, Radiology, Nuclear medicine.

Paper III

Medical Oncology including chemotherapy, epidemiology, rehabilitation, terminal care, clinical trials and prevention.

2. *Clinical and practical*

Long case 1

Short cases 4

Spotters 4

3. Viva-voce

Grand viva, histopathology, hematology slides, CT scans and X rays.

BOARD OF EXAMINATION

Two internal and two external examiners

Assessment of Candidate

1. Assessment of the three parts of the examination shall be done jointly by the members of the respective board of examiners.
2. Assessment of theory papers will be done individually by each examiner. The average of marks will be taken into consideration
3. A candidate will be declared to have qualified for the DM degree in medical oncology if the candidate has satisfied the members of the respective boards of examiners individually and collectively that he/she had an adequate knowledge in all aspects of the three parts of examination. The candidate is required to score at least 50% of marks in theory separately and 50% of marks in clinical and viva-voce examination taken together.
4. A candidate whose thesis/research work has not been approved or who is unsuccessful in any part of the examination will be followed up as per institute rules.
5. The examination is conducted generally twice a year in the months of May and December.

SYLLABUS

Paper I (Basic Science in Oncology)

1. Cell cycle
2. Pathology, Invasion & Metastasis
3. Etiology of Cancer
 - a. Viral
 - b. Chemotherapy
 - c. Physical
 - d. Hormonal
4. Epidemiology of Cancer
5. Principles of Cancer Management – Surgical Oncology, Radiation Therapy, Chemotherapy, Biologic therapy
6. Pharmacology of Cancer Chemotherapy
7. Clinical trials in cancer

8. Cancer prevention Tobacco related cancer, Diet & Risk reduction Chemopreventive Agents, Hormones
9. Cancer Screening
10. Imaging Techniques of Cancer Diagnosis & Management
11. Specialized techniques of Cancer Diagnosis and Management
12. Vascular Access and Specialised Technique of drug delivery

Paper – II Clinical Oncology (Medical)

1. Cancer of Head and Neck
2. Cancer of Lung and Mediastinum
3. Cancer of Gastro Intestinal Tract
4. Cancer of Genito Urinary System
5. Cancer of the Breast
6. Cancer of Endocrine System
7. Sarcomas of Soft Tissues & Bone
8. Benign & Malignant Mesotheliomas
9. Cancer of skin
10. Malignant Melanoma
11. Neoplasms of CNS
12. Cancers of childhood
13. Lymphomas
14. Leukemias and other Haematological Malignancies
15. Paraneoplastic Syndromes
16. Cancers of unknown primary site
17. A.I.D.S – related malignancies
18. Oncological Emergencies
19. Treatment of Metastatic Cancers
20. Gynaecological Cancers
21. High Dose Chemotherapy & Transplantation

Paper – III (Recent Advances in Oncology)

1. Essentials of Molecular Biology
2. Molecular Biology of Cancer: Oncogenes Cytogenetics
3. Bone Marrow dysfunction in cancer patient
4. Infections in cancer Patients and neutropenic patients
5. Adverse effects of treatment
6. Supportive Care and Quality of Life

7. Rehabilitation of Cancer Patient
8. Newer approaches in cancer treatment
9. Newer drugs in cancer treatment

Periodicals Recommended

<i>Book</i>	<i>Editor</i>
1. Cancer Principles and Practice of Oncology	Vincent T. Devita
2. Principles and Practice of Pediatric Oncology	Philip A. Pizzo
3. Decision Making in Oncology	Bengamin Djubegovic
4. Current Medical Diagnosis and Treatment	Lange Medical Book International edition
5. The Basic Science of Oncology	IanF. Tannock
6. Cancer Treatment	Charles M Haskel
7. Cancer Chemotherapy	Chabner
8. Principles of Internal Medicine	Harrison
9. Text Book of Pediatrics	Nelson
10. Text Book of Oncology	Abeloff and Armitage

Journals

1. Cancer Treatment Review
2. Journals of Pediatric Hematology/Oncology
3. Current Opinion in Oncology
4. The Indian Journal of Cancer
5. The Seminars in Oncology
6. Haematology/Oncology Clinics of North America
7. Medical and Pediatric Clinic of North America
8. Cancer
9. Current Problems in cancer
10. Journal of Clinical Oncology
11. Lancet
12. NEJM (New England Journal of Medicine)
13. Blood
14. British Journal of Hematology
15. Bone Marrow Transplantation
16. Seminars in Hematology

NEONATOLOGY — D M

1. AIM

The aim of the DM Programme is to provide advanced training in Neonatology to produce competent super-specialists who are able to provide clinical care of the highest order to the newborn infants, and serve as future teachers, trainers, researchers and leaders in the field of Neonatology.

2. LEARNING OBJECTIVES

After completing the DM (Neonatology) course, the student will be able to:

1. Analyse neonatal health problems scientifically, taking into account the biological basis as well as the socio-behavioural epidemiology of perinatal-neonatal disease, and advise and implement strategies aimed at prevention of neonatal morbidity and mortality.
2. Provide primary, secondary and tertiary care to all newborn infants including intensive care of the highest standard to the critically sick and the very low birth weight neonates using advanced therapeutic and supportive modalities and skills.
3. Implement a comprehensive follow up and early intervention programme for the 'at risk' newborn infants, and plan, counsel and advise rehabilitation of the neurodevelopmentally challenged infants.
4. Take rational decisions in the face of ethical dilemmas in neonatal-perinatal practice.
5. Exhibit communication skills of a high order and demonstrate compassionate attributes befitting a caring neonatologist.
6. Plan and carry out research in neonatal health in clinical, community and laboratory settings.
7. Teach newborn care to the medical and the nursing students as well as grassroots health functionaries, and develop learning resource materials for them.
8. Plan, establish and manage level II and level III neonatal units independently.
9. Use and maintain the essential neonatal equipment and keep abreast with advances in newborn care technology.

10. Organize newborn care in the community and at the secondary level of health system, and play the assigned role in the national programmes aimed at the health of mothers and their infants.
11. Work as a productive member of the interdisciplinary team consisting of obstetricians, pediatricians, pediatric surgeons, other doctors, nurses, and grassroots functionaries providing care to the pregnant mother, the fetus and the newborn in any setting of health care system.
12. Seek and analyse new literature and information on neonatology, update the concepts, and practise evidence-based neonatology.

3. DURATION

3 years

4. ELIGIBILITY

M.D. Pediatrics or equivalent (including Diplomate of National Board in Pediatrics)

5. SELECTION

5.1 The selection of candidates for the DM neonatology course will be based not only on their knowledge, but also clinical skills and aptitude. The knowledge will be assessed through a Theory Test consisting of multiple choice questions covering neonatology and rest of pediatrics of the level of MD (Pediatrics). The clinical skills and the aptitude will be tested by a Practical Test consisting of clinical cases and a grand viva voce. The weightage of the theory and practical tests will be equal.

5.2 The *distribution* of marks for the selection test will be as follows :-

• Theory Test	50%
– Neonatology	25%
– Rest of Pediatrics	25%
• Practical Test	50%
– Clinical assessment (neonatal cases)	25%
– Grand viva voce	25%

5.3 The theory test will be the screening test. Based on the Theory Test, the topmost candidates equalling three times the number of available seats will be called for the Practical Test.

6. POSTINGS

6.1 Overview

The total period of DM course is 36 months. Of this, at least three fourths (27 months) will be spent in the newborn service, 6 months will be meant for essential rotations in related specialties and the rest 3 months will be apportioned for either optional rotations or for the newborn service.

6.2 Newborn services

The candidates will have at least 27 months of posting in the newborn services at concerned institutions. The candidates must get adequate exposure to neonatal follow up, neonatal emergencies, delivery room care of neonates and acquisition of practical skills (specified in Annexure I).

6.3 Essential Rotations

- Perinatology – obstetrics (Deptt. of Obstetrics-Gynecology) : 2 months
- Neonatal surgery (Deptt of Pediatric Surgery) : 1 months
- Community neonatology : 1 month
- Elective* : 2 months

*The candidates can undertake upto 2 months' elective rotation at the parent or other institutions in the country or abroad at centres approved by the Department.

6.4 Optional rotations

- The departments will have the flexibility of additional rotations for upto 3 months in the above mentioned disciplines or in other relevant areas such as (neonatal cardiology/cardiac surgery, rehabilitation service, genetics perinatal pathology, imaging, anaesthesiology, neonatal ophthalmology, epidemiology/bostatistics, informatics and education technology etc.) depending upon the strength of the disciplines and functional requirements at the concerned institutions. [Under no circumstances however, would the training in neonatal services be of less than 27 months i.e three fourths of the total course].

7. LEARNING OPPORTUNITIES

- Learning in DM neonatology will essentially be self-directed and will take place while working in various areas and through interactions in the rounds.
- *Following minimum formal sessions* are recommended in order to facilitate and supplement the efforts of the faculty and students :
 - Journal club (once in 2 weeks)
 - Perinatal round (once in 2 weeks)
 - Physiology round (once in 2 weeks)
 - Seminar (once in 2 weeks)
 - Clinical case discussion (once a week)
- In addition, depending on the strength of the institutions sessions or imaging, pathology, microbiology, as well as interdepartmental seminars may be undertaken.

8. RESEARCH

- 8.1 The candidates will be required to submit *one thesis* during the course of DM programme. Progress on dissertations will be reviewed every semester and feed back given to the candidates. The

candidate will make at least 3 formal presentations to the Department, namely, (i) Protocol, (ii) Mid- course progress and (iii) Final report. *Thesis will be submitted at least six months before the completion of the course.*

- 8.2 Two papers (pertaining to the thesis or otherwise) for publication in indexed journal(s) before appearing for the final DM examination.
- 8.3 The candidate must attend continuing education symposia, workshops and conferences including meetings of the National Neonatology Forum, workshops neonatal resuscitation and ventilation etc.

9. TEACHING EXPERIENCE

- The candidates will be regularly involved in the teaching of undergraduate medical/nursing students and pediatrics postgraduate students. Their teaching skills will be assessed and shall form part of the internal assessment.

10. ASSESSMENT

10.1 Overview of DM Assessment

- A maximum of 800 marks will be awarded. The candidate must obtain at least 50% (i.e. 400) marks to pass the examination (Table 1).
- Of the 800 marks, 200 marks (25%) will be for the Internal Assessment. The breakup of Internal Assessment marks is shown in Table 2.
- A total of 600 marks, will be assigned to the Final Examination (Theory 300, Practicals 300). It will be essential to pass theory and practical both separately in the Final Examination by securing at least 50% marks in each.

Table 1: Overview of DM Assessment

• Internal assessment	200 marks
Continuous	50
Mid-term examination	125
Teaching, research etc.	25
• Final examination	600 marks
Theory	300
Practical	300
TOTAL	800 marks

10.1 **Internal assessment** [200 marks]

- The outline of internal assessment is shown hereunder.*

- (i) *Continuous assessment* 50 marks
 Consultants' reports, every 6 months;
 (5 such reports, each of 10 marks)

- (ii) *Mid-term examinations* 125 marks
(three such viz., at completion of 6 months, 18 months and 30 months of training, respectively)
- (iii) *Evaluation of research, teaching and managerial abilities* (assessed at two stages viz. at completion of 18 months and 30 months) 25 marks

- Details of time schedule and break-up is shown in Table 2.

Table 2: Schedule and brekup of of internal assessment and respicive marks (in arentheses)

Heading	At completion of how many months of training						Total marks
	6	12	18	24	30	36	
Continuous [50]	*	*	*	*	*		(50)
Mid term examinations [125]	+		+		+		
Practical	(10)		(20)		(20)		(50)
Theory	(15)		(30)		(30)		(75)
Research, teaching & managerial skills			□ (10)		□ (15)		(25)
TOTAL INTERNAL ASSESSMENT MARKS							(200)

NB:

- Continuous assessment will be done on an ongoing basis using a log book covering day to day performance of the candidate. It will be compiled and converted into marks by the faculty every 6 months.
- The scope of curriculum covered in the three mid-term examinations will be decided by the departments beforehand.
- Tools and methods will be developed by the departments to assess research, teaching and managerial skills.

10.2 Final Examination

- 10.2.1 Final assessment will be carried out by two EXTERNAL EXAMINERS and two INTERNAL EXAMINERS. The summary of the examination is shown in Table 3.

Table 3: Summary of final DM Examination

1. Theory		300
Paper I	100	
Paper II	100	
Paper III	100	
2. Practical		300
Long case I	60	
Long case	60	
Short case I	40	
Short case II	40	
OSCE/Spots	40	
Viva Voce	60	

NB: Candidate must pass in theory and practical independently by obtaining at least 150 marks in theory as well as in practicals.

10.2.2 Final Theory Examination

(300 marks)

- This will have three papers of 100 marks each. The broad areas covered in the these papers will be as follows:
 - Paper I Basic sciences as applied to neonatology and perionatology; research methods (100 marks)
 - Paper II Clinical neonatology (100 marks)
 - Paper III Community neonatology; national MCH programmes; allied disciplines such as; neonatal surgery; neurodevelopment follow up, rehabilitation etc. (100 marks)
- Theory examination will consist of structured essay questions with emphasis on problem-solving exercises.

10.2.3 Final Practical Examination

(300 marks)

- Long case I (a neonate receiving intensive care) (60 marks)
- Long case II (60 marks)
- Short case I (40 marks)
- Short case II (a follow up high risk newborn) (40 marks)
- Objective Structured Clinical Examination (OSCE) (40 marks)
or if not possible, spots examination
- Structured Viva Voce (two parts) (60 marks)
 - Patient management problems (20 marks)
 - General viva (including radio- imaging Investigations i.e. ultrasound/CT/MRI records, interpretation of ABGs' neurophysiological records such as BERA, EEG; national programmes, policy (40 marks)

ANNEXURE I

D M (Neonatology) Programme

LIST OF SKILLS

CLINICAL

- Neonatal examination, anthropometry and developmental assessment
- Neonatal resuscitation
- Neonatal ventilation : CPAP, IMV; newer modes of ventilation
- Blood sampling : Capillary, venous, arterial
- Insertion of peripheral venous, umbilical venous and umbilical arterial catheters
- Monitoring : invasive, non-invasive
- Enteral feeding (katori-spoon, gavage, breast)
- Lactation management
- Parenteral nutrition
- Lumbar puncture and ventricular tap
- Placing of 'chest tube'
- Exchange transfusion
- Bed side tests : shake test, sepsis screen, hematocrit, urine examination, CSF examination, Kleihauer technique, Apt test etc.
- Neonatal drug therapy
- Nursery house keeping routines and asepsis procedures
- Universal precautions
- Handling, effective utilization and trouble shooting of neonatal equipment.

COMMUNICATION

- Communication with parents, families and communities

EDUCATION/TRAINING

- Teaching skills: lectures, tutorials
- Participatory and small group learning skill
- Principles of educational objectives, assessment and media
- Preparing learning resource material

SELF-DIRECTED LEARNING

- Learning needs assessment, literature search, evaluating evidence

RESEARCH METHOD

- Framing of research question, designing and conducting study, analyzing and interpreting data and writing a paper.

ANNEXURE II

Contents For D M Neonatology Course

A. BASIC SCIENCES

- Basic genetics
- Fetal and neonatal immunology
- Mechanism of disease
- Applied anatomy and embryology
- Feto-placental physiology
- Neonatal adaptation
- Development and maturation of lungs, respiratory control, lung functions, ventilation, gas exchange, ventilation perfusion
- Physiology and development of cardiovascular system, developmental defects, physiology and hemodynamics of congenital heart disease
- Fetal and intrauterine growth.
- Development and maturation of nervous system, cerebral blood flow, blood brain barrier.
- Fetal and neonatal endocrine physiology
- Developmental pharmacology
- Developmental hematology, bilirubin metabolism
- Renal physiology
- Physiology of gastrointestinal tract, digestion, absorption.
- Electrolyte balance
- Metabolic pathways pertaining to glucose, calcium and magnesium
- Biochemical basis of inborn errors of metabolism

B. GENERAL TOPICS

- Research methodology
- Biostatistics
- Ethics in perinatology/neonatology
- Principles of education (objectives, curriculum, assessment and use of media)
- Computer, informations technology, internet

C. PERINATOLOGY

- Perinatal and neonatal mortality, morbidity, epidemiology

- High risk pregnancy: detection, monitoring and management
- Fetal monitoring, clinical, electronic; invasive, and non-invasive
- Intrapartum monitoring and procedures
- Assessment of fetal risk, and decision for termination of pregnancy
- Diagnosis and management of fetal diseases
- Medical diseases affecting pregnancy and fetus, psychological and ethical considerations
- Fetal interventions
- Fetal origin of adult disease

D. NEONATAL RESUSCITATION E. NEONATAL VENTILATION

F. BLOOD GAS AND ACID BASE DISORDERS

G. NEONATAL ASSESSMENT AND FOLLOW UP

- Assessment of gestation, neonatal behaviour, neonatal reflexes
- Developmental assessment, detection of neuromotor delay, stimulation techniques
- Immunization

H. BODY SYSTEMS

i) RESPIRATORY SYSTEM

- Neonatal airways: physiology, pathology; management
- Pulmonary diseases: Hyaline membrane disease, transient tachypnea, aspiration pneumonia, pulmonary air leak syndromes, pulmonary hemorrhage, developmental defects
- Oxygen therapy and its monitoring
- Pulmonary infections
- Miscellaneous pulmonary disorders

ii) Cardiovascular system

- Fetal circulation, transition from fetal to neonatal physiology
- Examination and interpretation of cardiovascular signs and symptoms
- Special tests and procedures (Echocardiography, angiography)
- Diagnosis and management of congenital heart diseases
- Rhythm disturbances
- Hypertension in neonates
- Shock: pathophysiology, monitoring, management.

iii) Gastrointestinal system

- Disorders of liver and biliary system.

- Bilirubin metabolism
- Neonatal jaundice: diagnosis, monitoring, management, phototherapy, exchange transfusion
- Prolonged hyperbilirubinemia
- Kernicterus
- Congenital malformations
- Necrotising enterocolitis

iv) Nutrition

- Fetal nutrition
- Physiology of lactation
- Breast feeding
- Lactation management, breast milk banking, maternal medications and nursing
- Parenteral nutrition
- Vitamins and micronutrients in newborn health

v) Renal system

- Developmental disorders
- Renal functions
- Fluid and electrolyte management
- Acute renal failure (diagnosis, monitoring, management)

vi) Endocrine and metabolism

- Glucose metabolism, hypoglycemia, hyperglycemia
- Calcium disorders
- Magnesium disorders
- Thyroid disorders
- Adrenal disorders
- Ambiguous genitalia
- Inborn errors of metabolism

vii) Hematology

- Physiology
- Anemia
- Polycythemia
- Bleeding and coagulation disorders
- Rh hemolytic disease

viii) Neurology

- Clinical neurological assessment
- EEG, ultrasonography, CT scan
- Neonatal seizures
- Intracranial hemorrhage
- Brain imaging
- Hypoxic ischemic encephalopathy
- Neuro-muscular disorders
- Degenerative diseases
- CNS malformation

ix) Surgery and orthopedics

- Diagnosis of neonatal surgical conditions
- Pre and post operative care
- Neonatal anesthesia
- Metabolic changes during anesthesia and surgery
- Orthopedic problems

x) Neonatal infections

- Intrauterine infections
- Superficial infections
- Diarrhea
- Septicemia
- Meningitis
- Osteomyelitis and arthritis
- Pneumonias
- Perinatal HIV
- Miscellaneous infective disorders including HBV and candidemia

xi) Neonatal imaging

- X-rays, ultrasound, MRI, CT Scan etc.

xii) Neonatal ophthalmology

- Developmental aspects
- Retinopathy of prematurity
- Sequelae of perinatal infections

xii) Neonatal dermatology

I. TRANSPORT OF NEONATES K. NEONATAL PROCEDURES

K. DEVELOPMENTAL ASSESSMENT AND FOLLOW UP

xix) Organization of neonatal care

- Community neonatology
- Vital statistics, health system;
- Causes of neonatal, perinatal death
- Neonatal care priorities
- Care at secondary level of care
- Care at primary health centre
- Role of different health functionaries
- National programmes
- National Neonatology Forum

NEPHROLOGY — D M

AIMS AND OBJECTIVES

The programme aims at training a physician in the specialty of Nephrology encompassing the related knowledge, skills, research methodology and attitudes which will enable him/her to function as an independent clinician/consultant, a teacher or a research scientist.

During the period of training the candidate is expected

1. To acquaint himself/herself with the past and current literature on relevant aspects of basic, investigative and clinical nephrology.
2. To acquire performance skills for diagnostic and therapeutic procedures and interventions.
3. To diagnose, plan and interpret investigations and treat various acute and chronic kidney ailments by relevant therapeutic methods.
4. To identify, frame and carry out research proposals in the specialty.
5. To acquire thorough knowledge of internal medicine and allied general and clinical disciplines to ensure appropriate and timely referrals.
6. To acquaint with relevant education delivery system to be able to function as a health educator.

ELIGIBILITY CRITERIA FOR ENTRY TO D M

MD Internal Medicine

CURRICULUM

1. Training will be exclusively on whole time in-service basis on the residency pattern.
2. The programme will impart a sound training in the diagnosis and management of patients with renal disorders. During the training period, the candidate shall take part in all the activities of the department including inpatient and outpatient nephrology care, laboratory and investigative work up, lectures, seminars, conferences, group discussions and various other clinical and teaching

assignments. The candidate will work as a member of the renal team and will be given the responsibility of investigation and therapeutic care of all patients under the direct guidance of the consultants in Nephrology. He will be first on call for routine and emergency renal consultants.

Each candidate will go through the following rotations in various areas/subspecialties of nephrology during 3 years of training in Nephrology.

- | | | |
|-----|---|---------|
| (1) | Indoor services/Out patient Clinics/Consultations | 1 year |
| (2) | Dialysis | 6 month |
| (3) | Renal transplantation | 6 month |

The candidate would be involved in the pre-transplant, immediate post-transplant and late post-transplant medical management of renal transplant recipients and the donors including immunosuppressive therapy, immunological monitoring, diagnostic and therapeutic interventions in patients with allograft dysfunction including renal allograft biopsy and ultrasound evaluation of the allograft.

- | | | |
|-----|--------------------------|---------|
| (4) | Critical Care Nephrology | 3 month |
|-----|--------------------------|---------|

Intensive care nephrology including management of electrolyte and acid base problems, CRRT and dialysis of critically ill patients with multiorgan failure.

- | | | |
|-----|---------------------------|---------|
| (5) | Interventional Nephrology | 3 month |
|-----|---------------------------|---------|

Various procedures in nephrology including renal ultrasonography, renal biopsy, insertion of peritoneal dialysis catheter and hemodialysis, vascular access and monitoring.

- | | | |
|-----|------------------|---------|
| (6) | Research Posting | 6 month |
|-----|------------------|---------|

During this period, the candidate will complete his on-going research projects and would also familiarize himself/herself with research methodologies with laboratory techniques being carried out in HLA lab, immunofluorescence and EM laboratories and also with routine laboratory investigations being done in the Renal Lab.

Clinical training schedule will include the following:

- Bedside rounds - daily
- Mortality meeting - once a week
- Seminar - once in two weeks
- Grand rounds - once a week
- Journal club - once in two weeks
- Renal histology conference - once in two weeks
- Clinical case discussion - once a week
- Transplant meeting - once a week
- Nephro-urology conference - once a week
- Nephro-radiology conference - once a week
- Out patient nephrology care including renal transplant clinic

Didactic Lectures

A minimum of 15-20 lectures/year covering the recent advances in all aspects of renal diseases would be delivered by consultant faculty. In addition, candidates will be required to attend the complete, short term basic and clinical courses on

1. Bio-statistics
2. Research methodology and experimental lab medicine relevant to Nephrology
3. Use of Computers in Medicine
4. Bio ethics, ethical issues in transplantation including “Human Organ Transplant Act”

Interventional Procedures

A candidate will be required to have achieved proficiency in performing and supervising hemodialysis, peritoneal dialysis and renal biopsies. He would be expected to have performed a minimum of 50 renal biopsies, 300 hemodialysis including CVVHD, CRRT and 50 peritoneal dialysis. The candidate would be expected to involve and be trained in all aspects of CAPD programme. The candidate would also be expected to have inserted at least 50 internal jugular, 50 femoral and 50 subclavian vascular access catheters. The candidate would maintain record of all the procedures/ interventions in a log book, which would be certified by the Head of the department. A proficiency certificate from the head of the department regarding the clinical competence and skillful performance of procedures by the candidate will be necessary before he would be allowed to appear in the examination. Six monthly internal assessment would be done to monitor and evaluate the training in various areas/ subspecialties of Nephrology.

Investigative work-up

The candidate is expected to perform routine urine examination and ultrasonography. In addition he/she must familiarize himself/herself with the following investigations:

Laboratory:

- Electrolyte and acid base analysis
- Renal function tests
- Auto analyzer functioning
- Renal pathology interpretation including immuno-fluorescence and electron microscopy.

Radiological:

- Intravenous urography
- Micturating cystourethrography
- Digital subtraction angiography
- Selective renal angiography and interventional angioplasty and stenting
- Selective renal venography
- Doppler studies
- Antegrade and retrograde pyelography

- CT imaging
- Magnetic resonance imaging

Nuclear Medicine:

- Various renal isotope imaging and functional techniques
- Urodynamic studies

Microbiology:

- Viral, Bacterial and fungal cultures, Serological and PCR techniques

Immunological test:

- ANCA, ANA, anti DsDNA, complement, anti GBM ab, cryoglobulin, immunoelectrophoresis

Tissue typing:

- Cross match, serological typing, molecular HLA typing, PRA

Renal function testing

- Renal plasma flow, GRF
- Renal concentrating, diluting capacity
- Micro albuminuria
- Proteinuria measurement
- Urinary acidification
- Renal sodium and potassium handling

Research

Each candidate will be required to undertake research under the guidance of the consultants. They will be required to submit a research plan within 6 months after joining the course and submit a dissertation not later than 2 years after joining the course. In addition the candidate will participate in all the departmental research activities.

SYLLABUS

Applied basic sciences knowledge relevant to the field of nephrology including electrolyte and acid base disorders.

Investigative techniques, selection and interpretation of results

Pathogenesis of renal diseases and renal histopathology

Diseases of the urinary tract (glomerular diseases urinary tract infection, tubulointerstitial diseases, inherited diseases, toxic nephropathies, systemic diseases with renal involvement, renal stone disease, urinary tract obstruction, vascular diseases of kidney, hypertension, neoplasia etc)

Renal failure (diagnosis and medical management)

Principles and practice of dialysis

Renal transplantation

Recent advances in nephrology

Biostatistics and clinical epidemiology

Ethics, psychosocial, economics of management of renal diseases, human organ transplant act and medicolegal aspects of transplantation.

SUGGESTED BOOKS AND JOURNALS

Following books and journals are suggested for reading. Latest edition should be made available in central/departmental library.

<i>Book</i>	<i>Editor</i>
1. The Kidney	Brenner and Rector
2. Diseases of kidney and urinary tract	Schrier and Gottschalk
3. Heptinstall's Pathology of the kidney	J Charles Jennets
4. Hand book of dialysis	Daugirdas
5. Kidney Transplantation	Peter Morris
6. Oxford Text Book of Nephrology	Alex davision, Stewart Cameron et al
7. Massry and Glassock's Text Book of Nephrology	Saul G Massry and RJ Glassock
8. The Kidney: Physiology and Pathophysiology	DW Seldin and G Giebisch
9. Essential Atlas of Nephrology	RW Schier
10. Immunological Renal Diseases	EG Neilson and WG Couser

Journals

1. American Journal of Nephrology
2. Kidney International
3. American Journal of Kidney Diseases
4. Nephrology Dialysis and Transplantation
5. Journal of American Society of Nephrology
6. Seminars' in Nephrology
7. Indian Journal of Nephrology
8. Electronic edition of Uptodate in Nephrology and Hypertension
9. Current opinion in Nephrology and Hypertension
10. New England J of Medicine
11. New England J of Medine
12. Lancet

EXAMINATION SYSTEM

Dissertation evaluation: The dissertation submitted by the candidate will be evaluated by two external examiners and would need to be approved before the candidate is allowed to appear in the theory examination.

Written examination: There will be 3 papers; each of 3 hours duration carrying 100 marks each. Each paper shall consist of ten short notes of 10 marks each.

Paper I : basic Sciences as applicable to nephrology

Paper II : Clinical Nephrology including Pathology, pathophysiology and therapeutic aspects.

Paper III : Recent advances in nephrology

Clinical examination: There would be four examiners. These would include two internal (one head of department and the other by rotation) and two external examiners. There would two short and one long clinical case. Candidate would also be assessed on histopathology slides, radiological investigations and oral viva-voce.

The candidate must pass separately in theory (pass percentage – 40%), practical (pass percentage – 50%) and in aggregate of the two (pass percentage – 50%)

NEURO-ANAESTHESIOLOGY — D M

BASIC SCIENCES AND PRINCIPLES OF NEURO-ANAESTHESIA, NEUROINTENSIVE CARE AND PAIN MANAGEMENT

- i) **Anatomy** - Gross and applied anatomy of the central and autonomic nervous system.
- ii) **Physiology** - This would include brain, spinal cord cerebrospinal fluid, cerebral blood flow, mechanism of transmission of pain in different acute and chronic pain conditions, cardio-respiratory physiology in patients with neurologic and neurosurgical diseases, and endocrine function of the pituitary and pineal gland. Revision of cardiovascular, respiratory and neuro muscular functions.
- iii) **Pharmacology** - This would include drugs affecting the functions of brain, spinal cord, CSF and cerebral blood flow and action of drugs on transmission of different stimuli, including pain, and pharmacology of drugs used in neuro intensive care for management of both cardio-respiratory dysfunctions and brain protection.
- iv) **Monitoring** - This would include indication, technique and interpretation of different types of monitoring devices.
- v) **Fluid-electrolyte and acid** - Base disturbance in general with special emphasis on neurosurgical and neurological patients including patients with stroke, subarachnoid haemorrhage, patients with acid-base disturbances. Management of fluid and electrolytes therapy in Diabetes insipidus and SIADH and various nephrologic disorders.
- vi) **Temperature regulation** - In paediatric neurosurgical/neurological patients and use of hypothermia in head injured patients and during surgery.
- vii) **Nutritional considerations** - in neurosurgical and neurological patients requiring prolonged intensive care management. Evaluation of nutrition and complications of these therapy.
- viii) **Principle of airway management** - The type of airway the patient requires, when to intubate, how to maintain the patency of airway for a long period, when to extubate, indications management and complication of tracheostomy.

- ix) **Principles of ventilatory therapy** - What type of ventilation the patient requires, care of the patient during ventilatory care, prevention and treatment of complications during ventilatory therapy, when and how to wean the patients from ventilator.
- x) **Principles of cardiac support** - Care of the arterial pressure, treatment of arrhythmia, management of different types of heart failure and treatment of cardiac arrest.
- xi) **Basic guideline for establishing Neuro ICU** - Arrangement of beds, monitoring systems, airconditioning, its administration aspects and infection control.

CLINICAL ASPECTS OF NEUROANAESTHESIA, INTENSIVE CARE AND PAIN MANAGEMENT

- i) Anaesthetic problems related to raised intracranial pressure either due to space-occupying lesions or due to hydrocephalus. Anaesthetic and post-operative management of such patients.
- ii) Perioperative anaesthetic problems of pituitary tumours, craniopharyngeoma and other endocrine disorders of neuro-surgical origin. Management of patients with pituitary apoplexy, hypothalamic disorders, diabetes insipidus and SIADH.
- iii) Anaesthetic management of vascular tumours like meningiomas, aneurysms and arteriovenous malformations. Control of haemodynamic responses, control of ICP, care during excessive bleeding and care of patients in presence of ischaemia.
- iv) Management of patients undergoing cervical spine surgery.
- v) Paediatric anaesthesia – Congenital hydrocephalus, encephalocele, meningomyelocele, craniosynostosis and other congenital deformities and brain tumours.
- vi) Anaesthetic management of posterior fossa lesions, like midline tumours, C-P-angle tumours, meningioma. The challenges of different abnormal positions like (prone, park bench and sitting).
- vii) Anaesthetic management of patients with head trauma and polytrauma patients. Management of these patients with full stomach cervical spine and chest injury.
- viii) Neuroradiological procedures – Anaesthesia for myelogram, angiogram, intervention neuroradiology and MRI.
- ix) Intensive care of post operative neurosurgical patients like head injury, C-P- angle tumour, vascular lesions and patients who deteriorated during the postoperative period. Intensive care of neurological patients like, myasthenia gravis, ascending polyneuritis, encephalitis, stroke, status epilepticus etc.
- x) Infection control in neuro ICU and neuro operation theatre, sterilization of anaesthetic equipments, monitors, ventilators circuits and intensive care equipments.
- xi) Management of patients with trigeminal neuralgia, causalgia, myofascial pain and cancer pains.
- xii) Assessment for brain death.

RECENT ADVANCES AND EMERGENCY MANAGEMENT

- i) Emergency management of patients with raised intracranial pressure, head injured patients and patients with polytrauma.
- ii) Management of patients with haemorrhagic shock, airway problems and ventilatory failure.

-
- iii) Management of patients with stroke, myasthenic crisis or cholinergic crisis and other neurologic diseases with cardio-respiratory distress or failure.
 - iv) Barbiturate or diazepam coma for patients with status epilepticus or management of patients with malignant intracranial hypertension.
 - v) Hypotensive anaesthetic techniques to control excessive blood loss and at the same time preserve the neurologic functions.
 - vi) Hypothermia and cardio-pulmonary bypass for patients with giant aneurysm.
 - vii) Institution and management of hypothermia to control increased intracranial pressure in patients with head injury.

 - viii) Brain protective measures during management of patients with subarachnoid haemorrhage or during and following aneurysmal clipping.
 - ix) Role of different therapeutic modalities like exchange transfusion or plasmapheresis for treatment of patients with myasthenia or polyneuritis.
 - x) Detailed knowledge on evoked potentials, extracranial doppler, ultra-sound, cerebral blood flow measurement techniques and newer methods of imaging to assess brain functions e.g. PET scan.
 - xi) Anaesthesia for awake craniotomies for patients with epilepsy.
 - xii) Anaesthetic management of patients with extensive skull base surgery.
 - xiii) Pre-op, intra-op and post-operative care of patients with carotid artery stenosis for carotid endarterectomy.
 - xiv) Indication and technique of selective neurectomy or cordotomy for intractable pain of any origin.

NEUROLOGY — D M

1. PREAMBLE

D M (Neurology) course is designed to train candidates in the principles and practice of Neurology to equip them to function as faculty/consultants in Neurology.

2. ADMISSION REQUIREMENTS

For admission to D M (Neurology) course, a candidate is required to possess MD/DNB degree either in Medicine or in Paediatrics of an Institute/University recognized by the Medical Council of India.

3. DURATION OF THE COURSE

Three academic years.

4. METHOD OF SELECTION

The selection of candidates for admission to D M (Neurology) course is to be made on the basis of an entrance examination both in theory and clinical assessment held by the Institute /University. The selection should be based on merit only.

5. AIMS AND OBJECTS OF THE COURSE

The aim of the course is to impart thorough and comprehensive training to the candidate in the various aspects of the specialty to enable him:

1. to function as Faculty/consultants in the specialty
2. to plan and set up independent Neurology Unit catering to clinical and investigative Neurology
3. to carry out and help in conducting applied research in Neurosciences.

6.1. TEACHING METHODS

During the period of training the candidates follow in-service training-cum-residency programme. He/she works as a Senior Resident and is given gradually increasing responsibility in decision making

process in the clinical and investigative aspects of Neurology and its allied specialties such as Neuroanatomy, Neuropsychiatry, Neuropathology, Neurophysiology, Neurochemistry, Neuroradiology, Neuroanaesthesiology, Neurorehabilitation and Neurosurgery.

The day-to-day work of the trainees is supervised by the Consultants of the department of Neurology. The posting is so organized that the trainee gets posted in various areas of the department like OPD, wards, laboratories etc. He/She participates in the consultation service provided by the department to the Institute.

Besides in-service activities a programme of bedside demonstrations, seminars, tutorials, group discussion, workshops, journal clubs and lectures is also organized.

6.2. TEACHING PROGRAMME

The following teaching schedule is prescribed for the course:

The Outpatient service	- 3 days a week
Major ward rounds	- 3 days a week
D M Seminars	- Once a week
Journal club	- Once a week
Neuroradiology (teaching session)	- Once a week
EEG/EMG etc.	- Once a week

Teaching of M D Medicine, Psychiatry, Physiology, Rehabilitation Medicine & Pediatrics residents by the D M students if available, is part of the training.

Neurosurgery

During the Neurosurgery posting which is for one month, the candidate is required to attend all the operations and see for himself/herself, the surgical techniques. Postoperative care and complications and selection of cases for surgery are also taught.

Neuroradiology

The trainee is made conversant with the technique and interpretation of carotid/vertebral angiography, pneumoencephalography, Myelography, CT scan and MRI scan. All these investigations are taught under the guidance of a neuroradiologist during one month. Neuroradiology investigations are conducted every day in the Radiology Department.

1. Regular Neuroradiology posting - 1 month
2. Weekly sessions - once a week

Neuropathology

Brain cutting sessions are held once a week. During the one month posting in the Neuropathology, the candidate is imparted training in special staining procedures and interpretations of the histopathological sections.

Neurophysiology

The resident is imparted training in the technique of application of EEG/EMG/evoked response electrodes. He/She learns to detect various types of artifacts in the EEG and evoked response results. He also learns the handling of EEG/EMG and evoked response machines, under the guidance of technical assistant and the consultants. During the first year of the course, training is imparted in the interpretations of nerve conduction studies, EMG, evoked response and ultrasound studies. He/she is taught the interpretation of EEG records and reports under the guidance of senior colleagues and consultants in the beginning and independently in the second year of training.

The trainee is made well conversant with each and every aspect of known knowledge about Neuroanatomy, Neurophysiology, Neurochemistry, Neuroradiology, Neuropharmacology and Applied Neurology by the end of two year training. Related neuropathology and neurosurgery is also taught through bed-sides, teaching rounds lectures, seminars and group discussions.

Neuropsychiatry

One month posting in the Psychiatry department.

7. PERIOD OF POSTINGS IN VARIOUS UNITS, DIVISION/ DEPARTMENTS

The trainee will be posted in different specialities as follows:

Neurology	- 2 yrs.
Clinical Neurophysiology	- 4 months
Neurosurgery	- 1 month
Neuropathology	- 1 month
Neuroradiology	- 1 month
Neuropsychiatry	- 1 month
Research Exp.	- 1 month (optional)
Neuro. Anaesthesiology	- 15 days
Elective posting	- 2½ months

8. ASSESSMENT

Regular two internal assessment both in theory and clinical should be made for every candidate. Internal assessment will be made in day-to-day work of the trainee who involves patients' care, learning bedside case presentation and research.

Research

The trainee shall be required to undertake research and write papers under the guidance of consultants.

The candidates will have to submit a proposal/topic for project work within three months of the joining of the course. The work period for the project will for 1½ – 2 years. Papers from the project should be accepted for publication in an indexed journal. Another article as the first author should also be

submitted for publication in an indexed journal before the candidate appears in the final D.M. Neurology Examination.

The candidate whose project/research work has not been accepted may be permitted to re-submit within not less than 6 months and not more than one year after rejection.

9. FINAL EXAMINATION

Eligibility: The candidate will be allowed to appear after three years of training.

Board of examiners: Neurologists with minimum of 8 years of teaching experience in the specialty.

Theory papers: There shall be three theory papers with the following titles:

1. Basic sciences as related to Neurology
2. Clinical Neurology
3. Investigative and recent advances in Neurology

Clinical, Practical and viva voce: One long case and two short cases are given to the candidates and the discussion thereon lasts 30-40 minutes in each case. Additional spots/cases also may be shown. The candidates are also given EEG, pathology specimens, histology slides and X-rays to be interpreted. Viva is also held. Two examinations are held each year in the months of May and December. The examination should last for 2 days.

10. NEUROLOGY CURRICULUM

- a) Every institution undertaking post-graduate training programme shall set up a curriculum Committee under the Chairmanship of the HOD, which shall work out the details of the training programme in their department in consultation with other departmental faculty staff and also co-ordinate and monitor the implementation of this programme. The training programme shall be updated as and when required.
- b) Post-graduate students shall maintain a Log Book of the work assigned to them.

NEURO-RADIOLOGY — D M

Eligibility : M D in Radiology or its' equivalent from a recognized institution.

Upper Age Limit : 35 years.

Duration of the Course : Three years.

SELECTION CRITERIA

- a) All India advertisement.
- b) Screening of application for compliance of basic qualification & career grading.
- c) Objective test for grading aptitude & merit. (90 minute's examination, 100 multiple choice questions).
- d) Departmental interview for assessment of past performance, curricular ability to imbibe training & interactive abilities.
- e) Final interview by institutional board headed by the Director.

INSTRUCTIONAL OBJECTIVES

The D M course in Neuroradiology is targeted to rationalising the candidates' clinical acumen and analytical abilities so as to make him capable of devising appropriate action plan for executing all types of neuroradiological procedures. On completion of the course the candidate should be capable of delivering highest quality of patient care, be a competent and inspiring teacher, and be able to pursue both clinical and experimental research in this field.

(i) Patient Care

At the end of training the candidate should be able to comprehend & supplement the clinical assessment of the status of patients brought to his/her care, before undertaking any neuroradiological procedure. Therefore the candidate should be trained for a period of three to four months, in basic clinical neurological examination methods, by rotational posting in Neurology & Neurosurgery ward floors. He/she should be trained to tailor & independently execute the desired neuroradiological procedures, with assistance, wherever necessary. The scope of the training should include all invasive and non-invasive neuroradiological

procedures, including neurointervention. In addition he/she should continue to improve his expertise to interpret radiological examinations of body systems other than CNS during the tenure of this course.

(ii) Research

Learning the art of research methodologies and its' implications is an important aspect of superspecialty courses. A candidate completing DM course should be well versed with such methodologies by being exposed to designing and carrying out two projects during the course & make all efforts to publish them in recognised journals.

(iii) Teaching

As a senior resident (all D M candidates are deemed senior residents), the candidate will undertake undergraduate and postgraduate teaching assignments of the department, both in form of didactic lectures and practical demonstrations.

In order to achieve the above objectives, he should be given ample opportunity to acquire thorough knowledge of basic sciences as applicable to neuroradiology, such as neuro-anatomy including embryology, basics of neuro-physiology and pharmacology, neuropathology, neurochemistry, neurobiology, pharmacology, immunology etc.

SYLLABUS

Part - I

Basic Sciences:

1. *Anatomy*
 - a) Embryology of the brain, spinal cord and their vascular system including to aorta and brachiocephalic vessels.
 - b) Basic and correlative anatomy of brain, spinal cord, cranial nerves, peripheral nervous system and pathways for special senses.
 - c) Blood supply of the brain and spinal cord with special reference to functional vascular anatomy.
 - d) Embryology and anatomy of skull, face, head and neck
 - e) Anatomy of musculoskeletal system relevant to diseases of nervous system & head & neck.
2. *Physiology*
 - a) Basic concepts and applied neurophysiology relating to nerve conduction, brain and spinal cord function.
 - b) Basic of haemodynamics, autoregulation, homeostasis, cerebral and spinal cord blood flow, blood-brain, blood-CSF, blood-meningeal and blood-choroid barriers.
 - c) CSF flow dynamics & interplay of haemodynamics & hydrodynamics in CNS, Intracranial pressure equilibrium.
 - d) Basics of perception of senses including special senses, functions of the hypothalamo-pituitary axis, pyramidal & extrapyramidal systems etc.

- e) Monitoring- A brief review of cardiorespiratory and electrophysiological monitoring including SEP monitoring should be an essential part of the syllabus. Principles governing fluid-electrolyte, acid-base balance, systemic and intracranial pressure monitoring, airway management as well as cardiac support should also be an integral part of the curriculum.
- f) Coagulation & related physiology of haemostasis, thrombosis etc.

PATHOLOGY AND MICROBIOLOGY

- a) General and specific neuropathology of neural neoplasms, infections & infestations, degeneration, demyelination & dysmyelination, trauma & its' sequelae, etc. General orientation of applications of electron microscopy, bacteriology, parasitology and virology in these areas.
- b) Neurovascular pathology (with special emphasis on endothelial biology & genetics).
- c) Pathology of congenital malformations, neonatal and perinatal CNS disorders.
- d) Genetic and metabolic disorders of CNS.

BIOCHEMISTRY AND PHARMACOLOGY

- a) Applied neuro-chemistry in relation to neuroradiology.
- b) Pharmacology of drug action in relation to neuroradiology.
- c) Contrast media.
- d) Antihypertensive, antiplatelets and anticoagulants.
- e) Vasodilators and vasoconstrictors.
- f) Embolic agents.
- g) Thrombolytic agents.
- h) Anaesthetic and analgesics with respect to neuroimaging and interventions.

PHYSICAL PRINCIPLES & INSTRUMENTATION IN IMAGING

- a) Image intensifier and T.V.
- b) Tomography.
- c) Angiography and digital subtraction angiography with recent advances.
- d) CT and recent advancements in CT.
- e) Ultrasound, Doppler and colour Doppler ultrasound.
- f) MRI, MRA, spectroscopy and functional MRI, EPI etc.
- g) Radionuclide studies in CNS, SPECT and PET.
- h) PACS and computers in Radiology with special emphasis on image database generation, auditing & conferencing.
- i) Planning of department & selection of equipment for the department.

- j) Patient monitoring equipments & life support systems in neuroimaging & intervention.
- k) Catheters and Biomaterials used in Interventional radiology.
- l) Radiation Protection devices with special emphasis on protection during neurointervention.

STEREOTACTIC RADIOTHERAPY AND STEREOTACTIC PROCEDURES

- a) Principle, theory and practice of stereotactic Radiotherapy using X-ray source (X-knife) and cobalt source (Gamma-knife).
- b) Principle, theory and practice of stereotactic procedures on brain, spine and spinal cord.

EPIDEMIOLOGY AND BIOSTATISTICS IN NEURORADIOLOGY

Part II

Clinical Sciences

1. Neuroradiology: Principle & practice of clinical and applied neuroradiology including Paediatric Neuroradiology, Head and Neck Radiology, Non-invasive Vascular Imaging, Neuro-sonography, Ophthalmic and Otorhinolaryngologic radiology.
2. Interventional Neuroradiology - Principles and practice of Interventional Neuroradiology.
3. Neurology, Neuro-ophthalmology, Neuro-otorhinolaryngology: Principles, theory and practices as related to Neuroimaging & Intervention.
4. Neurosurgery: Basic principles and common problems in neurosurgery.
5. Recent advances and emergency management in neuroradiology.
6. Experimental Neuroradiology.

Training Programme

This training programme is aimed mainly to give basic understanding of clinical problems in neurosciences and how to solve these problems by intelligent use of clinical findings and imaging. The training programme should be so structured that the candidates are exposed to graduated & closely supervised practical experience in the department of Neuroradiology and related departments. Candidates will participate in all the academic activities of the department, which will include lectures, seminars, journal clubs, clinico-radiological meetings, film-reading sessions, neuropathology rounds, besides actively participating in interventional & experimental neuroradiology work and other duties assigned to them. They will also actively participate in undergraduate teaching schedule of the department.

First year: Basics of clinical Neurosciences & basic sciences related to Neuroradiology:

1. Basics of Clinical Neuroradiology (ten months)
During this period the candidate will gain familiarity with basic neuroradiological imaging including conventional neuroimaging, neurosonography, routine & colour doppler imaging, CT, basics of neuro MRI, basic catheterization techniques and introduction to interventional techniques. Candidates

should also be familiarised with research methods, biostatistics, elements of health economics, departmental administration management (12 sessions 1.5 to 2 hours each) etc. through select lecture modules.

2. **Basics of Neurology and Neurophysiology (one months)**
The candidate should be included in neurology programme and will function as a resident there under head of the department of Neurology. Familiarisation with clinical neurology, neurophysiology and management of critically ill patients should be acquired during this posting.
3. **Basics of Clinical Neurosurgery (one months)**
The candidate should be included in neurosurgical training programme and will function as a resident there under the head of the department of Neurosurgery. Candidate will be required to gain familiarity with common neurosurgical problems, their pre- and post-operative evaluation, operative techniques, post-operative and critical care management and follow up.
4. **Basic sciences related to Neuroradiology - Orientation in these complements as per part-I of the syllabus to be covered by lecture schedules in consultation with departments of Anatomy, Physiology, Biochemistry, Pharmacology etc.**

Second year: Clinical Neuroradiology, research and other allied speciality training.

1. **Clinical Neuroradiology - candidate gets further experience in holistic neuroradiological evaluation of the patient including all modalities of imaging, interpretation, pre and post procedure work up of interventional procedures and care of the patient. Every candidate will perform emergency duties. He will be on call in rotation for such neuroradiologic management of emergency cases as would be required by the on duty faculty of Neurology, Neurosurgery and other units. He would be guided for these procedures by the on duty faculty of neuroradiology.**
2. **Neuropathology (2 weeks) - posting in department of Pathology for the study of technical, practical and interpretative aspects of neuropathology under the supervision of head of the department.**
3. **Neuroanaesthesia and Emergency Management (2 weeks) - Posting in department of Anaesthesia to acquaint with basic principles of neuroanaesthesia with emphasis on cerebral protection, neuroleptanalgesia, intensive care in neuro-ICU and critical care management under the supervision of Head of the department.**
4. **Research - Apart from the clinical responsibility, the candidate will have to undertake two elective research projects either clinical, animal or experimental work with a formal protocol, under the supervision of faculty(s). He will be required to submit dissertations based on his work to a committee of faculty of the department, chaired by the head of the department within 3 months of completion of the project, which shall be completed within 2½ years of registration into the course or 6 months prior to completion of the course. The same should be forwarded to the Dean, academic affairs, so as to comply with the basic requirement for completion of training.**
5. **Visit to another centre - Since centres of excellence for promoting this discipline is few & far between in the country, the candidate may be supported for travel to a pre-eminent institution to acquaint himself with trends & practices in this field at that institution, particularly in areas deficient in the parent institution. The duration of this visit may not exceed three months and should be scheduled for the later half of second year or early third year of training.**

Third year: Clinical Neuroradiology and interventional Neuroradiology (12 months)

During the final year candidates will function in a senior capacity and will be involved in the teaching and training programmes for the juniors. He will carry out and report independently on the various modalities of neuroimaging in addition to assuming the full clinical responsibilities. The candidate at this stage will be given responsibility to assist major interventional neuroradiological procedures and to independently perform minor interventional and related procedures.

A logbook will be maintained by the candidate, who would submit the list of imaging, interventional and patient care activities conducted during his training period. The candidate would be deemed familiar with a given procedure if he has assisted a faculty member for the procedure, performed at least two such procedures independently and has effectively provided guidance to a junior resident. In order to monitor his/her progress during the course, a logbook could be maintained by the candidate, updated periodically and countersigned by the faculty.

Following list gives the minimum number & variety of procedures to be carried out independently by the candidates.

1. Neuro-imaging

i. Ultrasound

a. Neurosonography	50
b. Transcranial Doppler	50
c. Carotid Doppler	100

ii. CT

a. Cranial and spinal CT	300
b. Temporal bone imaging	25
c. Imaging of air sinus	25
d. Orbit	50
e. Head and neck	50
f. CT angio, 3D imaging	variable

iii. MR

a. Cranial	200
b. Spinal	200
c. Head & neck, temporal bone, orbit	50
d. Examination by fast sequence	100
e. MR angio	100
f. CV junction	25

iv. Digital subtraction angiogram

a. Four vessel angiogram	200
b. Spinal angiogram	5

- | | |
|--|----|
| c. Aortogram, Head neck angiography | 50 |
| d. Super selective angiogram | 10 |
| 2. Neurointervention | |
| a. Minor vascular interventions | 10 |
| b. Assist major vascular interventions | 50 |
| c. Non vascular interventions (CT/US) | 20 |

Research & Publication: The candidate will be initiated into the field of medical research and scientific publications relevant to neuroradiology. The importance of designing appropriate methodology and data collection by making use of proformas and its use in identification of the crucial hospital as well as community based problems should be stressed. Clinical and experimental research oriented to understand, analyse and improve upon the scientific knowledge pertaining to this discipline should be the aim of this exercise as well as appreciation of ethical issues involved in human and animal research. He/she will be encouraged to publish such data from the research, in recognised journals in the last year of training.

Teaching: As a senior resident (all DM candidates are deemed senior residents), the candidate will undertake undergraduate and postgraduate teaching assignments of the department, both in form of didactic lectures and practical demonstrations. Obligatory responsibilities include regular journal reviews, case reviews and case presentation to peer group. This would include conducting clinico-neuroradiological conferences at-least twice a week.

ASSESSMENT SYSTEM FOR DM NEURORADIOLOGY

The assessment of candidates will be a continuous process. Each candidate will be required to maintain a logbook, wherein his/her clinical, teaching and research activities through the period of three years of training will be logged. Each candidate shall be required to present evidence of having undertaken research before being permitted to appear in the examination for the degree of DM. This research should be of good quality, which has either been published or is accepted for publication. The evaluation of this research shall be made, by the Board of Examiners appointed by the Dean of the Institute.

The DM examination shall be conducted by a board of four examiners, two of whom shall be external examiners. At least one of the internal examiners would be a Professor. The general scheme of examinations for DM shall be as under:

1. Theory: 3 Papers (3 hours each)
 - i. Physical principles of imaging as applied to neuroimaging.
 - ii. Basic sciences as applied to neuroradiology.
 - iii. Principles & practice of clinical neuroradiology.
2. Practicals: (4 hours)

Practical examination shall include evaluation of two long and four short cases (2 hours) and demonstration of skills of clinical in evaluation & execution of at-least one neuroradiologic procedure to reach a diagnosis (2 hours).

3. Viva Voce (2 hours)

- i. Viva voce examination shall be exhaustive and every effort should be made to evaluate the candidate for his knowledge of neuroradiology including instrumentation, techniques and current concepts & future trends in clinical Neuroradiology.
- ii. This examination also should include evaluation of the candidates' knowledge in application of Neuroanatomy, Neuro-pathology, Neuro-chemistry and Neuro-immunology relevant to clinical neuroradiology.
- iii. Discussion on research work carried out by the candidate and related presentations and publications should be included in the viva-voce.

CARDIO-THORACIC VASCULAR SURGERY (CTVS) — M Ch

SECTION I: PREAMBLE

- A. The M Ch degree is the highest degree under the Faculty of Medicine for which any University/ Autonomous Institute conducts an examination and therefore the Standards for the course in a Super-speciality subject and those of the examination leading to this Degree cannot but be higher than those for the award of the Degree of M.S. and very much higher than those of M.B.B.S. The following regulations have been framed based on these understandings. It may be noted that since Latin words are frequently found in the medical literature, two Latin words have been used for expanding M Ch.
- B. As per Section of the Indian Medical Council Act, 1956, as amended by the Indian Medical Council (Amendment) Act, 1993, no medical college shall open a new or higher postgraduate course of study or training except with the previous permission of the Central Government obtained in accordance with the provisions of that Section. Keeping this in mind, due care has been taken to ensure that the Syllabi and Regulations to follow are in harmony with the Recommendation of the Medical Council of India on Postgraduate Medical Education.

SECTION II: REGULATIONS AND SYLLABI

A. NOMENCLATURE OF THE DEGREES

M Ch : MAGISTER CHIRURGIA

B. SUBJECT

CARDIO-THORACIC VASCULAR SURGERY

C. PRE-REQUISITES

1. Only the department, defined as an independent academic entity of a teaching institution, having the following minimum facilities shall be permitted to commence a postgraduate training programme to qualify for the award of the M Ch degree of any University/autonomous Institute.

2. FACULTY:

- a) Every faculty member shall possess a postgraduate qualification in the subject concerned. The degree must be recognised by the Medical Council of India for inclusion in its 1st Schedule. The status of any other degree as equivalent thereto shall be determined by the concerned University/autonomous Institute, after referring the matter to its Board of Studies for the Super-specialities.
- b) Each department training candidates in the subject of Cardiovascular-Thoracic Surgery shall have a minimum of 3 Faculty Members as under:

Professor : 1
Associate Professor/Reader/Assistant Professor/Lecturer : 2
- c) Out of these three faculty members, atleast 2 must be Postgraduate Teachers possessing 7 years or more of teaching experience (including the period spent in training in the concerned subject, following successful completion of the postgraduate course in the appropriate Board-Speciality); provided that atleast 2 years of such teaching experience have been acquired after obtaining a degree in Cardiovascular-thoracic Surgery.

3. OPERATING DAYS:

A Cardiovascular-thoracic Surgery department admitting upto 2 postgraduate students in a year must have atleast 3 full Operating Theatre Days per week earmarked for elective surgery. The number of Operating Theatre Days shall be a minimum of 4 per week if the department admits 3 or 4 postgraduate students per academic year. More importantly, the minimum number of major operations performed per year by the department admitting upto 2 Postgraduate students in a year shall be as follows:

Cardiac operations : 200
(including atleast 100 open-heart procedures).
General Thoracic Operations : 50
Vascular : 50

The above cited numbers shall be proportionately more depending on whether the department admits 3 or 4 students per year.

4. BED STRENGTH

Any department to be recognised for training in Cardiovascular-thoracic Surgery must have a minimum of 25 beds, including not less than 7 beds earmarked for patients of paediatric age group.

D. NUMBER OF STUDENTS TO BE ADMITTED

1. A department having the minimum facilities cited above can admit upto 2 postgraduate students in an academic year.
2. A department having 40 beds or more, with atleast 10 beds earmarked for paediatric patients, and 5 or more Faculty Members, out of which atleast 4 are recognised Postgraduate Teachers, can admit upto the maximum of 4 postgraduate students in an academic year.

3. Under no circumstances this ceiling on students' number shall be exceeded.

E. SELECTION PROCESS

1. The selection shall be made based strictly on merit and aptitude for the concerned Super-speciality subject, without any consideration of caste, community, language, religion or domicile.
2. All seats shall be filled through an open selection process which shall consist of four steps as under:
 - a) Preselection Assessment of Carrer
 - b) Written Test
 - c) Departmental Assessment
 - d) Final Grand Interview Assessment & grading of each student can be determined by the concerned institution.

F. TRAINING PROGRAMME

1. To qualify for the award of the M.Ch. degree, either of the undermentioned two streams of training programme shall be followed:
 - a) Higher Postgraduate (Postdoctoral) Course of 3 years.
 - b) Post-undergraduate (Post MBBS) Course of 6 years.
2. POSTDOCTORAL COURSE:
 - a) Eligibility Criteria:
 - i) A candidate applying for a postdoctoral course, shall have obtained the degree of M.S., (General Surgery) of any of the Indian Universities/autonomous Institute recognised by the Medical Council of India for inclusion in its 1st Schedule. The status of any other degree as equivalent thereto shall be determined by the admitting University/autonomous Institute, after referring the matter to its Board of Studies for the Super-Specialities.

Provided that Membership of the National Academy of Medical Sciences (M.N.A.M.S.) shall be considered equivalent qualification, only if it has been granted on the basis of the results of a duly held examination attached to a medical college or autonomous institute for atleast one year during or after the completion of the training period prescribed by the

G I SURGERY — M Ch

This curriculum was devised so that at the end of 3 years of training in the Department of G I Surgery, a resident would be conversant with all the complex gastrointestinal surgical problems and in addition would be able to manage complex abdominal, alimentary tract and hepatobiliary diseases independently with a high degree of competence. To achieve a high degree of surgical and clinical skill, a resident requires to be proficient with both the theoretical and practical aspects of gastrointestinal diseases. With this aim the curriculum which is followed at All India Institute of Medical Sciences, is elucidated below. The training period consists of three years duration. Each candidate undergoes a stepwise training programme as mentioned below:

Ist Year

- Clinical exposure with bed responsibilities
- Ist on call duties (house man) - in patients only.
- Exposure to intensive care and artificial respiratory support with ventilators.
- Academic work - Journal Club/Topic discussion
- Protocol submission for research projects
- Surgical work - mainly as an assistant in all surgical procedures-emergency + elective. In addition he is allowed few operations under supervision.

2nd Year

1. Ward responsibilities + out patients (supervision of Ist year residents).
2. Project work
3. Perform emergency and elective operations as specified below.
4. Academic presentation - topic discussion/journal clubs/ grand rounds and case conferences.
5. Surgical work as outlined in the table.

3rd Year (1st Half)

1. Ward responsibilities similar to 2nd year + out patients (supervision of 1st year).
2. Emphasis on completion of projects/data analysis.
3. Academic work -as before along with intra department clinical case presentations.
4. Expected to perform major abdominal operations independently (as outlined in the table).

3rd Year (2nd Half)

1. Ward responsibilities (lesser duties) + out patients.
2. Submission of research projects.
3. Clinical case presentation - 3 times/ week along with topic discussion.

Surgical work as before.

The details of curriculum are further described in the following headings:

1. **Theory Syllabus**
2. **Clinical training**
3. **Surgical training**
4. **Academic activities.**
5. **Research and publication**
6. **Intra-departmental resident evaluation**
7. **Degree Qualifying Examination**

1. THEORY SYLLABUS

Each resident is expected to acquire a thorough theoretical knowledge of the organs of the GI tract as regards anatomy, physiology, pathology of various diseases congenital/acquired/traumatic vascular/neoplastic and their detailed principles of management both medical and surgical. For the management of malignant diseases, the candidates are supposed to be acquainted with general oncological principles, various investigative approaches and different modalities of adjuvant treatment employed (e.g. chemotherapy, radiotherapy, immunotherapy etc.).

a. Oesophagus

Anatomical detail, physiology of swallowing, esophageal manometry, pilmonitoring, endoscopic ultrasound and other diagnostic techniques, brush cytology, vital staining, contrast imaging and CT scan, congenital lesions (TOF), Zenker's diverticulum, epiphrenic diverticulum, esophageal trauma, rupture-spontaneous or introgenic, corrosive burns- detection, evaluation and management, esophageal motility disorders, Gastro esophageal reflux disease, achalasia. Barrett's esophagus, esophageal cancer- adeno & suarmous, various esophageal operations-diverticulotomy, excision of leiomyoma, oesophagostomy, myotomy,

fundoplication, oesophageal resection (Ivor Lewis, Mc Keown, Transhiatal). cervical exploration, oesophagogastronomy, gastric pull-up, gastric and colonic bypass, complications of oesophagectomy, management of chylothorax.

b. Stomach and Duodenum

Anatomical details, physiology of gastric secretions, gastroduodenal motility, diaphragmatic hernia (congenital and acquired), volvulus, pyloric stenosis in children and adults, Foreign bodies (bezoars), stomach trauma, H.pylori in gastric diseases, peptic ulcer, Zollinger-Ellison syndrome, NUD, Gastric tumours, gastric surgery-vagotomy pyloric drainage, gastrojejunostomy, bariatric gastric tube creation, R-en-Y oesophagojejunal anastomosis, postgastrectomy syndromes and complications.

c. Biliary System

Detailed anatomy, bile physiology, enterohepatic circulation, acute cholecystitis, chronic cholecystitis, acalculus cholecystitis, gallstones-pathogenesis and presentation, CBD stones. CBD stricture, cholangitis, sphincter of Oddi (SOD) dysfunction and biliary dyskinesia, cholelithiasis, postcholecystectomy syndromes, choledochal cyst, polyps of GB, carcinoma of gall bladder, cholangiocarcinoma, parasitic infestations of biliary tree, cholecystectomy-open and laparoscopic, CBD exploration and drainage, biliary bypass radical cholecystectomy, choledochal cyst excision, primary sclerosing cholangitis endoscopic biliary interventions and stenting hemobilia.

d. Liver

Segmental anatomy in detail, liver function and tests, liver regeneration, liver failure-diagnosis and management, liver abscess cysts, benign and malignant tumours (HCC, intrahepatic cholangiocarcinoma, hemangioma, FNH adenoma), cirrhosis, PBC, viral hepatitis, radiological imaging modalities (US, CECT, Lipiodol CT, Dynamic CT, MR imaging and radionuclide scanning), percutaneous transhepatic biliary drainage and cholangiography. Liver biopsy, portal hypertension (cirrhotic and non-cirrhotic causes), hepatic venous outflow obstruction, Shunt surgery (Proximal lienorenal shunt, cavoatrial, mesocaval, portocaval-side to side), splenectomy and devascularisation, liver resecting-anatomic and non-anatomic, liver trauma, hepaticojejunostomy, seg III bypass, Orthotopic liver transplantation, liver related transplantation, Caroli's disease, hemobilia.

e. Pancreas

Anatomy, physiology, pancreatic ductal anomalies, acute pancreatitis, chronic pancreatitis-calcific, tropical and alcoholic; endocrine tumours, exocrine tumours of pancreas, cystic neoplasms; pseudocysts of pancreas, haemosuccus pancreaticus; pancreatic operations : pancreatic resection, pseudocystogastrostomy/jejunostomy, pylorus preserving pancreatoduodenectomy, duodenum preserving pancreatic head resections (Frey's, Beger's), distal pancreatectomy, regional pancreatectomy, total pancreatectomy, lateral pancreaticojejunostomy, Whipple's, pancreatic transplantation.

f. Peritoneum, Omentum, Retroperitoneum

Recesses, reflections, subdiaphragmatic spaces, peritonitis primary secondary and tertiary, tuberculosis, mesenteric cyst, pseudomyxoma peritonei, ascites (diag. invest and management), retroperitoneal tumours, inguinal hernia, ventral hernias, peritoneoscopy.

g. Spleen

Anatomy, splenic function, haemolytic anaemias, splenomegaly hypersplenism, splenic trauma, cysts and granulomas, physiological effects of splenectomy, OPSI, splenic vein thrombosis, splenic artery aneurysms, splenectomy, splenic preservation.

h. Small Intestine

Mesenteric vascular anatomy, intestinal physiology, Ladd's band, malrotation, volvulus, hernia, intestinal obstruction, ileocaecal TB, lymphoma, tumours of small intestine, Meckel's diverticulum, intussusception, small bowel gangrene, intestinal resections, lengthening and transplantation, mesenteric ischaemia, short gut syndrome, small bowel fistulae, Crohn's and other inflammatory bowel diseases enteral feeding, home/parenteral nutrition.

i. Colon, Rectum and Anal Canal

Anatomy, physiology, colonic motility, physiology of defaecation and anal continence; Hirschsprung's disease, anorectal malformations, rectal prolapse, SRUS, pseudoobstruction (Ogilvie syndrome), descending perineum syndrome, anismus and constipation, anal incontinence; haemorrhoids, fissure, fistulae and anal stricture; polyps and other benign tumours-hereditary and familial polyposis syndrome, ulcerative colitis and Crohn's amoebic colitis, ischaemic colitis, diverticulitis. lower GI haemorrhage, carcinoma of the colon, rectum, anal canal; Operations-APR, anterior resections, segmental colectomies, pelvic exenterations, colostomy, ureterosigmoidostomy, hemicolectomies, urinary diversions, surgery for anal incontinence, rectal prolapse and complex fistulae, restorative proctocolectomy and ileoanal pouch anastomosis.

j. General Topics

Tumour genetics-oncogenes, tumor markers, systemic inflammatory. Response syndrome (SIRS), multiple organ dysfunction syndrome (MODS), immunology in relation to transplantation and rejection, intensive care and respiratory support, surgical nutrition- parenteral and enteral, iatrogenic complications of surgery like enterocutaneous fistulae, biliary strictures, intrabdominal sepsis/collections, AIDS, hepatitis and surgeons, renal failure, shock, disorders of coagulation, biostatistics, research methodology and surgical audit.

2. CLINICAL TRAINING

The clinical work of a resident involves patient workup and evaluation both indoor and outdoor, day to day patient care both pre and post-operative including intensive care whenever necessary. Once a week combined rounds are held in collaboration with the Department of Gastroenterology with the aim of clinical and teaching discussions. Besides this, the candidate is also required to undergo a rotation in the Department of Gastroenterology (2 weeks) to learn about endoscopic procedures and with Department of Radiology (weeks) to learn about abdominal ultrasounds and other GI radiological investigations.

3. SURGICAL TRAINING

- The candidate is required to maintain a log book which details his surgical experience during his tenure in the department as an assistant, surgeon and supervisor.
- The log book is to be updated on a daily basis and the Head of Department counter checks and

endorses it every 6 months to notice any shortcomings in the residents surgical training.

The procedures that the candidate is expected to assist and perform depends upon the stage of his training tenure and is detailed in table I.

Liver Transplant Programme

Each resident is expected to be conversant with the Departmental protocols (viz.recipient selection and workup, pre-transplant evaluation, Indian brain death law, brain dead donor management - before and during retrieval, donor harvesting procedure, recipient management - operative and post transplant care and follow up).

Residents have been divided into 4 teams each separately responsible for donor retrieval, recipient procedure, bench procedure and operation theatre equipment management (for eg.running the veno-venous bypass, cell saver and organising thromboelastography monitoring along with frequent blood gas and biochemical assays which may be required during the recipient operation).

4. ACADEMIC ACTIVITIES

- By rotation each resident is expected to present 3-4 Clubs and 3-4 topics a year and enter it in the log books.
- Additionally each resident (2nd year onwards) has to participate in one clinical Case Round and one Clinical Grand Round which are presented to the entire faculty.
- 3rd year residents are required to present cases one/week (5th semester) and thrice/week in the final semester.
- By rotation residents are allowed to participate in and attend National and Regional surgical (ASI/ IASG) conferences and symposia. ASI - Association of Surgeons of India. IASG - Indian Association of Surgical Gastroenterology.

5. RESEARCH AND PROJECT WORK

- Each M.Ch. candidate is required to submit 2 research projects (preferably 1 clinical and 1 experimental). The projects should be acceptable to the external examiners and also should be publishable in indexed journals.
- All M.Ch. candidates are required to submit their proposed project protocols, within 6 months of joining the department.
- The final submission is mandatory 3 months prior to the final examination.
- The candidate is allowed to appear in the examinations only after the research projects have been approved by the examiners.

6. INTRA DEPARTMENTAL EVALUATION OF RESIDENTS

- Every 6 months the department conducts an internal examination of the residents designed to test their theoretical knowledge as well as clinical skills. For this purpose the residents take a written theory paper of 3 hrs.duration and also present cases.

- In addition to this, he is also graded and marked for his academic presentations within the department.
- The log books endorsed every 6 months by the HOD also give an idea of each resident's program.
- In addition, the candidates are assessed on day to day basis on clinical ward rounds as well as routine and emergency clinical/operative management of the patients.

7. DEGREE QUALIFYING EXAMINATION

The Degree qualifying examination is held at the end of 3 years after successful submission of research projects/papers. This is conducted in the Department in the presence of 2 external examiners.

- a. Theory examination comprises of 3 papers (3 hrs. and 100) marks each), covering basic sciences, clinical and surgical principles and recent advances with regard to GI Surgery.
- b. Practical examination comprises of :
 - Evaluation of surgical techniques :- Candidate is asked to operate and perform an open abdominal procedure (eg.cholecystectomy)
 - Case presentation 4-5 cases(Total time - 90 minutes)
 - Grand viva.

Surgical Procedures, each Candidate is Expected to Perform or Assist

Esophagus Heller's Operation Fundoplication THE + GPU TTE + GPU Colonic pull up Stomach and Duodenum TV + G.I./Poloroplasty Billroth I & II gastrectomy Radical gastrectomy Small Intestine Resection and anastomosis Ileostomy closure Feeding jejunostomy	Large Intestine Rt hemicolectomy Lt hemicolectomy APR Ant.Resection Restorative Proctocoledctomy Ileal J Pouch and anastomosis Pancreas Pancreatic Necrosectomy Cyto-gastrostomy/jejunostomy Lateral pancreatico-jejunostomy Whipple's procedure	Biliary surgery Open cholecstectomy Radical cholecystectomy CBD Exploration/CDD Hepatico-jejunostomy R-en-y Segment III HJ Portal Hypertension Splenectomy+Devascularisation Proximal Ilenorenal shunt Portocaval/Mesocaval shunt Liver Surgery Major hepatic resection Wedge resections Hydatid cyst excision
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NEUROSURGERY — M Ch

I. M Ch NEUROSURGERY 3 YEAR COURSE FOR POST M S

II. DIRECT M Ch NEUROSURGERY 6 YEAR COURSE

(The committee strongly feels that there should be two streams of programmes)

A. AIM OF TRAINING

The end product should have acquired knowledge, skills, aptitude and attitudes to be able to function as an independent clinician/consultant and a teacher acquainted with research methodology.

OBJECTIVES

The End Product:

1. Should be well acquainted with the current literature on relevant aspects of the basic, investigative, clinical and operative neurosciences.
2. Should have learned indications and performance skills of common neurosurgical operations.
3. Should have acquired performance skills and ability to interpret relevant clinical investigations.
4. Should be able to diagnose, plan investigations and treat common conditions in the speciality by relevant current therapeutic methods.
5. Should be acquainted with allied and general clinical disciplines to ensure appropriate and timely referral.
6. Should be capable of imparting basic neurosurgical training.
7. Should be able to identify, frame and carry out research proposals in the relevant speciality.

B. TRAINING SYSTEM

Exclusively on whole time in service basis, on residency pattern.

C. ELIGIBILITY

Essential

For Direct 6 year course

1. M.B.B.S. degree of an Indian University recognized by the Medical Council of India or any other equivalent degree recognized by MCI.
2. We recommended that during the MBBS course the candidate should have atleast 2 weeks rotation in Neurosurgery and the Neurosurgery related teaching should be taught by qualified Neurosurgeon wherever available.

For Post MS

M S (Gen. Surgery only) degree of an Indian University recognized by the Medical Council of India or any other examination recognized for the purpose by the MCI. During MS Gen. Surgery – candidate should have worked in Neurosurgery for 3 months.

Mode of Selection

Twice a year on All India basis based entirely on merit (by a written test followed by departmental assessment). For written test (MCA type) 75% of questions should be of level of MS (Gen. Surgery) only those acquiring more than 50% marks in the theory would be eligible for departmental assessment. 3 times of the no. of post available should be called for departmental assessment strictly on the basis of merit 70% marks should be for written test 30% of should be for department assessment.

D. TRAINING METHODS

1. Clinical teaching in the OPD, Emergency and Operation theatres. Clinical teaching rounds in Neurosurgery Ward and bed side presentations.
2. Special teaching sessions like Neuroradiology rounds, Neuro-ophthalmology round combined Neurology-Neurosurgery case discussions.
3. Seminars, journal clubs, mortality, morbidity conferences.
4. Treatment planning sessions.
5. Assisting and performing neurosurgical operations.
6. Paper presentations at conferences.
7. Preparation of manuscript for publication.
8. Training in an experimental microsurgical laboratory.

E. COURSE CONTENTS

1. Clinical Neurosurgery including history taking, physical examination, diagnosis, selection and planning of relevant investigations, appropriate treatment and rehabilitation of patients with neurosurgical disorders including those presenting as emergencies.

2. Essentials of clinical Neurology especially with reference to disorders common in India and those likely to present to the Neurosurgeons.
3. Basic medical sciences relevant to the practice of Neurosurgery.
4. Surgical Neuropathology and the essentials of the Pathology of Neurological disorders likely to present to the Neurosurgeon.
5. Performance and interpretation of Neuroradiological procedures, such as carotid arteriography and myelography. Familiarity with the technique of selective arteriography and its interpretation.
6. Principles and interpretation of common Neurophysiological, Neuro-ophthalmological, Neuro-otological and Neuroendocrinological tests especially with reference to Neurosurgical disorders.
7. Principles and interpretation of computerized axial tomography, MRI and other modern investigations.
8. Performance of common neurosurgical operations in the supra and infra-tentorial compartments in the spinal canal and on the peripheral nerves – initially under supervision and later independently. Ability to use the operating microscope is mandatory.
9. Familiarity with various types of anaesthesia used in neurosurgery their indications and contraindications, the use of ventilators and techniques of monitoring and resuscitation.
10. Pharmacology of various drugs used in Neurosurgery.
11. Knowledge of the history of neurological surgery and its allied disciplines with special reference to India.
12. Knowledge of recent advances in the field of neurological surgery.
13. Preparation of papers for presentation at scientific conferences and for publication.
14. Introduction to the techniques involved in the organisation and development of a department, its subsections and newer facilities.
15. It is desirable to have microsurgical laboratory training where candidates learn dissection/suturing of fine arteries/nerves under microscope and skull base dissections.
16. Development of proper attitudes towards patients, subordinates, colleagues and seniors.
17. Should have basic knowledge about application of computers.

F. TRAINING ON SUB-SPECIALITY OF NEUROSCIENCES

Neuro-Anaesthesiology

There should be a didactic lectures which may be a common programme for the Neurology and Neurosurgery postgraduates. The major thrust in these would be the resuscitation management of coma, life-support systems and monitoring of patients. The Neurosurgery trainees would have additional requirements in which they should know the interaction of anaesthetic drugs with systemic diseases and neurosurgical disease conditions and for this few more didactic lecture would be required. The major thrust would be on continuing training for the Neurosurgery trainees in the operation theatre as a result of the informal discussions which would be taking place during the training period.

Neuroradiology

Combined Neuroradiology rounds or meetings twice or thrice a week.

Clinical Neurology Neurophysiology

Candidates should have 2 months (1 month in the beginning and 1 month in the middle of course) training under Neurology department to familiarize themselves regarding common neurological disorders. During this period candidate should also familiarize themselves with the technique and interpretation of EEG/EMG/NCV and evoked potentials.

Neuropathology

It is suggested that there should be a 4 week capsuled training for Neurosurgery trainees or regular once a week Neuropath conference in which they should be familiarized with the techniques of grossing, staining procedures, brain cutting, autopsy methods and tissue processing including frozen sections and should be able to identify histological features of the common neurosurgical disorders.

In regard to weightage in the examination it is felt that it should be five percent of the theory and the practical examination.

Neuro-Biochemistry, Neuroimmunology

In regard to both above it is felt that there should be a capsuled course of didactic lectures which should run every alternate year or so to familiarize the trainees with the elements and techniques of neuro-chemistry and neuro-immunology.

In these subjects it was felt that a total weightage of 1-2% questions of theory and practical should be there.

G. VISIT TO OTHER INSTITUTIONS

Candidate in 3rd year (Post MS) and in 5th year (Post MBBS) should visit other neurosurgical centers recognized by MCI for about 4 weeks to be able to observe difference in approaches to various neurosurgical problems.

It is desirable to have training in certain special areas to be arranged outside the institute, when necessary like micro surgical lab training if not available within the deptt.

For 6 yrs. candidate should spent about 1 yr. in Gen. Surgery including plastic surgery/ortho/pediatrics surgery to learn the basic principles of Gen. Surgery and to have exposure to the common problems in the above fields.

H. ESSENTIAL PRE-REQUISITE FOR APPEARING FOR M Ch (NEUROSURGERY) EXAMINATION

1. Logbook of work done (surgical procedures performed/assisted case presentation and other academic activities): rotations, internal assessment report.
2. Publications (a) paper on review of available clinical material from the department.

3. One laboratory oriented project/prospective research related to Neurosurgery/thesis completed in all respects for publication preferably published.
4. Attendance, as per laid down rules of the Institute.

I. EVALUATION OF M Ch (NEUROSURGERY)

1. Internal assessment – 20% weightage

To be done by all teachers concerned in the training of the candidate both inside and outside the parent department independently and entered into log book on a standard marking system (see infra). The course director will average out and put the final evaluation.

2. Theory Papers – 30% weightage

(equally distributed for each paper)

Minimum pass marks 50% in each paper.

Timing of Examinations

- a) Part I – at the end of 2 yrs. for 6 yrs. course on General Principles of General Surgery and basic neurosciences.
- b) Part II – at the end of 36 months of training (for post MS) and at the end of 6 yrs. for direct M Ch course. Three papers – Basic Neurosciences (applied), Clinical Neurology and Neurosurgery, advances and operative Neurosurgery.

3. Practical Examinations

Total weightage 50%

Distributed as follows:

- a) Clinical - 20%
- b) Operative demonstration for M Ch - 20%
- c) Radiology, Pathology and general viva - 10%

Minimum pass marks 50%

J. MINIMAL REQUIREMENTS OF TRAINING UNIT FOR M Ch NEUROSURGERY

1. Separate 30 bedded department with an OPD and casualty attendance of at least 1000/year attached with or having access to a well equipped general hospital with casualty services and investigative facilities, with well equipped departments of biochemistry, pathology, microbiology, ophthalmology, otorhinolaryngology, general medicine, paediatrics, behavioural sciences, forensic medicine and neurology.
2. The radiology department would provide required support and should be equipped with skull table, myelography table, image intensifiers and facilities for selective angiography. Facilities for intervention radiology, DSA, CT scan, MRI and Ultrasonography are desirable. The availability of 2 trained neuroradiologists is desirable.

3. The department of anaesthesiology would provide the required support. The availability of at least 2 trained neuroanaesthesiologists is desirable.
4. There should be access to a separate operation theatre(s) and intensive care area of at least 3 beds. In addition to the usual neurosurgical equipment it should have operating microscope, bipolar cautery, microsurgery instruments, image intensifiers and monitors, etc.
5. Department of Pathology would provide the required support including autopsy facilities, the availability of 2 fully trained Neuropathologists is desirable.
6. There should be a faculty of 3 persons with one of them atleast 10 years teaching experience.
7. For every recognized teacher two candidates may be taken for training per year, subject to a maximum of 1 trainee per 4 beds at any given time.

PAEDIATRIC SURGERY — M Ch

A. INSTRUCTIONAL GOALS

At the end of the training the candidate should have acquired knowledge, abilities and attitudes to be able to function as a pediatric surgeon in a teaching/non teaching hospital with confidence and competence to diagnose and manage surgical conditions of infancy and childhood. He would also have acquired skills to identify, plan and carry out surgical treatment and the ability to transfer knowledge and skills of his speciality and thus fulfil the function of a teacher.

B. INSTRUCTIONAL OBJECTIVES

At the end of the course the student should have acquired:

- i) A broad understanding of the principles of basic sciences related to Paediatric Surgery.
- ii) Ability and skills to perform and interpret investigative procedures relating to his speciality.
- iii) Skills in the clinical diagnosis and management, with capabilities to take independent decisions in emergency situations, perform major paediatric surgical operation and guide postoperative treatment and manage complications, thereof.
- iv) Competence in intensive care of newborn infants before and after surgery with practical knowledge of working with resuscitative and monitoring equipments.
- v) Ability of self learning critically appraise published literature, interpret data and to broaden his knowledge by keeping abreast with modern developments in Paediatric Surgery.
- vi) Ability to identify, outline and initiate research projects relating to his speciality and draw relevant/pertinent scientific conclusions.
- vii) Ability to search online, use information technology to his advantage, and critically evaluate medical literature and draw own conclusion.
- viii) Ability to impart instructions and transfer knowledge and skills to postgraduates and undergraduate and nursing students in the basic management of surgical diseases of infancy and childhood.

- ix) Necessary knowledge of basic pediatric health care and principles of management of common ailments of childhood.
- x) Keep abreast of Government's latest policies and procedures as related to health care.

C. SYLLABUS

- I. General knowledge of basic medical sciences as applied to Paediatric Surgery:
 - 1.1 Developmental Anatomy and physiology.
 - 1.2 Applied and regional anatomy.
 - 1.3 Physiology as applied to children.
 - 1.4 Neonatal physiology, metabolism and pathology.
 - 1.5 General pathology-with special emphasis on paediatric conditions.
 - 1.6 Pharmacokinetics in paediatric and neonates.
 - 1.7 Biochemical and metabolic considerations related to paediatric surgery.
 - 1.8 Foetal anatomy physiology and pathology.
- II. Growth & Development.
- III. Genetics as applied to surgery: parent counselling.
- IV. Knowledge of common Paediatric medical conditions and their treatment.
- V. Neonatal surgery.
- VI. Etiology and treatment of congenital malformations.
- VII. Organisation of intensive care unit, referral & transfer services.
- VIII. Specialised investigative procedure : technique and interpretation of results.
- IX. Pathology of surgical conditions of childhood and broad knowledge of microscopic appearances.
- X. Systemic and Regional paediatric surgery. Including Paediatric Urology, Plastic Surgery thoracic and neurosurgery etc.
- XI. Paediatric operative surgery.
- XII. Trauma in children-including burns.
- XIII. Malignancy in childhood – knowledge of antineoplastic drugs and radiation therapy.

There are some items common to the teaching of Pediatrics and can be jointly taken up. Similarly rotation through Paediatric, Newborn ICU and genetics should be planned.

D. RESEARCH WORK

The candidate should carry out research during the period of training for M Ch. However, the department should see that the work is of a satisfactory quality and completed well in time for the M Ch examination. The research work can be submitted either in dissertation form or a manuscript ready for publication, if not already accepted for publication.

CURRICULUM FOR M Ch COURSE IN PAEDIATRIC SURGERY

The list below is only a guideline and not comprehensive

All candidates admitted to the 3 years and 6 years M Ch course in paediatric surgery should be proficient in the following areas at the end of the training period.

A. Basic Sciences

Ethics

Molecular biology (relevant to Pediatric Surgery)

Genetics (relevant to Pediatric Surgery)

Embryology Growth & Development

Fetal medicine (diagnosis and management of Surgically correctable lesions)

Physiology as applicable to surgery (including neonatal physiology, Monitoring, acid-base etc.)

Respiratory physiology (including ventilatory support)

Metabolism and nutrition (including principles and practice of parenteral nutrition)

Haematology (including coagulation defects and transfusion medicine)

B. Training of Surgery

B (I). Neonatal Surgery

Special Anatomy and Physiology as applicable to fetus and newborn

- Surgical technique
- Pre and post operative management
- Ventilatory/respiratory care
- Monitoring
- Investigative Procedures

B (II). General Paediatric Surgery

Wound healing

Infections and sepsis

Organ transplantation

Anesthesia (including pain relief)

Trauma (including burns)

Head and neck (excluding ophthalmic and otorhinolaryngologic disorders)

Abdomen

Umbilicus
Abdominal wall
Hernia
Testis
Adrenals

Vascular Malformations

Hemangioma
Lymphangiomas
Peripheral arterio-venous disorders

*Soft Tissue Lesions**Twinnig**Oncology***B (III). Imaging Techniques**

Including ultrasound, conventional and specialized Radiology and nuclear scans MRI (Knowledge of radiation biology).

Gastroesophageal reflux
Meconium ileus
Disorders of rotation and fixation
Intestinal obstruction due to various causes
Short bowel syndrome
GI bleeding
Ascites
Necrotising enterocolitis
Inflammatory bowel disease
Peritonitis, other infections
Stomas
Constipation
Obstructive and hemolytic jaundice

B (IV). Genitourinary Tract

Anatomy and physiology
Congenital anomalies
Kidney

Ureter
Bladder
Urethra
Renal
Bladder

Adrenal

Obstructive uropathy
Vesicoureteral reflux, Megaureter
Urinary tract infections
Urinary lithiasis
Renal vein thrombosis, renovascular hypertension
Urinary diversion and undiversion
Functional disorders of bladder
Hypospadias and epispadias
Other disorders of urethra, penis and scrotum
Ambiguous genitalia
Female genital tract
Endoscopy, laparoscopy
Urodynamic studies

B (V). Gastrointestinal, Pancreatic, Hepatobiliary

Anatomy and physiology

Congenital anomalies

Esophagus
Stomach
Small bowel
Large bowel
Anorectum
Liver and biliary tree
Pancreas
Spleen

Esophagus

Esophageal burns, strictures, replacement
Esophageal manometry and pH studies
Gastroesophageal reflux

Meconium ileus
Disorders of rotation and fixation
Intestinal obstruction due to various causes
GI Bleeding
Ascites
Necrotising enterocolitis
Short Bowel syndrome
Inflammatory bowel disease
Peritonitis and other infections

Tumors

Gastrointestinal
Hepatobiliary
Pancreatic

Portal Hypertension
Anorectal manometry
Endoscopy and Laparoscopy

B (VI). Thoracic

Anatomy and Physiology
Chest wall deformities
Congenital Malformation
Tumors
Chest wall
Mediastinal
Lungs and pleura
Infection of lung and pleura
Foreign bodies
Airway

Congenital Malformations

Breast
Chest wall
Diaphragm
Mediastinum
Aerodigestive tract
Lungs
Disorders of breast

B (VII). Surgical staplers & Endoscopy***B (VIII). Plastic Surgery***

Principles, anatomy (relevant)
 Burn management and sequele
 Cleft lip and Palate,
 Choanal Atresia
 Syndactyly
 Skin graft, flap rotation, z-plasty

B (IX). Neurosurgery

Anatomy and physiology of brain, CSF pathways and spine
 Hydrocephalus
 Cranio-spinal dysraphism and sequele
 Craniofacial deformities

B (X). Oncologic Surgery

Physiologic effects mode of actions, synergism of chemotherapy

- Biopsies
- Curative/palliative resections
- Use of CUSA and Argon laser
- Administration of chemotherapeutic agents, monitoring and management of their complications.

C (I). Educational methods/

Lectures

C (II). Teaching experience

Demonstrations

Case discussions

Journal clubs

Seminars

C (III). Research methods

Projects leading to the degree

- Clinical
- Experimental
 - small animal
 - laboratory based

Other projects

Clinical case studies

Epidemiologic studies

Statistical methods

Literature search,critical
Of published

C(IV). Assessment/evaluation of performance

Day to day performance
Academic exercises
work
Outpatient/special clinics
Operation theatre
End term assessments
(at the end of each semester)
Final examination

C (V). Attitudes

- Punctuality
- Behaviour
- Keeness
- Motivation and initiative
- Reliability
- Aptitude for research

UROLOGY — M Ch

PREAMBLE

The objective of M Ch (Urology) degree course is to produce highly competent medical manpower in Urology. The training ingredients should provide in-depth knowledge of the entire urology and relevant basic allied subjects. The course is expected to bring about a change in attitude towards better scientific approach with logic and analysis. More stress should be given to development of psychomotor skills. This should culminate in shaping of a shrewd clinician, confident surgeon and a knowledgeable teacher insured to basic research methodology. Basis of an ideal training programme will be a powerful urology service complete in every sense. Today, a urology-teaching department should include complete adult and pediatric urology services with fully developed subspecialties such as gynaecologic urology, uro-oncology, neuro-urology, andrology & sexual dysfunction, newer modalities of stone management like endourological techniques and extracorporeal shock wave lithotripsy and renal transplantation.

ELIGIBILITY

M S in (General Surgery) from any recognized University or its equivalent qualifications recognized by the Medical Council of India.

SYLLABUS

It will cover wide spectrum of the diseases of urogenital system & retroperitorium. Apart from the clinical aspect of these subjects, candidate has to acquire indepth knowledge of the related basic subjects like applied; anatomy; embryology, physiology; biochemistry, pharmacology; pathology, microbiology epidemiology, immunology etc.

1. Anatomy and Embryology of GU tracts, adrenal & retroperitoneum.
2. Applied physiology and biochemistry pertaining to Urology, Nephrology, renal transplantation and renovascular hypertension.
3. Investigative urology & Genito-urinary radiology and imaging including nuclear medicine.
4. Male Infertility, Andrology and Urological endocrinology.

5. Sexual dysfunction- investigations and management.
6. Perioperative care, management of urological complications and care of the critically ill patients.
7. Urodynamics and Neurology.
8. Genito-urinary trauma.
9. Urolithiasis-Medical, Biochemical & Surgical aspects.
10. Uro-oncology-Adult & Paediatric
11. Reconstructive Urology.
12. Paediatric Urology-congenital malformations and acquired diseases.
13. Urinary tract infections and sexually transmitted diseases.
14. Obstructive Uropathy.
15. Renal transplantation (including transplant immunology medical & surgical aspects).
16. Renovascular Hypertension.
17. Gynaecological urology.
18. Newer developments in urology.
19. Operative Urology-open & endoscopic
20. Endourology
21. Behavioural and social aspects of urology.
22. Neonatal problems in Urology.
23. Electrocoagulation, lasers, fibre optics, instruments, catheters, endoscopes etc.
24. Retroperitoneal Diseases & Management.
25. Medical aspects of the kidney diseases.
26. Laparoscopic Urologic Surgery.

Apart from above mentioned subjects, each candidate should have basic knowledge of the following:

1. Biostatistics & Epidemiology.
2. Computer Sciences.
3. Experimental & Research methodology and Evidence Based Medicine.
4. Scientific presentation.
5. Cardio-pulmonary resuscitation.
6. Ethics in medicine.

TRAINING & TEACHING METHODOLOGY

Besides didactic lectures (delivered by the faculty members, national & international visiting teachers, seminar symposium and journal clubs is to be organized. Problem oriented training to be given in the form of case discussions, ward rounds, inter-disciplinary meetings and department statistical meetings. Every candidate is supposed to discuss a minimum of 2 clinico-pathological conferences. Practical training is to be imparted by full time residency training programme, where a trainee will be given full responsibility of the patients. He will be encouraged to improve and develop his decision-making ability under supervision of teachers.

Research

Each candidate has to carry out two dissertation or studies for thesis, which should be acceptable for publication in a Indian Journal or any International Journal.

1. Experimental Research Project – One
May be a) Animal lab work or
b) Associated with a Basic science Dept.
2. Clinical Research Project – At least one

TRAINING IN OPERATIVE UROLOGY

Special attention to be paid to improve the operative skill of the candidate. He shall be trained to take independent operative decisions. In a time bound schedule an opportunity will be accorded to perform all the major open as well as endoscopic procedures so as to let him develop mastery in the essential procedures. Candidates will be required to maintain a logbook of operative procedures with details of complications, if any, and their management. This will be reviewed every three months. Completed logbook is to be submitted before the practical examination and will be reviewed by the external examiners.

First Two Years

Each Candidate should spent time for basic research specially related to animal laboratory or in collaboration with basic department i.e. biochemistry, biotechnology and ratholog.

0-6 Months

A candidate is supposed to master following procedures.

1. Cystourethroscopy, filiform, dilatation, retrograde pyelography. Interpretation of normal and abnormal findings in relation to gross inflammations, obstructive and neoplastic changes in the lower urinary tract.
2. **Minor Urological Procedures:**
Needle biopsy of the prostate, dilatation, trocar cystostomy, open cystostomy, orchiectomy, circumcision, meatotomy/Meatoplasty Arterio-venous shunts, Excision of urethral caruncle.
3. **Uro-Radiological & Imaging Techniques:**
During this period a candidate should perform various uroradiological & Imaging procedures like Retrograde Urethrograms & Micturating, Cystourethrogram, cystogram, triplecystogram,

nephrostogram, Whitaker test, sinogram, vasoseminography, antegrade pyelography, interpretation of Ultrasound & computerized tomography's scans and renography, renal angiography including Digital Substraction Angiography & venography.

06-09 Months

A candidate should learn, perform and interpret urodynamic studies like Cystometrogram, electro myography & Urethral pressure profile & Video urodynamics. He will also perform and interpret various tests of sexual dysfunction such as dynamic cavernosography, papavarin test, Penil-Brachial Index, Nocturnal penile tumescence, regiscan, sacral latency period and other evoked potential studies.

9-23 Months

He will assist and perform following procedures.

(a) Endoscopic Surgery:

Internal urothrotomy, Bladder neck Incesion, Litholopaxy, cystolithotripsy, insertion & retrieval of bladder & ureteral stent, ureteral meatotomy, endoscopic suspension of bladder neck, Transurethral resection of bladder tumour.

(b) Surgical Procedures:

Simple nephrectomy, radical nephrectomy, cystolithotomy ureterolithotomy, pyelolithotomy, nephrostomy, pyeloplasty, various urethroplasties. Retropubic & a transvesical prostatectomy, surgery for underscended testis, partial and total amputation of penis, extended pyelolithotomy, VVF repair.

24-36 Months

Open Surgery

Candidate should learn more complex surgical procedures like-transpubic urethroplasty, Hypospadias repair, Augmentation cystoplasty, Anatomic Nephrolithotomy under hypothermia, Boari's flap procedure, exstrophy closure, urinary diversion, ureteroneocystostomy, partial and total cystectomy, nephroureterectomy, penile prosthesis, Artificial urinary sphincter, Microsurgical Vasoepididmostomy, and vasovasostomy,. Undiversion, Renal transplant surgery and AV fistulae, retroperitoneal lymphadenectomy.

Endoscopic Procedure

Trusurethral resection of prostate, percutaneous nephrolithotomy, Uretero-rensoscopy, Laser Surgery, other endourological procedures etc.

Efforts will be made that candidate is able to perform the following minimum stipulated number of procedures within three years of his training.

1. Endoscopies	100
2. Urethroplasties	5
3. Internal urethrotomy	20
4. Internal tract reconstructions	10
5. Repair of vesicovaginal fistulae	5
6. Pyeloplasties	5

7. Hypospadias repair	5
8. Transurethral Resection of Prostate	25
9. Uretero-Renoscapy	25
10. Percutaneous Nephrolithotomy & endopyelotomy	15
11. Donor Nephrectomies	5
12. Receptient Surgery	2

In addition to above mentioned procedures candidates will perform/assist minimum of two or five of each of following procedures depending upon the availability of the case material

- Nephrectomy for pyonephrosis-Surgical treatment of stress urinary incontinence
- Radical Cystoprostatectomy
- Radical Nephrectomy
- Ureteroneocystostomy
- Retroperitoneal lymphnode dissection-Ileal replacement
- Different type of Urinary diversion of orthotopic Neobaldder- Surgical management of Renal and Urethral trauma
- Transpubic urethroplasty
- Augmentation cystoplasty
- Nephroureteractomy – Undiversion
- Anatrohic Nephrolithotomy
- Laparoscopic Urologic Surgery
- Paediatric surgical procedures.

In course Training

Since it will be a full time residency cum M Ch course, a candidate will be responsible for the total care of the patients. He will be encouraged to take independent decisions. Every day there will be atleast one hour academic activity to a maximum of 10 hours/week in which all the faculty members & residents will participate. Case discusser will take place weekly with 3rd year resident as a moterator.

Other academic activities like journal clubs, seminars, group discussions statistical meetings will be a fortnightly feature where deaths, complications, operations and consultations rendered will be discusse.d consultation to the other department and in emergency will only be attended by the IInd & IIIrd year Senior Residents. Consultations given to other departments should also be discussed every morning with the respective consultants. In OPD a candidate will see the cases independently and will make all the pertinent notes. In problematic cases and a special referral, it is mandatory to show the case to the respective consultant. A candidate will not be allowed to provide independent consultations for first six months.

A candidate will have to attend all postmortem examination done for the department.

Interdepartmental meetings like uro radiology, uronephrology, uro radiotherapy & medical oncology, uro pathology, uro imaging will provide an opportunity for open discussion on a common subject and it will also provide an opportunity to learn views of the specialists on these subjects.

Posting

A candidate will be sent to Nephrology department for one month to learn medical aspect of Kidney diseases (except the renal transplantation). This posting should be after one to 1.1/2 year after joining the course.

It is highly desirable to formulate a reasonable teaching curriculum for this posting and a candidate is to be evaluated by the Nephrologist at the end of the posting. An unsuccessful candidate has to repeat his posting.

Exchange Programme

In view of expanding field of urology, it is difficult to see, observe and have training in all newer subspecialties. Therefore, it is imperative to include exchange programme and resident should be rotated to two or three centers as per advise by the department committee. It is also suggested that department weak in some subspeciality should invite visiting professor from other centers to strengthen the course.

BOOKS AND JOURNALS

The following books, journals and periodicals should be made available through Central/Departmental Library for perusal of residents so as to enable them to keep abreast with latest developments in the field of Urology. It is also important that department should have an Internet facility which would enable residents to browse and use medline search.

General Urology

<i>Book</i>	<i>Editor</i>
1. Campbell urology-3 Volumes Edited by	Walgh, et al
2. Scientific Basis of Urology	Mundy
3. Current Urological Therapy	Kaufman
4. Obstructive Uropathy	O'Reilly
5. Urogenital trauma	Macaminch
6. Text book of Urology	Whitefield & Hendry
7. Adult & Paediatric Urology	Gillenwater et al

Paediatric Urology

1. Pediatric Urology	Kelalis & King – 2 vol.
2. Paediatric Urology	Whitakar

Uro-oncology

1. Genito-urinary cancer management	Backeman & Paulson
2. Genitourinary cancer	Dekerrion et al
3. Testicular cancer	Javadopor

Urodynamics

- | | |
|-------------------------------------|---------------|
| 1. Urodynamics principle & practise | Mundy |
| 2. Controversy in Neurourology | Barret & wein |
| 3. Neurourology & urodynamics | Bradly & Hald |

Stone Diseases

- | | |
|--|--------------------------------|
| 1. Stone disease | Diagnosis & management by Rous |
| 2. Endourology | Clayman et.al |
| 3. Endourology | Carson |
| 4. Extracorporeal shock want Lithotripsy | Gravernstein |
| 5. Endourology | Arthur Smith |

Infertility

- | | |
|------------------------------------|--------|
| 1. Male Infertility | Amelar |
| 2. Reproductive infertility | Silber |
| 3. Microsurgery in male and female | |

Reconstructive and Female Urology

- | | |
|------------------------------------|-------------------|
| 1. Operative Gynaecology | Te Linde |
| 2. Female urology | Blandy |
| 3. Urinary Incontinence | Dat. D.O.'Donnel |
| 4. Urogynaecology & urodynamics | Obstargard & Bent |
| 5. Reconstructive urologic surgery | Libertino |

Renal Transplantation

- | | |
|-------------------------------------|-------------------|
| 1. Kidney transplantation | Peter morris |
| 2. Renal transplantation | Garovoy & Guttman |
| 3. Introduction to Dialysis | Logan |
| 4. Vascular arress in Haemodialysis | Bell et Al |

Operative Urology

- | | |
|-----------------------------|--------------|
| 1. Glen's operative urology | |
| 2. Urologic Endoscopy | Bagley et al |
| 3. Transurethral surgery | Maurmayer |

Laparoscopy

- | | |
|--|----------------------------------|
| 1. Laparoscopic urology | Ralph V. Clayman, E.M. McDougall |
| 2. Urologic Laparoscopy | Sakti Das |
| 3. Laparoscopic Urologic Surgery | A.K. Hemal |
| Uroradiology- Emmett's –Witten-Clinical Uroradiology 3 volumes | |

Journals

- Indian J. Urology
- Journal of Urology
- British J. Urology
- Neurourology & Urodynamics
- Urology (Gold Journal)
- European Urology
- Urologia internationalis
- Scandinavian J. Urology & Nephrology
- Transplantation
- Transplant Proceedings
- Urological Research
- Urologic Radiology
- World Journal of Urology

Periodicals

- Urological clinics of North America
- Seminars in Urology
- Controversy in Urology
- Recent Advances in Urology
- Year Book of Urology
- Modern Trend in Urology